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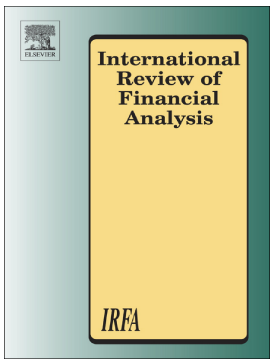

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Social Capital, Syndication, and Investment Performance: Evidence from PE Investing in LBOs

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Abstract

This study examines the influence of social capital on leveraged buyout (LBO) investments. Exploiting proprietary global private equity data at the investment-level for leveraged buyouts, we find that alumni of Harvard's MBA program are more inclined to co-invest and form syndicates in LBO with each another. The phenomenon of Crimson pairing manifests in deals that involve uneven investments in co-investor capital, necessitating trust to alleviate agency costs and enabling investors to diversify their portfolios. The outcome of Crimson pairing is an increase in value and investment returns relative to all other typical LBO syndication partnerships.

JEL: D83, G20, G30, G34, L14

Keywords: Social capital, Trust, Private equity, LBO syndication, Performance

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The authors have contributed equally to this research.

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1. Introduction

Since the 1970s, syndicated leveraged buyouts (LBOs) spearheaded by private equity (PE) have exceeded $2.5 trillion globally (Degeorge, Martin, and Phalippou, 2016). The investor base for these LBOs comprises a small, sophisticated group of investment experts whose social ties can significantly impact syndicate creation, investment yields, and the LBO market (Acharya, Gottschalg, Hahn, and Kehoe, 2013; Lopez-de-Silanes, Phalippou, and Gottschalg, 2015). This study investigates whether social capital, embodied by shared college alumni connections among institutional investors, affects LBO syndicate structure and performance by alleviating information and agency problems typical in syndicated deals (Stacchini and Degasperi (2015) and Javakhadze, Ferris and French (2016)). Utilizing a novel dataset of worldwide LBO fundraising prospectuses provided by financial institutions, we find that shared connections among Harvard Business School (HBS) alumni within the PE investor community enhances the likelihood of LBO syndication, resulting in superior *transaction-level* performance in *Crimson* syndicated deals.[1]

Social capital can be categorized into: (i) personal relationships, (ii) support from social networks, (iii) participation in civic activities, and (iv) trust and cooperative norms. Prior research on social capital in financial contracting stresses the importance of civic participation and trust in promoting financial growth and economic stability at the firm level (Guiso, Sapienza and Zingales, 2004; 2008; Lins, Servaes and Tamayo, 2017; Gurun, Stoffman and Yonker, 2018; Hasan and Habib, 2019). Only a handful of studies, all utilizing venture capital (VC) data, investigate the impact of personal relationships and trust on investment outcomes at the transaction level (Gompers, Mukharlyamov and Xuan, 2016b; Bottazzi, Da Rin and Hellmann, 2016; Bubna et al, 2020).

Our research builds upon previous studies on social capital and financial contracting in two notable ways. First, we explore the role of social capital in LBO syndication, with a specific

[1] Harvard University graduates are colloquially referred to as Crimson.

emphasis on the selection of PE co-investors in LBO syndications. Second, we examine whether social capital influences the performance of investment transactions executed by PEs in syndicated LBOs. Fundamentally, our goal is to bridge a gap in the existing literature by exploring shared college connections as a symbol of social capital and trust in the choice of LBO syndication partners by PE co-investors, and their transaction-level investment performance. As a result, our study can be considered groundbreaking in scrutinizing the factors influencing LBO syndication and carries significant implications, especially concerning the elements that propel the performance of PE syndicated transactions that differ from VC investments.

In a nutshell, we hypothesize that social connections influence the selection of syndication partners and PE investment performance. Regarding the selection, we expect that PE investors will syndicate with those who share social capital via their college affiliations and the trust inherent in these relationships. However, we predict this effect will vary among colleges, potentially being more pronounced for those tasked with fostering and preserving strong alumni networks.[2] As for the outcome, the expected impact of such connections among PE investors in a syndicated LBO is not immediately clear and is likely a matter for empirical investigation. On one side, the management team of an LBO co-investor and syndicate member, who has personal obligations to another co-investor team due to college alumni ties might overlook flaws in a deal. This could potentially jeopardize their own investors' capital (Fang, Ivashina and Lerner, 2015; Lopez-de-Silanes, Phalippou and Gottschalg, 2015). On the other side, a personal relationship rooted in strong college affiliations among PE management teams could encourage a *reliable* flow of information strengthened by alumni ethos. This could lead to decreased monitoring costs due

[2] There is evidence that the social connections developed at HBS have a profound and enduring impact, influencing entrepreneurial and managerial choices even years after graduation. A study by Lerner and Malmendier (2013) on HBS MBA students revealed a lower level of unsuccessful ventures. Lee (2017) discovered that having social ties in venture capital results in more deal opportunities and larger funds under management for the initial funds of HBS executive-led venture capital firms. This suggests that HBS graduates gain an advantage by accessing top-tier deals through their network.

to trust established by college alumni credos, giving the alumni-*connected* deal an edge over all other co-investor deals (Malenko and Malenko, 2016; Lins, Servaes and Tamayo, 2017).

Considering this conflict, we assemble a dataset that extracts proprietary data from private placement memorandum (PPM) on 941 global LBOs from 1991 through 2004.[3] In line with Degeorge, Martin and Phalippou (2016), we utilize proprietary data in PPMs to accurately capture the characteristics and returns of PE investments at the deal level, rather than at the firm-level where the bulk of prior work has concentrated (see Officer, Ozbas and Sensoy, 2010; Boone and Mulherin, 2011; Humphery-Jenner, 2013; and Arcot, Fluck, Gaspar and Hege, 2015; among others). The performance metrics available in the PPMs include valuation multiple and gross internal rate of return (GIRR).[4] To enhance these data, we trawl Capital IQ, VentureXpert and SDC to find any public information on sample LBO syndications, and verify whether an LBO was ultimately sold or underwent an IPO.[5]

Next, we identify the college affiliations of all senior management in PE firms investing in all LBOs, using data from the PPMs and various databases. This information highlights shared college connections based on Masters of Business Administration (MBA) degrees, which have been used in related studies on the influence of peer effects on financial performance (Cohen, Frazzini and Malloy, 2008; 2010; Lerner and Malmendier, 2013; Shue, 2013; Ahern, Duchin and Shumway, 2014). We place particular emphasis on Harvard Business School (HBS) due to its strong alumni ties (e.g., Lerner and Malmendier, 2013; Lee, 2017) and its historical role as a

[3] The size and duration of our sample are not uncommon in private equity (PE) research. For instance, the study by Braun, Engel, Hieber, and Zagst (2011) used a sample of 460 buyouts from 1990-2005, while Kim and Palia (2014) analyzed 526 PE transactions from 1980 to 2009. We recognize that our sample size and time frame are somewhat smaller compared to the research conducted by Braun, Jenkinson and Stoff (2017), and Braun, Jenkinson and Schemmerl (2020), which focus on PE co-investments among limited partners (LPs) and institutional investors. Therefore, a potential direction for future research could be to explore the influence of college alumni networks on PE co-investments involving LPs and other institutional investors, in addition to other PE firms.

[4] We contend that both performance measures based on PPM are suitable, given that the majority of sample investments exit by 2008, leaving less than 1% of the sample still active. This significantly alleviates recent worries about distortions in the valuation of unrealized PE investments, as discussed in the studies by Brown et al. (2019) and Gornall and Strebulaev (2020).

[5] Clearly, this method is subject to selection bias. However, it's widely recognized that investors experience substantial wealth gains when a leveraged buyout (LBO) firm re-enters the public market.

significant source of company executives and finance professionals (Lerner and Malmendier, 2013; Lee 2017). It may not come as a surprise that 51% of the management teams of PE investors from the 941 sample LBOs hold an MBA degree from HBS.

The analyses of these data reveal that deal value, capital invested, geographic distance, and management buyout (MBO) are drivers of LBO syndication.[6] Team characteristics, such as diversity of skills or MBA cohorts, do not appear to play a role in a PE's decision to syndicate an LBO. It's worth noting that the drivers we identify could be incidental due to a PE investor's preference in syndicating an LBO (Officer, Ozbas and Sensoy, 2010; Boone and Mulherin, 2011; Gorbenko and Malenko, 2014; and Degeorge, Martin and Phalippou, 2016). To address this concern and potential bias from omitted variables, we employ a modified selection model in pooled cross-sectional regressions based on whether IRRs are disclosed for an investment in an LBO. The primary findings remain consistent to this adjustment.

While we find no clear evidence that team characteristics motivate PEs to co-syndicate, it is still possible that shared alumni connections could potentially influence PE partner selection in LBO syndications. To reduce the effect of selection on observable variables in the pooled regressions, we estimate McFadden conditional logit regressions on a subset of 153 LBO investments involving only two PE co-investors. This analysis reveals that MBA graduates from Harvard and Chicago are more inclined to syndicate with their fellow alumni. Furthermore, the existence of at least one pre-existing HBS alumni connection among the management teams of co-investors, which predates the LBO, significantly boosts deal value and capital invested. For example, a single overlap of HBS alumni results in an average increase of 80% in capital invested

[6] Braun, Jenkinson and Schemmerl (2019) report that larger LBOs are more likely to be offered as co-investments for the purpose of diversification, which in the scope of their study refers to co-investing with limited partners. We believe a similar rationale applies to our work, where co-investments club PE investors together in larger syndicated LBOs. Kim and Palia (2014) examine reasons for alliance formation between PE bidders when compared to sole-sponsored PE deals and find that private bidders are more likely to form an alliance in a diversifying acquisition. We moderate both these effects in our study.

by PE co-investors. In comparison, when there is an overlap of other Ivy League alumni or no overlap at all, both the capital invested, and deal value are generally much lower.

One possible interpretation of the results so far could be a home bias among the management teams of PE co-investors. If PE investor teams are geographically close, then the observed results could be attributed to local labor markets and/or information networks (Engelberg, Gao and Parsons, 2012; Knyazeva, Knyazeva and Masulis, 2013). However, we find no evidence to suggest that geographic proximity among the management teams of PE co-investors is linked to the likelihood of HBS-HBS syndication, which dismisses the home bias explanation.

Another possibility is that the *Crimson* alumni connections among the management teams of PE co-investors are merely capturing deals that might not have otherwise been syndicated. For example, differences in capital investment among PE investors might deter some PE investors from participating in LBO syndication. This hurdle might be overcome by a bond formed through an alumni connection that fosters mutual trust. Indeed, differences in capital invested among PE co-investors are positively related with syndication for *Crimson* management team pairings. This suggests that social capital among management teams of PE investors facilitates LBO syndication reducing agency costs.

In the second part of the study, we delve into the normative implications of our findings. Having established that affiliation based on alumni relationships influence co-investing by PEs, we explore if transactions linked through alumni networks are superior in terms of overall returns for LBO investors. The overall relationship between the performance of PE co-investments and syndication is negative, although not consistently statistically significant. In line with Kaplan and Lerner (2010), Harris, Jenkinson, and Kaplan (2014), Fang, Ivashina, and Lerner (2015), Buchner, Mohamed and Schwienbacher (2016), and Robinson and Sensoy (2016), among others, the lowest valuation multiples and IRRs are observed in syndicated LBOs. However, this trend reverses

when we focus on matched pairs of PE co-investor management teams that are HBS graduates. Within this subset, we find that PE co-investors connected through HBS alumni consistently outperform all other alumni connected PE co-investor teams, as well as pairings where there are no alumni-connected PE co-investor teams. This finding is not solely driven by an HBS effect *per se* and remains valid after accounting for key deal-specific variables and fixed effects.[7]

We realize a need to address endogeneity issues before we can infer causality from our findings. One concern is the possibility of reverse causality, where PE co-investments result in the formation of social relationships (Cohen, Frazzini and Malloy, 2010; and Engelberg, Gao and Parsons, 2012). On average, an 11-year time lag exists between attending HBS and forming relationships and making LBO investment decisions. This helps mitigate concerns about reverse causality.[8] Another concern is that our findings could be driven by unobserved attributes of PE firms or syndicated LBOs that correlate with the personal connections of PE co-investor management teams based on an alumni network. PE co-investors with greater assets under management (AUM) are likely to share more common alumni connections with other PE co-investors, not just those they co-invest with (Lopez-de-Silanes, Phalippou and Gottschalg, 2015). Similarly, more established PE co-investing firms may have more alumni ties with other PE investors, potentially mechanically, leading to better scaling and screening capabilities (Robinson and Sensoy, 2016). Finally, larger PE investors may share more alumni connections with other PE investors if they encounter fewer financial constraints, enabling them to partake in more and larger syndicated LBOs (Demiroglu and James, 2010).

[7] Our findings regarding *Crimson* connections also add to the discussion on the scalability of private equity returns, as explored by Humphery-Jenner (2012), Lopez-de-Silanes, Phalippou and Gottschalg (2015), Malenko and Malenko (2016), and Robinson and Sensoy (2016). A comprehensive examination of this topic is reserved for future research.

[8] Another less significant concern is the issue of self-selection, or the endogenous grouping among graduate batches. In this scenario, school affiliations simply mirror the shared abilities or skills within a cohort. According to Lerner and Malmendier (2013) and Shue (2013), the Harvard MBA student cohorts are grouped in a balanced and random manner, supervised by the HBS administration, which tempers this concern.

To address these issues and other recognized agency cost concerns linked to PE investments, we run several robustness tests. These tests incorporate controls on buyout leverage (Axelson, Jenkinson, Stromberg and Weisbach, 2013; and Hotchkiss, Stromberg and Smith, 2014), economy wide effects and endogenous timing in fundraising (Wilson, Wright, Siegel and Scholes, 2012), premature fund exit (Gompers 1996; and Robinson and Sensoy, 2013), excessive fundraising and simultaneous investments (Lopez-de-Silanes, Phalippou and Gottschalg, 2015), and fund reputation (Malenko and Malenko, 2016).[9] The inclusion of these additional controls does not alter the key findings.

Our study adds to earlier work on trust and social capital in financial contracting, LBO syndication and co-investing, and buyout performance in several ways. First, we investigate shared college connections in PE co-investing management teams across various countries where information access and agency cost concerns are likely more acute. This supplements studies on (Harvard) alumni networks among security analysts and directors in U.S. publicly traded firms (Cohen, Frazzini and Malloy, 2010; Brochet, Miller and Srinivasan, 2013; and Ishii and Xuan, 2014). Second, our work on social capital in PE investments builds upon the work of Gompers, Mukharlyamov and Xuan (2016b), Bottazzi, Da Rin and Hellmann (2016) and Bubna, Das and Prabhala (2020) who focus on VC investments. Third, we highlight shared connections as a key driver in the formation of LBO syndicates (Officer, Ozbas and Sensoy, 2010; Boone and Mulherin, 2011; and Degeorge, Martin and Phalippou, 2016; Giovannetti and Pipic, 2023). Fourth, the detailed nature of PPM data enables us to measure PE investment performance more accurately. Fifth, we add to the work of Acharya, Gottschalg, Hahn and Kehoe (2013) and Gompers, Kaplan and Mukharlyamov (2016a), among others, on the experience of PE

[9] Due to the confidential nature of PPMs, we are unable to gather substantial data on lenders. Consequently, we cannot incorporate the reputation of lenders into our analysis (Ivashina and Kovner, 2011; Fang, Ivashina and Lerner, 2015). The inclusion of this variable would enhance our study. However, Braun, Jenkinson and Stoff (2017) suggest that lender data may not be as crucial in buyouts, as these are predominantly driven by investment bank auctions where debt financing is highly competitive and deal structures are alike. To address both perspectives, we create an indicator variable for deal leverage using data from Capital IQ and Dealscan whenever possible.

management teams and fund performance. Finally, we offer preliminary evidence on shared investor connections as a determinant of PE performance persistence and scalability of equity returns (see Humphery-Jenner, 2012; Lopez-de-Silanes, Phalippou and Gottschalg, 2015; Buchner, Mohamed and Schwienbacher, 2016; and Braun, Jenkinson and Stoff, 2017; Giovannetti and Pipic, 2023).[10]

Gompers, Mukharlyamov and Xuan (2016b), a study closely related to ours, uses a sample of VC co-investments from 1973 to 2003 to study how personal traits (homophily, or affinity) influence the selection of syndication partners and the success of investments (IPO or not). Our paper focuses on syndication decisions at the senior management team level, both within and across firms, which is more suitable to PE investments. We connect these decisions to investment success using performance metrics. Importantly, our emphasis is not on homophily, or similarity, but on trust, or cooperative norms among people that can be cultivated during education, specifically an MBA, a prevalent qualification in the PE industry uniquely tailored for each top school. Our findings indicate that not all such connections are significant and some work much better than others. For example, Harvard affiliations among PE co-investors decrease agency costs in LBO syndications by undertaking deals that might not have been executed otherwise, while overcoming financial constraints through diversification. *Crimson* PE pairings also uniquely generate superior investment returns in LBO co-investing. Our findings underscore the role of social capital in deal formation and value creation, offering practical insights for investors contemplating a PE co-investment.

The structure of the paper is as follows. The next section details the collection of data on sample LBOs, PEs, and their senior management teams, and outlines characteristics of the sample. In Section 3, we conduct univariate and multivariate analyses to identify the factors influencing

[10] The top executives of private equity (PE) firms usually hold a carried interest in the investments and funds they manage, giving them a direct impact on every co-investment made. This supervisory role is likely to differ based on the size of the PE firm, so we account for the size of the PE firm in our multivariate analyses.

LBO syndication, including the role of college alumni connections among PE co-investor management teams. Section 4 is dedicated to exploring PE co-investment returns and shared college connections. Section 5 reports the results of robustness checks, and Section 6 concludes.

2. Data and Sample

In this section, we assemble a database on LBOs using PPMs and investor data from various sources. PPMs are fund raising prospectuses produced by PE firms and distributed to select clients. They include information on securities offered in a placement, as well as details and performance data on all prior investments made by the PE firm, whether they are currently held in a portfolio or have been divested. The key benefit of using PPMs is that they provide performance metrics and characteristics for each PE firm's LBOs at the investment level.[11]

The proprietary PPMs provided by various financial institutions, cover 6,611 PE investments dating back to as early as 1971.[12] Our primary interest in PPMs pertains to LBO investments. Therefore, we initially screen PPMs to identify all references to buyouts between 1991 and 2004.[13] We then scrutinize each reference to narrow down the sample to investments that specify an exit date and report information about the investment fund and portfolio company (PC). This process reduces the initial sample to 1,317 LBO investments. For each of these, we rescan PPMs to record: the initiation and exit (if realized) date of each buyout; the status of each buyout classified as realized, partially realized, or unrealized; the exit route if relevant; the industry classification (SIC code) and country of incorporation of the LBO firm; the total equity

[11] Traditional databases like Thomson Ventures Economics do not offer investment-level PE data for managers, and inconsistencies in fund sequences make comparisons challenging.

[12] The dataset we've put together is based on one compiled by Lopez-de-Silanes, Phalippou and Gottschalg (2015), and Degeorge, Martin and Phalippou (2016). Our sample of private equity (PE) investments: (a) are comparable to PE deals found in Capital IQ and Thomson Reuters; (b) provide superior coverage outside the U.S. and prior to 2000; and (c) exhibit no significant survivorship or selection bias compared to commercially available PE databases.

[13] Ending the sample in 2004 aligns with the time required for all our investments to be exited, with the latest exit year in our sample being 2008. Ideally, we would like the sample to extend beyond 2004, but due to the confidential nature of the data and the sensitivity of the providers, this is not feasible. We have no reason to suspect that the results would vary over time.

value invested by each PE firm; the total distributions (if any) to each PE firm; and the current value of any remaining unsold equity stake by a PE firm at the time of PPM issuance. We also gather performance metrics from PPMs on each PE firm investment: multiple is the value of total equity scaled by investment size and the gross internal rate of return (GIRR).[14] We then cross-reference each investment, whenever possible, with data from Capital IQ, VentureXpert, and Securities Data Corporation (SDC) to confirm a buyout is syndicated and identify PE firms.

PPMs provide biographical details about the senior management in each PE firm participating in the LBO, including data on senior managers who have left the firm.[15] We gather biographical background information for all senior managers in each PE firm from sample PPMs, as available.[16] The depth of employment history and educational background information in PPMs can vary. We fill any obvious gaps using resources like Galante's Venture Capital and Private Equity Directory, ZoomInfo, LinkedIn, and company websites to compile the most comprehensive education and employment profile on each PE firm senior management team.[17] The key bio variable that we need for each senior manager includes academic degree(s) along with the name of the granting institution(s) and graduation date(s), as well as professional certifications with respective dates.

We drop an LBO investment by a PE firm from the sample when there is incomplete or conflicting information across various data sources. This requirement reduces the sample to 941

[14] The term 'Multiple' refers to the current equity valuation plus cash received, scaled by the total cash invested. 'GIRR' is calculated by interpolating multiple^(1/duration)-1. Both Multiple and GIRR are at the fund level and are gross of fees, including cash transfers and loans from the fund to the portfolio company.

[15] Commercial PE databases such as CEPRES do not provide current or historical bios on PE management.

[16] The titles that are considered as senior management include: managing director, partner (but not operating, administrative, advising, recruiting, technology, venture, or special partner), principal (excluding finance principal), director, executive director (excluding independent), senior director, controller, senior manager, investment director, chief executive, chairman (excluding vice chairman), chief financial officer, and founder. Titles such as vice president, analyst, investment manager, investor relations, associate director, marketing, associate, assistant, account, and advisor are not considered as senior titles.

[17] The Directory, which began in 1996, is an annual publication by Dow Jones & Company. It includes information on over 3,000 professionals in private equity (PE), venture capital (VC), and mezzanine investments from 1995 onwards. However, the depth of coverage can differ greatly. For instance, some firms list all their employees in the directory, while others only report their top professionals. ZoomInfo is an online resource that offers biographical and employment data for 65 million business professionals. LinkedIn is a social networking website for professionals, boasting a user base of 225 million individuals spread across more than 200 countries and territories.

LBO investments, of which 406 are syndicated with two or more PE firms across 825 unique PCs. The data we assemble is unique in three ways. First, we have comprehensive historical biographies of college alumni and employment records for senior PE management. Second, we know the identity and senior management of PE firms involved in a large sample of both syndicated and non-syndicated LBOs.[18] Last, we have performance data at the investment level for each PE firm.

Table 1 presents summary statistics for each sample LBO. Panels A, B, and C report the deal value, capital invested, and transaction year, respectively. Columns D and E enumerate the locations of portfolio companies and their industry affiliations. An inspection of Table 1 reveals six key observations. First, 43% of sample LBOs are syndicated between two or more buyout firms, aligning with the findings of Officer, Ozbas and Sensoy (2010) who studied U.S. LBOs from 1984 to 2007. Second, syndicated LBOs have deal values that are more than triple those of non-syndicated LBOs. Third, over 90% of both syndicated and non-syndicated LBOs have less than $100 million in capital invested. Fourth, 59% of LBOs took place between 1995 and 1999, coinciding with the buyout boom of the 1990's. Fifth, 53% of portfolio companies are based in the U.S., with another 20% domiciled in the U.K. The share of portfolio companies by country is similar for both syndicated and non-syndicated deals. Finally, over half of the sample portfolio companies operate in the manufacturing or services sectors, with the trend evenly spread between syndicated and non-syndicated deals.[19]

[insert Table 1 around here]

After detailing the LBO investments, we shift our focus to their management teams. Table 2 provides summary statistics on the size of the management team, nationality, background, and academic qualifications in Panels A, B, C and D respectively. Panels A and B show that the size

[18] For completeness, we also collect data on private equity (PE) investments in non-syndicated leveraged buyouts (LBOs) and compile biographical and employment information on these PE firms.

[19] In general, the trends over time for both syndicated and non-syndicated leveraged buyouts (LBOs) are alike and align with the description of buyout and venture capital (VC) activity as outlined in Stromberg (2008).

of LBO management teams varies from 1 to 20 members, with a third of firms having between 5 to 10 members. The nationality of team members aligns with the location of portfolio companies.

As shown in Panel C, there are 1,304 PE senior management that participated in our sample deals. We focus on the College alumni connections among these individuals and classify each manager's education by discipline and degree type. The disciplines include business, legal studies, and engineering, while the degree types are MBA and other non-business-master's degree. Interestingly, about 70% of the senior management from PE firms involved in LBOs have business education, and half hold an MBA. Panel D provides the distribution of MBAs by academic institution and functional background. It reveals that 30% of MBAs graduated from HBS, which surpasses the combined total of MBA graduates from Wharton, Columbia, Stanford, and the University of Chicago.[20] Moreover, it's worth noting that an average of 13% of all MBA graduates also have an Engineering degree.

[insert Table 2 around here]

In the next section, our first task is to scrutinize the factors influencing LBO syndication. Then, we delve into the relationship between the alumni networks of top PE managers and the formation of LBO syndicates. That is, we estimate how overlapping college connections among PE management teams affect the choice of partners in LBO syndication. To alleviate the influence of selection based on observable factors, we run McFadden's conditional pooled logit regressions.

3. LBO Syndication and Shared College Connections

This section begins with a simple question: Given all other factors being equal, do the senior management of PE firms who share college connections tend to form syndicates? To answer this

[20] In our sample of syndicated investments from 1992 to 2004, approximately 30% of executives are Harvard graduates. This is slightly lower than the 38% reported by Gompers, Kaplan, and Mukharlyamov (2016a) in their 2011 survey of large firms in the private equity (PE) industry. The discrepancy could be attributed to the different time periods considered and/or our focus on PE firms involved in syndicated LBOs.

question, we use multivariate regressions to pinpoint the factors influencing LBO syndication.[21] The results of these analyses are displayed in Table 3. Across all the specifications in this table, we estimate binomial probit models to regress LBO syndication, represented by an indicator variable that is set to one, against a variety of deal and PE investor attributes. This approach facilitates a 'horse race' among the principal independent variables to discern the primary catalysts of LBO syndication. The selection of independent variables in this table is guided by prior studies on LBOs, PE, and PE syndication (Acharya, Gottschalg, Hahn and Kehoe, 2013; and Lopez-de-Silanes, Phalippou and Gottschalg, 2015), as well as survey data (Gompers, Kaplan and Mukharlyamov, 2016a).

[insert Table 3 around here]

The base regressions in the first two columns of Table 3 consider deal value, capital invested, geographic distance, PE experience, and MBO as main independent variables. Acknowledging that the sample is not random, we address selection issues by using IRR reporting in PPMs as an instrument within our two-stage framework. For brevity, we only present the results of the second stage of the regression models in Column 3. The subsequent columns in Table 3 augment the base regression in Column 2 with attributes of the PE firm and its senior management team, including skill diversity and the representation of MBA alumni in the top team.[22]

[21] Table 1 in the Appendix presents the characteristics of deals and private equity (PE) investors for both syndicated and non-syndicated LBOs. The main observations from this table are that the deal value, capital invested, size of the PE fund, age, experience, and the distance between the portfolio firm and the PE investment firm are all greater in syndicated LBOs. The team size in syndicated LBOs is also larger. LBO syndication is less likely in transactions involving company founders, but more likely when senior management hold MBA degrees. This increased likelihood could be a function of MBA specific skills needed in syndication or the ability to network among the PE investment community possibly thought a college alumni connection. None of the other team attributes presented in this table are different between syndicated and non-syndicated LBOs at the 0.10 level or less.

[22] The term 'skill diversity' refers to the standard deviation of three density variables that represent three functional degree disciplines (law, business, and engineering) pursued by the senior management in each sample PE firm (at the investment level). Each density variable is calculated as the number of team members who have earned related degrees, normalized by the team size (with values ranging from 0 to 1). A higher value of the skill diversity variable indicates a greater uniformity in educational skills and functional background. Similarly, each MBA subgroup variable is a density measure that calculates the ratio of the number of PE team professionals with specific characteristics to the team size. The primary benefit of using density is that it minimizes any potential influence of team size on other variables.

An inspection of Table 3 reveals that both the size of the investment and geographic distance play a significant role in the decision to syndicate LBOs. For example, an increase in capital invested by $10 million raises the probability of syndication by 3.3% (p-value = 0.06). Similarly, a 10-kilometer increase in the geographic distance between the PE investor and the investee raises the likelihood of syndication by 1% (p-value $\leq$ 0.05). LBO syndication is also more common in MBOs by 18% (p-value $\leq$ 0.01), potentially to alleviate financial constraints. The proxy for team attributes by MBA subgroups and the experience of the PE investor is not statistically significant at the 0.10 level or less in the regressions. After accounting for deal-specific characteristics, holding an MBA or PE experience does not impact LBO syndication.[23] Similarly, skill diversity does not correlate with the likelihood of LBO syndication, implying that homogeneity in discipline-specific skills across PE management teams does not determine whether an LBO will be syndicated.[24]

The findings indicate that deal-specific characteristics such as deal value, capital invested, the distance between the portfolio firm and the PE investor, and MBO are key determinants of the likelihood of LBO syndication. Attributes of the PE management team do not seem to influence the decision to syndicate an LBO. However, this analysis falls short as it ignores the impact of college alumni networks on LBO syndication. Cohen, Frazzini and Malloy (2010) argue that a major benefit of MBA alumni membership is the capacity to exchange information and secure resources, leading to improved deal performance. To rectify this oversight, we investigate whether PE senior managers with MBAs have a greater propensity to syndicate LBOs with other PE

[23] This result remains when we employ a different metric to gauge PE experience, which is the number of deals in the 3 years preceding the PE firm's key investment, normalized by the total number of deals in the same 3-year period. It's important to note that using measures based on past deal numbers leads to a decrease in the sample size. We consider a 3-year window to be a prudent choice that doesn't result in the loss of too many investments for analysis.
[24] Table 2 in the Appendix presents the pairwise correlation coefficients between deal characteristics and PE team attributes in relation to the probability of LBO syndication. The main takeaway from this table is that the size of the investment and invested capital, along with numerous PE team attributes, are highly correlated.

managers who also hold MBAs, and subsequently check if an alumni connection increases the likelihood of syndication.

In order to model the selection of LBO syndication partners and tease out whether MBAs tend to syndicate more with specific partners due to alumni connections, we screen syndicated LBOs that involve a pair of PE co-investors. This filtering process identifies 153 syndicated LBOs with paired PE co-investors. The rationale behind this approach is grounded in the assumption that PE investors seek a single 'best' syndication partner, where each PE investment firm (*f*) at a given time (*t)* can choose from the pool of all other PE investing firms (*i*) in the sample that have available data on team attributes at time *t*.[25, 26] The McFadden conditional logit model is employed to handle the selection of one alternative among many. The dependent variable in this model is an indicator that takes the value one for PE co-investing-candidate pairs at time *t* and zero otherwise.[27] For each PE firm $\int$ denotes the utility derived from selecting a syndication partner $i \in \{0, \dots, I\}$ as $y_{fi}^* = \beta' x_{fi} + \epsilon_{fi}$. Here x_{fi} is a vector of observable PE co-investor attributes, while ϵ_{fi} captures unobservable characteristics that might affect their utility. We then let i be the choice of PE firm $\int$ that maximizes its utility $y_f = \arg u \max(y_{f0}^*, y_{f1,}^* \dots, y_{fI}^*)$. Following McFadden (1974), if $\{\in_{fi}\}_{i\in 0,1,\dots I}$ is independently distributed with Weibull distribution $(\epsilon_{fi}) = \exp(-e^{-\in_{fi}})$, then the likelihood that a PE co-investor *i* is selected is given by $\mathrm{P}y_f = i|x_f) \frac{e^{\beta' x_{fi}}}{\sum_{h=0}^{I} e^{\beta' x_{fh}}}$

Since our primary focus is on the relations among senior management teams of PE co-investors. The most significant interactions are the team characteristics within PE firms,

[25] The findings outlined in this section remain consistent even when the method is adjusted to include more than two co-investors. A discussion on alternative strategies for pairing PE firms in LBO syndication is provided in Section 5.
[26] Counterfactuals are drawn from the initial dataset, which includes 6,611 investments dating back to 1971. Depending on the year, the count of possible pairs fluctuates between 132 and 177.
[27] The selection process is in line with Kuhnen (2009) and follows the random utility model of McFadden (1974).

specifically between firm-candidate pairs. In our regressions we prioritize the attributes of PE co-investor pairs over those of individual PE investors (*f*). Hence, we initially investigate if PE co-investor management teams, which include MBA graduates, syndicate LBOs among themselves. Following this, we incorporate college alumni membership as an incremental factor to determine its influence on LBO syndication. The base regression in this model states Matching Propensity = $\int$ (MBA(*f*)*MBA(*i*), MBA(*f*)*Engineer(*i*), MBA(*f*)*Law(*i*), MBA(*f*)*Other Master(*i*)), where "*f*" refers to the PE co-investor top management team of the focal investment and "*i*" refers to each potential syndication (or co-investing) partner. The density variable measures certain attributes at the PE level, where MBA(*f*) represents the number of MBA graduates, adjusted by the team size in the PE co-investor. By using interaction terms in individual density variables of potential pairs, we can accommodate non-linear relationships of team characteristics between pairs of firms.

Table 4 reports the coefficients of these regressions, with the independent variables being interaction terms on density variables associated with team attributes as described above. Column 1 is considered as the base regression specification. Columns 2 to 6 provide estimates on PE co-investor management teams with MBAs categorized by college alumni. Despite the low fraction of PE investment professionals with post-graduate degrees from non-business disciplines, the results in Column 1 of Table 4 indicate a preference among MBAs to collaborate with each other rather than with investment professionals with graduate degrees from non-business disciplines. The key coefficient of 1.81 on MBA(f)*MBA(i) is positive and significant at the 0.01 level. Column 6 of the same table shows that the Harvard-Harvard syndication coefficient is 7.23 and statistically significant at the 0.01 level, suggesting that Harvard MBAs prefer to co-invest with each other and that Harvard affiliations play a significant role when it comes to syndicating LBOs. It is well-known that a strong network, like the HBS alumni, not only offers valuable business connections but also promotes mutual trust among its alumni members (Cohen, Frazzini and Malloy, 2008). MBAs from other colleges do not express any alumni preference for co-investing

in LBOs, with the exception of Chicago alumni who also appear to favor LBO syndication among themselves, as indicated by a statistically significant syndication coefficient at the 0.05 level in Column 5.

[insert Table 4 around here]

Nevertheless, we have not yet dismissed omitted variables that could potentially moderate agency costs among co-investors, which might explain the relationship among *Crimson* alumni in LBO syndication. One such variable could be co-investing in deals where there are significant differences in the capital committed to a syndicated transaction, especially if such partnerships impact future deal flow generation. To address this issue, we examine the difference in capital invested among PEs in Column 7 of Table 4. The coefficient on the interaction between HBS-HBS co-investors and the difference in capital invested is 2.69 with a p-value of 0.01. This reaffirms the view that agency costs stemming from asymmetric investments in syndicated LBOs can be alleviated when PE firm managers, who are Harvard alumni, invest with each other.

Home bias could be yet another omitted variable. If co-investors are located nearby, this could offer advantages in monitoring, and our results could reflect local labor markets and information networks. In Column 8 of Table 4, we demonstrate that the marginal effect of geographic distance on the HBS-to-HBS co-investor connection is not statistically significant. This implies that home bias among *Crimson* PE co-investors does not drive LBO syndication.[28]

In sum, investment size, geographic proximity, and MBOs are key considerations for PE investment teams when syndicating an LBO. Regarding syndication partners, PE investment teams with MBAs tend to syndicate with each another, a trend largely driven by the Harvard MBA alumni network. Moreover, a preference for co-investment among Harvard alumni is found in deals where there are significant differences in capital invested among PE co-investors. This

[28] We run similar tests on omitted variables for the Chicago-Chicago pairs. We fail to report any significant results on the key coefficients in these models.

aligns with the view that Harvard ties not only facilitate information sharing and resource acquisition but also foster trust in deals to mitigate agency costs related to differences in invested capital and financial constraints that arise in syndicated transactions. An obvious question this analysis raises is whether deals connected through *Crimson* alumni are beneficial to LBO co-investors.[29]

4. LBO Syndication, Shared College Connections and Performance

To assess if Harvard-to-Harvard co-investing pays off, and whether matching MBAs by their college alumni creates value for co-investors in syndicated LBOs, we propose a straightforward game that is illustrated in Figure 1.

Undoubtedly, syndication is favored when it results in better deal selection and/or provides additional value (NPV) to PE co-investors. If this is true, then syndicated deals should, all else being equal, offer lower returns to PE co-investors. This is because PEs wouldn't need to co-partner LBOs that they consider promising and more certain, assuming a PE possesses the necessary scale, expertise, and resources to carry out such deals. However, it's reasonable to assume that PEs wouldn't resort to syndication unless necessary.[30]

[insert Figure 1 around here]

In the first stage of the game, firms assess deals and, if required, they proceed to the second stage to seek a co-partner. At this stage, a typical deal can result in three outcomes: $NPV_1 = A > 0$, $NPV_1 < 0$, and $NPV_1 = 0$. Firms ignore investments with negative NPV and only invest in positive NPV projects. For all other deals, including those with uncertain NPVs, or those that involve

[29] We acknowledge that the connections we designate as shared may contain some noise. For instance, it's likely that most members of a graduating class won't know all their peers, much less keep in touch after graduation, which could dilute any effect we might detect. We exercise caution to balance the potential for information exchange among PE co-investor teams syndicating LBOs to mitigate error in variables bias.

[30] Looking ahead to Tables 5 and 6, we find a negative correlation between LBO syndication and performance, although this is not consistently statistically significant.

value-added services to/from a co-investor, syndication is more likely. In the second stage of the game, a syndicated deal can yield three possible NPVs: $NPV_{12} = A > 0$, $NPV_{12} < 0$, and $NPV_{12} = 0$. This assumes that any payoff will be equally shared among two PE co-investors.[31] As shown in Figure 1, LBO investments can either be syndicated or non-syndicated, hence the best performers will satisfy the following conditions:

*if A≥ (1/2)*B => non-syndicated > syndicated > non-syndicated = syndicated … (1)*

*if 0 < A < (1/2)*B => syndicated > non-syndicated > non-syndicated = syndicated … (2)*

Identifying *superior* LBO investments, whether syndicated or non-syndicated is quaint. However, the key question is whether the expected outcomes are realized in the data. To address this, we collect data on two investment performance measures - - value multiple and gross internal rate of return (GIRR) - from PPMs for each LBO investment. We present these data at the investment level for both syndicated and non-syndicated LBOs in Table 5.[32]

[insert Table 5 around here]

[insert Figures 1 and 2 around here]

Table 5 (and Figure 2) confirm the statistics from the two-stage game, indicating that syndicated LBO investments typically earn lower average returns for PE co-investors. The value multiple for syndicated LBOs stands at 3.74, which is one-fifth the size compared to non-syndicated deals. To build on this, we run multivariate regressions with the performance at the investment level for each PE firm as the dependent variable and deal size, capital invested, geographic distance, PE experience, skill diversity, and syndication as independent variables. Panel A of Table 6 reports regression coefficients when the dependent variable is the value

[31] Relaxing this assumption does not change the primary conclusions.

[32] Figure 2 presents corresponding histograms for syndicated and non-syndicated leveraged buyouts (LBOs), with data trimmed at the 0.05 level. This chart shows that the value multiple and GIRR are concentrated around the mean with smaller standard deviations for syndicated LBO investments, while they are more dispersed in non-syndicated deals.

multiple, while Panel B shows coefficients when the dependent variable is gross IRR.[33] The independent variables are borrowed from the base specifications in Columns 1 and 2 of Table 3. The key coefficient in Columns 1 through 4 of Table 6 is syndication, which is negative and statistically significant at the 0.01 level or less. This negative correlation between syndication and performance remains robust and statistically significant when deal value is the independent variable but becomes less pronounced when gross IRR substitutes deal value. This implies that the relationship between PE investment performance and LBO syndication is not clear cut.

[insert Table 6 around here]

It's expected that syndicated investments in the game are more likely to be inferior compared to non-syndicated deals, making syndication a self-selected 'treatment' instead of a random variable. To better understand this relationship, we employ a treatment effect model that yields two-stage consistent coefficient estimates. We present the coefficients for value multiple and GIRR in Columns 5 and 6 of Panels A and B in Table 6, respectively. In this setup, the correlation between investment returns (GIRR and value multiple) and LBO syndication disappears. Thus, the main takeaway from Table 6 is that the relationship between LBO syndication and investment performance is complex, even when we account for selection bias.

Next, we examine whether the MBA qualification by college alumni drives LBO investment performance for PEs when syndicating LBOs. We report performance data for deals involving Harvard alumni in Panel A of Table 7. A quick look at Panel A shows higher average and median value multiple and GIRR for deals involving Harvard alumni. We then run average and median tests on investment performance for syndicated and non-syndicated deals that involve Harvard MBA alumni compared to those that do not. The results in Panel B of Table 7 indicate

[33] The standard errors on the coefficient estimates in Table 6 are clustered at the industry level. These results are robust when clustered at the PE firm level. Moreover, a small number of investments by each sample PE firm does not appear to explain the result as these typically range anywhere from 1 to 48, with a mean and median of 7 and 4, respectively.

that LBOs managed by *Crimson* alumni are linked with higher investment returns in non-syndicated deals, but this is not the case for syndicated deals.

[insert Table 7 around here]

To elaborate on the impact of MBA alumni on syndication performance, we run multivariate OLS regressions as shown in Table 8. The primary independent variable is a density variable that represents the fraction of the PE team with MBAs in Column 1, and the college affiliations of MBAs in Columns 2 to 6. We include key deal-specific variables and fixed effects across all specifications. The first six columns of this table pertain to non-syndicated LBOs, and the last six to syndicated deals. An inspection of this table reveals three main insights. First, only HBS MBA graduates show a positive correlation with investment performance in both syndicated and non-syndicated LBOs. The coefficient for HBS alumni membership is positive and statistically significant at the 0.10 level or less for both GIRR and value multiple in non-syndicated deals, and is significant only for the value multiple in syndicated transactions. Second, we see that other MBA college alumni, notably Wharton, Stanford, and Chicago are associated with positive performance, but these results are only evident in non-syndicated transactions and are not consistent for both value multiple and GIRR. This leads us to conclude that there is little consistency in the relationship between college alumni, syndicated LBOs, and investment performance. Therefore, alumni connection alone does not dictate the relationship between syndicated LBOs and investment performance.

[insert Table 8 around here]

After establishing that PE alumni connections *alone* do not influence the relationship between LBO syndication and performance, we proceed to check if matching college alumni across different PEs in syndicated transactions impacts performance. In this context, we switch the dependent variable in Table 4, which is LBO syndication, with a performance measure and

report the results in Table 9. Panels A and B of this table, report regression results when the dependent variable is value multiple and GIRR, respectively. Columns 1 to 12 in both panels indicate that the key coefficient MBA(i)*MBA(f) representing the pairing of college alumni, is statistically significant with p-values below 0.01 for the HBS-HBS pairing, regardless of the performance metric used. In Column 12 of Panel A, the coefficient on value multiple is 6.49 with a p-value of 0.01, and GIRR in the same column of Panel B is 2.12 with a p-value of 0.05. No other alumni pairings report superior performance (in both metrics) in syndicated LBOs. This result supports the view that Harvard connections produce above-average performance when *Crimson* alumni co-invest to syndicate LBOs. The outperformance is not attributed to any performance advantage gained from an MBA-educated team, a large presence of Harvard MBAs in the team, or deal and/or investor characteristics. Performance is simply higher when Harvard MBA alumni from different PEs opt to syndicate LBOs together.

[insert Table 9 around here]

Collectively, the evidence supports a simple conclusion: Harvard MBAs collaborate with each other because such cooperation can reduce agency costs that might arise in large asymmetric co-investments requiring trust to create value, such as in syndicated LBOs. That said, it's challenging to comment on the potential benefits of syndication for other MBA alumni networks, as syndication could be pursued for reasons beyond those we have explored.

5. Robustness Checks

Having already addressed concerns related to reverse causality, selection, and endogeneity, we now conduct two additional robustness tests to eliminate spurious correlations. The first test deals with data and modeling challenges, while the second test investigates whether *known* agency costs linked to PE investments can explain the observed *Crimson* alumni effect in LBO investment performance.

5.1 Data and modeling

(i) IPO – an alternative performance metric: To further verify the impact of Harvard alumni connections on the performance of syndicated LBOs, we examine the proportion of syndicated LBOs that undergo an IPO for a second time. This analysis reveals that 22% of the co-invested LBOs reenter the public market, and among these, 41% involve an HBS-HBS pairing. This percentage surpasses all others in the sample and could explain the superior investment performance in HBS matched deals.[34]

(ii) Country-effect: Our sample comprises LBO investments worldwide. As a test for sample stability, we exclude a sub-sample of 23 PCs from smaller-developing countries. This exclusion has no meaningful impact on the key regression coefficients in Tables 6 through 9.[35] We repeat this exercise, removing all European LBOs from the sample, and once again observe no change in the main results.

(iii) Outliers: In Section 4, we present histograms that trim both tails of the performance data at 5%. To verify if this truncation affects the results, we re-run the regressions in Tables 6 through 9 using performance data trimmed at 1%. The results remain unchanged when trimmed at 1%, indicating that they are not influenced by how we treat outliers.

(iv) Indicator on HBS-HBS overlap: To quantify the degree of overlap of *Crimson* alumni across PE firms, we employ a density variable. An alternative approach could be to use an indicator variable when PE firms co-syndicating an LBO have Harvard alumni on their investment teams. The switch from a density variable to an indicator does not significantly impact the key findings.

[34] Public Market Equivalent (PME) is another frequently used performance metric in private equity (PE) literature, serving as a relative performance indicator. However, we lack the necessary cash flow data to compute PME. Harris, Jenkinson, and Kaplan (2014) point out that PME is strongly correlated with both IRR and value multiple, leading us to believe that our key findings would remain unchanged even if PME were used. Moreover, survey data from Gompers, Kaplan and Mukharlyamov (2016a) suggests that PE investors place more emphasis on absolute performance than on relative performance.

[35] The countries removed from the sample include China, Finland, Ireland, Netherlands, Spain, Sweden, and Switzerland. The countries that remain are Canada, France, Germany, UK and US.

(v) Partner selection and deal flow: To address concerns about the selection of partners and deal flow, we choose repeated pairings in LBO co-investments (47 versus 103 investments) and check if the impact of Harvard alumni connections remains robust with unique pairings. The coefficients on GIRR and multiple in this set-up, which uses the model in Column 12 of Table 9, are statistically significant at the 0.01 level. Thus, deal flow does not explain the superior performance in Harvard syndicated LBOs.[36] Another potential criticism concerns the consistency of the sample selection process, since we use a restricted sample in Tables 4 and 9 and the full sample in other tables. To address this issue, we repeat the analysis using the restricted sample and discover that the main findings still apply.[37] We also rerun the regressions after removing repeated deals, and the results are nearly identical to those reported in the tables.[38]

(vii) Higher bar: From Tables 7 through 9, we understand that LBO co-investors connected to *Crimson* exhibit superior ex-post-performance. However, this result doesn't necessarily align with the idea that HBS connections boost syndicated returns, as they could potentially harm deal efficiency while enhancing performance for other reasons. In our work, we argue that information about high performing LBOs is available to all potential co-investors, but co-investors connected by college alumni *simply* use the information differently. Proponents of a higher bar story might argue that co-investors connected to alumni receive a different set of information, resulting in friction with no offsetting advantage. If there's a cost associated with co-investing related to alumni, then the uncertainty of meeting the higher bar implies that co-investors without connections must steer clear of those with connections. The results in Tables 4 and 9 show that HBS participation generally increases the likelihood of a deal being syndicated, and these deals

[36] The key coefficients for the two subsets, as per the specification in Column 12 of Table 9, are not statistically significant for both performance measures (multiple and GIRR).
[37] A copy of these tables is available from the authors.
[38] In this test and ones that follow, the impact of the Chicago-Chicago effect vanishes, but the HBS-HBS effect remains significant.

perform better (with the most significant gains involving *Crimson* connected co-investors), which appears to contradict the higher bar narrative.

5.2 Other known agency costs

Prior research on LBO performance, PE scalability, and investment returns has found that factors such as buyout leverage, macroeconomic effects and endogenous timing, fund reputation, overfunding, and premature fund exits influence fund performance. Evidently, agency-based alternatives could also account for the relationship between HBS connections among co-investors and syndicated LBO performance. To manage this possibility, we adjust the regression in Column 12 of Table 9 by sequentially adding a proxy for each of the variables and present the results in Table 10.

[please insert Table 10 around here]

Consistent with Axelson, Jenkinson, Stromberg and Weisbach (2013), we employ two different indicator variables in the first two columns of Panel A in Table 10 to capture high leverage in buyouts: (a) the amount of debt; and (b) the ratio of debt to deal value. The inclusion of these proxies does not alter the significance of the key coefficient, MBA(f)*MBA(i). In Columns 3 and 4 of Table 10, we adopt definitions of PE fund reputation from Demiroglu and James (2010), which are based on completed deals. In Column 3, the reputation variable is an indicator that is set to one for PEs that completed at least one deal annually from 1991-2004, and zero otherwise, while in Column 4 it represents the raw count of deals. The coefficients on both PE fund reputation proxies are not statistically significant, whereas the coefficient MBA(f)*MBA(i) is significant at the 0.05 level or lower.

In Column 5 of Table 10, we add a proxy for PE overfunding, in accordance with Metrick and Yasuda (2010) and Robinson and Sensoy (2013). They suggest that larger PE funds have a smaller proportion of managing partners responsible for allocating the fund's capital, leading to

potential issues of incentive misalignment and diseconomies of scale. The proxy we employ is an indicator variable that equals one when the PE fund size exceeds the top 25% fund value for the entire sample (greater than $1 billion), and zero otherwise. The overfunding proxy in Column 5 is not significant at the 0.10 level or lower.

In Column 6 of Table 10, we use investment duration as a proxy for early fund exit, due to the lack of data on waterfall threshold or early IPOs (Gompers (1996), Robinson and Sensoy (2013), and Lopez-de-Silanes, Phalippou and Gottschlag (2015)). The early fund exit proxy is set to one when the investment duration is 2 years or less, and zero otherwise. The coefficient on duration in Column 6 has a p-value of 0.10, suggesting that short-term investments do yield marginally higher value multiples, while the MBA(f)*MBA(i) coefficient remains significant at the 0.05 level. In Panel B of Table 10, we replicate the regressions in Panel A with GIRR as the dependent variable. The result on the coefficient MBA(f)*MBA(i) is still significant at the 0.05 level or less in all columns of this panel, as are the coefficients on fund reputation and early exit in Columns 3, 4, and 6. Even after accounting for other agency cost factors in Table 10, we find that PE co-investment teams with overlapping Harvard MBA alumni produce superior investment performance in syndicated LBOs.

In our final examination of agency-based explanations, we scrutinize deals on management buyouts (MBO) and notice that Crimson syndicated LBOs are less frequent in MBO transactions. Out of 68 MBOs in the co-investment sample, we find that only 22% are syndicated by HBS alumni. Intriguingly, the performance in the HBS-HBS subsample is significantly superior to that in all other MBOs. This suggests that the enhanced performance in *Crimson* deals may be driven by MBOs, although we don't heavily rely on this result due to the small sample sizes involved.[39]

[39] To dive deeper into this, we examine the existence of Harvard affiliations among MBO managers and PE co-investors. A quick review of a few deals indicates that such Harvard connections are indeed present at this level. From this observation, we infer that *Crimson* ties are prevalent not just among PE co-investors, but also between PE co-investors and MBO management. The *Crimson* alumni network appears to function at various levels to yield

In sum, the process through which *Crimson* connections add value involves syndicating LBO transactions with significant disparities in capital invested among co-investors. This encourages PEs to undertake deals that otherwise would not be possible, leading to increased fund diversification and improved performance for PE co-investors.[40]

6. Conclusion

We investigate if social capital among institutional investors can alleviate agency issues in syndicated transactions. Utilizing confidential investment-level data from financial institutions on global LBOs, we explore whether college connections among PE co-investors yield enhanced investment performance. The anticipated effect of shared college connections on LBO syndication is not clear-cut, as social capital could stimulate information exchange and decrease transaction expenses, thereby boosting co-investor returns. Conversely, deal concerns might be overlooked by trusting co-investors, leading to diminished returns.

Given this tension, we conduct an empirical analysis to determine if MBA alumni networks among PE co-investors influence LBO syndication decisions and investment performance. Our findings indicate that PE co-investors with shared HBS alumni connections are more likely to engage in LBO syndication, and these co-investments generate superior performance. In contrast, co-investments involving other college alumni, or no alumni connections are less likely to be syndicated and realize significantly lower performance for PE co-investors.

exceptional performance, although the evidence supporting this pathway is merely suggestive due to the limited number of firms involved.

[40] Table 3 in the Appendix presents a summary of statistics related to deal-specific, team-specific variables, and proxies for agency costs among co-investing groups with HBS alumni. When we compare this data with that in Figure 1, we observe a temporal trend between HBS-HBS pairings and the U.S. business cycle. This suggests that deal reciprocity could be a potential driving factor in HBS-HBS pairings. While our data doesn't allow us to conclusively capture deal reciprocity, we can't entirely dismiss this hypothesis. However, the incorporation of year fixed effects in our regression analyses should help alleviate this concern to some extent.

As one might expect, tying 'alumni network' to LBO syndication comes with selection and endogeneity issues. We perform a battery of checks to alleviate these concerns, ensuring that identification arises from performance changes rather than an omitted variable at the co-investor level. We show that differences in capital invested among PE co-investors are positively associated with LBO syndication in deals involving *Crimson* alumni. A question prompted by this result is whether these investments yield better results. We find that performance (value multiple and GIRR) is indeed higher when Harvard alumni are part of co-investor teams. These findings align with PE co-investors relying on mutual trust nurtured by a strong alumni connection like HBS, which facilitates the completion of LBOs with large asymmetric information (i.e., co-investments) that might be overlooked by other PE co-investors. Consequently, this subset of PE co-investors can reduce syndication agency costs and diversify their investments to achieve higher returns.

We also conduct several robustness tests and eliminate other recognized agency costs associated with PE investments in syndicated LBO using proxies derived from previous studies. These tests reaffirm that HBS alumni have a higher propensity to co-invest in syndicated LBO with each other, resulting in increased investment returns and valuation.

We acknowledge that our sample has limitations, and our analyses leave some questions unresolved. First, our conclusions are drawn from data sourced from a subset of financial institutions, which may not be representative of a wider population. Second, previous research on sources of PE outperformance categorizes them into three broad areas: operational improvements; governance; and financial engineering (Cumming, Siegel and Wright, 2007; Gompers, Kaplan and Mukharlyamov, 2016a). Our data does not allow us to identify the category contributing to PE co-investment gains, nor does it allow us to determine whether information flow or trust is the primary driver of the relationship we observe. Third, we only offer preliminary evidence on the scalability of PE performance (Lopez-de-Silanes, Phalippou and Gottschlag, 2015). Finally, while

our results are arguably consistent with performance persistence in PE, this is not the central focus of our study (Buchner, Mohamed and Schwienbacher, 2016; Braun, Jenkinson and Stoff, 2017). We recognize these limitations and leave more detailed analyses of these issues for future research.

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Table 1

Summary Statistics: LBO Investments

This table provides summary statistics on sample LBO investments. The sample consists of 941 investments that meet the following criteria: (1) acquiring year from 1991; (2) buyout related; (3) already exited. Panels A and B show size distribution in terms of deal value and capital input (in $U.S. million), respectively. Panel C shows sample time trend in calendar time. Panels D and E report geographic distribution and industrial orientation of portfolio companies on sample investments according to SIC code classifications in Chidambaran und Prabhala (2003).

Panel A: Deal Value

	LBO Investments				
	Total	Non-Syndicated		Syndicated	
	Number	Number	Fraction in %	Number	Fraction in %
< 50	136	84	61.76	52	38.24
50 – 100	84	47	55.95	37	44.05
100 – 200	100	48	48.00	52	52.00
200 – 300	30	14	46.67	16	53.33
300 – 400	25	8	32.00	17	68.00
400 – 500	16	8	50.00	8	50.00
500 - 1000	39	11	28.21	28	71.79
>= 1000	23	3	13.04	20	86.96
Sample Size	453	223	49.23	230	50.77

Panel B: Capital Invested

	LBO Investments				
	Total	Non-Syndicated		Syndicated	
	Number	Number	Fraction in %	Number	Fraction in %
< 10	356	213	59.83	143	40.17
10 – 20	196	115	58.67	81	41.33
20 – 30	129	74	57.36	55	42.64
30 – 40	72	40	55.56	32	44.44
40 – 50	39	21	53.85	18	46.15
50 – 100	75	35	46.67	40	53.33
100 - 200	45	23	51.11	22	48.89
200 – 500	25	12	48.00	13	52.00
>= 500	4	2	50.00	2	50.00
Sample Size	941	535	56.85	406	43.15

Panel C: Time Trend

	LBO Investments				
Year	Total	Non-Syndicated		Syndicated	
	Number	Number	Fraction in %	Number	Fraction in %
1991	52	24	46.15	28	53.85
1992	55	32	58.18	23	41.82
1993	85	51	60.00	34	40.00
1994	85	49	57.65	36	42.35
1995	102	62	60.78	40	39.22
1996	141	72	51.06	69	48.94
1997	127	72	56.69	55	43.31
1998	103	70	67.96	33	32.04
1999	83	44	53.01	39	46.99
2000	41	26	63.41	15	36.59
2001	31	17	54.84	14	45.16
2002	19	7	36.84	12	63.16
2003	6	2	33.33	4	66.67
2004	11	7	63.64	4	36.36
Sample Size	941	535	56.85	406	43.15

Panel D: Geography of Portfolio Company

	LBO Investments				
Country	Total	Non-Syndicated		Syndicated	
	Number	Number	Fraction in %	Number	Fraction in %
United States	495	303	61.21	192	38.79
United Kingdom	206	109	52.91	97	47.09

France	57	21	36.84	36	63.16
Sweden	31	20	64.52	11	35.48
Germany	28	21	75.00	7	25.00
Canada	20	15	75.00	5	25.00
Italy	17	5	29.41	12	70.59
Switzerland	17	11	64.71	6	35.29
Netherlands	16	6	37.50	10	62.50
Spain	14	5	35.71	9	64.29
Denmark	7	6	85.71	1	14.29
Finland	6	2	33.33	4	66.67
Austria	5	2	40.00	3	60.00
Other Countries	22	9	40.91	13	59.09
Sample Size	941	535	56.85	406	43.15

Panel E: Industry of Portfolio Company

Classification	Total	LBO Investments			
		Non-Syndicated		Syndicated	
	Number	Number	Fraction in %	Number	Fraction in %
Agriculture & Food	63	39	61.90	24	38.10
Mining	5	3	60.00	2	40.00
Construction	7	6	85.71	1	14.29
Oil & Petroleum	9	5	55.56	4	44.44
Small Scale Manufacturing	19	6	31.58	13	68.42
Chemicals/related Manufacturing	143	94	65.73	49	34.27
Industrial Manufacturing	119	70	58.82	49	41.18
Computers & Electronic Parts	49	21	42.86	28	57.14
Printing & Publishing	19	9	47.37	10	52.63
Transportation	31	13	41.94	18	58.06
Telecommunication	73	44	60.27	29	39.73
Utilities	12	8	66.67	4	33.33
Wholesale	52	37	71.15	15	28.85
Retail	31	17	54.84	14	45.16
Services	230	119	51.74	111	48.26
Financials	46	23	50.00	23	50.00
Software & Technology	20	12	60.00	8	40.00
Biotech	10	7	70.00	3	30.00
Sample Size	938	533	56.82	405	43.18

Table 2

Summary Statistics: Management Teams

This table provides summary statistics on management team characteristics involved in sample LBO investments. Panel A shows the size distribution of investment firms, where size is measured by the number of senior professionals in the firm at the time of investment. Panel B reports the nationality on investment professionals. Panel C provides other managerial characteristics. Panel D reports summary statistics on MBA graduates and other educational attainments and disciplines (engineering, law, and regular master's degree).

Panel A: Team Size

Number of Professionals	LBO Investments				
	Total	Non-Syndicated		Syndicated	
	Number	Number	Fraction in %	Number	Fraction in %
< 5	135	80	59.26	55	40.74
5 – 10	310	205	66.13	105	33.87
10 – 15	189	109	57.67	80	42.33
15 – 20	156	86	55.13	70	44.87
20 – 25	33	12	36.36	21	63.64
25 – 30	35	10	28.57	25	71.43
30 – 35	31	9	29.03	22	70.97
35 – 40	12	5	41.67	7	58.33
≥ 40	11	9	81.82	2	18.18
Sample Size	912	525	57.57	387	42.43

Panel B: Management Nationality

Country	Number of Professionals	Fraction in %
United States	788	60.71
United Kingdom	250	19.26
France	61	4.70
Sweden	28	2.16
Germany	27	2.08
Canada	24	1.85
Netherlands	22	1.69
Italy	20	1.54
Denmark	13	1.00
Switzerland	12	0.92
South Africa	7	0.54
Spain	7	0.54
Other Countries	39	3.00
Sample Size (firm-person)	1,298	100.00

Panel C: Managerial Characteristics

Attributes	Number of Professionals	Fraction in %
Founder of the Firm	202	15.49
MBA	637	48.85
Law	133	10.20
Business	953	73.08
Engineering	131	10.05
Master	241	18.48
Sample Size (firm-person)	1,304	100.00

Panel D: MBA Graduates

Attributes	Number of Professionals	Engineering	(%)	Law	(%)	Master	(%)
Harvard	199	25	12.56	22	11.06	15	7.54
Wharton	53	2	3.77	3	5.66	4	7.55
Columbia	49	6	12.24	3	6.12	7	14.29
Stanford	48	11	22.92	1	2.08	6	12.50
University of Chicago	39	4	10.26	3	7.69	3	7.69
INSEAD	28	7	25.00	2	7.14	10	35.71

Dartmouth	18	0	0.00	0	0.00	0	0.00
NYU	15	0	0.00	1	6.67	1	6.67
London Business School	12	4	33.33	0	0.00	0	0.00
Northwestern	11	1	9.09	0	0.00	1	9.09
Darden	9	2	22.22	0	0.00	0	0.00
Others	156	20	12.82	6	3.85	22	14.10
Total	637	82	12.87	41	6.44	69	10.83

Table 3

Determinants of LBO Syndication Likelihood

This table provides coefficient estimates (marginal effects) on LBO syndication using binomial probit models. The dependent variable equals one for syndicated LBO conducted by multiple co-investors and 0 otherwise. For the explanatory variables, investment size is measured by two proxies: deal value and capital invested in U.S. million dollars. Geographic distance is defined as the distance between the capital city of the portfolio company and the investment firm. Firm Experience is the difference between the founding year of the investment firm and the acquiring year of the portfolio company. Geographic distance and Firm Experience are transformed by logarithm. Management buyout is an indicator variable which equals the value one for management buyouts and zero otherwise. Investment team characteristics are proxied using density variables (i.e., number of investment professionals who have specific characteristics scaled by size of the investment team within a PE firm). Skill diversity is the standard deviation on three variables of skills, i.e., Law, Business, and Engineering. Standard deviations are clustered at the industry level. Z-values are reported in parentheses, and the symbols *, **, and *** denote statistical significance at the 0.10, 0.05, and 0.01 levels, respectively.

		Baseline Models			Restricted Models with Team Attributes						
Explanatory Variables	Predicted Signs	(1)	(2)	(3)	(4)	(5) All MBA	(6) Wharton MBA	(7) Stanford MBA	(8) Columbia MBA	(9) Chicago MBA	(10) Harvard MBA
Deal Attributes:											
Deal Value	+	0.132***									
		(4.53)									
Capital Invested	+		0.033*	0.081*	0.031	0.027	0.030	0.028	0.030*	0.031	0.026
			(1.68)	(1.91)	(1.59)	(1.38)	(1.56)	(1.29)	(1.66)	(1.63)	(1.36)
Geographic Distance	+	0.003	0.010**	0.024	0.010*	0.009*	0.010*	0.010**	0.010*	0.010**	0.010*
		(0.35)	(2.12)	(1.54)	(1.8)	(1.81)	(1.96)	(2.04)	(1.79)	(2.04)	(1.94)
PE Experience	-	-0.057	0.011	0.009	0.017	0.021	0.016	0.018	0.017	0.017	0.020
		(-1.61)	(0.65)	(0.14)	(0.7)	(1.08)	(1.05)	(1.01)	(1.07)	(1.07)	(1.1)
Management Buyout	?	0.185***	0.188***	0.491***	0.172***	0.174***	0.173***	0.174***	0.174***	0.171***	0.176***
		(3.54)	(3.57)	(4.37)	(3.31)	(3.46)	(3.34)	(3.38)	(3.48)	(3.31)	(3.57)
Team Attributes:											
Skill Diversity	+				0.035						
					(0.15)						
MBA Subgroups	+					0.104	0.161	0.168	0.187	0.226	0.147
						(1.28)	(0.59)	(0.83)	(0.67)	(0.92)	(1.58)
Year and PC Industry FE		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo R^2		0.1660	0.0666		0.0634	0.0653	0.0637	0.0639	0.0638	0.0639	0.0654
Wald Chi^2				52.28							
Probability > Chi^2				0.0233							
Sample Size		450	938	910	910	910	910	910	910	910	910

Table 4

MBA Selection of LBO Syndication Partners: Networks and Agency Costs

This table reports coefficient estimates on the conditional logit model of syndication partner selection for MBA graduates from leading universities on the subsample of matched PE co-investments. Each investment firm(f) at time t can choose among all other investment firms(i) in the sample with available team attributes data at time t. The dependent variable is an indicator that equals one for the investment firm-candidate pairs that co-invest with each other at the time when the deal is initiated and 0 otherwise. Independent variables are measured in density, which is defined as the number of the professionals who have specific characteristics, scaled by the number of the whole investment team within each firm. Model (1) is the baseline model for MBA graduates. Models (2)-(6) provide coefficient estimates for different subgroups by University. Models (7)-(8) extend Model (1) to include two proxies on agency costs: differences in capital invested and geographic difference between co-investors. The proxies on agency costs are transformed by logarithm. Z-values are reported in parentheses, and the symbols *, **, and *** denote statistical significance at the 0.1, 0.05, and 0.01 levels, respectively.

Explanatory Variables	(1) All MBA	(2) Wharton MBA	(3) Stanford MBA	(4) Columbia MBA	(5) Chicago MBA	(6) Harvard MBA	(7) Harvard MBA	(8) Harvard MBA
MBAs:								
MBA(f)*MBA(i)	1.81**	10.00	11.08	22.27	29.89**	7.23***		
	(2.10)	(1.03)	(1.06)	(1.47)	(2.09)	(4.03)		
MBA(f)*Engineer(i)	2.09	3.67	-1.45	13.69	0.40	0.37		
	(1.04)	(0.34)	(-0.18)	(1.2)	(0.03)	(0.10)		
MBA(f)*Law(i)	-0.38	-3.81	-0.03	3.79	-17.26	2.74		
	(-0.19)	(-0.32)	(-0.00)	(0.34)	(-1.23)	(0.87)		
MBA(f)*Master(i)	-2.91**	-3.89	-3.03	-7.68	-5.96	-4.88*		
	(-2.09)	(-0.55)	(-0.54)	(-0.87)	(-0.75)	(-1.73)		
Agency Costs Attributes:								
Size(f,i)*MBA(f)*MBA(i)							2.69***	
							(2.69)	
Distance(f,i)*MBA(f)*MBA(i)								-1.44
								(-1.62)
Wald Chi^2	9.31	1.57	1.58	3.20	5.44	20.20	7.26	2.63
Probability > Chi^2	0.0538	0.8142	0.8115	0.5250	0.2452	0.0005	0.0071	0.1046
# of Investments (cases)	153	153	153	153	153	153	86	153
# of Observations	24,839	24,839	24,839	24,839	24,839	24,839	14,030	24,839

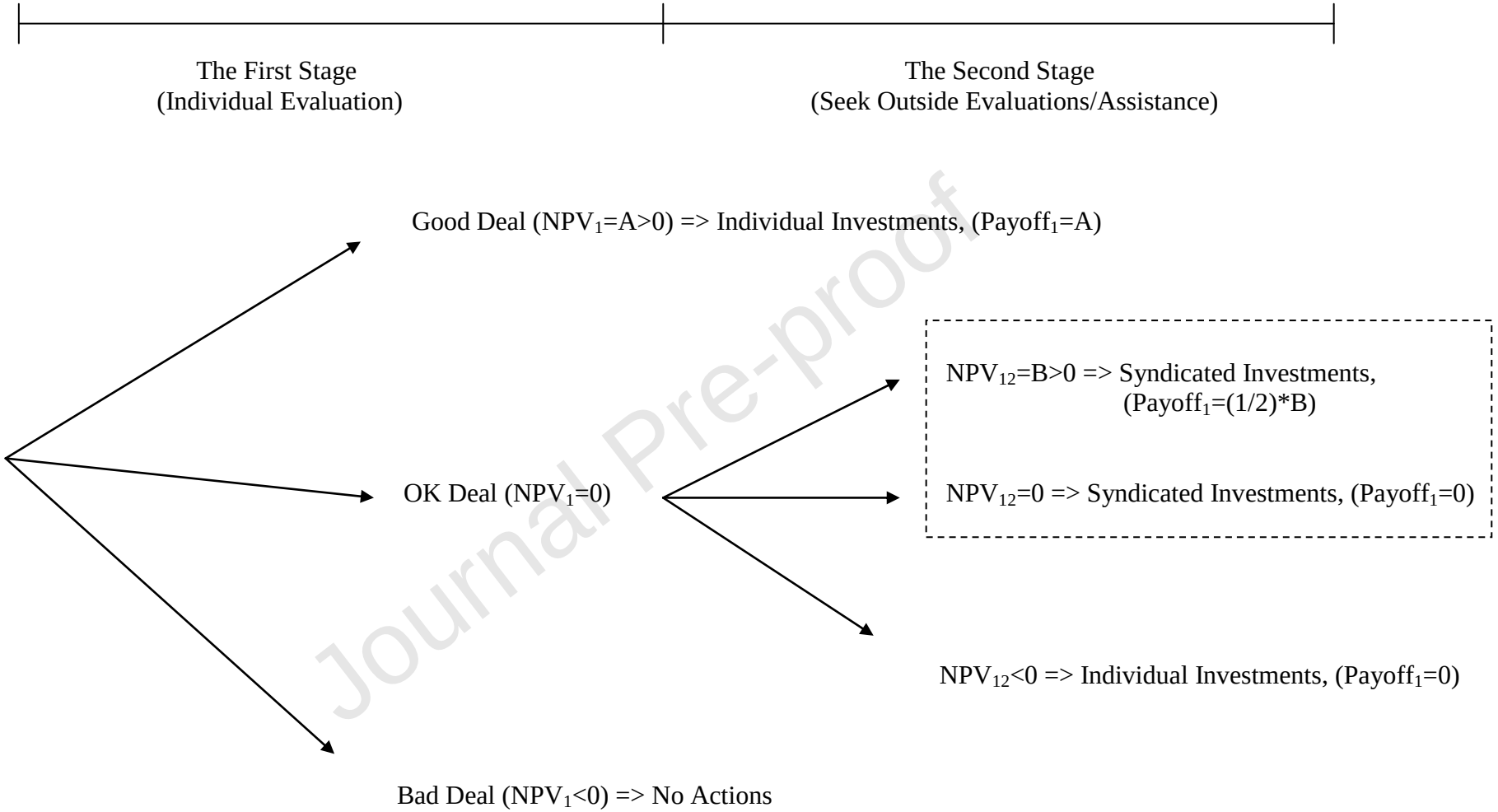


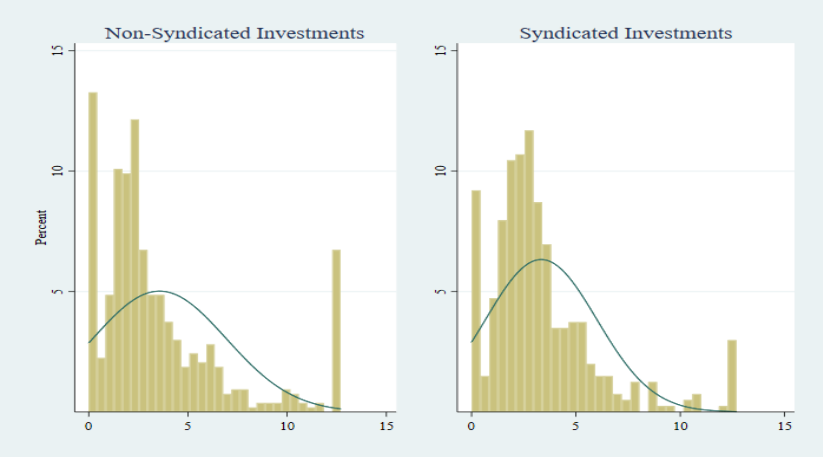
Figure 1 Illustration of the Relationship between Investment Type and Performance

Table 5

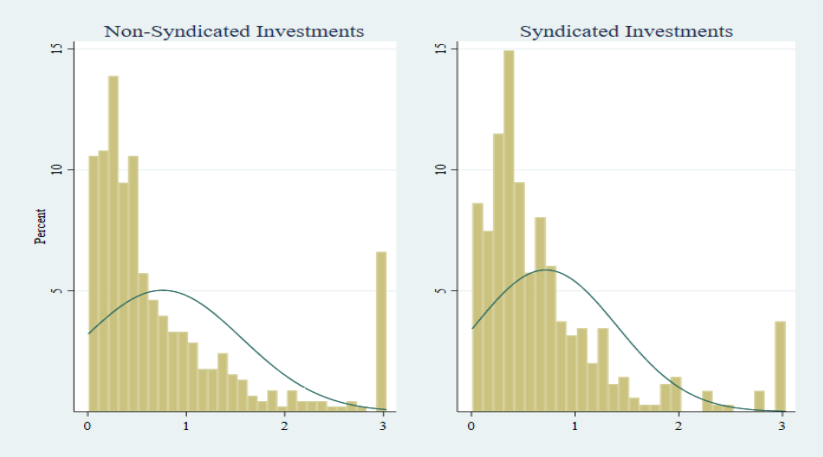
Summary Statistics: LBO Performance

This table reports summary statistics on LBO investment performance using value multiple and gross internal rate of return (GIRR). The value multiple is defined as the ratio of total cash received from the investment plus its current valuation (if not fully liquidated) to the total cash invested (that is, total value divided by investment size, gross of fees) and GIRR is defined as the internal rate of return, gross of fees, of the investment in the PPM.

		Mean	The 25th percentile	Median	The 75th percentile	Standard Deviation	Number of Obs.
Multiple	Non-Syndicated	16.73	1.50	2.47	4.56	259.72	535
	Syndicated	3.74	1.80	2.72	4.17	5.05	402
	Total	11.16	1.57	2.60	4.40	196.31	937
Gross IRR	Non-Syndicated	1.33	0.24	0.46	0.98	4.87	454
	Syndicated	1.09	0.29	0.47	0.91	4.54	348
	Total	1.23	0.27	0.46	0.93	4.73	802



Multiple of Investments (winsorized at 5% level)



Gross IRR of Investments (winsorized at 5% level)

Figure 2 Histogram of LBO Performance

Table 6

Syndication and Performance

This table shows the relationship between syndication and LBO investment performance. The dependent variable is investment performance, proxied by multiple (Panel A) and gross internal rate of return (Panel B), both winsorized at the 5% level. The independent variables include an indicator variable that equals one for syndicated investments and 0 otherwise. Deal value and capital invested are in $U.S. million. Geographic distance is measured in miles between the capital city of the portfolio company and that of the investment firm. Firm experience is the difference between the founding year of the PE firm and the acquiring year of the portfolio company. All variables are transformed by logarithm. The skill diversity variable is the standard deviation of three variables of skill - - Law, Business, and Engineering. Team attributes are measured by density, which is defined as the number of the professionals who have specific characteristics, scaled by the size of the investment team in a firm. Models (1)-(4) report OLS coefficient estimates with standard deviations clustered at the industry level. Models (5)-(6) report coefficient estimates on the two-stage treatment effect model. Z-values (T-values) are reported in parentheses, and the symbols *, **, and *** denote statistical significance at the 0.1, 0.05, and 0.01 levels, respectively.

	Panel A: Multiple						Panel B: Gross Internal Rate of Return					
	(1) Pooled Sample	(2) Separate: > median	(3) Pooled Sample	(4) Separate: > median	(5) Pooled Sample	(6) Separate: > median	(1) Pooled Sample	(2) Separate: > median	(3) Pooled Sample	(4) Separate: > median	(5) Pooled Sample	(6) Separate: > median
Deal Value	-0.068	-0.220					0.023	0.016				
	(-0.44)	(-1.39)					(0.74)	(0.26)				
Capital Invested			-0.386***	-0.499***	-0.422***	-0.462***			-0.087*	-0.088	-0.100***	-0.084**
			(-4.75)	(-2.99)	(-4.39)	(-3.48)			(-1.81)	(-1.38)	(-3.78)	(-2.32)
Geographic Distance	-0.070	-0.099	-0.056	-0.044	-0.068*	-0.024	0.003	0.022	-0.003	0.010	-0.007	0.012
	(-1.37)	(-1.35)	(-1.29)	(-1.06)	(-1.91)	(-0.45)	(0.20)	(1.30)	(-0.38)	(0.71)	(-0.73)	(0.83)
PE Experience	-0.167	0.049	-0.210	-0.221	-0.241*	-0.072	-0.182***	-0.091	-0.048*	-0.013	-0.059	-0.009
	(-0.66)	(0.13)	(-1.28)	(-1.12)	(-1.75)	(-0.29)	(-3.62)	(-0.94)	(-2.00)	(-0.33)	(-1.61)	(-0.16)
Skill Diversity	1.850	1.072	1.156	-0.683	1.169	-0.723	-0.406	-0.188	-0.058	-0.065	-0.056	-0.062
	(1.64)	(0.87)	(1.73)	(-1.05)	(1.35)	(-0.59)	(-1.16)	(-0.47)	(-0.25)	(-0.24)	(-0.25)	(-0.18)
Syndication	-0.583**	-1.487***	-0.231	-0.973***	1.001	-3.087	-0.225***	-0.322**	-0.057	-0.136	0.323	-0.283
	(-2.28)	(-6.23)	(-1.64)	(-3.71)	(0.70)	(-1.33)	(-3.79)	(-2.28)	(-1.02)	(-0.99)	(0.89)	(-0.51)
Selection Variables:												
Capital Invested					0.073**	0.041					0.083**	0.071
					(2.07)	(0.80)					(2.13)	(1.29)
Geographic Distance					0.026*	0.019					0.024	0.024
					(1.89)	(0.93)					(1.63)	(1.08)
PE Experience					0.027	0.140*					0.026	0.030
					(0.52)	(1.84)					(0.47)	(0.36)
Management Buyout					0.394***	0.348***					0.418***	0.370***
					(4.34)	(2.71)					(4.26)	(2.72)
Year and PC Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.1111	0.1880	0.1065	0.2062			0.1250	0.1980	0.0937	0.1929		
Wald Chi^2					115.01	104.64					87.09	92.22
Probability > Chi^2					0	0					0	0
Sample Size	444	228	907	447	907	447	373	182	776	387	776	387

Table 7

Summary Statistics: Harvard MBA and LBO Performance

This table reports LBO investment performance using value multiple and gross internal rate of return (GIRR) of deals made by investors involving Harvard MBA graduates. The value multiple is defined as the ratio of total cash received from the investment plus its current valuation (if not fully liquidated) to the total cash invested (that is, total value divided by investment size, gross of fees) and GIRR is defined as the internal rate of return, gross of fees, of the investment in the PPM. Panel A shows summary statistics of these deals. Panel B shows comparisons in investment performance (winsorized at the 5% level) of deals with versus without Harvard MBA graduates.

Panel A: Sample deals involving Harvard MBAs

		Mean	The 25th percentile	Median	The 75th percentile	Standard Deviation	Number of Obs.
Multiple	Non-Syndicated	28.69	1.50	2.94	5.30	373.52	258
	Syndicated	3.79	1.50	2.63	4.33	5.79	207
	Total	17.61	1.50	2.70	4.80	278.29	465
Gross IRR	Non-Syndicated	0.93	0.27	0.52	1.03	1.39	208
	Syndicated	1.20	0.27	0.52	1.02	5.26	163
	Total	1.05	0.27	0.52	1.03	3.63	371

Panel B: Comparisons between deals with and without Harvard MBAs

		Non-Syndicated Investments			Syndicated Investments		
		Mean	Median	Number of Obs.	Mean	Median	Number of Obs.
Multiple	No HBS	3.23	2.24	267	3.35	2.78	177
	HBS	3.99	2.94	258	3.28	2.63	207
	P-value of Test for Diff. in Means (Distribution)	0.0097	0.0153		0.8027	0.2385	
Gross IRR	No HBS	0.72	0.43	239	0.65	0.43	168
	HBS	0.83	0.52	208	0.76	0.52	163
	P-value of Test for Diff. in Means (Distribution)	0.1571	0.0954		0.1516	0.3098	

Table 8

MBA Team Attributes, Syndication, and Performance

This table shows how MBA team attributes affect investment performance of non-syndicated and syndicated investments, respectively. The dependent variable is investment performance captured by multiple (Panel A) and gross internal rate of return (Panel B), both winsorized at the 5% level. The key independent variable is MBA(f), which is a density variable defined as the number of the professionals who have (specific) MBA degrees, scaled by the size of the investment team in the firm. The remaining independent variables are size which is the capital invested in US million dollars, distance as measured by miles between the capital city of the portfolio company and investment firm, and experience is the difference between the founding year of the investment firm and the acquiring year of the portfolio company. Aforementioned independent variables are transformed by logarithm. Each specification provides coefficient estimates for different subgroups of MBA graduates. Standard deviations are clustered at the industry level. T-values are reported in parentheses, and the symbols *, **, and *** denote statistical significance at the 0.1, 0.05, and 0.01 levels, respectively.

Panel A: Multiple

	Non-Syndicated Investments						Syndicated Investments					
	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)
Explanatory Variables	All MBA	Wharton MBA	Stanford MBA	Columbia MBA	Chicago MBA	Harvard MBA	All MBA	Wharton MBA	Stanford MBA	Columbia MBA	Chicago MBA	Harvard MBA
MBA(f)	1.120**	3.408*	2.067	-0.353	3.849	3.215***	-0.168	-3.451	0.607	-3.448*	0.865	1.022*
	(2.86)	(2.00)	(1.43)	(-0.22)	(1.73)	(4.85)	(-0.74)	(-1.62)	(0.59)	(-1.81)	(0.98)	(1.77)
Controls:												
Capital Invested	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Distance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Experience	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year and PC Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.1512	0.1491	0.1468	0.1448	0.1497	0.1714	0.1042	0.1101	0.1043	0.1103	0.1044	0.1091
Sample Size	524	524	524	524	524	524	383	383	383	383	383	383

Panel B: Gross Internal Rate of Return

	Non-Syndicated Investments						Syndicated Investments					
	(1)	(2)	(3)	(4)	(5)	(6)	(1)	(2)	(3)	(4)	(5)	(6)
Explanatory Variables	All MBA	Wharton MBA	Stanford MBA	Columbia MBA	Chicago MBA	Harvard MBA	All MBA	Wharton MBA	Stanford MBA	Columbia MBA	Chicago MBA	Harvard MBA
MBA(f)	0.069	0.196	0.933*	-0.497	0.611*	0.644*	0.042	-0.366	0.359	-1.574***	0.266	0.262
	(0.37)	(0.44)	(1.91)	(-1.25)	(2.03)	(1.91)	(0.34)	(-0.71)	(0.98)	(-3.02)	(0.53)	(1.18)
Controls:												
Capital Invested	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Distance	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Experience	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year and PC Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.1462	0.1461	0.1537	0.1474	0.1481	0.1640	0.0901	0.0909	0.0920	0.1048	0.0905	0.0952
Sample Size	446	446	446	446	446	446	330	330	330	330	330	330

Table 9

MBA Selection of Syndicated Partners and Performance

This table shows how MBA team attributes affect investment performance of the subsample of investments co-invested by only two investors. The dependent variable is investment performance, proxied by multiple (Panel A) and gross internal rate of return (Panel B), both winsorized at the 5% level. The main explanatory variable, MBA(f), is a density variable, defined as the number of the professionals who have (specific) MBA degrees, scaled by the number of the whole investment team members within the firm. The control variables include size, proxied by the capital invested in US million dollars. Distance is measured by the distance between the capital city of the portfolio company and that of the investment firm. Experience is the difference between the founding year of the investment firm and the acquiring year of the portfolio company. All these control variables are transformed by logarithm. Each specification provides coefficient estimates for different subgroups of MBA graduates. Standard deviations are clustered at the industry level. T-values are reported in parentheses, and the symbols *, **, and *** represent statistical significance at the 0.1, 0.05, and 0.01 levels, respectively.

Panel A: Multiple

Explanatory Variables	(1) All MBA	(2) All MBA	(3) Wharton MBA	(4) Wharton MBA	(5) Stanford MBA	(6) Stanford MBA	(7) Columbia MBA	(8) Columbia MBA	(9) Chicago MBA	(10) Chicago MBA	(11) Harvard MBA	(12) Harvard MBA
MBA(f)	-0.14	-0.34	-1.39	-6.52	-0.94	-3.05	-2.92	-3.21	-0.91	-0.57	1.33*	-0.16
	(-0.22)	(-0.57)	(-0.39)	(-1.61)	(-0.32)	(-1.07)	(-0.50)	(-0.78)	(-0.37)	(-0.29)	(1.79)	(-0.17)
MBA(f)*MBA(i)		0.40		93.92**		60.69		11.08		-7.42		6.49***
		(0.20)		(2.86)		(1.28)		(0.11)		(-0.35)		(3.00)
Controls: Capital Invested, Distance, Experience, Year & PC	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE												
R^2	0.2732	0.2739	0.2742	0.3170	0.2736	0.2851	0.2770	0.2774	0.2735	0.2740	0.2841	0.3039
Sample Size	150	150	150	150	150	150	150	150	150	150	150	150

Panel B: Gross Internal Rate of Return

Explanatory Variables	(1) All MBA	(2) All MBA	(3) Wharton MBA	(4) Wharton MBA	(5) Stanford MBA	(6) Stanford MBA	(7) Columbia MBA	(8) Columbia MBA	(9) Chicago MBA	(10) Chicago MBA	(11) Harvard MBA	(12) Harvard MBA
MBA(f)	0.16	0.18	-0.86	-0.75	1.07	1.47	-0.76	-0.70	0.25	0.82	0.20	-0.25
	(0.94)	(1.06)	(-1.73)	(-1.26)	(1.00)	(1.15)	(-0.88)	(-0.80)	(0.22)	(0.71)	(0.72)	(-0.66)
MBA(f)*MBA(i)		-0.04		-2.39		-11.71		-3.88		-12.00*		2.12**
		(-0.14)		(-0.32)		(-0.70)		(-0.62)		(-1.78)		(2.47)
Controls: Capital Invested, Distance, Experience, Year & PC	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE												
R^2	0.1666	0.1667	0.1682	0.1685	0.1723	0.1777	0.1655	0.1660	0.1630	0.1800	0.1657	0.1944
Sample Size	135	135	135	135	135	135	135	135	135	135	135	135

Table 10

Sensitivity Test of Harvard MBA Selection of Syndicated Partners and Performance

This table shows how the impact of Harvard MBA match on investment performance of the subsample of investments co-invested by only two investors might be affected by potentially other known agency costs. The dependent variable is investment performance, proxied by multiple (Panel A) and gross internal rate of return (Panel B), both winsorized at the 5% level. The main explanatory variable, MBA(f), is a density variable, defined as the number of the professionals who have (specific) MBA degrees, scaled by the number of the whole investment team members within the firm. High leverage amount is a dummy variable equal to the value of one if debt value is more than the 75 percentile of this subsample (278 million dollars), and zero otherwise. High leverage ratio is a dummy variable equal to the value of one if debt over deal value ratio is at least 80%, and zero otherwise. High PE reputation (d) is a dummy variable equal to the value of one if the PE firm has conducted at least 15 deals in the whole sample, and zero otherwise. High PE reputation (count) is the log of the number of deals conducted by the PE firm in the whole sample. Large fund size is a dummy variable equal to the value of one if fund size is more than the 75 percentile of this subsample (1000 million dollars), and zero otherwise. Early exit is a dummy variable equal to the value of one if the difference between the acquiring year and the exiting year is no more than two. The control variables include size, proxied by the capital invested in US million dollars. Distance is measured by the distance between the capital city of the portfolio company and that of the investment firm. Experience is the difference between the founding year of the investment firm and the acquiring year of the portfolio company. All these control variables are transformed by logarithm. Each specification provides coefficient estimates for different subgroups of MBA graduates. Standard deviations are clustered at the industry level. T-values are reported in parentheses, and the symbols *, **, and *** represent statistical significance at the 0.1, 0.05, and 0.01 levels, respectively.

	Panel A: Multiple						Panel B: Gross IRR					
Explanatory Variables	(1) Harvard MBA	(2) Harvard MBA	(3) Harvard MBA	(4) Harvard MBA	(5) Harvard MBA	(6) Harvard MBA	(1) Harvard MBA	(2) Harvard MBA	(3) Harvard MBA	(4) Harvard MBA	(5) Harvard MBA	(6) Harvard MBA
MBA(f)	-0.14	-0.07	-0.38	-0.80	-0.31	-0.45	-0.25	-0.22	-0.71	-0.70	-0.31	-0.04
	(-0.15)	(-0.07)	(-0.33)	(-0.70)	(-0.32)	(-0.45)	(-0.66)	(-0.58)	(-1.54)	(-1.55)	(-0.77)	(-0.11)
MBA(f)*MBA(i)	6.51**	6.07**	6.61**	7.13**	6.54***	6.63**	2.12**	1.98**	2.20**	2.43***	2.07**	2.21**
	(2.81)	(2.44)	(2.84)	(2.76)	(3.02)	(2.88)	(2.44)	(2.29)	(2.75)	(3.02)	(2.51)	(2.91)
High Leverage Amount (d)	0.74						0.05					
	(0.94)						(0.19)					
High Leverage Ratio (d)		0.50						0.17				
		(0.85)						(1.00)				
High PE Reputation (d)			0.14						0.31***			
			(0.41)						(2.96)			
High PE Reputation (count)				0.31						0.22**		
				(0.89)						(2.34)		
Large Fund Size (d)					0.55						0.20	
					(1.27)						(1.13)	
Early Exit (d)						-0.63*						0.56***
						(-1.79)						(7.94)
Controls: Capital Invested, Distance, Experience, Year & PC Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.3125	0.3116	0.3045	0.3094	0.3084	0.3182	0.1949	0.2065	0.2280	0.2277	0.2022	0.3477
Sample Size	150	150	150	150	150	150	135	135	135	135	135	135

Appendix Table 1

Comparisons of Selected Characteristics of Syndicated and Non-Syndicated Investments

This table presents means and medians on deal- and management team-specific characteristics for syndicated and non-syndicated investments in LBO. Deal value, capital invested, and fund size are in U.S. million dollars. Geographic distance is defined as the distance between the capital city of the portfolio company and the investment firm. Firm Experience is the difference between the founding year of the investment firm and the acquiring year of the portfolio company. Except for team size, investment team characteristics are proxied using density variables (i.e., number of investment professionals who have specific characteristics scaled by size of the investment team within a PE firm). Skill diversity is the standard deviation on three variables of skills, i.e., Law, Business, and Engineering.

Variable	Non-Syndicated Investments		Syndicated Investments		p-Value of Test for Diff. in Means (Distribution)	Number of Observations
	Mean	Median	Mean	Median		
Deal Attributes:						
Deal Value	142.91	70.25	351.73	130.83	0	453
					(0)	
Capital Invested	33.83	14.00	39.98	18.40	0.2432	941
					(0.0188)	
Fund Size	495.71	252.00	778.09	424.50	0.0001	598
					(0)	
Geographic Distance	545.26	0.00	752.14	0.00	0.0677	941
					(0.0764)	
Firm Experience	13.58	10.00	14.62	12.00	0.2185	941
					(0.0687)	
Team Attributes:						
Team Size	11.10	9.00	13.33	11.00	0.0001	912
					(0.0001)	
Founder (%)	0.23	0.17	0.19	0.13	0.0176	912
					(0.0118)	
MBA (%)	0.46	0.47	0.49	0.56	0.083	912
					(0.0674)	
Law (%)	0.10	0.07	0.10	0.08	0.5427	912
					(0.6963)	
Business (%)	0.70	0.75	0.71	0.75	0.6043	912
					(0.5642)	
Engineering (%)	0.08	0.03	0.09	0.04	0.143	912
					(0.1713)	
Master (%)	0.16	0.11	0.17	0.12	0.8094	912
					(0.7047)	
Skill Diversity	0.37	0.38	0.37	0.39	0.7047	912
					(0.5242)	

Appendix Table 2

Correlation Matrix of Selected Variables for LBO Syndication Likelihood

This table reports pair-wise correlation coefficients between the selected variables for LBO syndication likelihood. Syndication is a dummy variable which is assigned the value 1 for syndicated investments and 0 otherwise. Deal value, capital invested, and fund size are in US million dollars. Geographic distance is measured by the distance between the capital city of the portfolio company and that of the investment firm. Firm Experience is the difference between the founding year of the investment firm and the acquiring year of the portfolio company. All these variables are transformed by logarithm. Management buyout is a dummy variable which is assigned the value 1 if the investment team is involved with the portfolio company management and 0 otherwise. The investment team characteristics are proxied by using density variables, i.e., defined as the number of the professionals who have specific characteristics, scaled by the number of the whole investment team members within a firm. The skill diversity variable is the standard deviation of the three variables of skills, i.e., Law, Business, and Engineering.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Syndication	1.00																
2. Deal Value	0.29*	1.00															
3. Capital Invested	0.08*	0.63*	1.00														
4. Fund Size	0.20*	0.53*	0.63*	1.00													
5. Geographic Distance	0.06	0.06	0.00	0.04	1.00												
6. Firm Experience	0.05	0.09	0.15*	0.37*	0.00	1.00											
7. Management Buyout	0.17*	-0.02	0.03	-0.01	0.00	0.18*	1.00										
8. Founder	-0.08*	-0.08	-0.02	-0.27*	-0.10*	-0.63*	-0.13*	1.00									
9. Engineering	0.05	-0.03	-0.10*	-0.06	0.10*	0.14*	0.08*	-0.22*	1.00								
10. Law	0.02	0.15*	0.17*	0.13*	-0.18*	-0.11*	-0.10*	0.16*	-0.14*	1.00							
11. Skill Diversity	0.01	0.11*	0.07*	-0.01	0.12*	-0.25*	-0.05	0.26*	-0.23*	-0.07*	1.00						
12. MBA	0.06	0.20*	0.16*	0.13*	0.04	-0.15*	-0.05	0.12*	0.00	0.18*	0.59*	1.00					
13. Harvard MBA	0.05	0.26*	0.18*	0.16*	0.03	-0.14*	-0.10*	0.11*	0.09*	0.25*	0.30*	0.62*	1.00				
14. Wharton MBA	0.01	0.16*	0.05	0.13*	0.01	-0.11*	-0.07*	0.11*	-0.04	0.08*	0.08*	0.26*	0.13*	1.00			
15. Stanford MBA	0.03	0.16*	0.25*	0.24*	-0.08*	-0.15*	-0.06	0.12*	0.08*	0.20*	0.08*	0.25*	0.14*	-0.03	1.00		
16. Columbia MBA	0.02	0.08	0.08*	0.11*	0.06	-0.12*	-0.10*	0.19*	-0.13*	0.04	0.17*	0.24*	0.02	0.04	-0.08*	1.00	
17. Chicago MBA	0.01	-0.03	0.01	0.04	-0.09*	-0.11*	0.00	0.06	-0.07*	0.10*	0.24*	0.32*	0.07*	0.05	0.07*	0.03	1.00

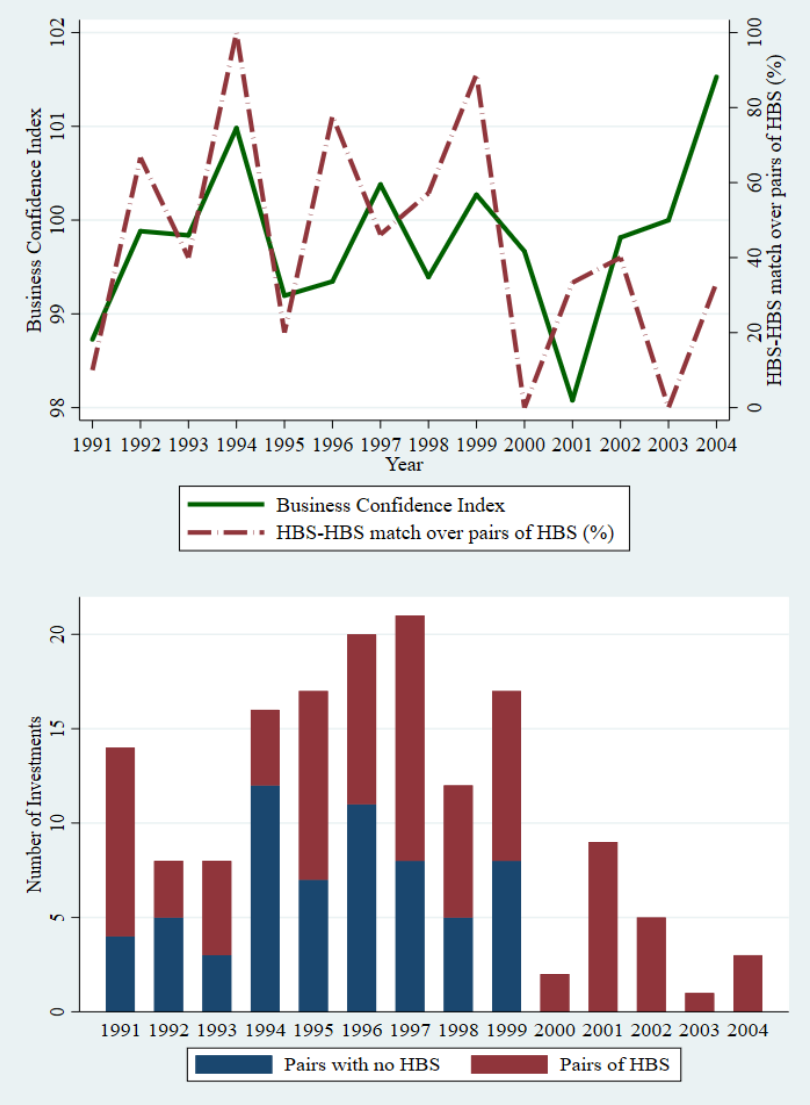
*$P \leq 0.05$.

Appendix Table 3

Comparisons of Selected Variables between Co-investing Team Pairing with Harvard MBAs

This table reports comparisons in the subsample of investments co-invested by only two investors managed by teams with HBS or not. Multiple is defined as total value divided by investment size, gross of fees, and GIRR is defined as the internal rate of return, gross of fees, of the investment. Both performance measures are winsorzed at the 5% level. Deal value, capital invested, and fund size are in US million dollars. Geographic distance is measured by the distance between the capital city of the portfolio company and that of the investment firm. Firm Experience is the difference between the founding year of the investment firm and the acquiring year of the portfolio company. All these variables are transformed by logarithm. Management buyout is a dummy variable which is assigned the value 1 if the investment team is involved with the portfolio company management and 0 otherwise. Team size is measured by the number of senior professionals in the firm at the time of investment The investment team characteristics are proxied by using density variables, i.e., defined as the number of the professionals who have specific characteristics, scaled by the number of the whole investment team members within a firm. The skill diversity variable is the standard deviation of the three variables of skills, i.e., Law, Business, and Engineering. Capital Invested (f,i) is the difference in capital invested and Geographic Distance (f,i) is the difference in geographic difference between co-investors. These two proxies on agency costs are transformed by logarithm. High leverage amount is a dummy variable equal to the value of one if debt value is more than the 75 percentile of this subsample (278 million dollars), and zero otherwise. High leverage ratio is a dummy variable equal to the value of one if debt over deal value ratio is at least 80%, and zero otherwise. High PE reputation (d) is a dummy variable equal to the value of one if the PE firm has conducted at least 15 deals in the whole sample, and zero otherwise. High PE reputation (count) is the log of the number of deals conducted by the PE firm in the whole sample. Large fund size is a dummy variable equal to the value of one if fund size is more than the 75 percentile of this subsample (1000 million dollars), and zero otherwise. Early exit is a dummy variable equal to the value of one if the difference between the acquiring year and the exiting year is no more than two.

	Pairs with no HBS			Pairs of one HBS			Pairs of HBS-HBS		
	mean	p50	N	mean	p50	N	mean	p50	N
Multiple	3.28	2.83	61	3.15	2.81	48	3.24	2.87	42
Gross IRR	0.67	0.50	60	0.68	0.52	41	0.82	0.64	35
Deal Value	158.99	56.88	42	233.43	150.90	25	730.47	340.00	23
Capital Invested	25.91	8.70	63	50.74	20.36	48	66.10	29.75	42
Fund Size	484.35	291.50	30	761.82	360.00	31	1,439.27	950.00	30
Geographic Distance	372.52	0.00	63	761.25	0.00	48	590.24	0.00	42
Firm Experience	17.19	14.00	63	15.02	10.00	47	15.07	14.00	42
Management Buyout	0.57	1.00	63	0.35	0.00	48	0.36	0.00	42
Team size	11.13	8.00	63	12.21	11.50	48	16.55	13.00	42
MBA	0.34	0.25	63	0.45	0.37	48	0.66	0.68	42
Founder	0.16	0.06	63	0.23	0.13	48	0.17	0.11	42
Law	0.06	0.00	63	0.11	0.10	48	0.14	0.13	42
Business	0.63	0.63	63	0.67	0.71	48	0.78	0.80	42
Engineering	0.07	0.00	63	0.08	0.08	48	0.06	0.03	42
Master	0.21	0.11	63	0.16	0.13	48	0.14	0.11	42
Skill Diversity	0.33	0.33	63	0.34	0.36	48	0.40	0.42	42
Proxies for main agency costs:									
Capital Invested (f,i)	7.70	3.36	30	47.35	22.58	34	38.13	26.08	22
Geographic Distance (f,i)	574.70	0.00	63	1,117.02	0.00	48	25.76	0.00	42
Proxies for other agency costs:									
High Leverage Amount (d)	0.08	0.00	63	0.13	0.00	48	0.29	0.00	42
High Leverage Ratio (d)	0.29	0.00	63	0.15	0.00	48	0.26	0.00	42
High PE Reputation (d)	0.33	0.00	63	0.38	0.00	48	0.69	1.00	42
High PE Reputation (count)	2.58	2.56	63	2.57	2.56	48	2.78	2.86	42
Large Fund Size (d)	0.05	0.00	63	0.17	0.00	48	0.36	0.00	42
Early Exit (d)	0.37	0.00	63	0.35	0.00	48	0.29	0.00	42



Appendix Figure 1
Time Trend of Co-investing Team Pairing and Business Environment

Highlights:

- We document a unique HBS MBA effect on leveraged buyout investments (LBOs).
- Harvard MBA alumni are more likely to co-invest with one another.
- Deals co-invested by Harvard MBA alumni are associated with higher investment returns.
- The effects are robust to various alternative explanations.
- Our findings suggest that strong and long-lasting social capital enables trust and cooperative norms among PE investors to mitigate information and agency problems common in LBOs.