# Board interlocks and the propensity to be targeted in private equity transactions ☆

Toby E. Stuart *, Soojin Yim

[a] Harvard Business School, Soldiers Field, Boston, MA 02163, USA

A B S T R A C T

We examine how board networks affect change-of-control transactions by investigating whether directors' deal exposure acquired through board service at different companies affect their current firms' likelihood of being targeted in a private equity-backed, take-private transaction. In our sample of all US publicly traded firms in 2000–2007, we find that companies which have directors with private equity deal exposure gained from interlocking directorships are approximately 42% more likely to receive private equity offers. The magnitude of this effect varies with the influence of directors on their current boards and the quality of these directors' previous take-private experience, and it is robust to the most likely classes of alternative explanations—endogenous matching between directors and firms and proactive stacking of board composition by management. The analysis shows that board members and their social networks influence which companies become targets in change-of-control transactions.

© 2010 Elsevier B.V. All rights reserved.

## 1. Introduction

A large body of literature has examined the monitoring and advisory roles of boards, as well as how board characteristics affect firm value. Recently, a number of papers have extended this work to gauge the ramifications of social relationships among board members. One subset of this work studies social ties between boards and Chief Executive Officers (CEOs), finding that such connections enhance a board's advising ability but possibly at the cost of diminished efficacy in its monitoring function

(Kramarz and Thesmar, 2006; Schmidt, 2008; Hwang and Kim, 2009). Another subset investigates the effectiveness of boards made up of directors who hold multiple board seats. This work suggests that boards with more "interlocked" directors could be poor monitors either because directors' independence is compromised (Hallock, 1997; Fich and White, 2003; Larcker, Richardson, Seary, and Tuna, 2005) or because board members are simply too busy to keep a watchful eye on management (Fich and Shivdasani, 2006).

Investigating the governance implications of directors' social ties is a natural extension of the corporate governance literature. However, a second perspective on the role of directors' social networks has received less attention in the corporate finance literature: the board network as a means for information transmission. Sociologists have long viewed each company's board as a node in a firm-to-firm network (overall, the board interlock network) that arises because a large fraction of public company directors are either directors or executives of other firms (Burt, 1983; Palmer, 1983; Mizruchi, 1992).

Individuals who are officers or directors at two or more companies—interlocked directors—become conduits for information, knowledge, and experiences that travel across the active links in the boardroom network.

A number of papers have analyzed the impact of the interlock network on financial variables. Davis (1991) examines the diffusion of poison pills in the 1980s, finding that companies with board interlocks to firms that had already adopted the poison pill were more likely to adopt themselves. Khurana (2002) finds that the CEO search process unfolds across the board interlock network as well, as directors consult board-level contacts to identify and vet potential CEO candidates. Cohen, Frazzini, and Malloy (2008) show that mutual fund managers have superior performance on holdings when the investor shares an educational affiliation with a director of the portfolio company, suggesting that membership in an exclusive educational network conveys access to privileged information. Bizjak, Lemmon, and Whitby (2009) trace the spread of options backdating through the board interlock network. Of the work in corporate finance, this paper most resembles ours in its emphasis on the board network as the transmission route for the diffusion of a financial practice. More generally, our paper contributes to the growing stream of research on the effects of social networks in different areas of finance, such as venture capital (Sorenson and Stuart, 2001; Hochberg, Ljungqvist, and Lu, 2007), strategic alliances (Robinson and Stuart, 2007; Lindsey, 2008), and lending markets (Garmaise and Moskowitz, 2003). These works provide empirical support for the idea that social networks are the pipes through which private information flows, and the fact that the agents in (or outside) a network have differential access to this information can influence diverse financial behaviors and outcomes.

Our paper investigates the influence of the board network on change-of-control transactions. Specifically, we study the role of board interlocks on a firm's likelihood of being targeted in a private equity (PE)-backed take-private transaction (take private). We capture the spread of PE-relevant experience via the board interlock network by creating a measure of PE Interlocks, which flags director interlocks that occur when a firm has a current director who is interlocked to a past take-private experience through his service as a director or executive of a second company. To illustrate, Eugene Davis was a director of Metals USA in 2005 when it received a take-private offer from a PE firm. Davis also served on the board of Knology Inc. from 2002 to 2007. In years 2006 and 2007 (but not 2002–2005), we treat Knology as having a PE Interlock because it was connected to the Metals USA buyout via Davis. We believe that the presence of a PE Interlocked director on the board (such as Davis on the Knology board after 2006) can increase the likelihood that a company becomes a PE target.

We study PE-backed take privates for a few reasons. First is their magnitude. The 473 deals in our sample total to $790 billion in transaction volume, and at the peak of activity in 2007, PE deals made up 45% of all merger and acquisition (M&A) deal value involving public targets. Second, a supportive board facilitates take-private

transactions. Although this is also true of M&As, analyzing the take private process is more tractable. Specifically, M&As are strategic transactions in which acquirer–target pairs match through a search process that occurs over a restricted set of firms within which synergies are plausible (Rhodes-Kropf and Robinson, 2008). In contrast, PE deals are often financially oriented transactions in which PE acquirers can (simplistically) be viewed as interchangeable, bringing similar capabilities to the table.[1] This allows us to analyze the firm-level hazard rate of going private, instead of modeling matches between specific acquirer–target pairs.

We argue that deal experience transmitted through the board interlock network can increase the likelihood that a firm receives a PE offer. A central assumption of our analysis is that prior experience with a private equity deal often favorably disposes a director to future deals, either because it lowers the incremental cost of acquiring deal-relevant information or simply because familiarity with this type of major transaction breeds comfort. In turn, the PE-friendliness of the board matters in the takeover process. Target boards can invoke state-level anti-takeover laws or enact defensive tactics such as poison pills to deter hostile acquirers.[2] In addition, as advisers to senior management, directors wield informal power in the take-private process. Given these sources of influence, a PE firm considering a formal offer for a target company is likely to take into account the board's disposition. A favorable board facilitates a quick transaction, whereas an antagonistic one could cause costly and protracted negotiations.

Among all US public companies in 2000–2007, we find that firms with one or more directors who have experienced a PE offer at another company are ~42% more likely to become targets of PE-backed take privates. Also, we show that specific director characteristics and experiences contour the magnitude of the effect of having a PE Interlock. For still-public companies with PE Interlocked directors who had relatively unsuccessful experiences in their past take-private transactions, the PE Interlock effect largely disappears. Likewise, the effect attenuates when the PE Interlocked director has less influence on the board of the still at-risk firm. Thus, PE

---

[1] This is a simplifying assumption, but it is consistent with evidence that there is greater selectivity of target search in M&A relative to PE deals. Specifically, Boone and Mulherin (2009) find that the pool of potential acquirers is much smaller in M&As than in PE transactions. Public targets acquired by public firms were in contact with an average of nine bidders and signed confidentiality agreements with four. In contrast, targets acquired by PE firms were in contact with 32 bidders and signed confidentiality agreements with 13.

[2] State-level anti-takeover laws include so-called merger moratorium provisions that prohibit mergers between a target and another party that controls a threshold percentage of shares for 3–5 years after the controlling interest is acquired. Because unfriendly boards can invoke these and other defensive tactics, hostile acquirers increasingly have pursued proxy fights in attempts to unseat the target company's board. Given the obstacles, however, PE acquirers in recent years have avoided hostile takeovers. In fact, members of three of the largest PE firms told us that their placement memoranda specifically prohibit them from pursuing hostile buyouts, and only 2% of all PE-backed take-private transactions in our data are classified as hostile.

Interlocked directors' individual past experiences and influence on their boards affect whether or not boards adopt a pro-PE stance. These results support the interpretation that past experiences are transmitted across the links in the board network.

Our findings, like much of the work on social networks, are vulnerable to the question of causal interpretation. Two salient alternative explanations exist for the correlation between PE Interlocks and PE offers. First, the effect could reflect a reverse causal process by which management teams that desire a private equity transaction recruit directors with PE experience to their boards. Prior work indicates that CEOs could influence the board selection process to hire directors who are friendly to their agenda (Shivdasani and Yermack, 1999; Baker and Gompers, 2003). We refer to this alternative explanation as "board stacking."

Second, directors and firms do not match randomly. Hermalin and Weisbach (2003) and Adams, Hermalin, and Weisbach (2008) argue that because board members are chosen, board characteristics often are endogenously related to firm outcomes. Several authors have modeled board composition as a response to firms' relative needs for monitoring versus advising (Hermalin and Weisbach, 1998; Adams and Ferreira, 2007; Harris and Raviv, 2008), and empirical studies have also found associations between board composition and firm characteristics (Boone, Field, Karpoff, and Raheja, 2007; Linck, Netter, and Yang, 2008; Coles, Daniel, and Naveen, 2008). If board composition mirrors firm characteristics, the concern for our argument is that the presence of a director on two companies' boards could reflect an underlying similarity between the two firms, and it could be this commonality that causes each to have an elevated propensity to become a PE target. We refer to this alternative explanation as "director-firm matching."

We conduct an array of supplemental analyses to address these alternatives and to sharpen the identification of a causal effect. We believe that a strength of this paper is the manner in which we exploit the timing of directors' arrival to and departure from boards, coupled with the timing of the onset of PE Interlocks, to address these endogeneity issues.

We show that the evidence is not consistent with board stacking. For instance, we find that PE Interlocked directors typically have many years of tenure on the board of a company when a take-private offer arrives. Likewise, the PE Interlock effect holds specifically for long-seated directors. In both cases, because a multi-year lag exists from when a director joins a company's board and when a transaction is announced, the specific directors who create PE Interlocks are unlikely to have been placed on the board by current management for the purpose of facilitating a private equity deal.

Director-firm matching on omitted variables that could be correlated with the likelihood of becoming a PE target is more difficult to definitively exclude, but here, too, we can exploit the sequence of events in the data. First, we show that the PE Interlock effect (on focal firm $j$) depends on the timing of the onset of the PE experience (at PE target $k$). Prior to the actual time that a director on

company $j$'s board gains PE experience on the board of firm $k$, company $j$ does not have an elevated risk of being targeted in a takeover. Similarly, reversing this logic, when an interlocked director leaves company $k$'s board prior to the time that firm $k$ attracts a PE offer, we find that the other company $j$, whose board the director later joins, does not have an elevated risk of being targeted. Both findings suggest that director-firm matching on time-invariant characteristics is unlikely to be driving the core result. We further exploit the timing of interlocks to address the concern that time-varying director-firm matching accounts for the result, and drawing on the literature on the determinants of board composition, we directly control for many of the factors on which directors and firms are likely to match. Overall, the evidence in the paper supports the assertion that the board network influences which firms become PE targets.

The remainder of the paper is organized as follows. Section 2 describes the data and summary statistics. Section 3 provides an overview of the methodology and the identification strategy. Section 4 provides baseline results on the drivers of PE offers and examines director-specific interlock effects. Section 5 addresses potential alternative explanations in interpreting the interlock effect, and Section 6 concludes.

## 2. Data and summary statistics

### 2.1. Firm-level financial, ownership, and governance data

Our sample consists of all US publicly traded firms in 2000–2007. We limit the regressions to the post-2000 period because it coincides with the coverage of the Directors Database, a comprehensive source of information about the directors of firms trading on the New York, American, and Nasdaq stock exchanges.[3] We use these data to construct board characteristics such as size and fraction of insider directors. As well, a particular strength of this data set is its extensive coverage of directors' board title, primary company affiliation, and primary job title, which enables us to construct measures of director experience and influence. We also use Compact Disclosure to selectively supplement the board data.[4]

We collect additional data describing firms' financial, ownership, and governance structures. Data on stock prices and company financials are from the Center for Research in Security Prices and Compustat. Institutional

---

[3] The Directors Database covers 6,000–8,000 firms per year, which includes firms trading on the New York, American, and Nasdaq stock exchanges as well as ~300–500 private firms (described as "large" or "important" private firms that the vendor chose to track) and ~500–800 mutual funds (that are traded but would not be considered a "firm" for most purposes).

[4] Compact Disclosure's board data come from Securities and Exchange Commission filings. It provides board data back to 1992, but relative to Directors Database, Compact Disclosure has two weaknesses for our needs. First, there are no unique director identifiers and hence one must resort to name matching to track directors across firms. Second, information on directors' board titles is often missing, and no information is provided on directors' primary jobs (for non-employee directors).

ownership data are from Thomson Financial's CDA/ Spectrum 13F database, compiled from Securities and Exchange Commission filings of institutional money managers who control over $100 million of 13F securities. Data on the ownership interests of officers and directors are from Compact Disclosure.[5]

## 2.2. Sample of going private transactions

We collect data on going private transactions announced between January 1, 1995 and December 31, 2007 from Capital IQ and Thomson's SDC Platinum M&A database. The time period of interest is 2000–2007. However, we collect 1995–1999 transaction data to construct our key explanatory variable. We include only deals in which the target was a US firm that traded on the New York, American, or Nasdaq stock exchanges on the announcement date, and the target had outstanding ordinary common shares or was a Real Estate Investment Trust (REIT).[6] Finally, we exclude strategic take-private transactions by corporate buyers (i.e., when a private company acquires a public one and retires the public equity). We categorize deals as "PE" if a private equity firm was in the acquiring party, "MBO" if the buyout was management-led, or "Other," which includes individual investors (e.g., Carl Icahn) or unaffiliated investor groups.

Table 1 shows the going private activity in 1995–2007. In 2000–2007, we identify 642 going private transactions, of which 473 are PE-backed and constitute $790 billion of $840 billion of value in going private activity during that period. MBOs are much smaller in total deal value and average deal size. PE deals are approximately eight times (mean) and 12.5 times (median) the size of management-led take privates. The 473 PE deals involve 444 firm-years and 425 distinct firms, as competing and withdrawn bids can occur for the same firm in multiple years in our sample of announced transactions. These 444 firm-year observations on PE-backed deal announcements are the positive realizations of our dependent variable (i.e., PE-backed take private=1).

## 2.3. Comparison of PE targets and public firms

To explain the propensity of firms to be targeted in take privates, we compare firms that received a PE offer with the entire population of US public firms. The risk set for the analysis, therefore, is the full population of domestic, public companies. We include all public companies in the comparison group for take privates because we have no a priori criterion for creating a more restricted control group. In studies of deals before the mid-1990s, it could have been appropriate to limit control cases to companies in a few industries or below a certain size threshold. However, in the recent time period, private

equity transactions have spread far beyond their historical concentration in manufacturing industries, and even firm size no longer has been an (unconditionally) important criterion in determining the risk of a take private in post-2000 deals.[7] Without an impartial method for generating a comparison sample, we use the set of all public firms.

Table 2, Panel A reports mean and median differences in variables broken out by take-private offer. Mean differences between the PE-targeted and all other public firms are significant for many of the financial variables, but medians for total capitalization and assets are similar. Take-private targets have lower market to book ratios, lower monthly share turnover, and higher free cash flow [as measured by (EBITDA – interest – taxes – dividends)/ total capitalization]. The PE and public samples also differ in ownership and board structure, with PE firms having higher institutional ownership, smaller boards, and a lower proportion of inside directors.

## 2.4. Network measures

The Directors Database covers all public board memberships held by a director in the period 2000–2007. We use these data to track directors across firms and over time to construct measures of director experience and of interlocking relations between boards. A focal firm $j$ is said to be interlocked with firm $k$ at time $t$ ($Int_{jt}^k = 1$) if there exists a director $x$ on firm $j$'s board at time $t$ who either serves on the board of $k$ or is an officer of $k$ at time $t'$, for $t-5 \leq t' \leq t$.

This definition of board interlocks incorporates two coding decisions. First, we assume that directors carry their previous learning, experience, and contacts with them to the boards on which they currently and subsequently serve and, therefore, the connections in the network need not be contemporaneous to exert influence. However, we employ a 5-year moving window because we also surmise that past experiences and connections do not persist indefinitely and treating them as if they do introduces noise as the past loses its current relevancy. Second, we allow board interlocks to be asymmetric. Specifically, when linked director $x$ is on the board of $j$ but is a non-board-level executive of $k$, we define $Int_{jt}^k = 1$ but $Int_{kt}^j \neq 1$. We do not limit interlocks to board-to-board relations because we believe board members transmit information and experiences from other companies, either as directors or executives of those origin companies.

We create two additional variables using the director network. First, we define a given firm's Board Interlock Count as its total number of interlocks with other companies, or $\sum_{k \neq j} Int_{jt}^k$. This is a general measure of a firm's connectedness in the board interlock network. For use in the regressions, we define a board Interlock Dummy set equal to one if Board Interlock Count $\geq 1$.

---

[5] A limitation of these data is that Compact Disclosure does not distinguish directors' from executives' holdings. Therefore, we know only the total of insider holdings in the firm.

[6] REITs make up 8% of the deal count and 16% of the deal volume, including the second biggest take–private transaction in history, Equity Office Properties.

[7] A two-sample Kolmogorov–Smirnov test for equality of the size distribution functions of the all-public and take-private subsamples failed to reject the null hypothesis that the samples are drawn from the same distribution.

**Table 1**

Going private transactions, 1995–2007.

    Data on going private transactions involving US publicly-traded targets announced between January 1, 1995 and December 31, 2007. This sample includes only deals in which the target traded on the New York, American, or Nasdaq stock exchanges on the announcement date, either with outstanding ordinary common shares or as a REIT. This sample excludes strategic take-private transactions by corporate buyers. PE deals are transactions in which a private equity firm led the acquiring party or was identified as providing financing. MBOs are deals identified as management-led with no private equity involvement. Other deals include offers made by other financial buyers, such as individual investors or unaffiliated investor groups.

| Year | Number of deals | | | | Total deal value (millions of dollars) | | | |
|---|---|---|---|---|---|---|---|---|
| | PE | MBO | Other | All | PE | MBO | Other | All |
| 1995 | 1 | 8 | 15 | 40 | 5,013 | 690 | 22,638 | 28,341 |
| 1996 | 27 | 10 | 7 | 44 | 5,769 | 149 | 2,016 | 7,934 |
| 1997 | 49 | 3 | 6 | 58 | 16,168 | 63 | 1,999 | 18,230 |
| 1998 | 46 | 16 | 7 | 69 | 13,150 | 1,980 | 1,260 | 16,389 |
| 1999 | 64 | 17 | 6 | 87 | 20,657 | 2,630 | 1,120 | 24,407 |
| 2000 | 54 | 25 | 14 | 93 | 23,998 | 2,310 | 10,037 | 36,345 |
| 2001 | 24 | 20 | 10 | 54 | 4,558 | 952 | 2,302 | 7,812 |
| 2002 | 25 | 23 | 8 | 56 | 8,917 | 2,571 | 383 | 11,871 |
| 2003 | 49 | 18 | 4 | 71 | 7,570 | 404 | 103 | 8,076 |
| 2004 | 35 | 12 | 2 | 49 | 28,215 | 447 | 5,011 | 33,673 |
| 2005 | 68 | 5 | 6 | 79 | 65,564 | 1,522 | 1,278 | 68,364 |
| 2006 | 103 | 11 | 3 | 117 | 290,228 | 14,218 | 404 | 304,850 |
| 2007 | 115 | 6 | 2 | 123 | 362,760 | 2,497 | 4,405 | 369,662 |
| 1995–2007 | 676 | 174 | 90 | 940 | 852,566 | 30,434 | 52,955 | 935,956 |
| 2000–2007 | 473 | 120 | 49 | 642 | 791,810 | 24,921 | 23,923 | 840,654 |

| Year | Mean deal value (millions of dollars) | | | | Median deal value (millions of dollars) | | | |
|---|---|---|---|---|---|---|---|---|
| | PE | MBO | Other | All | PE | MBO | Other | All |
| 1995 | 313 | 115 | 1,886 | 834 | 45 | 55 | 33 | 44 |
| 1996 | 231 | 19 | 336 | 203 | 69 | 19 | 123 | 54 |
| 1997 | 351 | 21 | 400 | 338 | 151 | 16 | 205 | 151 |
| 1998 | 292 | 132 | 180 | 245 | 182 | 86 | 156 | 124 |
| 1999 | 333 | 155 | 187 | 287 | 211 | 42 | 174 | 173 |
| 2000 | 444 | 92 | 772 | 395 | 161 | 29 | 67 | 93 |
| 2001 | 198 | 50 | 230 | 150 | 54 | 23 | 25 | 33 |
| 2002 | 357 | 117 | 64 | 224 | 252 | 17 | 66 | 66 |
| 2003 | 161 | 22 | 26 | 117 | 68 | 11 | 23 | 43 |
| 2004 | 806 | 41 | 2,506 | 702 | 257 | 21 | 2,506 | 110 |
| 2005 | 979 | 304 | 256 | 888 | 347 | 263 | 27 | 333 |
| 2006 | 2,932 | 1,422 | 135 | 2,722 | 440 | 484 | 110 | 439 |
| 2007 | 3,210 | 416 | 2,203 | 3,055 | 878 | 266 | 2,203 | 800 |
| 1995–2007 | 1,298 | 184 | 654 | 1,036 | 249 | 31 | 66 | 150 |
| 2000–2007 | 1,710 | 215 | 532 | 1,347 | 321 | 26 | 54 | 165 |

Table 2, Panel B illustrates the Board Interlock Count in 2007, which is likely to be representative of a steady-state interlock distribution (when interlocks are defined over 5-year sliding windows). In 2007, just 11% of all firms are isolates, meaning that none of these firms' directors served on the boards of other public companies in 2002–2007. All other companies are connected to at least one other firm through the board interlock network.

The Board Interlock Count is defined at the firm level, but the actual links in the network are created by the individual directors who connect companies. We consider an alternative network measure at the individual level, Directorship Count, which is a count of the number of distinct board seats held by a director. Table 2, Panel C reports the distribution of board seats held by directors who were active in 2007. It shows that 63% of directors serve on a single public company board, while the remaining 37% create all of the board-to-board links in the data. Aggregating this to the firm level, Average

Directorship Count is the mean number of board seats held by the individuals on each firm's board. Table 2, Panel A shows that, at the median public firm, the average director serves on 0.7 additional boards.

### 2.5. PE Interlock variable

The variable of primary interest in our paper is PE Interlock: that is, whether a firm that is still public (and therefore in the risk set for going private) is interlocked through a shared director with another firm that received a take-private offer in the past. Formally,

$$PE\ Interlock_{jt} = 1 \ \text{ if } (\sum_{k \neq j} Int_{jt}^k PE_{kt}) \geq 1, \tag{1}$$

where $Int_{jt}^k = 1$ when firms $j$ and $k$ are interlocked and $PE_{kt} = 1$ for company $k$ if the firm received a going private offer in $t'$, for $t-5 \leq t' < t$. In other words, PE Interlock=1 when any of a public company's directors served on the

**Table 2**
Sample descriptive statistics.

 In Panel A the sample consists of US firms trading on the New York, American, and Nasdaq stock exchanges in 2000–2007. Observations are at the firm-year level. The PE subsample consists of observations where the firm has received a private equity (PE)-backed going private offer; all other observations comprise the Public subsample. Market capitalization is the market value of the outstanding equity. Total capitalization is book assets plus market value of equity less book value of equity. Assets is book value of assets. Sales is annual sales. EBITDA is earnings before interest, taxes, depreciation and amortization. Market-to-book is the total capitalization divided by book value of assets. Share turnover is monthly trading volume scaled by shares outstanding. Free cash flow is EBITDA less interest, taxes, and dividends. Institutional ownership is the fraction of outstanding shares held by 13F investors. Insider ownership is the fraction of outstanding shares held by officers and directors. Board size is the number of board members. Inside directors is the fraction of board members who are inside directors. A firm's Board Interlock Count is the number of other firms connected to it via interlocking board memberships. A firm's Average Directorship Count is the mean number of board seats held by its directors. PE Interlock is a binary variable that equals one if the firm has a director who served as a director or executive of another firm during the year that firm became a take-private target, at any point in the preceding five years. Company financials statistics are winsorized at the 1st and 99th percentile by year: a indicates differences in mean between PE and Public firms are significant at 5%; b indicates that PE and Public sample distributions are different at 5% significance level using the Mann–Whitney–Wilcox nonparametric test. Panel B shows the distribution of Board Interlock Count among public firms in 2007. Panel C shows the distribution of Directorship Count among directors of public firms in 2007. A director's Directorship Count is the number of distinct board seats held by the director.

| Panel A. Characteristics of PE targets versus non-targeted public firms | | | | |
| --- | --- | --- | --- | --- |
| | PE | | Public | |
| | Mean | Median | Mean | Median |
| *Company financials* | | | | |
| Market capitalization (millions) | 1,176[a] | 217 | 1,895 | 216 |
| Total capitalization (millions) | 1,789[a] | 327 | 2,514 | 296 |
| Assets (millions) | 1,675[a] | 329 | 2,660 | 297 |
| Sales (millions) | 1,056[a] | 264[b] | 1,370 | 146 |
| EBITDA (millions) | 170 | 35[b] | 216 | 18 |
| Market-to-book | 1.49[a] | 1.22[b] | 2.26 | 1.32 |
| Share turnover | 1.13[a] | 0.81 | 1.38 | 0.82 |
| Free cash flow/total capitalization | 0.02[a] | 0.06[b] | −0.01 | 0.04 |
| *Ownership or governance structure* | | | | |
| Insitutional ownership | 0.49[a] | 0.50[b] | 0.39 | 0.35 |
| Insider ownership | 0.18 | 0.09 | 0.17 | 0.09 |
| Board size | 7.77[a] | 7.00 | 8.13 | 8.00 |
| Inside directors | 0.20[a] | 0.17[b] | 0.22 | 0.20 |
| *Network characteristics* | | | | |
| Board Interlock Count | 8.89[a] | 7.00[b] | 7.91 | 5.00 |
| Average Directorship Count | 1.96[a] | 1.86[b] | 1.86 | 1.70 |
| PE Interlock | 0.25[a] | 0.00[b] | 0.15 | 0.00 |
| Number of observations | 444 | | 42,962 | |

| Panel B. Distribution of Board Interlock Count in 2007 | | |
| --- | --- | --- |
| Number of interlocks | Frequency | Percent |
| 0 | 540 | 11 |
| 1–2 | 711 | 15 |
| 3–5 | 827 | 18 |
| 6–10 | 1,044 | 22 |
| 11–20 | 1,107 | 23 |
| 21–30 | 368 | 8 |
| Over 30 | 118 | 3 |
| All | 4,715 | 100 |

| Panel C. Distribution of Directorship Count in 2007 | | |
| --- | --- | --- |
| Number of board seats | Frequency | Percent |
| 1 | 24,935 | 63 |
| 2 | 8,239 | 21 |
| 3–5 | 5,787 | 15 |
| Over 5 | 842 | 2 |
| All | 39,803 | 100 |

board of a second firm that was a take-private target at any point in the 5 preceding years.

 Because the network measures are backward-looking, we face a complication when these variable definitions are brought to the data. From the Directors Database, we have board composition data only for 2000–2007. However, the interlock measures require that we know the other board seats held by each firm's directors during the

**Table 3**
Incidence of PE Interlock among all public firms versus firms targeted in private equity deals.

    The sample consists of US firms trading on the New York, American, and Nasdaq stock exchanges in 2000–2007. Observations are at the firm-year level. All public firms include all sample observations. PE targets consist of observations where the firm has received a private equity (PE)-backed going private offer. PE Interlock=1 if the firm has a director who served as a director or executive of another firm during the year that firm became a take-private target, at any point in the preceding five years.

| Year | All public firms | | | | PE targets | | | |
|------|------------------|--|--|--|-------------|--|--|--|
|      | PE Interlock=1 | PE Interlock=0 | All | Percent PE Interlock=1 | PE Interlock=1 | PE Interlock=0 | All | Percent PE Interlock=1 |
| 2000 | 741 | 5,872 | 6,613 | 11 | 12 | 36 | 48 | 25 |
| 2001 | 812 | 5,524 | 6,336 | 13 | 6 | 18 | 24 | 25 |
| 2002 | 835 | 4,831 | 5,666 | 15 | 5 | 18 | 23 | 22 |
| 2003 | 821 | 4,460 | 5,281 | 16 | 9 | 39 | 48 | 19 |
| 2004 | 784 | 4,188 | 4,972 | 16 | 7 | 27 | 34 | 21 |
| 2005 | 774 | 4,167 | 4,941 | 16 | 17 | 46 | 63 | 27 |
| 2006 | 815 | 4,067 | 4,882 | 17 | 17 | 81 | 98 | 17 |
| 2007 | 1,068 | 3,647 | 4,715 | 23 | 38 | 68 | 106 | 36 |
| All years | 6,650 | 36,756 | 43,406 | 15 | 111 | 333 | 444 | 25 |

previous 5 years. From the Directors Database alone, we cannot identify any interlocks for firms in the sample in year 2000, and for firms in 2001 the interlock variables can make use of directorships held only in 2000. Therefore, the interlock measures are truncated prior to 2005.

We address this problem for our primary variable, PE Interlock, by collecting additional board data from Compact Disclosure in the pre-2000 period. Specifically, we compile a list of the take-private transactions in 1995–1999 and used Compact Disclosure to identify all directors of these companies in the year of the transaction. Then, we match these directors to those in the Directors Database to identify all instances of interlocks between earlier-period (1995 and 1999) take privates and active directors in the 2000–2007 interval. This addresses the truncation problem in PE Interlock.[8]

Table 3 shows the number of firms that have PE Interlock=1, for all public firms and for the subset of firms receiving private equity-backed offers. The PE Interlock rate is 15% for all public firms, but, at 25%, it is much higher for firms that receive PE offers. We see a monotonic increase in PE Interlock over time, which reflects, with a lag, the growth in PE activity in the post-1995 period (on which the interlock variables are based). In 2007, the incidences of PE Interlock reach peaks of 23% and 36% for, respectively, the all-public and PE-target samples.

### 3. Identification strategy

The basic specification of the paper is a logit model of the probability that a public firm *j* receives a PE-backed

take-private offer in year *t*, or

$$Pr(PETx_{jt} = 1) = G(b_1 PE\,Interlock_{jt} + b_2 X_{jt} + u_{jt}), \qquad (2)$$

where $X_{jt}$ is a matrix of firm characteristics and $G$ is the logistic function given by $G(z) = \exp(z)/[1 + \exp(z)]$. Our primary hypothesis is that $b_1 > 0$.

We propose a causal explanation for $b_1 > 0$ wherein board members' past experiences with take privates travel with them to other current and future directorships, and the knowledge, credibility, and contacts they have gained then causally influence the take-private hazards of the still-public firms whose boards they later join. However, in the absence of a persuasive instrument for the presence of a PE-experienced director, two broad sources of endogeneity challenge the credibility of this effect: (1) reverse causation, as boards may be stacked by a management team eager to do a PE deal, and (2) director-firm matching on an omitted characteristic that determines board service and predicts the take-private hazard.

The salience of the first concern stems from the fact that virtually all recent private equity deals have been friendly. In some deals, management could have actively shopped the company to PE firms. If a deal-friendly board influences the attractiveness of a company to PE buyers, the presence of PE-experienced directors could reflect forward-thinking management's manipulation of board composition to increase the probability of a take-private offer.

Second, it could be that directors and firms match on underlying characteristics that are correlated with PE deal activity. Thus, the fact that a director who previously matched with a take-private target also currently sits on a still-public company's board could just indicate a similarity between the two firms that heightens the risk that both are targeted in take-private transactions.

Our strategy for addressing these alternatives in large part relies on the timing of director interlocks. Consider the scenarios in Fig. 1, each of which can be exploited for cleaner identification. In Panel A, Firm A receives a take-private offer in 2002 and Director *x* creates interlocks among Firms A, B, and C with his service on the boards of those firms. Spans of board service are indicated by black arrows in the figure, and diamonds represent the years for

---

[8] To correct for truncation in our Board Interlock Count variable, it would be necessary to gather board composition for all public firms in 1995–1999. Although these data exist in Compact Disclosure, collecting and accurately matching them to the Directors Database data is a laborious task. Instead, we use the Interlock Dummy in all regressions because the truncation problem is much less severe in the dummy specification. In addition, all regressions will include year fixed effects, so the primary consequence of truncation in the Interlock Dummy variable is that its coefficient is less precisely estimated in the earlier years of the sample.
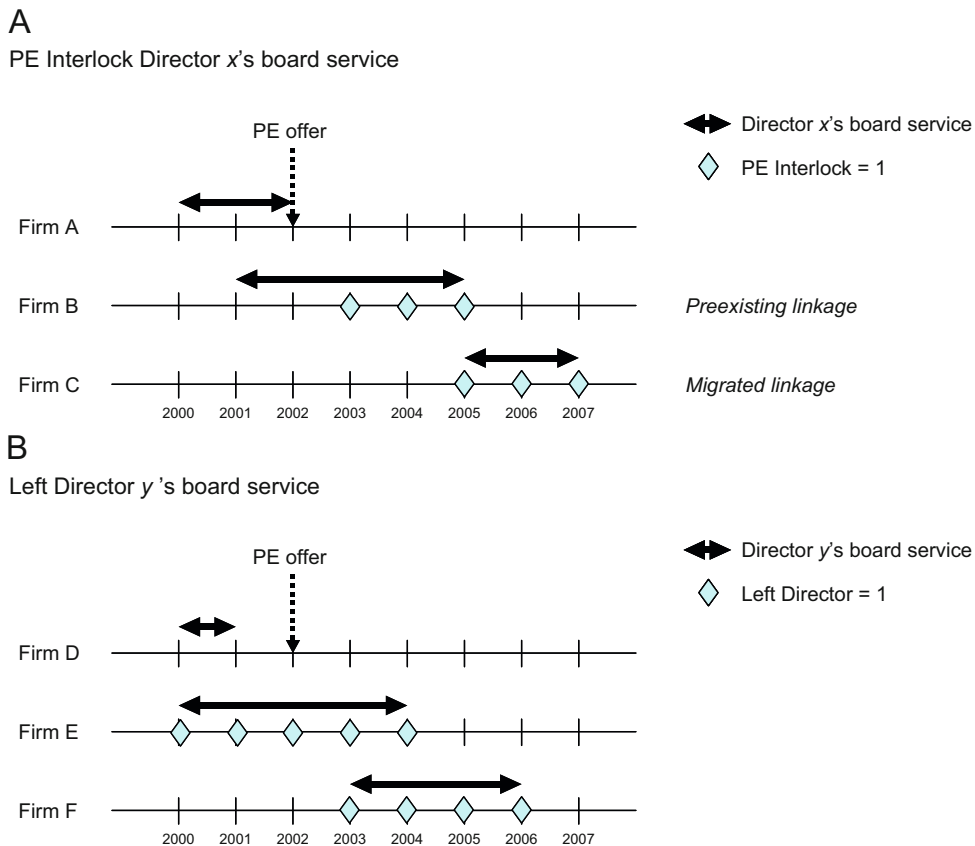
**Fig. 1.** Board interlocks and timing of director movement across boards. This figure illustrates the various types of interlocking relations that are possible among firms that have received private equity (PE) offers and the directors that serve on the boards of those and other firms. Panel A illustrates the difference between two types of PE Interlock directors, Preexisting and Migrated directors. Director *x* serves on the boards of Firms A, B, and C (span of service indicated by black arrows), and the PE offer received in Firm A triggers PE Interlock=1 (indicated by diamonds) in Firms B and C. Panel B illustrates the construction of Left Director. Director *y* serves on the boards of Firms D, E, and F but departs D before the PE offer. This results in Left Director=1 for the span of service on firms E and F.

which Firms B and C have PE Interlock=1 due to Director *x*'s PE experience on the board of Firm A in 2002.

Firm B demonstrates the case of a preexisting director. In this scenario, the director who creates the interlock serves on the board of Firm B before Firm A is taken private. In contrast, the interlock between Firms A and C is created by a migrated director. This individual joins the board of Firm C after he or she is known to have participated in a take private. Clearly, identification is more precise in the case of preexisting directors. Migrated directors could be candidates who were specifically recruited by management to populate a pro-PE board, but this is less likely to be the case for preexisting directors whose service on the at-risk company's board began before they obtained PE experience at a second firm.

A similar but more general approach to addressing the issue of board stacking is to consider the role of individual directors' tenure on the board. For example, in Panel A, the PE Interlock observation induced by Director *x* at Firm B is associated with 2 years of board tenure in 2003, but four in 2005. We could be concerned that the PE Interlock effect arising from recently recruited directors can more easily be attributed to board stacking. Thus, we can isolate the PE Interlock effect for directors who have served on the at-risk company's board for a minimum span of time, for instance, 3 or more years. If the effect holds for long-seated directors, we can be more confident that it is not driven by the manipulation of board composition by the incumbent management team.

It is also possible to use the sequence in Panel A to address the second and thornier endogeneity issue: director-firm matching based on unobserved similarities. Assume that director-firm matching occurs on time-invariant characteristics. If the PE Interlock=1 effect derives only from an unobserved characteristic of the firm that makes it more prone to PE offers, then conditional on the firm being chosen by a PE-experienced director, the firm should be no more prone to PE offers in years in which PE Interlock=1 versus when PE Interlock=0. For instance, in the case of Firm B, we should observe that the take-private hazard is comparable for 2003–2005 (years in which PE Interlock=1) versus 2000–2002 and 2006–2007 (years in which PE Interlock=0). If the data show that the effect holds just for the subset of years when PE Interlock=1, this would build the case for a true causal effect.

**Table 4**

Effect of PE Interlock on private equity-backed going private offers.

Table reports results of logit regressions where the dependent variable equals one if a firm receives a private equity (PE)-backed going private offer. The sample consists of US publicly traded firms in 2000–2007, with observations at the firm-year level. PE Interlock is a binary variable that equals one if the firm has a director who served as a director or executive of another firm during the year that firm became a take-private target, at any point in the preceding 5 years. Firm size is the log of the market value of outstanding equity. Market-to-book is total capitalization (book assets plus market value of equity less book value of equity) divided by book value of assets. Share turnover is monthly trading volume scaled by shares outstanding. Free cash flow is EBITDA less interest, taxes, and dividends divided by total capitalization. Institutional ownership is the fraction of outstanding shares held by 13F investors. Insider ownership is the fraction of outstanding shares held by officers and directors. Interlock Dummy is a binary variable that equals one if the firm has current or preceding 5-year board interlocks with other firms. Standard errors are Huber–White heteroskedasticity-consistent and are clustered at the firm level. *Significant at 10%; **significant at 5%; and ***significant at 1%.

| Variable | Prediction | (1) | (2) | (3) | (4) |
|---|---|---|---|---|---|
| PE Interlock | (+) | 0.511*** | 0.593*** | 0.470*** | 0.351*** |
| | | (0.114) | (0.120) | (0.120) | (0.121) |
| Firm size | (−) | | −0.064** | −0.219*** | −0.148*** |
| | | | (0.025) | (0.039) | (0.045) |
| Market-to-book | (−) | | −0.347*** | −0.324*** | −0.363*** |
| | | | (0.085) | (0.091) | (0.107) |
| Share turnover | (−) | | −0.041 | −0.117** | −0.133** |
| | | | (0.033) | (0.049) | (0.052) |
| Free cash flow | (+) | | 0.303 | 0.311 | 0.283 |
| | | | (0.267) | (0.271) | (0.238) |
| Institutional ownership | (+) | | | 1.662*** | 1.098*** |
| | | | | (0.247) | (0.274) |
| Insider ownership | (+) | | | 0.909*** | 0.474* |
| | | | | (0.278) | (0.281) |
| Interlock Dummy | (+) | | | 0.758*** | 0.409* |
| | | | | (0.216) | (0.219) |
| Year fixed effects | | Yes | Yes | Yes | Yes |
| Industry fixed effects | | No | No | No | Yes |
| Number of observations | | 43,406 | 43,241 | 41,232 | 40,339 |
| Pseudo-$R^2$ | | 0.04 | 0.06 | 0.07 | 0.11 |

If director-firm matching occurs on time-varying characteristics, then the specific years in which a director serves on a board could be more indicative of the time span in which a public company has a heightened PE takeover risk due to the influence of an omitted variable. To address this possibility, we can further restrict the comparison used to identify the PE Interlock effect to years in which the director actually served on the second, still-public firm's board. For example, we can compare the take-private hazard for Firm B in 2001–2002 (where the future PE Interlocked Director x serves on the board but PE Interlock=0), with 2003–2005 (where PE Interlock=1). If matching drives the results, once we condition on the period in which the interlock between A and B is active, we would expect no additional explanatory power for the specific years in which PE Interlock=1. But if the explanatory power rests in the interlocked director's transmission of his or her PE experience, then the specific timing of PE Interlock=1 should matter.

In Panel B of Fig. 1, we approach this issue from the reverse angle. We examine "left directors" who depart a board before the company receives a take-private offer. In the sequence in Fig. 1, Panel B, Director y leaves Firm D before its PE offer in 2002, but Director y also serves on the boards of Firm E (concurrently) and Firm F (subsequently). We define Left Director=1 for the years on Firms E and F in which Director y serves on the board (again indicated by the diamonds). If matching were driving the PE Interlock results, we would expect that directors who serve on companies that receive take-private offers, even

if they were not on the origin company's board at the time to actually experience these offers, would continue to match to the boards of other companies that have an elevated likelihood of a PE offer. But if the effect of PE Interlock derives from having a board member who has actually experienced a take-private offer, Left Director should have no effect in the regressions.

## 4. Results

### 4.1. Baseline

Table 4 shows logit regression results of the probability a firm becomes a PE target. Column 1 includes only PE Interlock as an explanatory variable. Column 2 controls for firm size (log of market capitalization) and financial ratios that have been considered in the literature. Market-to-book can proxy for undervaluation, which may make firms attractive PE targets (Opler and Titman, 1993; Fidrmuc, Roosenboom, and van Dijk, 2007). In addition, it could be more costly for firms with low visibility to remain public (Mehran and Peristiani, 2008; Boot, Gopalan, and Thakor, 2008). We control for firm visibility with share turnover, a measure of trading interest. To address free cash flow hypotheses of take-private deals (Jensen, 1986; Lehn and Poulsen, 1989; Kieschnick, 1998), we also include measures of cash flow. (We limit discussion of coefficient magnitudes to the full specification.)

Column 3 adds measures of equity ownership structure (Halpern, Kieschnick, and Rotenberg, 1999; Weir, Laing, and Wright, 2005). Substantial insider and institutional ownership could influence PE deals for a few reasons. First, because executives' shares in the company are typically purchased at a premium to the current market price and then (assuming their continued involvement with the firm) they are reloaded with equity in the private company, insiders with large ownership stakes could have a strong incentive to secure PE-led bids. Second, large institutional owners, particularly those that are dissatisfied with a company's performance, often pressure directors and managers to consider a change-of-control transaction. Third, PE firms could be most attracted to targets with large shareholders because mobilizing support for such transactions could be comparatively simple.

We also include the Interlock Dummy=1 if the at-risk firm has any interlocks with other companies. Boards with one or more directors who serve on other boards are privy to more of the information traveling across the broader director network. We surmise that these interlocks increase the likelihood that a focal company is in the network of potential bidders. This could stimulate PE interest in a company, and vice versa.[9]

Column 4, our baseline specification, adds industry fixed effects defined at the Fama-French 48 level. It shows that smaller, more undervalued, and less liquid firms are more likely to become PE targets. To provide a sense of the economic magnitudes, a one standard deviation increase in the following covariates results in a (parentheses) decrease in the probability of becoming a target: firm size (26%), market-to-book (68%), and share turnover (20%).[10] We do not find a significant effect of free cash flow on the likelihood of receiving a take-private offer. Both insider and institutional ownership are positively associated with PE offer. A 10-point increase in institutional or insider ownership raises the probability of a deal by 12% and 5%, respectively.

Turning to the board interlock measures, we find that being connected to other firms, as captured by the Interlock Dummy, increases the likelihood of a PE offer by 51%. Finally, firms with one or more PE Interlocked directors are estimated to have a 42% increase in the likelihood of becoming a PE-backed take-private target, net of the effect of general connectedness. Based on the pattern of attenuation in the coefficient on PE Interlock

across Columns 1–4 in the table, the firm-level characteristics and industry effects clearly drive a meaningful amount of covariation between PE Interlocks and the probability of being targeted in a take private. However, the PE Interlock effect remains statistically significant. Thus, if we view the Interlock Dummy as capturing the effect of general connectedness to other firms on the take-private hazard, we can see that linkages specifically to take-private offer-receiving firms represents an additional margin of influence.

### 4.2. Director-specific effects

In Table 5 we consider characteristics specific to the directors responsible for creating PE Interlocks to determine whether the magnitude of the effect is sensitive to the experience or the influence of the individuals involved. In addition to their stand-alone interest, if the PE Interlock effect depends on differences in the past experiences of PE Interlocked directors, this would strengthen the case for a causal effect of PE Interlock.

Column 1 considers the effect of a PE Interlock to a firm $k$ in which the PE offer for $k$ was received poorly by the market—specifically, where the announcement day return of the deal was below the median of all take-private announcement day returns. Column 2 looks at PE Interlocks to firms $k$ in which the offer for $k$ was withdrawn. Column 3 assesses PE Interlocks to firms $k$ in which the offers for $k$ were hostile. These cases capture instances in which the interlocked director's prior PE experience could have been negative. The interaction terms on all three are negative and statistically significant in Columns 1 and 2. Moreover, the coefficient magnitudes almost entirely offset the positive PE Interlock effect. Directors with prior, negative experiences appear not to adopt a pro-PE stance at companies they subsequently represent.

Columns 4–6 consider interactions in which the PE Interlocked director could hold an influential position on the still-public company's board. Column 4 examines whether PE Interlock has a bigger effect if the interlocked director is chairman of the board. The interaction term is positive but not statistically significant. Column 5 assesses whether PE Interlock has a bigger effect in companies with less influential directors, as measured by the average number of external board seats held by the firm's directors. Low Directorship Count is a dummy variable equal to one for boards with below-median Average Directorship Count relative to firms in the same year. The positive interaction effect (PE Interlock)∗(Low Directorship Count) illustrates that having a PE-experienced director is especially conducive to PE offers in companies where the general profile of the board members in the overall interlock network is relatively low—which are otherwise less likely to receive PE offers. In such cases, we hypothesize that the experienced director's credentials leads him to have relatively greater influence on the agenda and outcomes of boardroom deliberations. Column 6 examines the PE Interlock effect when the interlocked director has less tenure on the board than the non-interlocked directors. Consistent with the influence view,

---

[9] We also consider Board Interlock Count and various nonparametric formulations of Board Interlock Count as controls in place of Interlock Dummy. Inclusion of Board Interlock Count actually strengthens the PE Interlock effect, but the variable suffers from a more severe truncation problem than does Interlock Dummy, as described earlier.

[10] Estimates of effects on outcome probability are based on coefficients in Column 4 and are calculated as follows: Define odds($X$) as $p/(1-p)$, where $p$ is the outcome success probability evaluated at the vector of covariate values $X$. Then, for a $dx_i$ change in covariate $X_i$ with coefficient estimate $b_i$, $\exp(b_i*dx_i)=$odds($X+b_i*dx_i$)/odds($X$). Because in our sample $1-p \approx 1$, $\exp(b_i*dx_i)$ approximately gives the ratio of $p$ evaluated at $(X+b_i*dx_i)$ to $p$ evaluated at $X$, or, equivalently, the percent increase in the outcome success probability relative to baseline due to $dx_i$.

**Table 5**
Director-specific PE Interlock effects.

Table reports results of logit regressions where the dependent variable equals one if a firm receives a private equity (PE)-backed going private offer. The sample consists of US publicly traded firms in 2000–2007, with observations at the firm-year level. All regressions include the full set of (unreported) covariates from the baseline regression in Table 4 Column 4. PE Interlock is a binary variable that equals one if the firm has a director who served as a director or executive of another firm during the year that firm became a take-private target, at any point in the preceding 5 years. Low announcement day return equals one if the PE Interlock is with a firm whose market return on the deal announcement day was below the median of PE deal announcement day returns. Withdrawn offer equals one if the PE Interlock is with a firm whose PE offer was withdrawn. Hostile equals one if the PE Interlock was with a firm that received a hostile takeover offer. Chairman equals one if the PE Interlock is via a director who is the board chairman. Low Directorship Count equals one for firms whose directors have below median Average Directorship Count for firms in the same year. Low tenure equals one if the PE Interlock is via a director whose tenure is less than the mean tenure of non-PE Interlock directors on the board. Standard errors are Huber–White heteroskedasticity-consistent and are clustered at the firm level. *Significant at 10%; **significant at 5%; and ***significant at 1%.

| Variable | Prediction | Director experience | | | Director influence | | |
|---|---|---|---|---|---|---|---|
| | | (1) | (2) | (3) | (4) | (5) | (6) |
| PE Interlock | (+) | 0.560*** (0.152) | 0.526*** (0.137) | 0.387*** (0.127) | 0.339*** (0.132) | 0.149 (0.143) | 0.543*** (0.142) |
| ×(Low announcement day return) | (−) | −0.430** (0.202) | | | | | |
| ×(Withdrawn offer) | (−) | | −0.502** (0.221) | | | | |
| ×(Hostile) | (−) | | | −0.224 (0.288) | | | |
| ×(Chairman) | (+) | | | | 0.248 (0.266) | | |
| ×(Low Directorship Count) | (+) | | | | | 0.671** (0.264) | |
| ×(Low tenure) | (−) | | | | | | −0.372* (0.205) |
| Low Directorship Count | (−) | | | | | −0.296** (0.134) | |
| Controls | | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effects | | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry fixed effects | | Yes | Yes | Yes | Yes | Yes | Yes |
| Number of observations | | 40,339 | 40,339 | 40,339 | 40,339 | 40,339 | 40,339 |
| Pseudo-$R^2$ | | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 |

the negative coefficient on the interaction term shows that the PE Interlock effect is attenuated when the PE-experienced directors have lower tenure on the board than their peers.

Considered together, the findings in Table 5 bolster the assertion that directors carry forward their experiences from other firms and also that the effect of their past experiences on current-firm outcomes is mediated by their influence on the current firm's board.

## 5. Endogeneity concerns and the timing of interlocks

### 5.1. Management manipulation through board stacking

Table 6 addresses reverse causation, that management could recruit PE-experienced directors to stack the boards of their firms to attract PE interest. As outlined in the section on identification strategy, we can exploit the specific timing of director arrivals to examine this issue. In Column 1, we consider separately the effect of migrated directors, who join the still-public firm's board only after they have acquired their PE experience (see Fig. 1, Panel A). These individuals, in contrast to preexisting directors, are more likely to have been recruited to develop a pro-PE board. They are invited to serve at the still-public company after their support of a PE-led take-private transaction at another company is public information.

However, when we interact "migrated director" with "PE Interlock," we find that migrated directors have no statistically greater effect on the take-private hazard than do preexisting directors.

Even at a descriptive level, the timing of the movements of directors between boards is informative. If management teams specifically recruit PE-experienced directors in anticipation of a hoped-for deal, we would expect two things. First, in the overall board network, there would be a coterie of pro-PE directors who are frequently recruited to boards with PE-hopeful management teams. Second, we would also expect to find that PE Interlocked directors have brief tenures on at-risk company boards. Regarding the first point, we find that 94% of the individual directors who trigger PE Interlock=1 do so through their participation in a single deal. With a maximum of three deals experienced by < 1% of directors, there are no directors who disproportionately collect and propagate PE experiences. Thus, it does not appear that there is a select group of directors who are recruited to public firm boards because they are known to be friendly to PE-backed take privates.

Concerning the second point, we find that the average tenure of PE Interlocked directors on public company boards is 7.2 years. While not conclusive, a mean tenure of service of this duration is difficult to reconcile with the idea that board rosters are proactively stacked with

**Table 6**
PE Interlock effect of tenured directors.

Table reports results of logit regressions where the dependent variable equals one if a firm receives a private equity (PE)-backed going private offer. The sample consists of US publicly traded firms in 2000–2007, with observations at the firm-year level. All regressions include the full set of (unreported) covariates from the baseline regression in Table 4 Column 4. PE Interlock is a binary variable that equals one if the firm has a director who served as a director or executive of another firm during the year that firm became a take-private target, at any point in the preceding 5 years. Migrated equals one if the director who triggers the PE Interlock joined the focal firm subsequent to his PE deal experience in the linked firm. $\dot{E}3$ years tenure equals one if the director who triggers the PE Interlock has been on the board of the focal firm for 3 or fewer years. Average board tenure is the mean number of years of directors have served on the board. Standard errors are Huber–White heteroskedasticity-consistent and are clustered at the firm level. *Significant at 10%; **significant at 5%; and ***significant at 1%.

| Variable | (1) | (2) | (3) |
|---|---|---|---|
| PE Interlock | 0.321** | 0.336** | 0.308** |
| | (0.129) | (0.136) | (0.121) |
| $\times$ (Migrated) | 0.194 | | |
| | (0.269) | | |
| $\times$ ($\dot{E}3$ years tenure) | | 0.053 | |
| | | (0.220) | |
| Average board tenure | | | $-0.078$*** |
| | | | (0.015) |
| Controls | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes |
| Industry fixed effects | Yes | Yes | Yes |
| Number of observations | 40,339 | 40,339 | 40,339 |
| Pseudo-$R^2$ | 0.11 | 0.11 | 0.12 |

pro-PE directors. Generalizing this line of reasoning Column 2 of Table 6 considers separately the PE Interlock effect of directors who have had 3 or fewer years of tenure on the board. Once again, the results indicate that recent recruits to the board do not have any greater influence on the likelihood of a PE offer, and the effect of PE Interlocked directors with greater than 3 years of board tenure remains highly significant.

Finally, if board stacking is taking place but it is occurring through a director characteristic other than PE Interlock, we would expect that the take-private hazard negatively correlates with average board tenure because boards with low tenure are more likely to be made up of directors who were, based on any criterion, strategically placed (or replaced) by current management. In Column 3, we directly control for the average tenure of board members, and we do find that companies with recently seated directors are more likely to become take-private targets. Although it is likely that the average tenure of board members partially captures the effect of other uncontrolled firm attributes, such as company age or turnover in the senior management team, PE Interlock remains robust to this control.

## 5.2. Director-firm matching

Given nonrandom assignment of directors to firms, it remains possible the positive effect of PE Interlock on the probability of a PE offer could indicate only similarities in the propensity to receive PE offers between the two firms that share a common director. This is an omitted variables problem, in which a potentially omitted factor is anything that determines both director matching to firms and is correlated with susceptibility to take-private offers.

The theoretical and empirical literature on board composition offers some insight into the likely determinants of matches between director, board, and firm characteristics. This work suggests that boards are structured to correspond to firms' monitoring and advising needs. For instance, small, insider-dominated boards could be more likely in firms with low monitoring requirements due to CEO incentive alignment (Raheja, 2005; Linck, Netter, and Yang, 2008) or in knowledge-intensive firms that are difficult for outsiders to monitor (Linck, Netter, and Yang, 2008; Coles, Daniel, and Naveen, 2008). Alternately, the complexity of a firm's portfolio could increase the demand for the advisory services of external experts and result in large, outsider-dominated boards (Linck, Netter, and Yang, 2008; Boone, Field, Karpoff, and Raheja, 2007). It is plausible that one or more of these factors correlates with both director assignment and the take private hazard.

We address these issues and other thus far omitted correlates of the take-private hazard in Table 7. Column 1 includes board size and shows that it is negatively associated with the likelihood of becoming a PE target. The explanation for this effect is open to interpretation. It could be that the size of a firm's board has a direct effect on its likelihood of becoming a PE target because of coordination issues. More likely, though, firm complexity (or some other firm attribute) correlates with board size and decreases the take-private hazard. However, the PE Interlock effect remains robust. Similarly, controlling for the fraction of inside directors in Column 2 does not change our core result.

There is also sure to be nonrandom matching between specific director expertise and the advisory needs of firms, and the existence of such needs could correlate with a firm's appeal as a take private target. Of particular relevance could be financial expertise. For example, bankers could be recruited to the boards of companies that anticipate a heavy need for external financing (Guner, Malmendier, and Tate, 2008) and venture capitalists are more likely to serve on boards with strong control rights relative to management (Baker and Gompers, 2003).

In Columns 3–4 we examine the effects of financial expertise. Column 3 shows that the presence of financial experts on a board, which we define to be those with primary job titles of Chief Financial Officer or vice president of finance, is associated with a lower likelihood of a PE offer. This effect could reflect the unobserved financing needs of a firm, or it could be that companies with financially savvy directors could be better managed and thus leave less room for improvement by a PE acquirer. Column 4 shows that the presence of financial investors, which we define to be those whose primary job titles suggest that they are managing directors or general partners of asset management firms, is associated with a higher likelihood of a PE offer. This effect is consistent with such directors steering the companies toward PE

**Table 7**
PE Interlock effect and potential correlates of private equity activity.

Table reports results of logit regressions where the dependent variable equals one if a firm receives a private equity (PE)-backed going private offer. The sample consists of US publicly traded firms in 2000–2007, with observations at the firm-year level. All regressions include the full set of (unreported) covariates from the baseline regression in Table 4 Column 4. PE Interlock is a binary variable that equals one if the firm has a director who served as a director or executive of another firm during the year that firm became a take-private target, at any point in the preceding 5 years. Board size is the number of board members. % Inside directors is the fraction of board members who are inside directors. % Finance experts is the fraction of board members whose primary job title suggests financial expertise (e.g., Chief Financial Officer, Vice President of Finance). % Financial investors is the fraction of board members whose primary job title and primary company name suggest they are financial investors (e.g., managing directors of asset management firms). PE Interlock, different industry only is a binary variable that equals one if PE Interlock equals one and results from an interlock with a firm in a different Fama-French 48 industry. PE Proximity is an inverse distance-weighted measure of previous PE activity. Standard errors are Huber–White heteroskedasticity-consistent and are clustered at the firm level. *Significant at 10%; **significant at 5%; and ***significant at 1%.

| Variable | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| PE Interlock | 0.379*** | 0.337*** | 0.342*** | 0.336*** |  | 0.344*** |
|  | (0.121) | (0.121) | (0.121) | (0.121) |  | (0.121) |
| Board size | −0.063** |  |  |  |  |  |
|  | (0.029) |  |  |  |  |  |
| % Inside directors |  | −0.593 |  |  |  |  |
|  |  | (0.469) |  |  |  |  |
| % Finance experts |  |  | −1.587* |  |  |  |
|  |  |  | (0.854) |  |  |  |
| % Financial investors |  |  |  | 0.731** |  |  |
|  |  |  |  | (0.365) |  |  |
| PE Interlock, different industry only |  |  |  |  | 0.343*** |  |
|  |  |  |  |  | (0.129) |  |
| PE Proximity |  |  |  |  |  | −0.003 |
|  |  |  |  |  |  | (0.012) |
| Controls | Yes | Yes | Yes | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Number of observations | 40,339 | 40,339 | 40,339 | 40,339 | 40,339 | 39,928 |
| Pseudo-$R^2$ | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 | 0.11 |

deals, but it is also possible that financial experts are recruited to the boards of firms that are likely to be interested in an external investment. Once again, the PE Interlock effect is unaffected after conditioning on these potential correlates of PE activity.

We also consider industry- and geography-specific effects, because these are dimensions along which PE activity can cluster and board service is determined. Just as merger activity can occur in industry-specific waves (Mitchell and Mulherin, 1996), take-private activity could have an industry component as well. In addition, links in the director network could reflect patterns of demand for individuals with industry-specific expertise that enhances the value of directors' advice. Thus, Column 5 limits the effect of PE Interlock to cases in which the origin firm (the prior PE target) is in a different industry than the still-public firm. Even limiting the interlocks to cross-industry pairings, PE Interlock still strongly predicts the probability of becoming a target.

In Column 6, we control for the geographic proximity of the at-risk firm to all previous take-private transactions. Here, the concern is that directors tend to serve on geographically proximate firms (Kono, Palmer, Friedland, and Zafonte, 1998) and that such firms could share similar likelihoods of take-private activity for reasons such as industry clustering, regional economic conditions, and the geographic focus of PE firms. To address this issue, we compute, for every firm in each year, a PE geographic proximity variable that captures each still-public firm's proximity to the volume of all prior PE activity. We define

PE Proximity for firm $j$ at time $t$ as

$$\sum_{k \neq j} \frac{1}{1 + d(j,k)}, \tag{3}$$

where $k$ is a firm that receives a PE offer in $t' < t$ and $d(j, k)$ is the physical distance between firms $j$ and $k$.[11] This measure weights the contribution of each firm $k$, which has experienced a PE offer at some time in the past, according to the inverse distance between the geographic location of $k$ and the currently at-risk firm $j$. Summing these weighted contributions across all firms $k$ produces a distance-weighted measure of the proximity of all PE activity to each focal firm $j$. The highest values of this variable are achieved for firms that are physically located nearest to the largest volume of prior take-private transactions. In Column 6, however, we find no evidence of geographic clustering in PE targets. Spatial proximity to past targets does not increase the predicted hazard of becoming a target and PE Interlock continues to hold.

In addition to the direct controls for some of the probable bases of director-firm matching, in Table 8 we return to the timing of link activation and the movement of directors across firms to improve the identification of

---

[11] We calculate distance $d(j,k)$ (in hundreds of miles) by locating firms in space according to their latitudes and longitudes, using the Great Circle Distance Formula: $d(j,k) = 34.377 * \{\arccos[\sin(\text{lat } j)* \sin(\text{lat } k) + \cos(\text{lat } j)* \cos(\text{lat } k)* \cos(\Delta)]\}$, where lat $j(k)$ is the latitude in radians of the zip code in which firm $j(k)$ is located and $\Delta$ is the absolute value of the difference between the longitude of $j$ and the longitude of $k$.

**Table 8**
PE Interlock effect and timing of link activation.

Table reports results of logit regressions where the dependent variable equals one if a firm receives a private equity (PE)-backed going private offer. The sample consists of US publicly traded firms in 2000–2007, with observations at the firm-year level. All regressions include the full set of (unreported) covariates from the baseline regression in Table 4 Column 4. PE Interlock is a binary variable that equals one if the firm has a director who served as a director or executive of another firm during the year that firm became a take-private target, at any point in the preceding 5 years. Chosen Firm equals one for firm *j* if firm *j* at some point in time acquires a PE-experienced director (i.e., has PE Interlock=1 for some *t*). Chosen Firm-Year equals one for firm-years in which there is a director on board who either is PE-experienced or will become PE-experienced. Left Director equals one if a firm *j* in year *t* has a director on board who left a firm pre-offer (i.e., left a firm that would later receive a PE offer but did not stay to experience the offer). PE Interlock, deal 1 year ago equals one if PE Interlock=1 and the interlocked deal was announced in the preceding year. PE Interlock, deal 1 year ago equals one if PE Interlock=1 and the interlocked deal was announced in the preceding 2–5 years. Standard errors are Huber–White heteroskedasticity-consistent and are clustered at the firm level. *Significant at 10%; **significant at 5%; and ***significant at 1%.

| Variable | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| PE Interlock | 0.672*** | 0.578*** | 0.354*** | |
| | (0.180) | (0.206) | (0.121) | |
| Chosen Firm | − 0.421** | | | |
| | (0.170) | | | |
| Chosen Firm-Year | | − 0.271 | | |
| | | (0.194) | | |
| Left Director | | | − 0.038 | |
| | | | (0.141) | |
| PE Interlock, deal 1 year ago | | | | 0.271 |
| | | | | (0.197) |
| PE Interlock, deal 2–5 years ago | | | | 0.384*** |
| | | | | (0.136) |
| Controls | Yes | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes | Yes |
| Industry fixed effects | Yes | Yes | Yes | Yes |
| Number of observations | 40,339 | 40,339 | 40,339 | 40,339 |
| Pseudo-/adjusted $R^2$ | 0.11 | 0.11 | 0.11 | 0.11 |

PE Interlock. Column 1 includes a dummy variable, Chosen Firm, which equals one for firm *j* if, at time, it has a PE Interlocked director. If the PE Interlock effect is due to matching, then conditional on being chosen by a PE-experienced director, the timing of PE Interlock=1 should not matter. However, we find that the specific firm-years during which PE Interlock=1 do strongly predict PE activity, even after controlling for Chosen Firm. Similarly, Column 2 includes a dummy variable, Chosen Firm-Year, for firm-years in which a director who is or will become PE-experienced serves on the board. Here we condition more specifically on the years in which the future PE Interlock director actually serves on the board of firm *j*. This addresses concerns that the director-firm matching occurs on an underlying characteristic that more closely coincides with the span of the director's service. Again, PE Interlock strongly persists.

In Column 3, we track Left Directors who depart the board of a take-private offer-receiving firm pre-offer, to determine whether other firms whose boards they join have a higher likelihood of a PE offer (see Fig. 1, Panel B). If the PE Interlock effect is due to matching, then the fact that these directors once matched to firms that received a PE offer would suggest that the subsequent firms they match with also have a higher likelihood of PE offer. However, because they leave the firm prior to the PE offer and do not actually experience the PE deal firsthand, they cannot be transferring their PE experience to these subsequent firms. We find that Left Director is not significant in predicting PE activity and that the PE Interlock effect is robust after controlling for Left Director.

Lastly, we examine the vintage of the transactions experienced by PE Interlocked directors to address the possibility that the PE Interlock effect is driven by contemporaneous waves of private equity activity traveling through groups of related firms. Under such a scenario, the PE Interlock effect could reflect a surge of PE activity that elevates the risk of PE takeover in a generalized or localized fashion, but the directors themselves play no causal role. To explore this, we consider when a PE Interlocked director at current-firm *j* experienced a PE transaction at a second firm *k*. A theory of "PE waves" suggests that the greatest predictive effect occurs for transactions that are the most proximate in time. In other words, if a director *x* acquired his PE experience at firm *k* last year, he should have a stronger effect on the take-private hazard of firm *j* than if his experience is more dated. As Column 4 shows, however, we find that the effect of PE Interlocks attributable to deals experienced by the director in the previous year is in fact weaker than the effect of deals that took place 2 or more years past.

### 5.3. Robustness: propensity score analysis

As a final robustness test, we consider whether the results are influenced by differences in firm characteristics of the PE Interlock=1 relative to PE Interlock=0 subgroups. For instance, we have shown that firms with PE Interlocks are larger. Moreover, we know from our baseline regressions that firm size is also correlated with the likelihood of becoming a PE target. If our baseline specification inadequately controls for this and other firm characteristics, then differences in covariate distributions between the PE Interlock=1 and 0 samples might affect the results. Ideally we would have a sample that is comparable on all covariates but one, PE Interlock.

If we construe the PE Interlock variable as a treatment indicator, we can apply propensity score-based methods to achieve covariate balance in the treatment and control samples (Rosenbaum and Rubin, 1983; Hirano, Imbens, and Ridder, 2003). We use inverse probability of treatment weighting (IPTW) (Imbens and Wooldridge, 2007) to create a trimmed, weighted sample in which, intuitively, observations with characteristics that result in high likelihood of treatment are down-weighted in the treatment group and observations with a low likelihood of treatment are down-weighted in the control group. Regressions on this weighted sample then produce estimates of the treatment effect that are independent of distributional differences in the initial control and treatment groups.

Table 9, Panel A reports the differences in covariates between the PE Interlock=1 and 0 samples. Unweighted

**Table 9**
Achieving covariate balance with propensity score-based weighting.

   The sample consists of US publicly traded firms in 2000–2007, with observations at the firm-year level. Panel A compares the covariate means for the PE Interlock=1 and PE Interlock=0 samples, unweighted as in the original sample and weighted using the inverse probability of treatment weighting (IPTW) method. Panel B reports results of logit regressions where the dependent variable equals one if a firm receives a private equity (PE)-backed going private offer. All regressions include the full set of (unreported) covariates from the baseline regression in Table 4 Column 4. PE Interlock is a binary variable that equals one if the firm has a director who served as a director or executive of another firm during the year that firm became a take-private target, at any point in the preceding 5 years. Column 1 reports the regression results using the original sample, and Column 2 shows results after applying the IPTW procedure. Standard errors are Huber–White heteroskedasticity-consistent and are clustered at the firm level. *Significant at 10%; **significant at 5%; and ***significant at 1%.

| Panel A. Covariates for PE Interlock=1 versus PE Interlock=0 samples | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Variable | Unweighted | | | | Weighted | | | |
| | PE Interlock=1 | PE Interlock=0 | Difference | *t*-statistic | PE Interlock=1 | PE Interlock=0 | Difference | *t*-statistic |
| Size | 6.35 | 5.28 | 1.08 | 39.50 | 6.08 | 6.09 | −0.01 | −0.38 |
| Market-to-book | 2.18 | 2.27 | −0.09 | −2.07 | 2.10 | 2.12 | −0.02 | −0.57 |
| Share liquidity | 1.43 | 1.36 | 0.06 | 2.61 | 1.36 | 1.38 | −0.02 | −0.83 |
| Free cash flow | 0.01 | −0.02 | 0.03 | 7.92 | 0.01 | 0.01 | 0.00 | 0.48 |
| Institutional ownership | 0.53 | 0.37 | 0.16 | 41.05 | 0.50 | 0.50 | 0.00 | 0.79 |
| Insider ownership | 0.14 | 0.18 | −0.04 | −13.67 | 0.15 | 0.15 | 0.00 | 0.44 |
| Interlock Dummy | 1.00 | 0.83 | 0.17 | 36.98 | 1.00 | 1.00 | 0.00 | – |

| Panel B. Inverse probability of treatment-weighted regressions | | |
|---|---|---|
| Variable | Baseline (1) | IPTW (2) |
| PE Interlock | 0.351*** | 0.329*** |
| | (0.121) | (0.124) |
| Controls | Yes | Yes |
| Year fixed effects | Yes | Yes |
| Industry fixed effects | Yes | Yes |
| Number of observations | 40,339 | 28,230 |
| Pseudo-$R^2$ | 0.11 | 0.11 |

data show substantial differences in means for all covariates in the initial sample, but weighted data then illustrate that all of these differences disappear after applying the IPTW procedure. Panel B, Column 2 then reports the regression results on this balanced sample (for comparison, Column 1 reproduces the baseline PE Interlock coefficient from Table 4, Column 4). The core PE Interlock effect is unaffected after adjusting for covariate differences between the treated and untreated samples.

## 6. Conclusion

   The evidence we present shows that board characteristics, including the intercompany network formed by directors who serve on more than one public company board, play an important role in private equity deal generation. We find that still-public firms with board interlocks are much more likely to become targets in PE-backed take-private transactions; that there is an additional, economically significant effect of having interlocked directors who specifically have PE experience through board service at a different company; and that the nature of the individual director's past PE experience and relative influence on a still-public company's board contours the effect of having a PE Interlocked director. We offer a set of explanations for these findings, including

that PE-experienced directors are more likely to have ties with key players in the private equity ecosystem, are more likely to be viewed as experts by other members of the board, are more likely to be known by PE firms searching for deals, and could be more likely to advise management to proceed with a deal. All of these factors could influence whether preliminary discussions between PE firms and potential targets are initiated and whether they ultimately rise to the level of a formal offer.

   We consider two primary alternative explanations: board stacking and director-firm matching on unobserved attributes that correlate with the take-private hazard, which might generate a positive but spurious relation between a firm with a PE Interlocked director and its likelihood of becoming a PE target. Through many supplemental analyses, we find that the PE Interlock effect is robust to these two alternatives.

   Finally, we believe that the boardroom network is a promising venue in which to further study the influence of social networks on financial market outcomes. First, as our descriptive statistics reveal, this is a relatively dense network. The vast majority of domestic, public companies now have one or more director interlocks with other public firms. Second, board members are central agents in an array of important decisions, including the selection of CEOs, divestitures, M&As, executive compensation, and the adoption of corporate governance practices. At one level, our findings reinforce the idea that a small number

of individuals can wield significant influence in company-wide outcomes. At another level, because these types of decision are taken by the entire board, not by solitary directors, our findings ultimately suggest that individual directors are both swayed by and influence others in the network in which they are embedded. Further research into the sources and conduits of boardroom influence can yield important insights that enhance traditional understandings of the drivers of corporate financial behavior.

## References

Adams, R., Ferreira, D., 2007. A theory of friendly boards. Journal of Finance 62, 217–250.

Adams, R., Hermalin, B., Weisbach, M., 2008. The role of boards of directors in corporate governance: a conceptual framework and survey. Unpublished working paper. National Bureau of Economic Research, Cambridge, MA.

Baker, M., Gompers, P., 2003. The determinants of board structure at the initial public offering. Journal of Law and Economics 46, 569–598.

Bizjak, J., Lemmon, M., Whitby, R., 2009. Option backdating and board interlocks. Review of Financial Studies 22, 4821–4847.

Boone, A., Field, L., Karpoff, J., Raheja, C., 2007. The determinants of board size and composition: an empirical analysis. Journal of Financial Economics 85, 66–101.

Boone, A., Mulherin, J., 2009. Do private equity consortiums facilitate collusion in takeover bidding? Unpublished working paper. University of Kansas, School of Business, Lawrence, KS.

Boot, A., Gopalan, R., Thakor, A., 2008. Market liquidity, investor participation, and managerial autonomy: why do firms go private? Journal of Finance 83, 2013–2059

Burt, R., 1983. Corporate Profits and Cooptation: Networks of Market Constraints and Directorate Ties in the American Economy. Academic Press, New York.

Cohen, L., Frazzini, A., Malloy, C., 2008. The small world of investing: board connections and mutual fund returns. Journal of Political Economy 116, 951–979.

Coles, J., Daniel, N., Naveen, L., 2008. Boards: does one size fit all? Journal of Financial Economics 87, 329–356

Davis, G., 1991. Agents without principles? The spread of the poison pill through the intercorporate network. Administrative Science Quarterly 36, 583–613.

Fich, E., Shivdasani, A., 2006. Are busy boards effective monitors? Journal of Finance 61, 689–724

Fich, E., White, L., 2003. CEO compensation and turnover: the effects of mutually interlocked boards. Wake Forest Law Review 38, 935–959.

Fidrmuc, J., Roosenboom, P., van Dijk, D., 2007. Do private equity investors take firms private for different reasons? Unpublished working paper. Erasmus University, Rotterdam School of Management, Rotterdam, The Netherlands.

Garmaise, M., Moskowitz, T., 2003. Informal financial networks: theory and evidence. Review of Financial Studies 16, 1007–1040.

Guner, A., Malmendier, U., Tate, G., 2008. Financial expertise of directors. Journal of Financial Economics 88, 323–354.

Hallock, K., 1997. Reciprocally interlocking boards of directors and executive compensation. Journal of Financial and Quantitative Analysis 32, 331–344.

Halpern, P., Kieschnick, R., Rotenberg, W., 1999. On the heterogeneity of leveraged going private transactions. Review of Financial Studies 12, 281–309.

Harris, M., Raviv, A., 2008. A theory of board control and size. Review of Financial Studies 21, 1797–1832.

Hermalin, B., Weisbach, M., 1998. Endogenously chosen boards of directors and their monitoring of the CEO. American Economic Review 88, 96–118.

Hermalin, B., Weisbach, M., 2003. Boards of directors as an endogenously determined institution: a survey of the economic literature. Economic Policy Review (April), 7–26.

Hirano, K., Imbens, G., Ridder, G., 2003. Efficient estimation of average treatment effects using the estimated propensity score. Econometrica 71, 1161–1189.

Hochberg, Y., Ljungqvist, A., Lu, Y., 2007. Whom you know matters: venture capital networks and investment performance. Journal of Finance 62, 251–301.

Hwang, B., Kim, S., 2009. It pays to have friends. Journal of Financial Economics 93, 138–158.

Imbens, G., Wooldridge, J., 2007. Lecture 1: estimation of average treatment effects under unconfoundedness. National Bureau of Economic Research, summer seminar.

Jensen, M., 1986. Agency costs of free cash flow, corporate finance and takeovers. American Economic Review 76, 323–339.

Khurana, R., 2002. Searching for a Corporate Savior: the Irrational Quest for Charismatic CEOs. Princeton University Press, Princeton, NJ.

Kieschnick, R., 1998. Free cash flow and stockholder gains in going private transactions revisited. Journal of Business Finance and Accounting 25, 187–202.

Kono, C., Palmer, D., Friedland, R., Zafonte, M., 1998. Lost in space: the geography of corporate interlocking directorates. American Journal of Sociology 103, 863–911.

Kramarz, F., Thesmar, D., 2006. Social networks in the boardroom. Unpublished working paper. IZA (Institute for the Study of Labor), Bonn, Germany.

Larcker, D., Richardson, S., Seary, A., Tuna, A., 2005. Back door links between directors and executive compensation. Unpublished working paper, University of Pennsylvania, The Wharton School, Philadelphia, PA.

Lehn, K., Poulsen, A., 1989. Free cash flow and stockholder gains in going private transactions. Journal of Finance 44, 771–787.

Linck, J., Netter, J., Yang, T., 2008. The determinants of board structure. Journal of Financial Economics 87, 308–328.

Lindsey, L., 2008. Blurring firm boundaries: the role of venture capital in strategic alliances. Journal of Finance 63, 1137–1168.

Mehran, H., Peristiani, S., 2008. Financial visibility and the decision to go private. Unpublished working paper, Federal Reserve Bank of New York.

Mitchell, M., Mulherin, J., 1996. The impact of industry shocks on takeover and restructuring activity. Journal of Financial Economics 41, 193–229.

Mizruchi, M., 1992. The Structure of Corporate Political Action. Harvard University Press, Cambridge, MA.

Opler, T., Titman, S., 1993. The determinants of leveraged buyout activity: free cash flow vs. financial distress costs. Journal of Finance 48, 1985–1999.

Palmer, D., 1983. Broken ties: interlocking directorates and intercorporate coordination. Administrative Science Quarterly 28, 40–55.

Raheja, C., 2005. Determinants of board size and composition: a theory of corporate boards. Journal of Financial and Quantitative Analysis 40, 283–306.

Rhodes-Kropf, M., Robinson, D., 2008. The market for mergers and the boundaries of the firm. Journal of Finance 63, 1169–1211.

Robinson, D., Stuart, T., 2007. Network effects in the governance of strategic alliances. Journal of Law, Economics, and Organization 23, 242–273.

Rosenbaum, R., Rubin, D., 1983. The central role of the propensity score in observational studies for causal effects. Biometrika 70, 41–55.

Schmidt, B., 2008. Costs and benefits of "friendly" boards during mergers and acquisitions. Unpublished working paper, University of Southern California, Marshall School of Business, Los Angeles, CA.

Shivdasani, A., Yermack, D., 1999. CEO involvement in the selection of new board members: an empirical analysis. Journal of Finance 54, 1829–1853.

Sorenson, O., Stuart, T., 2001. Syndication networks and the spatial distribution of venture capital investments. American Journal of Sociology 106, 1546–1586.

Weir, C., Laing, D., Wright, M., 2005. Incentive effects, monitoring mechanisms and the market for corporate control: an analysis of the factors affecting public to private transactions in the UK. Journal of Business Finance and Accounting 32, 909–943.