NBER WORKING PAPER SERIES

BOARD INTERLOCKS AND THE PROPENSITY TO BE TARGETED IN PRIVATE EQUITY TRANSACTIONS

Toby Stuart
Soojin Yim

Working Paper 14189
http://www.nber.org/papers/w14189

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
July 2008

The authors would like to thank Rakesh Khurana for some initial, provocative discussions on this project; Tracy Li for helpful research assistance; Guido Imbens, Bill Kerr, Josh Lerner, Steve Kaplan, Ramana Nanda, Bill Simpson, Jeremy Stein, David Robinson, David Scharfstein, Julie Wulf, Matthew Rhodes-Kropf, Mitchell Petersen, Scott Stern, and Yael Hochberg for helpful comments. In addition, we acknowledge Erika McCaffery's assistance in locating data for this project. Direct correspondence to yim@fas.harvard.edu or tstuart@hbs.edu. The views expressed herein are those of the author(s) and do not necessarily reflect the views of the National Bureau of Economic Research.

Board Interlocks and the Propensity to be Targeted in Private Equity Transactions
Toby Stuart and Soojin Yim
NBER Working Paper No. 14189
July 2008
JEL No. G34

ABSTRACT

In this paper, we examine the propensity for U.S. public companies to become targets for private equity-backed, take-private transactions. We consider the characteristics of 483 private equity-backed deals in the 2000-2007 period relative to public companies, and find that, in addition to the financial drivers studied in previous works, board characteristics and director networks are also associated with deal generation. We find that a company that has a director who has had LBO experience through prior board service is ~40% more likely to receive a private equity offer, and that the strength of this effect varies with the influence of the director and the quality of the prior LBO experience. This effect is robust to the most likely alternative explanations and supports the idea that directors and social networks play an influential role in change-of-control transactions.

Toby Stuart
Harvard Business School
Rock 211
Soldiers Field
Boston, MA 02163
tstuart@hbs.edu

Soojin Yim
Harvard Business School
Baker 220
Soldiers Field
Boston, MA 02163
yim@fas.harvard.edu

Social networks among the agents in a market can affect the nature of financial transactions and their outcomes. When information is privately held, the specific links among market participants in the social network often determine who acquires information, when they obtain it, how to interpret its significance, and how to effectively deploy it. Here, we examine the vast network that selectively interconnects tens of thousands of members of boards of directors of domestic, publicly held corporations. The director "interlock" network arises because many company officers and directors serve on multiple boards, thus creating information pathways between specific pairs of corporate boards. This is exactly the type of network that we would anticipate will influence corporate governance-related outcomes; it connects important decision makers who often operate in an environment characterized by incomplete information.

In this paper, we associate board "interlocks" with firms' propensities to become targets in private-equity-backed, take-private transactions. The private equity industry has expanded rapidly in recent years. In 2006 and 2007 alone, $700B was invested in take-private transactions of US public firms. Notwithstanding the market's abrupt collapse in August 2007, the industry's recent upsurge has been called a new wave of private equity, characterized by cheap debt, large inflows of capital, frequent auctions, the emergence of club deals, and a preponderance of friendly takeovers. However, despite the unprecedented scale of recent deals and their marked differences from those of the 1980s, the drivers of take-private activity have not been systematically examined in a broad sample of U.S. firms since research on the hostile takeover wave of the 1980s. In addition to presenting estimates of the effects of basic firm-level characteristics of private equity transactions, the recent backdrop of friendly deals offers a favorable context in which to

study the influence of boards and the role of board interlocks, which we believe yield interesting insights into the role of social networks in corporate transactions.

Corporate directors are key agents in all potential change of control transactions. With respect to private equity offers, boards may influence transaction probabilities through a number of mechanisms. First, because most recent private equity deals have been friendly, if directors oppose a private equity offer, behind-the-scenes discussions of a potential bid may never become public. Thus, a board's opposition may cause the take-private process to shutdown *before* public disclosure occurs. Second, directors may actively participate in off-the-record discussions that convey to private equity firms the openness of the companies they represent to take-private offers. Similarly, directors may be more or less open to the idea of management-initiated discussion about the possibility of a private equity deal. Third, viewed from the private equity side of the transaction, firms with certain director characteristics may, ceteris paribus, represent more appealing targets because the takeover process would be anticipated to occur efficiently or under more favorable terms.[1] Any or all of these factors would be sufficient to create an association between board characteristics and the probability that a firm becomes a target in a PE transaction.

The most novel contribution of this paper is the examination of board interlocks in driving a firm's hazard rate of receiving a PE-backed take-private offer (hereafter, "PE Tx"), presumably by influencing a director's disposition toward adopting a pro-PE stance. Two firms are said to be interlocked if, either concurrently or at different points in time, their boards share a common director. In 2007, approximately 85% of public firms

[1] In conversations with partners at private equity firms, we were explicitly told that potential transactions with experienced, knowledgeable, and "professional" directors were viewed more favorably than the alternative.

were interlocked with at least one other company. Within the complete set of director interlocks, we take a subset of linkages and create a dummy variable "PE Link" at the firm/board level, which equals one when a given firm has one or more directors with links to past take-private experience. For example, Eugene Davis sat on the board of Metals USA in 2005 when it received a take private offer from Apollo Management. Mr. Davis also served on the board of Knology Inc from 2004-2007. In 2006 and 2007, Knology would have PE Link=1, due to the relationship it has with the Metals USA buyout via Mr. Davis.

Following a large literature in sociology and a growing one in finance and economics, we believe that director interlocks create information pathways between firms. These links may lower the cost of acquiring information pertinent to the take private process. For instance, PE-linked directors of an at-risk firm will have existing relationships with attorneys, bankers, members of private equity firms, and other individuals whose services may be required in the take private process. Depending on their previous experiences, PE-linked directors also may be well positioned to assess the terms of a potential transaction, the reputation of the private equity firm, the chance that an initiated transaction will be completed successfully, and so on. Moreover, interlocked directors may be particularly influential on their respective boards. The relevance of this influence is that interlocked directors' views on whether to consider a change of control transaction and what alternative would be most favorable may garner the greatest weight in boardroom deliberations. In other words, insofar as board-level decisions emerge from an intra-board influence process, we anticipate that interlocked directors with private

equity experience will exert the strongest "peer effects" in boardroom deliberations about these transactions.

Our results support the core hypothesis about linkages to past take private deals. We find that firms with one or more directors who have experienced a private equity transaction at another firm at which they were a director or officer are, depending upon the specification, 30-40% more likely to become take-private targets.

We conduct an array of supplemental analyses to address alternative explanations. Two salient stories for PE Link immediately come to mind. First, the result may reflect a reverse causal process by which management teams that favor a private equity transaction recruit directors with PE experience to their boards. Second, it is undoubtedly the case that directors and firms match to each other on many characteristics, which raises the possibility that an unobserved variable may drive both PE Link and PE Tx. Regarding the first concern, we find that PE Link holds for long-seated directors who are unlikely to be placed on the board by management for the purpose of facilitating a private equity deal. Similarly, we find that the PE Link holds when we consider only the influence of directors who held positions on the board of a given at-risk firm since a date that *preceded* the time when they gained PE experience through a second directorship. With respect to possible omitted variables, we find that PE Link holds after controlling for numerous characteristics that could induce the observed matching between firms and directors; that the timing of PE Link activation within a firm matters; and that having a PE-experienced director matters most when the individual director that creates the interlock is influential and has had a positive prior PE experience. The latter results suggest that the interlocked director himself has an influence on the outcome, rather than

the effect being driven solely by an omitted characteristic. Considered collectively, we believe these findings support the view that boards play an important role in PE transactions, and that in particular, the board network serves as a conduit for the transmission of experience and influence that meaningfully affects financial transactions.

The paper is organized as follows. Section 1 reviews the related streams of literature and provides some background on the private equity process. Section 2 describes the data and summary statistics. Section 3 provides baseline results on the drivers of PE offers and provides estimates of the interlock effect. Section 4 addresses potential alternative explanations in interpreting the interlock effect. Section 5 presents additional analysis, and Section 6 concludes.

1. Background and Literature Review

The Private Equity Process. In the typical, *friendly* private equity deal, representatives from the private equity firm and target management engage in informal talks to assess mutual interest in the deal. Participants on both sides of these transactions describe an active role of social networks in generating leads for potential PE deals. For instance, conversations with industry veterans revealed that important sources of deal leads were specific contacts at region- and industry-specialized investment banks (in addition to the large Wall Street banks), as well as executives with whom they had prior (professional or social) relationships.

In the early stages of negotiations between management and PE principals, the board (in cases in which it is not involved from the beginning) is informed of talks and is

updated on negotiation proceedings. The board will often then hire its own financial and legal counsel and form a special committee comprised of independent directors to evaluate the deal. The merger agreement then will require board approval before it can be sent out to shareholders via proxy; the actual vote then takes place at a special shareholder meeting called for the purpose. Thus, although shareholders have the final vote and management is often the initial contact for negotiations, board approval is a critical step in the completion of a private equity transaction. The alternative to a friendly deal for an acquirer is to go directly to the shareholders via a tender offer, but this is costly due to legal filing fees, mailing costs, defensive tactics by the board, and the risk of attracting competing bidders.[2]

Propensity to Become a PE Target. Hostile takeovers were the norm in the deals of the 1980s, which have been the main focus of the existing literature on the drivers of private equity transactions. The papers on 1980s LBOs primarily examined the free cash flow and undervaluation hypotheses of take private transactions (Lehn and Poulsen 1988; Opler and Titman 1993; Kieschnick 1998; Halpern, Kieschnick, and Rotenberg 1999). The handful of papers focusing on more recent deals have added ownership structure and firm visibility (i.e. analyst coverage, share liquidity) as potential determinants of going private activity. In a sample with 95 UK deals in 1998-2000, Weir, Laing, and Wright (2005) find that CEO and institutional ownership positively related to the likelihood of going private. Fidrmuc, Roosenboom, and van Dijk (2007) use a multinomial logit

[2] In addition to the higher cost of completing a hostile bid, members of three of the largest PE firms told us that their private placement memoranda specifically prohibit the partnership from pursuing hostile buyout offers. Thus anecdotal result is consistent with the fact that only 2% of the transactions in the data were hostile deals.

framework in a sample of 212 UK deals, 1997-2003, to study the comparative drivers of MBOs versus PE-backed deals. They find that both MBOs and PE deals are undervalued; low analyst coverage predicts only MBOs; and that executive ownership drives both MBOs and PE deals but that institutional ownership only drives PE deals.

The more recent papers have focused on UK deals (primarily due to the availability of comprehensive UK transaction data from the Centre for Management Buyout Research), and none have studied the very recent period of private equity activity, which only peaked in 2006 to 2007. In contrast, our analysis focuses on US deals in the post-2000 period. Given that the nature of private equity activity has undergone substantial changes since the 1980s and the area of US deals has not been recently revisited, we expect a set of baseline estimates that provide a more relevant and timely picture of the drivers of US private equity activity. We also contribute to this literature by examining the role of social networks as a correlate of PE activity.

Networks in Markets. The study of board interlocks in particular and social networks more generally has been pioneered by sociologists. Since the late 1970s, sociologists have studied the interfirm connections that are created when the same individual director either simultaneously or sequentially serves on the boards of multiple companies (e.g., Useem 1984; Mizruchi 1992). For example, Davis (1991) shows that the decision to adopt poison pills is correlated with director interlocks—anti-takeover defenses appear to have diffused across director-interlocked boards in a predictable pattern. In a qualitative study, Khurana (2001) shows that directors search across the interlock network when identifying and doing diligence on potential CEO candidates.

Financial economists recently have adopted some of the ideas and techniques of social network analysis to study the consequences of director connections for different market outcomes. Larcker, Richardson, Seary, and Tuna (2005) argue that personal relationships between CEOs and "independent" directors reduce the independence of boards. They employ a measure of path distances (the minimum number of intermediaries that are required to connect two agents) in the director network to assess the relational proximity between inside and outside directors on boards. Larcker et al. find that CEO compensation is higher in firms with relationally "cozy" boards. In an analysis of social networks in the boardroom of a large sample of French companies, Kramarz and Thesmar (2006) find that CEOs who were former civil servants were more likely to accumulate directorships (thus creating multiple firm-to-firm interlocks), but were also more likely to run less profitable firms and were less likely to be replaced for poor performance. Fich and Shivdasani (2006) find that independent directors that sit on multiple boards—so-called "busy directors—are associated with weak corporate governance, and boards dominated by such directors exhibit governance characteristics similar to that of insider-dominated boards.

Beyond inter-firm board connections, Cohen, Frazzini, and Malloy (2007) study educational networks shared by mutual fund managers and the directors of the companies in their portfolio. They find that mutual fund managers perform better on investments when directors of their portfolio companies are members of their networks. They interpret their results as showing that network connections confer information advantages to fund managers. Other recent papers have shown that social networks affect investment choices and fund returns in venture capital (Sorenson and Stuart 2001; Hochberg,

Ljungqvist, and Lu 2007), the availability of financing for real estate transactions (Garmaise and Moskowitz, 2003), and the governance structure of strategic alliance contracts (Robinson and Stuart 2007). Thus, social networks are known to influence transaction patterns and impact real financial outcomes in an array of settings.

We contribute to the work on social networks in finance by examining one of the most important corporate outcomes: change of control decisions. Not only are board-level decisions critical in this process, we believe that inter-board relationships also have meaningful effects. In the remainder of the paper, our objectives are twofold: first, for a broad sample of firms, we present updated baseline estimates of the probability that a firm is targeted in a PE Tx; second, we connect the PE Tx propensity to the growing literature on social networks in financial markets.

2. Data and Summary Statistics

Sample of going private transactions. Our sample consists of 657 deals announced from January 1, 2000 to December 31, 2007 and identified as "Going Private" transactions in Thomson's SDC Platinum M&A database and Capital IQ.[3] We collected all transactions from both databases and deleted duplicate observations. These are US targets, which we could verify traded on the New York, American, or Nasdaq stock exchanges on the announcement date. Deals are categorized as "PE" if a private equity firm is part of the acquiring party, "MBO" if the deal is a management-led buyout without private equity involvement, or "Other," which includes financial buyers such as

[3] This includes 21 transactions from SDC flagged as "LBO" but appropriately considered "Going Private" upon reading descriptions of the deal.

wealthy individuals investors (e.g., Carl Icahn) or other unaffiliated investor groups. Table 1 shows that PE deals comprise 483 of the 657 deals, and constitute $800B of $850B of value in going private activity in 2000-2007. The MBO category is much smaller in total deal value and average deal size, and as PE activity has expanded in recent years the share of going private activity in the MBO category has fallen—especially as management itself increasingly turns to private equity firms to help finance deals it originates. PE deals are approximately 8 times (mean) and 12.5 times (median) the size of take private transactions that are management-led. The 483 PE deals involve 454 firm-years and 435 distinct firms, as competing bids and withdrawn bids are possible in our sample of announced transactions. These 454 firm-year observations on PE-backed deal announcements comprise our dependent variable of interest, i.e. PE Tx=1.

Comparison of PE target versus all public firm characteristics . To explain the propensity of firms to be targeted in PE-backed going private offers, we compare firms that received a PE Tx offer to the population of all US public firms from which the take private transactions are drawn. We collected firm characteristics broadly relating to financial situation, ownership and governance structure, and network characteristics. Data on stock prices and company financials came from CRSP and Compustat. Institutional ownership data comes from the Thomson Financial CDA/Spectrum 13F database, compiled from SEC filings of institutional money managers who control over $100M of 13F securities. Data on ownership by insiders (officers and directors of the firm) come from Compact Disclosure.[4] We obtained information on corporate directors from the

[4] One important limitation of the insider ownership data is that Compact Disclosure does not distinguish directors' from executives' holdings. We know only the total of insider holdings in the firm.

Directors Database, which provides board composition data for public firms trading on the New York, American, and Nasdaq stock exchanges in 2000-2007.[5] In addition to directors' identities, the database includes characteristics such as insider/outsider status, each director's primary company affiliation and primary job title. Using this database, we construct variables such as board size, fraction of inside directors, CEO-chairman duality, and other board characteristics related to director attributes. The database also contains information on public firms' top executives,[6] which we use to determine other positions held by directors.

Table 2 shows differences in means and medians of basic attributes of the companies in the data broken out by whether or not firms have received a PE-backed take private offer. Differences between the PE and Public groups are significant for most of the financial variables, but the differences in measures of size become much less pronounced using median comparisons (i.e. for total capitalization and assets); this reflects the greater right skew of the size of public firms. Also, it appears that although PE firms are smaller, they have larger EBITDA and free cash flow, defined as (EBITDA-interest-taxes-dividends). The PE and public samples also show very strong differences in ownership and board structure, with PE firms having higher institutional ownership, smaller boards, and a lower proportion of inside directors.

Network measures. The Directors Database provides data on all public board memberships held by a director over the period 2000-2007. We are able to use this data

[5] The Directors Database is the most comprehensive dataset on corporate directors, but it dates back only to the year 2000. Data availability rather than substantive considerations led to our choice of time period.
[6] Coverage of executives is somewhat inconsistent across firms, however, with no satisfactory answer from the data vendor on which executives get reported.

to track directors across firms and over time to construct measures of director experience and of interlocking relationships between boards. We say a focal firm *i* is interlocked with firm *j* at time *t* $\left(Int_{it}^{j}=1\right)$ if there exists a director *x* on firm *i* at time *t* who either serves on the board of *j* or is an executive officer of *j* at time *t'*, for some $t' \le t$. This interlock measure is intended to capture connections a firm has with other companies via its board of directors. As we have constructed it, this is an asymmetric measure of interlock (different papers have used different definitions) because it is possible that $Int_{it}^{j}=1$ but $Int_{jt}^{i} \neq 1$ if linked director *x* is on the board of *i* but is a non-board executive of *j*. We do not limit interlocks to board-to-board relationships because we believe board members can derive sources of influence and information from other companies, *either* as directors *or* executives.

Note as well that our definition of an interlock link leads to a stock variable, in that connections in the network need not be contemporaneous. We believe that this is the appropriate way to measure links because directors serving on boards in the present carry their previous learning, experience, and contacts with them to the boards on which they currently and subsequently serve.

A firm's Board Interlock measure is the firm's total interlock count with other public firms, or $\sum_{j \neq i} Int_{it}^{j}$. Table 2 shows that the median public company is interlocked with five other firms. In comparison, the median firm receiving a PE-backed going private offer has eight interlocks. Table 3 Panel A shows the distribution of Board Interlock in 2007, and we see that only 10% of firms are "isolates"; all members of such firms' boards appear only once in the Director's Database. All other companies are

connected to at least one other firm via its board interlock network. For future analysis, we also define an Interlock Dummy that equals 1 if Board Interlock>0, and 0 otherwise.

We also consider network measures at the director (rather than firm) level. In the social networks literature the simplest measure of centrality is an agent's degree score, which is the number of links involving the agent. In our case, a link is a director on firm *i* holding a director or executive position on firm *j*. Thus, analogous to our definition of board interlock, we define a director's centrality to be the number of firms on which he has held a director or executive position, currently or in the past. Table 3 Panel B shows the distribution of Director Centrality among directors serving on boards in 2007. We can see that 58% of directors serve only one board; the remaining 42% create all of the linkages in the data. At the firm level, we can construct an average centrality measure from the centralities of the individual directors on each board. Table 2 shows that at the median public firm, the average director serves on the boards of 0.7 other firms.

The variable of primary interest in our paper is "PE Link"—whether an "at risk" firm is interlocked through a shared director with another firm that in the past received a going private offer; we are interested in whether this relationship makes the firm more likely to itself receive a PE-backed take private offer. Formally, $PELink_{it} = 1$ if $Int_{it}^{j} = 1$ for some firm *j* and *j* received a going private offer in *t'*<*t*. Here, there are two things of note: the past transaction must strictly precede the year "at risk," and we consider the broader sample of going private transactions (rather than only PE-backed ones) where the linked director could have acquired the prior transaction experience. Although we are specifically interested in the realization of PE-backed offers as the outcome variable (PE Tx), we believe general take private experience is valuable to

directors and can influence their attitude toward future take-private transactions, PE-backed or otherwise.

Table 4 shows the number of public firms that have identified interlock relationships with take-private targets in prior years, that is, have PE Link=1. However, a data truncation problem arises if we rely on the 2000-2007 Directors Database to construct our PE Link variable. Because PE Link=1 only if we are able to match one or more of a firm's directors to a second firm that experienced a take-private offer in a *preceding* year, the PE Link variable in the earlier years of our sample is severely truncated. For example, for a public firm "at risk" in 2003, we identify the directors that sit on the board of the firm in 2003, and consider the other boards that they served on in 2000, 2001, and 2002. If any of the firms that these directors served on in those years had received a going private proposal, then PE Link=1. This naturally means that firms at risk in the year 2000—the first in our dataset—cannot have identified links to going private deals, since we do not have data on director composition prior to that year.

To alleviate this problem, we hand-collected data on all take-private transactions from 1995-1999 and obtained the directors that served on the boards of these companies in the year of the transaction using Compact Disclosure. Then we matched these directors to those in the Directors Database to identify all instances of interlocks between earlier (1995-1999) period going private transactions and active directors in the 2000-2007 period. Table 4 shows that this addition makes a substantial difference in the earlier years of the sample, with 10% interlocks among all firms and 25% interlocks among firms receiving PE offers in 2000, which otherwise would be 0%. However, the monotonic increase in the proportion of interlocks from 2000-2007 still remains, and likely indicates

that the truncation problem has been attenuated but not eliminated. As all specifications include year fixed effects, the major implication of this data truncation is that the effect of PE Link on propensity to receive private equity-backed going private proposals is less precisely estimated in the earlier years of the sample. However, it is also clear that the sample interlock average of 18% for all public firms and 34% for all firms receiving private equity-backed offers understates the true interlock rate for boards of directors. By 2007, these percentages grow to 29% and 49%, respectively.

Table 5 also gives additional characteristics of the PE Link variable. A firm-year can have PE Link=1 through the presence of one or more director who have experienced the same or multiple different prior deals. Panel A shows that 78% of PE Link=1 firm-years are generated by a single link between the focal firm-year and a prior going private experience. Panel B shows that 94% of directors who "induce" PE Link=1 have only experienced a single deal; with a maximum of 3 deals experienced by 1% of involved directors, there are no directors who are disproportionately responsible for collecting and propagating PE experiences. This will become important later, as it does not appear that there exists a coterie of directors who are recruited to public firm boards because they are known to be friendly to PE-led take private transactions.

3. Baseline Results

Table 6 shows logit regression results of the probability of a firm becoming a PE-backed target. Columns (2)-(4) of the table incorporate financial ratios and measures of equity ownership that have commonly been considered in the literature. In (2) we

consider market-based variables such as market capitalization, market-to-book, and liquidity (share turnover), and find that, consistent with the literature, smaller, more undervalued, and less liquid firms are more likely to be PE targets. For a sense of economic magnitudes[7]: a one standard deviation increase in the following covariates results in a (parentheses) decrease in the probability of becoming a target: size (23%), market-to-book (60%), and liquidity (25%). Column (3) includes measures of leverage and cash flow, but it is interesting to note that despite the prevalent practitioner concern over cash flow and debt capacity in private equity transactions, neither the debt to total capitalization ratio nor free cash flow consistently predict the likelihood of receiving a take private offer. This finding is consistent with prior research, and with the idea that ex ante leverage is not as relevant as post-deal leverage capacity.

In (4) we add covariates related to firms' equity ownership structure. We find that a 10 pt increase in institutional ownership raises the probability of a deal by 17%, while a 10 pt increase in insider shareholdings raises the probability by 9%. The positive effects of these ownership variables could arise for a number of reasons. First, PE firms may be most attracted to firms with concentrated shareholder bases because mobilizing support for transactions involving firms with concentrated ownership is comparatively simple. Second, because executives of the company are typically bought out at a premium to the current market price and then (assuming their continued involvement with the firm) are reloaded with equity in the private company, insiders with large ownerships stakes may

[7] Estimates of effects on outcome probability are based on coefficients in column (6), which will constitute our baseline specification. Estimates of effects 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_k change in covariate X_k with coefficient estimate b_k, $\exp(b_k*dx_k)$=odds($X+ b_k*dx_k$)/odds(X). Because in our sample 1-p $\approx$ 1, $\exp(b_k*dx_k)$ approximately gives the ratio of p evaluated at $(X+ b_k*dx_k)$ to p evaluated at X; or equivalently, the percent increase in the outcome success probability relative to baseline due to dx_k.

have a particularly strong incentive to secure PE-led bids. Third, large institutional owners—particularly those that are unsatisfied with a company's management team and share price performance—often pressure directors and managers of the firm to consider a change of control transaction.

Column (5) extends the baseline results to include board-level covariates. We find that a large board is negatively related to receiving a PE offer, possibly due to coordination costs that may deter a PE offer or hinder decision-making. We also include an Interlock Dummy set equal to 1 if the at-risk firm has any interlocks, past or present, with other companies. We find that being connected to other firms increases the likelihood of PE offer by 61%. There are a number of possible interpretations of this result. First, by definition, interlocked directors have more public board experiences than do non-interlocked directors. Thus, they are likely to be perceived as professional by potential PE bidders. Transaction costs with experience boards in the take-private process are likely to be lowered, and members of the board itself may perceive a more straightforward process when experienced directors are on hand. Second, boards that are interlocked are privy to a greater amount of the information flow across the broader board network. We surmise that these interlocks increase the likelihood that a focal company will be directly networked to potential bidders. These factors are likely to positively stimulate PE interest in a company, and vice versa.

Columns (6) includes basic controls for industry-level effects in the form of industry fixed effects defined at the Fama-French 48 level. Column (6) will constitute the baseline specification for analysis going forward.

Turning to the PE Link measure, we find based on the column (6) point estimate that a company is 42 percent more likely to become a PE target when it has one or more directors that previously served on the board of a company that has attracted a take-private offer. Based on the pattern of attenuation in the coefficient on PE Link across Columns (1)-(6) in the table, it is clear that the ownership structure covariates, general board characteristics, and industry effects do drive a meaningful amount of covariation between board interlocks to prior going private transactions and the probability of being targeted in a PE Tx. However, the PE Link effect remains statistically robust. Thus, if we view the Interlock Dummy as capturing the effect on PE Tx of generic connectedness to other firms, we can see that there is an additional effect of specific connectedness to take private offer-receiving firms on PE Tx, as captured by PE Link.[8]

4. Endogeneity Concerns

Although the PE link is statistically robust, the question remains whether the effect should be interpreted as causal. We know from the sociology literature (e.g., Kono, Palmer, Friedland, and Zafonte 1998) that directors are not randomly placed onto boards. The presence of a PE deal-experienced director may be picking up correlation with predictors of PE deals not captured in the model. In the absence of a persuasive instrument for the presence of a PE-experienced director, there are two broad sources of

[8] PE Link is not technically an interaction effect on Interlock Dummy, because construction of the PE Link variable uses supplemental data from 1995-1999 (as described in text). Thus, it is possible that Interlock Dummy (which is based only on 2000-07 directorships) =0 while PE Link=1 (if the link is with a prior transaction in, say, 1997). This, however, is the case in <1% of PE Link=1 observations; for the remaining observations PE Link=1 implies Interlock Dummy=1. If we do interpret PE Link as an interaction on Interlock Dummy, we estimate that PE Link, when considered jointly with the Interlock Dummy, actually then has an effect of increasing the likelihood of offer by ~130% relative to baseline.

endogeneity we most worry about: 1) reverse causation, as board composition is manipulated 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 PE Tx.

First, there is the concern that because most of the recent private equity deals have been friendly, management is not only a willing participant but an active instigator. Management retained in the deal often are awarded generous option packages and large ownership stakes in the newly capitalized firm. Given these incentives, it is plausible that management plays an active role in shopping the company around to private equity firms, and likely can wield a great deal of influence in how attractive a target their company appears to a private equity firm. If a deal-friendly board is one such component, we may be concerned that the presence of deal-friendly or deal-experienced directors just reflects the influence of forward-thinking management. We will address this by examining the role of directors with various levels of tenure on the board, including those whose board service preceded their PE deal exposure in the interlocked firm.

Second, there is a concern that directors and firms are matching on underlying characteristics that are correlated with PE deal activity. Then the fact that a director previously matched with a firm that received a going private offer and also currently sits on a company's board, suggests similarities between the past and current firm that would make the current firm more likely to receive a PE offer. We will address this concern in a number of ways. First, we control for what we believe to be the most likely potential correlates of PE activity, which include industry, geography, governance, and director attributes. To deal with the possibility that directors and firms are matching on more generic correlates of PE activity, we also construct a measure of susceptibility of the

focal firm to becoming a PE target, using the PE-susceptibility of interlocked firms as a proxy. Second, we explore the timing of PE Link activation within a firm, by exploiting the movement of directors across firms and also by using fixed effects. Lastly, we examine the effect of characteristics specific to the director who is responsible for the PE linkage—under the null that if the "PE Link" effect is due solely to matching then neither the influence of the director on the board nor the outcome of the director's experience in a previous deal should have predictive power in the regressions.

Management manipulation. In Table 7 we address the concern of reverse causation, that PE-experienced directors may be recruited to a firm by management in anticipation of doing a PE deal. In column (1), we consider only the effect of what we call "preexisting" directors. These are directors whose board service at the at-risk firm *precedes* their PE experience at a second firm in which they are directors or officers, *and which activates the PE Link dummy for the focal firm*. Alternately, "migrated" directors join the at-risk firm only after they acquired their PE experience. Migrated directors may be candidates who were specifically recruited by management looking to populate a PE-friendly board, but this would not be the case for preexisting directors whose service on the focal board began before they obtained PE experience through board membership at a second company. If the PE Link effect is driven solely by migrated directors, the result could be interpreted as indicating that pro-PE company insiders attempt to actively build PE-friendly boards.

We find that preexisting interlocks still predict the hazard of becoming a target. However, a shortcoming of this analysis is that we can only locate directors on boards of

firms only back to 2000, due to limitations of the Directors Database. For example, if we know a director experienced a PE deal in Company A in 1997 (from our SDC supplement of 1995-1999 transactions), but this director appears in Company B in 2000 (from Directors Database which covers 2000-2007), this director is labeled "migrated" because we cannot verify that he served on Company B's board prior to 1997. The result is that many directors are actually labeled "migrated" who in fact are likely "preexisting"; this we believe explains the marginal significance of results in column (1).

Alternately, in columns (2)-(3) we consider only the PE Link effect of directors who have over 2 or over 3 years of tenure on the board. These directors are not recent recruits to the board, and hence likely are not specific hires for the purpose of facilitating a private equity deal. In column (2), for example, for a firm at risk in 2003, we only consider the effect of PE-experienced directors who have served on the board at least through 2002 and 2001. Again, because we only have directors data back to 2000, this regression only makes sense for observations in years ≥ 2002. This results in fewer observations overall relative to column (1), but here we consider the effect of 4,724 tenured directors relative to the 3,352 preexisting directors in column (1). We find that interlocks of these tenured directors still predicts the likelihood of receiving a PE offer. Column (3) examines the effect of directors with 3 or more years of board service; results are also significant, although more marginal, which we attribute to fewer overall observations in the sample (≥ 2003 only) and fewer observations of such long-tenured directors.

Director-firm matching. Even if management is not directly responsible for manipulating director composition in advance of a PE deal, we might be concerned that a director's joint participation in a prior PE-involved firm and the current at-risk firm reflects some underlying similarities between the two firms that make them *both* more prone to take private offers. There are a few obvious candidates for omitted attributes that may determine both board service and private equity activity, such as industry, geography, firm governance characteristics, or director attributes/characteristics. We will consider these in turn in Table 8.

Just as merger activity can occur in industry-specific waves, take-private activity may have an industry component as well. In addition, board service may reflect industry-specific expertise. To eliminate the possibility that industry-specific relationships are driving the interlocks and the likelihood of receiving a take private offer, in column (1) we consider only the effect of PE Link where the interlocked firm belongs to a different industry from the focal firm. Such a link cannot reflect matching on industry-specific characteristics that would be predictive of within-industry private equity activity. But we find that PE Link here still strongly predicts the probability of becoming a target.

In column (2), 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, and that such firms may share similar likelihood of take private activity (due to industry clustering, regional economic conditions, geographic focus of PE firms, etc). To address this issue, we compute, for every firm in each year, a PE geographic proximity variable that captures an "at risk" firm's proximity to the volume of all prior PE activity. We define PE Proximity for firm *i* at time *t* as

$\sum_{j \neq i} \frac{1}{1+d(i,\ j)}$, where *j* is a firm that receives a PE offer in *t'<t*, and *d(i, j)* is the physical distance between firms *i* and *j*.[9] This measure weights the contribution of each firm *j* experiencing a PE offer according to the inverse distance between the location of the PE target and the focal firm *i*. Summing these weighted contributions across all firms *j* produces a distance-weighted measure of the proximity of all PE activity to each focal firm *i*. 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 (2), however, we find no evidence of geographic clustering in PE targets; special proximity to past targets does not increase the predicted hazard of becoming a target and PE Link continues to hold.

We may also be concerned that board service and take private activity may be correlated with governance characteristics—i.e. "lazy" directors are drawn to poorly governed firms, which then make ripe PE targets. We attempt to control for some basic measures of governance, including whether the CEO also holds the chairman role and the number of inside directors on the board—both of which reflect a lack of board independence.[10] However, column (3) shows that CEO-chairman duality does not predict

[9] We calculate distance d(i,j) by locating firms in space according to their latitudes and longitudes. Using information available from the U.S. Postal Service, we assigned the longitude and latitude coordinates for the center point of every zip code to each firm lying within that zip code. Over small distances, one might use Euclid's formula to compute the distance between two locations; however, the curvature of the earth seriously affects these calculations over areas as large as the continental United States. Thus, we calculated the distance between each set of points (A and B) using spherical geometry, using

$$d(A,B) = 687.56 * \{\arccos[\sin(\text{lat A}) * \sin(\text{lat B}) + \cos(\text{lat A}) * \cos(\text{lat B}) * \cos(\Delta)]\}$$

where the units for latitude (lat) are radians, and Δ is the absolute value of the difference between the longitude of A and the longitude of B in radians. The constant, 687.56, converts the distance into units of five miles.

[10] Ideally we would have a governance measure comparable to the GIM measure; however, this is only available for S&P1500 firms which are large firms that tend not to be vulnerable as PE targets.

PE deals, and that inside directors have a marginal effect directionally opposite to what we would predict under a governance hypothesis; PE Link remains robust.

In columns (4)-(5) we examine whether boards attract directors with a certain type of expertise, which may also be correlated with PE activity. In column (4) we find that the presence of financial experts[11] on a board—such as CFOs or VPs of Finance—is associated with a lower likelihood of a PE offer. One possible explanation for this effect is that boards with financially savvy directors may be better managed and leave less room for improvement by a private equity firm. Column (5) shows that the presence of financial investors[12]—directors who serve as Managing Directors or General Partners of asset management firms—is associated with a higher likelihood of PE offer. This is consistent either with such directors steering the companies toward PE deals, or being invited to PE-leaning firms to share their expertise. We do not claim any causality in these director attributes; however the PE Link effect remains unaffected even after controlling for them.

Beyond these specific characteristics, we may wonder whether there is a general "PE Susceptibility" factor on which directors match to the boards they serve on—i.e. whether directors systematically match with companies with certain underlying susceptibilities to going private deals—which we should be controlling for in our regression. If there is a shared PE-susceptibility factor among interlocked firms, we should be able to construct the focal firm's factor using the interlocked firms' factors as a proxy. Thus we construct a measure of a focal firm's PE-susceptibility by using the

[11] These are directors whose job title at the company with which they are primarily affiliated contains the phrase "Finan."
[12] These are directors whose job title contains the phrase "Managing Director" or "Partner," or whose primary company name contains the phrase "capital " "investment" " venture" or " asset" (note this is sensitive to use of spaces).

average of interlocked firms' predicted probabilities of receiving a PE offer. We define PE Susceptibility for firm *i* at time *t* as $\frac{1}{BoardInterlock_{it}} \sum_{j} pred \Pr(PETx_{jt} = 1)$, where *j* is a firm such that $Int_{it}^{j} = 1$ and $pred \Pr(PETx_{jt} = 1)$ is the predicted probability that the interlocked firm *j* receives a PE offer, which are the fitted values from the baseline logit model excluding PE Link. In column (6) we find that while there is evidence of director matching to firms with underlying susceptibility to PE deals, the PE Link measure is robust to this factor.

Timing of link activation. There are a few additional steps we can take to address the possibility that the PE Link effect is driven by director-firm matching. First, we can examine the timing of the "activation" of the PE Link within a firm and exploit the movement of directors across firms. In Table 9 column (1), we include a dummy variable Chosen Firm that equals 1 for firm *i* if firm *i* at some point in time acquires a director who has PE experience. If the PE Link effect is due to matching, then conditional on being a firm that is chosen by a PE-experienced director, the timing of PE Link=1 should not matter. However, we find that the firm-years that specifically have PE Link=1 do strongly predict PE activity, even after controlling for the fact that this firm is a "Chosen Firm."

In column (2) of table 9, we track directors who leave a take private-offer-receiving-firm *pre-offer*, to see whether other firms that they proceed to serve on have a higher likelihood of PE offer. If the PE Link 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 PE offer and do not actually experience the PE deal

firstand, they cannot be transferring their PE experience to these subsequent firms. We construct a dummy variable Left Director that equals 1 if a firm-year has a director who left a firm that later received a PE offer. We find that this variable is not significant in predicting PE activity, and that PE Link effect is still robust even after controlling for "Left Director."

Finally, to exploit within-firm variation of PE Link activation, we estimate a fixed effects specification using a linear probability model. Since a fixed effects logit drops all groups with no within-group variation (~95% of the firm-years in our sample), we opt for a linear probability model. We find that inclusion of firm fixed effects in column (4) causes the PE Link estimate to increase (column (3) results without firm effects are shown as a comparison). This is actually consistent with the findings in columns (1), which seem to indicate that firms that PE-experienced directors serve on are actually *poorer* candidates for PE deals (perhaps because they are higher quality firms in ways unaccounted for by our observables). Taken together, the evidence suggests that the specific firm-years in which a PE-experienced director occupies the board has incremental explanatory power for likelihood of receiving a PE offer.

Director-specific effects. In Table 10 we consider various characteristics specific to the director responsible for the interlock to determine whether the magnitude of the PE Link effect is sensitive to the influence or the experience of the director involved. If the PE Link effect does sensibly depend on measures of director influence, this would seem to refute the hypothesis that the results are driven simply by director-firm matching. In columns (1)-(3), we consider interactions on PE Link where the PE Link director is a non-executive chairman, dual CEO-chair, and a retired director, respectively. The

estimates are too noisy to yield statistical significance; however point estimates would suggest that an outsider chairman would wield substantial influence in deliberations over going private transactions whereas an insider chairman would not—this is fully consistent with standard practice of independent directors forming a special committee to negotiate transactions while insiders are sidelined. In addition, if the linked director is a retiree—i.e. no longer holds a position of power on a primary company—this would suggest that he is less influential on the board as well.

In column (4) of table 10, we examine whether PE Link has a bigger effect in companies with less influential directors, as measured by the average centrality of the directors on board. "Low board centrality" is a dummy variable that =1 for firms whose directors fall in the lowest quartile of board network connectedness. The positive interaction effect (PE Link)*(Low board centrality) shows that having a PE-experienced director on board is especially conducive to PE offers in companies where the general profile of the board members is relatively low. In such cases, we hypothesize that the experienced director's credentials will lead to his having relatively greater influence on the agenda and outcomes of boardroom deliberations.

In columns (5)-(8) we explore the nature of the experience the PE Link director may have been imprinted by in the prior linked deal. In column (5) we consider interlocks to deals experienced by the PE Link director where the deal was withdrawn and never completed. In column (6) we consider interlocks to deals where the PE offer was received poorly by the market—where the announcement day returns of the deal were below the median of going private deal announcement day returns. Both capture instances where the director's prior PE experience may have been a negative or unsuccessful one; and

both have substantially negative coefficients that effectively wipe out the PE Link effect. This suggests that directors who have had prior negative experiences do not then go on to encourage subsequent firms to be receptive to private equity offers. In column (7) we consider PE Links by directors who were insiders in management-led buyouts in their prior PE experience. These directors substantially enhance the PE Link effect; we attribute this to the fact that their prior experience consists of an active initiation and management of a prior PE deal, in contrast to experienced directors who may have just played a sympathetic but supportive role. Lastly, it is interesting to consider PE Link effects of directors who were MBO insiders on deals that had low announcement day returns vs high announcement day returns. In contrast to directors who may find a high stock market reaction to a PE deal desirable (for reasons of fiduciary duty, etc.), an MBO insider would likely favor a low announcement day return because this means he gets to acquire the company cheaply. Column (8) shows that while a low announcement day return negates the effect of PE Link for a non-MBO insider, for an MBO insider the effect of having experienced a deal with low announcement day return is quite powerful in predicting the likelihood of PE offer in the current firm. These results are consistent with the hypothesis that directors carry forward their experiences from other firms, and use their influence within the board to affect outcomes.

5. Further Analysis

Lastly we try to address the concern that the results are driven by differences in firm characteristics of the PE Link=1 vs PE Link=0 samples. For instance, firms that have PE Links tend to be bigger and have larger boards, since such characteristics makes

interlocking relationships with other companies more likely. However, we know from our baseline regressions that such characteristics are also correlated with the likelihood of becoming a PE target. If our baseline specification inadequately controls for such characteristics, then we might then be concerned that it is the differences in the distribution of such covariates between the PE Link=1 vs PE Link=0 samples that might be driving the results, and not the effect of the PE Link variable itself.[13] Ideally we would have two comparison samples that are comparable for all covariates but differ only one dimension, for PE Link.

If we think of our PE Link variable as a treatment indicator, we can apply propensity score-based methods developed in the program evaluation literature to achieve covariate balance in the treatment and control samples (Rosenbaum and Rubin 1983; Hirano, Imbens and Ridder 2003). The propensity score, p(*X*), is defined as the probability of receiving treatment conditional on the covariates *X*, and is typically estimated as a logit of the treatment indicator on *X*. In Inverse Probability of Treatment Weighting (IPTW), treated and control observations are weighted by 1/p(*X*) and 1/(1-p(*X*)), respectively, in the regression of interest. Intuitively, observations with characteristics that result in high likelihood of treatment, p(*X*), are down-weighted in the treatment group; similarly, observations with a low likelihood of treatment are down-weighted in the control group. This procedure evens out differences in the covariates between the control and treatment groups. Imbens-Wooldridge (2007) also suggest trimming observations with p(*X*) outside of the interval [0.1, 0.9] to eliminate poor candidates for matching across the control and treatment samples. The regression on the

[13] Although, bigger firms with bigger boards are *less* likely to become PE targets given our baseline estimates—so that it would likely not be these particular covariates that we would be concerned are driving the PE Link effect.

weighted, trimmed sample then produces estimates of treatment effects independent of distributional differences in the initial control and treatment groups.

Table 11 Panel A shows the differences in covariates between the PE Link=1 and PE Link=0 samples. Panel A1 shows substantial differences in means for all covariates in the initial sample. Panel A2 shows that after inverse-weighting and trimming, none of the differences are significant at conventional levels. Panel B column (2) then shows the regression results on this balanced sample; the results remain unchanged from our initial baseline specification. Despite substantial differences in the characteristics of firms that have versus lack PE-experienced directors, the IPTW method allows us to ascertain that those differences do not account for the PE Link effect.

6. Conclusion

We have considered many alternative stories that might explain the relationship between having a director on board who has had take-private transaction experience and the likelihood of becoming a PE target. However, we find that the PE Link effect is quite robust. In addition, we find that the strength of this effect seems to vary with characteristics specific to the director responsible to the link, which is supportive of our causal interpretation of this PE Link effect.

The evidence we have presented suggests that boards do play an important role in private equity deal generation, particularly in the more recent deals characterized by friendly relations between offerers and targets. To the extent that directors are imprinted by experiences at other firms and have the power to influence their colleagues on the board, the board interlock network in which a firm is embedded will be relevant in the

conversion of a potential target to an actual target. More generally, social networks are important feature of many financial transactions involving individual agents to entire firms.

References

Barnea, Amir, and Ilan Guedj, 2007, CEO Compensation and Director Networks, Working paper.

Burt, Ronald S., 2006, Interlocking Directorates Behind the S&P Indices, Working paper.

Cohen, Lauren, Andrea Frazzini , and Christopher J. Malloy, 2007, The Small World of Investing: Board Connections and Mutual Fund Returns, NBER Working Paper 13121.

Davis, Gerald F., 1991, Agents Without Principles? The Spread of the Poison Pill Through the Intercorporate Network, *Administrative Science Quarterly* 36, 583-613.

Dooley, Peter C., 1969, The Interlocking Directorate, *American Economic Review* 59, 314-323.

Fich, Eliezer M., and Anil Shivdasani, 2006, Are Busy Boards Effective Monitors, *Journal of Finance* 61, 689-724.

Fich, Eliezer M., and Lawrence J. White, 2003, CEO Compensation and Turnover: The Effects of Mutually Interlocked Boards, *Wake Forest Law Review* 38, 935-959.

Fidrmuc, Jana P., Peter Roosenboom, and Dick van Dijk, 2007, Do Private Equity Investors Take Firms Private for Different Reasons? Working paper, Erasmus Research Institute of Management.

Garmaise, Mark J., and Tobias J. Moskowitz, 2003, Informal Financial Networks: Theory and Evidence, *Review of Financial Studies* 16, 1007-40.

Hallock, Kevin F., 1997, Reciprocally Interlocking Boards of Directors and Executive Compensation, *Journal of Financial and Quantitative Analysis* 32, 331-344.

Halpern, Paul, Robert Kieschnick, and Wendy Rotenberg, 1999, On the Heterogeneity of Leveraged Going Private Transactions, *Review of Financial Studies* 12, 281-309.

Hirano, Keisuke, Guido Imbens, and Geert Ridder, 2003, Efficient Estimation of Average Treatment Effects Using the Estimated Propensity Score, *Econometrica* 71, 1161-1189.

Hochberg, Yael V., Alexander Ljungqvist, and Yang Lu, 2007, Whom You Know Matters: Venture Capital Networks and Investment Performance, *Journal of Finance* 62, 251-300.

Imbens, Guido and Jeffrey Wooldridge, 2007, Lecture 1: Estimation of Average Treatment Effects Under Unconfoundedness, "What's New in Econometrics" NBER Summer 2007 Seminar.

Khurana, Rakesh, 2002. *Searching For a Corporate Savior : the Irrational Quest for Charismatic CEOs* (Princeton University Press, Princeton).

Kieschnick, Robert, 1998, Free Cash Flow and Stockholder Gains in Going Private Transactions Revisited, *Journal of Business Finance & Accounting* 25, 187-202.

Kono, Clifford, Donald Palmer, Roger Friedland, and Matthew Zafonte, 1998, Lost in Space: The Geography of Corporate Interlocking Directorates, *American Journal of Sociology* 103, 863-911.

Kramarz, Francis, and David Thesmar, 2006, Social Networks in the Boardroom, Working paper, IZA Discussion Paper 1940.

Larcker, David F., Scott A. Richardson, Andrew Seary, and A. Irem Tuna, 2005, Back Door Links Between Directors and Executive Compensation, Working paper.

Lehn, Kenneth, and Annette Poulsen, 1989, Free Cash Flow and Stockholder Gains in Going Private Transactions, *Journal of Finance* 44, 771-787.

Mizruchi, Mark S, 1992. *The Structure of Corporate Political Action* (Harvard University Press, Cambridge).

Mizruchi, Mark S., 1996, What Do Interlocks Do? An Analysis, Critique, and Assessment of Research on Interlocking Directors, *Annual Review of Sociology* 22, 271-298.

Opler, Tim, and Sheridan Titman, 1993, The Determinants of Leveraged Buyout Activity: Free Cash Flow vs. Financial Distress Costs, *Journal of Finance* 48, 1985-1999.

Robinson, David, and Toby E. Stuart, 2007, Network Effects in the Governance of Strategic Alliances, *Journal of Law, Economics, and Organization* 23, 242-273.

Rosenbaum, Paul, and Donald Rubin, 1983, The Central Role of the Propensity Score in Observational Studies for Causal Effects, *Biometrika* 70, 41-55.

Simons, Tomas, and Luc Renneboog, 2005, Public-to-Private Transactions: LBOs, MBOs, MBIs and IBOs, Working Paper, ECGI Working Paper Series in Finance 94/2005.

Sorenson, Olav, and Toby E. Stuart, 2001, Syndication Networks and the Spatial Distribution of Venture Capital Investments, *American Journal of Sociology* 106, 1546-1588.

Useem M, 1984. *The Inner Circle* (Oxford University Press, New York).

Weir, Charlie, David Laing, and Mike Wright, 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 & Accounting* 32, 909-943.

Table 1. Going private transactions, 2000-2007

Data on going private transactions for firms trading on the NYSE, American, and Nasdaq stock exchanges, publicly announced between January 1, 2000 and December 31, 2007. "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" includes offers made by other financial buyers (i.e. Carl Icahn, powerful families such as the Pritzkers of Chicago, etc.)

	Number of deals				Total deal value ($MM)			
Year	PE	MBO	Other	All	PE	MBO	Other	All
2000	54	25	14	93	23,998	2,310	10,037	36,345
2001	24	21	10	55	4,558	986	2,302	7,846
2002	27	23	8	58	9,020	2,571	383	11,974
2003	49	20	5	74	7,570	524	294	8,388
2004	36	12	2	50	31,384	447	5,011	36,842
2005	70	5	7	82	66,601	1,522	1,278	69,401
2006	105	11	3	119	290,726	14,218	404	305,348
2007	118	6	2	126	366,825	2,497	4,405	373,727
All years	483	123	51	657	800,682	25,076	24,114	849,872

	Mean deal value ($MM)				Median deal value ($MM)			
Year	PE	MBO	Other	All	PE	MBO	Other	All
2000	444	92	772	395	161	29	67	93
2001	198	49	230	148	54	24	25	34
2002	347	117	64	222	236	17	66	66
2003	161	26	59	117	68	11	43	44
2004	872	41	2,506	752	329	21	2,506	111
2005	965	304	256	878	347	263	27	333
2006	2,878	1,422	135	2,678	440	484	110	439
2007	3,190	416	2,203	3,038	980	266	2,203	805
All years	1,700	211	524	1,336	322	26	54	165

Table 2. Characteristics of private equity-backed target firms

This table compares the characteristics of all public firms in 2000-2007 receiving private equity-backed going private offers against firms that received no offers. Market-related statistics and company financials 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.

	PE		Public	
	Mean	Median	Mean	Median
Market statistics				
Market capitalization ($MM)	1,164 [a]	221	1,843	215
Market to book	1.50 [a]	1.22 [b]	2.20	1.27
Share liquidity	1.12 [a]	0.80	1.39	0.81
Company financials				
Total capitalization ($MM)	1,772 [a]	328	2,741	322
Assets ($MM)	1,663 [a]	330	3,941	331
Sales ($MM)	1,055 [a]	264 [b]	1,901	165
EBITDA ($MM)	169 [a]	35 [b]	341	21
Free cash flow / Tot cap	0.02 [a]	0.06 [b]	(0.00)	0.04
Debt / Tot cap	0.26	0.19 [b]	0.24	0.13
Ownership / Governance structure				
Insitutional ownership	0.48 [a]	0.49 [b]	0.36	0.30
Insider ownership	0.17	0.08	0.15	0.07
Board size	7.78 [a]	7.00 [b]	8.29	8.00
Inside directors (%)	0.20 [a]	0.17 [b]	0.23	0.20
Dual CEO-chairman	0.50	0.00	0.49	0.00
Network characteristics				
Board interlocks	9.83 [a]	8.00 [b]	7.98	5.00
Avg board centrality	2.07 [a]	1.91 [b]	1.87	1.69
PE Link	0.34 [a]	0.00 [b]	0.18	0.00
Observations	454		50,117	

Table 3. Distribution of network measures

Panel A shows the distribution of Board Interlocks among public firms in 2007. Panel B shows the distribution of Director Centrality among directors on public firms in 2007.

A. Distribution of Board Interlocks in 2007

# Interlocks	Freq	%
0	573	10%
1 to 2	772	14%
3 to 5	871	16%
6 to 10	1,163	21%
11 to 20	1,390	25%
21 to 30	546	10%
over 30	270	5%
All	5,585	100%

B. Distribution of Director Centrality in 2007

# Board seats	Freq	%
1	23,022	58%
2	8,557	21%
3 to 5	6,754	17%
over 5	1,470	4%
All	39,803	100%

Table 4. PE Link, by firm-year

Based on board composition data in 2000-2007 and our sample of going private transactions, we determine whether a company has an interlock with a firm that has in the past received a going private offer--i.e.. whether the company currently has a director serving on the board who previously served as a director or executive of another firm in the year that it received a going private offer. Panel A shows the number of interlocks for all the firm-years in the sample; Panel B shows the interlocks for the subset of firm-years in which PE offers are received.

	A. All public firms				B. Firms receiving PE offers			
Year	Interlocked	Not interlocked	All	% Interlocked	Interlocked	Not interlocked	All	% Interlocked
2000	766	6,729	7,495	10%	12	36	48	25%
2001	916	6,367	7,283	13%	6	18	24	25%
2002	1011	5,598	6,609	15%	7	18	25	28%
2003	1095	5,083	6,178	18%	12	36	48	25%
2004	1138	4,698	5,836	19%	9	26	35	26%
2005	1240	4,576	5,816	21%	25	40	65	38%
2006	1,378	4,391	5,769	24%	29	71	100	29%
2007	1,639	3,946	5,585	29%	53	56	109	49%
All years	9,183	41,388	50,571	18%	153	301	454	34%

Table 5. Characteristics of PE Link

Panel A shows the distribution of distinct firms through which a director had prior PE experience at an at-risk firm-year with PE Link=1. Panel B shows the distribution of distinct deals experienced by a director who has prior PE experience.

A. Distribution of distinct firms comprising each PE Link

# Firms	Freq	%
1	7,180	78%
2	1,492	16%
3	397	4%
4	97	1%
5 to 9	17	0%
All	9,183	100%

B. Distribution of distinct deals experienced by each PE Link director

# Deals	Freq	%
1	1,763	94%
2	104	6%
3	14	1%
All	1,881	100%

Table 6. Effect of PE Link on private equity-backed going private offer

Table shows results of logit regressions where the independent variable =1 if a firm receives a private-equity backed going private offer. Observations are at the firm-year, and include public firms in 2000-2007. Regression (2) includes market-based controls, (3) includes measures of leverage and profitability, and (4) includes equity ownership controls. (5) includes board includes board characteristics, with General interlock dummy=1 if the company has any past or contemporaneous interlocks with other boards. (6) includes industry fixed effects (Fama-French 48). Standard errors are Huber-White heteroskedasticity-consistent, and are clustered at the firm level. * significant at 10%; ** significant at 5%; *** significant at 1%

Variable	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
PE Link	0.656***	0.767***	0.763***	0.528***	0.501***	0.354***
	(0.104)	(0.110)	(0.110)	(0.116)	(0.114)	(0.116)
Size		-0.071***	-0.073***	-0.237***	-0.156***	-0.123***
		(0.022)	(0.023)	(0.036)	(0.043)	(0.045)
Market to book		-0.259***	-0.264***	-0.242***	-0.288***	-0.296***
		(0.061)	(0.070)	(0.078)	(0.089)	(0.094)
Share liquidity		-0.080**	-0.079**	-0.150***	-0.165***	-0.169***
		(0.032)	(0.032)	(0.048)	(0.050)	(0.053)
Debt ratio			-0.065	0.184	0.371	0.342
			(0.205)	(0.222)	(0.227)	(0.234)
Free cash flow			0.059	0.124	0.146	0.112
			(0.142)	(0.176)	(0.196)	(0.169)
Institutional ownership				2.268***	1.902***	1.565***
				(0.215)	(0.222)	(0.231)
Insider ownership				1.212***	1.120***	0.831***
				(0.257)	(0.256)	(0.259)
Board size					-0.112***	-0.077***
					(0.024)	(0.026)
Interlock Dummy					0.750***	0.468**
					(0.218)	(0.223)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	No	No	No	No	Yes
Observations	50571	50470	50389	49107	47911	46470
Pseudo R2	0.04	0.05	0.05	0.08	0.08	0.12

Table 7. PE Link effect of tenured directors

Table shows results of logit regressions where the independent variable =1 if a firm receives a private-equity backed going private offer. Observations are at the firm-year. Regression (1) includes PE Link effects only for those directors whose service on the "at risk" firm preceded their PE experience; but directors for full sample of public firms are only observable for 2000-2007. (2) and (3) include PE Link effects for directors who sat on the board for the past 2 and 3 years, respectively, prior to the "at risk" year; regressions include observations through 2002 and 2003, respectively. Standard errors are Huber-White heteroskedasticity-consistent, and are clustered at the firm level. * significant at 10%; ** significant at 5%; *** significant at 1%

Variable	**(1)**	**(2)**	**(3)**
PE Link, preexisting directors	0.271*		
	(0.148)		
PE Link, directors with >=2 yr tenure		0.351**	
		(0.137)	
PE Link, directors with >=3 yr tenure			0.282*
			(0.149)
Controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
PE Link, =1	8501	6711	5779
Tenured directors, =1	3352	4724	3410
Tenured directors, =0	5149	1987	2369
Observations	46470	32146	26136
Pseudo R2	0.11	0.11	0.10

Table 8. PE Link effect, controlling for potential correlates of private equity activity

Table shows results of logit regressions where the independent variable =1 if a firm receives a private-equity backed going private offer. Observations are at the firm-year, and include public firms in 2000-2007. Regression (1) captures the effect of PE Link where the interlocks consist of companies in different Fama-French 48 industries. (2) controls for the geographic proximity of previous private-equity-backed take private activity, by weighting each previous take private deal by its distance from the firm at risk. (3) controls for basic measures of corporate governance such as the whether the CEO is also the Chairman and the # of insiders on the board. (4)-(5) control for director attributes related to board composition, such as the # of finance experts and financial investors, respectively. (6) controls for a generic "PE Susceptibility" measure of the at-risk firm, constructed as the average predicted Pr(PE tx=1) of the firms interlocked with the at-risk firm. Standard errors are Huber-White heteroskedasticity-consistent, and are clustered at the firm level. * significant at 10%; ** significant at 5%; *** significant at 1%

Variable	(1)	(2)	(3)	(4)	(5)	(6)
PE Link		0.285**	0.339***	0.344***	0.337***	0.340***
		(0.117)	(0.116)	(0.116)	(0.115)	(0.116)
PE Link, diff industry only	0.304**					
	(0.120)					
PE Proximity		-0.002				
		(0.012)				
Dual CEO-Chmn			-0.082			
			(0.104)			
# Inside directors			-0.095*			
			(0.053)			
# Finance experts				-0.255**		
				(0.114)		
# Financial investors					0.111**	
					(0.045)	
PE Susceptibility						0.188**
						(0.084)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	46470	40753	46470	46470	46470	46470
Pseudo R2	0.11	0.11	0.12	0.12	0.12	0.12

Table 9. Timing of PE Link activation

Table shows results of regressions where the independent variable =1 if a firm receives a private-equity backed going private offer. Observations are at the firm-year, and include public firms in 2000-2007. Regression (1), Chosen firm =1 for firm *i* if firm *i* at some point in time acquires a PE-experienced director (i.e. has PE Link=1 for some *t*). In (2), Left director=1 if a firm *i* 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). Regressions (3)-(4) present OLS results, without and with firm fixed effects. Standard errors are Huber-White heteroskedasticity-consistent, and are clustered at the firm level. * significant at 10%; ** significant at 5%; *** significant at 1%

Variable	**Logit (1)**	**Logit (2)**	**OLS (3)**	**OLS (4)**
PE Link	0.846***	0.350***	0.005***	0.007**
	(0.218)	(0.116)	(0.001)	(0.003)
Chosen Firm	-0.551***			
	(0.212)			
Left Director		0.047		
		(0.139)		
Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Firm FE	No	No	No	Yes
Observations	46470	46470	47851	47851
Pseudo / Adj R2	0.12	0.12	0.01	0.01

Table 10. Director-specific PE Link effects

Table shows results of regressions where the independent variable =1 if a firm receives a private-equity backed going private offer. Observations are at the firm-year, and include public firms in 2000-2007. Regressions (1)-(3) characterize the director who is responsible for PE Link=1. Non-executive Chmn=1 if the PE Link is via a director who is the board chairman but is not a firm employee; Dual CEO-Chm=1 if the PE Link is via a director who holds both the CEO and chairman titles in the firm; Retiree=1 if the PE Link is via a director who is retired from his primary job. In (4) Low board centrality=1 for firms whose directors fall in the lowest quartile of Average board centrality. Regressions (5)-(8) characterize the deals experienced by the PE Link director. Withdrawn offer=1 if the interlock is with a firm whose PE offer was withdrawn; Low annc day return=1 if the interlock is with a firm whose market return on the deal announcement day was below the median of PE deal announcement day returns; MBO insider=1 if the director was involved as an insider in an MBO in the prior linked deal. Standard errors are Huber-White heteroskedasticity-consistent, and are clustered at the firm level. * significant at 10%; ** significant at 5%; *** significant at 1%

Variable	Director Influence				Director Experience			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
PE Link	0.308**	0.362***	0.418***	0.279**	0.468***	0.574***	0.340***	0.573***
	(0.122)	(0.119)	(0.122)	(0.116)	(0.134)	(0.144)	(0.117)	(0.145)
* (Non-executive Chmn)	0.368							
	(0.255)							
* (Dual CEO-Chmn)		-0.136						
		(0.396)						
* (Retiree)			-0.264					
			(0.218)					
* (Low board centrality)				1.070**				
				(0.468)				
Low board centrality				-0.444**				
				(0.226)				
* (Withdrawn offer)					-0.279			
					(0.182)			
* (Low annc day return)						-0.426**		-0.452**
						(0.178)		(0.180)
* (MBO insider)							0.953*	0.012
							(0.522)	(1.018)
* (Low annc day return) * (MBO insider)								1.881*
								(1.109)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	46470	46470	46470	46470	46470	46470	46470	46470
Pseudo R2	0.12	0.12	0.12	0.12	0.12	0.12	0.12	0.12

Table 11. Achieving covariate balance with propensity score-based weighting

Panel A compares the covariate means for the PE Link=1 and PE Link=0 samples, unweighted as in the original sample (Panel A1) and weighted using Inverse Probability of Treatment Weighting (IPTW), trimmed at propensity score values of [0.1,0.9] (Panel A2). Panel B shows regression results using IPTW. Standard errors are Huber-White heteroskedasticity-consistent, and are clustered at the firm level. * significant at 10%; ** significant at 5%; *** significant at 1%`

A. Covariates for PE Link=1 vs PE Link=0 samples

Variable	1. Unweighted				2. Weighted			
	PE Link=1	PE Link=0	Diff	T-stat	PE Link=1	PE Link=0	Diff	T-stat
Size	6.43	5.19	1.24	52.56	6.10	6.09	0.01	0.50
Market to book	2.13	2.21	-0.07	-1.97	2.11	2.13	-0.02	-0.62
Share liquidity	1.41	1.39	0.03	1.18	1.35	1.34	0.01	0.56
Debt ratio	0.23	0.24	-0.01	-2.89	0.23	0.23	0.00	0.50
Free cash flow	0.02	-0.01	0.03	7.14	0.01	0.01	0.00	0.75
Institutional ownership	0.52	0.32	0.20	60.38	0.47	0.47	0.00	1.00
Insider ownership	0.13	0.16	-0.03	-11.95	0.15	0.15	0.00	-1.08
Board size	9.09	8.10	1.00	27.61	8.83	8.80	0.03	0.95
Interlock Dummy	0.99	0.80	0.19	45.97	1.00	1.00	0.00	1.07

B. Inverse Probability of Treatment-Weighted regressions

Variable	Baseline (1)	IPTW (2)
PE Link	0.354***	0.360***
	(0.116)	(0.120)
Controls	Yes	Yes
Year FE	Yes	Yes
Industry FE	Yes	Yes
Observations	46470	31897
Pseudo R2	0.12	0.11