

# Due Diligence and Investee Performance\*

Forthcoming in *European Financial Management*

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# Due Diligence and Investee Performance

## Abstract

We estimate the economic value of due diligence (DD) in the context of private equity by investigating the relationship between DD and investee performance, while controlling for endogeneity. With the adoption of a novel dataset, we find evidence highly consistent with the view that a thorough DD is associated with improved investee performance. We also distinguish the role of different types of DD and show that the DD performed by fund managers has a more pronounced impact on performance. Instead, the DD mainly performed by external agents, i.e., consultants, lawyers and accountants, gives rise to puzzling results and imperfect matching.

*JEL Classification:* G23, G24, G28

*Keywords:* Due Diligence, Governance, Performance, Private Equity

*“What we hope ever to do with ease, we must learn first to do with diligence.”*

*Samuel Johnson (Boswell, 2010. Life of Johnson, Volume 1, 1709-1765)*

## **1. Introduction**

This study aims at empirically investigating the determinants and economic value of due diligence (DD) in the context of private equity (PE) financing, as well as the impact of different types of DD (e.g., internal vs. external) on firm performance. Despite the emphasis placed on the importance of DD by various industry guides and venture capital associations (e.g., the European Venture Capital Association, the National Venture Capital Association, and the Canadian Venture Capital Association), very few academic studies have investigated its efficacy and economic value.<sup>1</sup>

Research in entrepreneurial finance has stressed the importance of DD, but primarily from a theoretical perspective (Yung, 2009). While empirical studies to date have emphasized the importance of investor characteristics, reputation, and cultural differences among venture capital (VC) and private equity (PE) intermediaries (Casamatta and Haritchabalet, 2007; Caselli *et al.*, 2013; Das *et al.*, 2010; Masulis and Nahata, 2009, Nahata, 2008; Nahata *et al.*, 2014; Sevilir, 2010), no empirical studies have formally examined the economic value and impact of DD. Related research in corporate finance (Li and Prabhala, 2006) and entrepreneurial finance (Sorensen, 2007; Yung, 2009; Bengtsson and Hsu, 2012) has focused on selection models. However, there have been no empirical studies examining the financial importance of selection and matching investors and investees in a PE setting. Also, little evidence exists on how such screening takes place and who exactly carries out DD. In this paper, we provide some of the first evidence

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<sup>1</sup> For the purpose of this paper, we adopt the term “private equity” to refer to the later stage financing of existing firms, in line with the definition provided by the Italian Venture Capital Association (AIFI), Capizzi (2004), and Heed (2010), among others. This definition, which differs from the one typically adopted in USA (see, e.g., Korteweg and Sorensen, 2014), excludes the funding of start-up and early stage firms (venture capital investments) and includes: a) development or expansion financing b) leveraged buyout (LBO) deals, and c) replacement and turnaround financing (see, e.g., Zambelli, 2010; 2014). Historically, the PE sector has dominated the Italian alternative financing industry, while early stage investments have always represented a minority (see AIFI Statistics Reports from 1999 onwards, Caselli *et al.*, 2013).

on screening by empirically investigating the determinants and the economic value of the DD in the context of private equity (PE) financing. Moreover, we provide a novel look at the impact of different types of DD (e.g., internal vs. external) on firm performance. We compare the role of lawyers, accountants, and consultants carrying out DD to assess whether there are agency costs associated with delegating DD.

As highlighted by Brown *et al.* (2008, 2009, 2012), DD is crucial for hedge fund and other types of alternative investments, including but not limited to PE financing. Likewise, we would expect that DD is particularly important in PE financing where value-added fund managers are actively involved in the governance and management of their portfolio companies (Gorman and Sahlman, 1989; Gompers and Lerner, 1999; Casamatta, 2003; Inderst and Muller, 2004; Yung, 2009; Ivanov and Xie, 2010). Also, private equity funds are generally not well diversified and, as such, fund managers take extra care to mitigate idiosyncratic risks (Kanniainen and Keuschnigg, 2003, 2004; Nahata, 2008; Nielsen, 2008; Knill, 2009; Wang and Wang, 2011, 2012; Altintig *et al.*, 2013; Nahata *et al.*, 2014).

In the context of our analysis, due diligence refers to the investigation process of a prospective investment in a particular target firm by PE investors (hereafter venture capitalists, or VCs). Due diligence involves a thorough assessment of a number of factors, e.g., management skills, target industry and competitors, project opportunity, financial forecasts, and strategic fit with the fund portfolio companies (Camp, 2002), as well as operational and financial risk (Brown *et al.*, 2008). This evaluation process may be performed mainly internally by PE fund managers themselves (“internal DD”) or mainly externally by strategic and financial consultants, or law and accountancy firms (“external DD”).<sup>2</sup>

A rigorous DD is costly and takes time. Expenses for DD include direct costs of paying for information pertaining to the investee, legal costs for background checks, and the value of time spent on the DD. Indirect costs of DD include the potential lost opportunity in terms of the investee walking away

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<sup>2</sup> For the purpose of this study, when we use the terms “internal” or “external” DD we refer to the agents (internal or external) who performed the *majority* of the DD process (not the entire process). These activities are not mutually exclusive and may act as complements. For example, an “internal” DD refers to a situation in which the *majority* of the DD is performed by the PE investor internally and it is possible that a small part of this activity (e.g., the legal DD) is delegated externally (see Table 1 for more details).

from the deal or getting financing elsewhere. Indirect costs likewise include opportunity costs on time not spent considering other potential projects, or time not spent on adding value to other firms in a fund's portfolio. Considering the costs, time and effort involved, important research questions are: a) How worth is the time spent on implementing it?; b) Would it be better to save time and delegate this investigation process to external agents (e.g., strategic consultants, law firms, or accountants)? As highlighted by Camp (2002), the main reason underlying such deep investigation of prospective investments in target companies is that, by doing so, VCs hope to make better investment decisions, and thereby enhance the returns on their overall portfolios. However, considering the direct and indirect costs involved, PE investors may be tempted to rush the DD process or to delegate it to external agents and it is not exactly clear as to whether or not additional DD is worth it in terms of performance payoffs.

Despite the existence of a vast literature on selection criteria (for a recent review see, e.g., Alemany and Villanueva, 2014), no prior study has empirically investigated the economic value of DD and its efficacy with reference to how much the investment in DD pays in terms of obtaining better future performance from the investee. The importance and the costs of DD for PE funds have been examined solely from a theoretical perspective by Yung (2009), who argues that DD facilitates matching and mitigates adverse selection problems. To the best of our knowledge no prior study has empirically examined the relationship between PE due diligence and investment performance. Partial exceptions are Wangerin (2015), who analyzes the DD in the context of M&A transactions, Brown *et al.* (2008), who investigated the role of DD solely for hedge funds, Sorensen (2007), who estimates the impact of sorting and matching in the context of investments made in early stage and startup companies, and Baum and Silverman (2004), who study the role played by VC funds in selecting startups belonging to the biotechnology industry. The above studies highlight the need for further and broader research on the selection process in PE settings. In this paper, we contribute to advance the literature by empirically assessing the efficacy and time-value of DD through the adoption of a novel and unique hand-collected dataset, which covers the majority of the funds actively involved in the Italian PE market, whose transactions experienced relevant legal changes that affected their frequency and the allocation of attention

of PE funds.<sup>3</sup> More specifically, we investigate the economic value of an additional week of DD, and account for the role played by the particular agent performing such DD (i.e., PE fund managers, external legal advisors, chartered accountants, or other external consultants). Sorensen (2007) provides a matching model without any empirical analysis of factors pertinent to internal versus external DD or the extent of internal versus external DD. Our study is the first to empirically evaluate this aspect.

In terms of outcomes, the key performance measures underlying our study are related to investee firms. In line with Richard *et al.* (2009) and Kabir and Roosenboom (2003), for each investee firm we track two operating performance indicators over the first three years from the investment date: the Return on Assets (ROA) and the operating profit margin (EBITDA to Sales ratio, hereafter EBITDA/Sales), as measures of operating profitability. These performance measures on a firm level are also consistent with Caselli *et al.* (2013), and Cao (2013).<sup>4</sup> The key independent variable underlying our study is represented by the time spent on DD, considered as a proxy of the importance and effort given by the investor to that particular activity, in line with a recent tendency in the entrepreneurial field (e.g., Wangerin 2015; Achleitner *et al.*, 2014).<sup>5</sup>

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<sup>3</sup> See Heed (2010) and Nahata *et al.* (2014) for related studies investigating the impact of the legal environment in PE finance; see Zambelli (2010) for details regarding the changes experienced by the PE legal setting in Italy.

<sup>4</sup> It is worth noting that other performance measures on a fund level could be considered (IRR and IPO exit). However, we decided to focus on ROA and EBITDA/SALES because we want to measure 3-year performance from date of investment to have a uniform measure of performance that can be reasonably connected to DD. IRRs are difficult to use, as many firms will not have had an exit within 3 years, and hence IRRs are based on imprecise valuations which are often wrong (Cumming and Walz, 2010). And because we look at a 3 years horizon where many firms do not yet have an exit, we cannot examine IPOs. Moreover, as highlighted in Caselli *et al.* (2013), ROA and EBITDA/SALES do not heavily depend on market conditions as IRR does (which is influenced by the entry and exit prices paid by the PE fund). The IPO exit is also a coarse measure of an investment outcome (i.e., ROA and EBIT/Sales can vary widely across different IPOs), despite his wide usage, as highlighted by Sorensen (2007). Nevertheless, for robustness purposes in Section 6.4. we do show results on the impact of DD on IPOs, and the findings are consistent.

<sup>5</sup> We decided to use the time spent on DD as a proxy of the importance given by investors to the DD activity and their effort in implementing such activity. The intuition behind this decision is that the time dedicated to a certain activity can capture the role and importance that this activity plays for a particular agent. This is especially true for the PE industry where the opportunity cost of time is enormous and PE investors may be tempted to rush the DD activity of perspective investments in order to allocate more attention to managing and adding value to existing portfolio firms. By looking at the high variability in the time spent on DD among different PE investors and external agents, as well as within the same PE fund,

Our empirical analyses consistently highlight the efficacy and importance of DD in improving firm performance (especially if the DD activity is carried out by internal fund managers). Our results are highly consistent with the view that the time spent on DD has substantial economic value, and reinforces the implications underlying the theoretical model of Yung (2009), and the evidence provided by Brown *et al.* (2008; 2012). Overall, an extra week of DD is statistically associated with higher levels of ROA and EBITDA/Sales over a three-year period after the investment date, even after controlling for endogeneity and other things being equal. PE funds on average carry out seven weeks of DD, and our estimates suggest that the effect of an extra four weeks of DD is on average associated with a doubling of three-year ROA performance.

Our data also allow us to distinguish the role played by different agents implementing the majority of DD. Our findings show that, when the majority of the DD is performed internally by PE investment managers, a more pronounced role on firm performance emerges. Surprisingly, when the majority of the DD is carried out externally by law firms, accounting firms, and external strategic management consultants there is no significant impact on target firm performance. Our study contributes to the literature in several ways. First, it helps advance the knowledge on the role and importance of DD. Second, it sheds some light on the economic value of the time spent on DD, in terms of future performance of investee firms. Third, it shows a greater efficacy of the DD internally implemented by PE fund managers. This latter result indicates the existence of apparent agency costs associated with external DD and emphasizes the need for more theoretical and empirical research in this field.

This paper is organized as follows. Section 2 reviews the literature and develops testable hypotheses. Section 3 discusses the institutional setting. Section 4 describes the employed research methodology and the dataset, as well as provides representative tests and summary statistics. Sections 5

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we imply that such difference can effectively capture a different level of effort, which differs on a case-by-case basis. The more time and attention a fund manager allocates to the DD of a certain firm, more resources the fund is allocating to that firm, and this captures the underlying importance given by such investor to the activity of DD. This is also in line with a recent evidence in the entrepreneurial finance field (see, e.g., Wangerin 2015, Achleitner *et al.*, 2014) where the time spent in implementing or discussing a certain activity is considered a proxy of the importance of such activity.

and 6 present the univariate and multivariate tests, respectively. The last section provides concluding remarks and suggestions for future research.

## **2. Related Literature and Testable Hypotheses**

Our paper is related to three main streams of literature. The first stream pertains to the literature directly related to DD in terms of the value of screening. The second stream pertains to matching models. The third pertains to the PE literature in terms of the drivers of performance. In this section we briefly discuss each in turn.

Our paper is most closely related to Yung's (2009) theoretical model of the tradeoffs associated with undertaking costly DD. One of the main reasons underlying the existence of PE funds is that banks and other financial intermediaries offering more traditional sources of capital are unable to perform, in a cost effective manner, the screening required to undertake DD and monitor an investee that exhibits significant adverse selection costs (Yung, 2009). Adverse selection costs of attracting excessively risky companies are particularly pronounced for banks and other loan sources of capital (Stiglitz and Weiss, 1981). As a result, PE funds that are able to mitigate adverse selection by undertaking costly DD are in a better position to finance such investee companies. Moreover, the investee companies that are able to incur costly signals of quality are more likely to obtain funding. Costly DD is typically more effective than costly signals of quality incurred by target companies because the latter are cash constrained while investors are in a better position to incur costs of DD (Yung, 2009).

How entrepreneurial firms and PE funds form matches has been the subject of recent scholarly research (Bengtsson and Hsu, 2012). Matching models more generally are useful in this regard because they enable evaluation of selection effects distinguished from other effects such as value-added. Sorenson (2007) uses general matching models to empirically study the importance of matching and finds that matching is roughly twice as important as PE experience, in terms of explaining IPO exit outcomes (see Li *et al.*, 2006 for a survey of these models). Empirical studies in venture capital and PE have examined both screening and the drivers of returns. Kaplan and Stromberg (2004) study screening in terms of factors

considered in DD and provide examples of what led an investor to invest in the context of venture capital deals. Drivers of returns are studied in numerous papers, such as Nahata (2008), Cao and Lerner (2009), and Chaplinsky and Haushalter (2010).

Our context is quite different, since we study PE deals and measure the extent of DD and who exactly carried out the DD (internally, or externally by an accounting firm, law firm, or consulting firm). Prior work has not studied the link between the duration of DD effort and PE investee performance. Prior work in the context hedge funds shows that DD is a source of alpha (Brown *et al.*, 2008; 2009; 2012). Brown *et al.*, however, do not consider the extent of DD effort in terms of the time, but rather examine materials related to registration statements. Our paper is different insofar as we measure screening by the extent of DD, and relate this DD to performance measures pertinent to the entrepreneurial firm, including ROA and EBITDA/Sales. Guided from the results of Brown *et al.* (2008; 2012), we expect a positive relation between firm performance and DD due to the improved decision making over whether to invest, and a better matching between investor and entrepreneur.

**H1:** *There is a positive but diminishing relation between weeks spent on due diligence and investee performance due to improved screening and matching.*

Also, we consider differences in this relationship for different parties that carry out DD. Guided from the implications underlying Yung's (2009) theoretical model, we expect that internal DD is more effective than external DD for the purpose of the matching function between entrepreneurs and their investors. The intuition is that external DD service providers such as accounting firms, law firms and consulting firms face information asymmetries associated with the skills of the PE fund and its fund managers, thereby leading to imperfect knowledge in matching with entrepreneurial teams. By contrast, PE fund managers face no information asymmetries about themselves, and only face the same information asymmetries that external service providers face vis-à-vis the entrepreneurial team. If the ability of the internal management team is the same as the ability of the external consultants in mitigating the

information asymmetries with the entrepreneurial team, then the PE fund managers will be more effective at finding a more suitable match than the external consultants.

**H2.** *When due diligence is primarily done internally (as opposed to primarily done externally by a law firm, accounting firm, or consulting firm), there is a stronger link between due diligence and performance due to the improved matching of the investor and the entrepreneur.*

In respect of H2, we note that different external service providers (accounting firms, law firms, and consulting firms) may have different abilities in terms of mitigating information asymmetries vis-à-vis the entrepreneurial firms. If so, we would expect different results depending on who carries out the DD. We do not conjecture who is most effective in advance of presenting the data, but we do carry out such tests in the analysis of the data.

These above hypotheses are tested for the first time in the subsequent sections. Our tests are based on unique and detailed data that are described below in section 4. The data are based on the Italian PE industry, and as such in section 3 we first describe the institutional context from which the data are derived.

### **3. Institutional Context Affecting the Italian PE Industry**

In Italy, buyout transactions experienced a period of uncertain legitimacy and illegality and only in 2004 did they become outright legal (with the issuance of the new corporate governance law, Legislative Decree 6/2003, applicable as of January 1, 2004; for details see Zambelli, 2010).<sup>6</sup>

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<sup>6</sup> Over the '90s, the legitimacy of leveraged buyouts were severely criticized and highly debated, because LBOs were accused of involving a lack of full disclosure and contributing to the weakening of the target firms. Leveraged buyout transactions even received an illegality declaration by the Italian Supreme Court which prohibited these types of transactions reinforcing the decisions of illegality made by various lower courts in prior years (see the Supreme Court Decision 5503/2000). In October 2001, the Italian Parliament issued a new Bill of Law (Law 366/2001) announcing its intention of reconsidering the buyout legal framework and create a safer harbor for such types of transactions (Article 7d). This Bill of Law 366/2001 was not immediately applicable in Italy as it was solely an enabling act with which the Government received the power of legalizing leveraged buyouts under specific guidelines. Even though this Bill of Law provided investors with some hope for a more favorable LBO legal harbor, there was no certainty regarding dates and outcomes of the new buyout reform. Moreover, in 2002, a new criminal law reform (Legislative Decree 61/2002) became effective introducing new prosecutions applicable to LBOs in the

Consequently, for the investment period spanning 1999–2006, it is possible to identify three different sub-periods, associated with a number of changes in legal settings experienced by the Italian PE industry. As shown in Cumming and Zambelli (2010), these legal changes significantly affected the frequency and the governance structure of PE transactions in Italy and, as such, it is plausible to expect that they may also affect the DD time and the type of DD performed by PE funds.

In order to account for these legal changes we have created three different dummy variables that are metaphorically labeled: “Dark period”, “Hope period”, and “Sun period” (as in Cumming and Zambelli 2010, 2013). In our data, the “Dark period” identifies the period of illegality and represents the time span from January 1999 to September 2001 over which the legitimacy of leveraged buyouts was highly disputed and LBOs were deemed illegal by the Italian Supreme Court (for a detailed discussion on the reasons and case law underlying the illegality of LBOs in Italy, see Zambelli, 2010). The subsequent period, characterized by Parliament’s announcement of rendering LBOs legal, is instead labeled the “Hope period”, and it covers the October 2001–December 2003 time horizon. The period subsequent to January 2004 (and ending July 2006 in our data) identifies the time horizon over which LBOs became legal. This particular period is labeled the “Sun period” (or period of legality) and represents the period over which the legitimacy of LBO was ultimately clarified.

The different institutional settings provide useful tools for our empirical analyses below. From the results of Cumming e Zambelli (2010), we expect a weaker DD over the Dark period (or at least a distorted DD), since PE funds in that period are aimed at minimizing the risk of a legal dispute with the target firm that could end up with an illegality declaration, and hence DD is focused on ascertaining the friendliness of the transaction in order to minimize the risk of a legal dispute. Over the dark period, PE investors have obvious legal incentives to not invest in hostile targets. The threat of a legal dispute at that time may distort the investors’ incentives to implement a thorough DD on items that may have otherwise

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case of bankruptcy of the target firms. In January 1, 2004, a new law came into force and leveraged buyouts were legalized under a set of conditions, especially with reference to disclosure (see the article 2501 bis, of the Legislative Decree 6/2003, applicable as of January 1, 2004). Contrary to what occurred in previous years, the new LBO reform reversed the burden of proof: LBOs are now considered legal until proven otherwise (see Zambelli, 2010 for more details).

been more important. Cumming and Zambelli (2010) show how the periods of illegality and uncertain legality in Italy have increased the incentives for PE investors to implement a distorted DD of their target firms, because PE investors seem to be more motivated to screen firms according to the level of agreeableness with their target management and minority shareholders in the hopes of reducing the risk of a legal dispute that could turn into an illegality declaration of the entire acquisition process.

#### **4. Data**

One of the major problems faced by scholars in PE financing is the lack of detailed public data. Typically, PE organizations and their investee companies are privately held and are not required to disclose detailed information on their investments, capital structure, governance, and performance.<sup>7</sup> In the absence of publicly available information on DD and investment outcomes, we hand-collected a unique proprietary dataset gathered from a number of primary and secondary sources. Our primary source of information is represented by a three-stage survey of PE investments carried out in Italy over the 1999-2006 time horizon and related divestments realized from January 2000 to December 2012. For each survey, we followed the methodology discussed in Cumming and Zambelli (2010, 2013). Our secondary sources of information are represented by various publicly available data on Italian PE deals (e.g., PEM database), performance of private firms (e.g., AIDA), market characteristics, fund websites, and economic press release, employed to integrate, cross-check and validate the information collected through the survey instrument (for more details, see the dedicated Online Appendix 1). The data underlying this paper provide

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<sup>7</sup>The most commonly used public database on PE financing is Thomson Financial Venture Economics, which is not helpful for our research purpose because it includes solely standard and basic information on PE deals around the world, e.g., target firms, lead investors, syndicated investors, invested and divested amounts, financing rounds, number of investors involved, equity stake, investment location. Moreover, for countries outside the U.S. and Canada, Thomson Financial Venture Economics only includes a small fraction of the PE deals carried out in each year. With reference to the Italian PE market, a few industry datasets exist: a) the AIFI Statistics Report, which disclose aggregate information of the PE and venture capital activity in Italy; b) the Venture Capital Monitor (VEM), which reports start-up deals; and c) the Private Equity Monitor (PEM), which reports generic data on the PE deals. Both VEM and PEM datasets are collected by the Italian Venture Capital Association in association with the Università Cattaneo di Castellanza. The above industry datasets include generic information on the deals carried out in Italy and do not report information on deal structure, DD, and investee performance.

new and innovative information on DD and investee performance that were specifically collected for the purpose of this study. The entire data collection procedure, the survey design and the associated response rates are summarized in Figure 1, and described in greater detail in a dedicated Online Appendix.

[include Figure 1]

In the dedicated Online Appendix 1 we also provide detailed information pertaining to the representativeness of our ultimate dataset by thoroughly discussing different comparison tests. In particular, to evaluate the representativeness of our ultimate sample, we compared our dataset with the Statistics Reports published by the Italian Venture Capital Association (AIFI) and the Private Equity Monitor (PEM<sup>®</sup>) database which includes generic information on PE deals realized in Italy. As shown in the Online Appendix 1 (Tables A1, Panels B-G), we performed a number of comparison tests between our sample and the PEM dataset (or AIFI database) with reference to various investee and investment characteristics, such as: area and industry distribution of the target firms, yearly distribution of PE investments, as well as exit distribution of the divestments occurred within the 2000-2012 period. Apart from a few exceptions, we did not find significant differences between our sample and the AIFI and PEM databases. The survey implementation and its validation took considerable time and effort but it ultimately allowed us to create a unique dataset containing detailed information on PE investment cycle, security design, deal structure, and investment outcomes.

Our ultimate dataset covers approximately 85% of the buyout investors operating in Italy over the 1999-2006 investment period (see the Online Appendix 1, Table A1, Panel A), and comprises in depth information on the divestments carried out by PE funds over the 2000-2012 time horizon. Our dataset includes 178 investee firms acquired by 27 PE organizations over the period from 1999 to 2006 (second quarter). Among these 178 PE investments, 150 have been divested within the period January 2000 - December 2012. In terms of types of exits employed by PE investors, our data show that the most commonly used divestment route is represented by the trade sale (51%), followed by the secondary sale (27%), IPO (9%), and buyback by the entrepreneur or founder (4%). This evidence is consistent with Caselli *et al.* (2013). Our sample also includes a portion of write-offs (10%), mostly associated with the

exits that occurred after the global financial crisis (post August 2007 – 2009 period; for details on the exit distribution over the 2000-2012 period, see the Online Appendix 1, Table A1, Panel E).. In terms of type of transactions, our database includes 116 (65%) leveraged buyouts and 62 (35%) expansion and replacement financing.<sup>8</sup> With reference to investor characteristics, our dataset includes the following types of PE funds: 4 (15%) are Italian bank-subidiaries, 12 (44%) are Italian independent closed-end funds, 3 (11%) are international bank subsidiaries, and the remaining 8 PE firms (30%) are international independent limited partners.

In the following Table 1 we describe the dependent and explanatory variables included in our dataset and provide related summary statistics. The main dependent variables are represented by firm performance indicators (in terms of Return on Assets - ROA - and EBITDA to Sales ratio), which are measured in terms of percentage difference over the first three years from the investment date. For example, the variable “Return on Assets three-year difference” represents the percentage difference between the ROA achieved by the target firm after three years (ROA 3) from the entrance of the PE investor (investment date) and the ROA at the investment date (ROA 0). Similarly, the variable “Return on Assets two-year Difference” represents the percentage difference between the ROA achieved by the firm after two years (ROA 2) from the investment date and the ROA at the time of the investment (ROA 0). Table 1 also provides statistics on DD efforts (measured in terms of time spent in implementing the DD) and type of DD (primarily internal or external). PE fund managers on average spend 7 weeks on DD prior to making a first investment in a portfolio firm. Forty-seven percent of the PE funds in the sample perform the vast majority of the DD internally. Sixty-six percent also employ consultants, 68% use lawyers, and 11% use accountants in their DD efforts.<sup>9</sup>

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<sup>8</sup> Our database does not allow to distinguish repeated investments in the same firms. However, as highlighted by Caselli *et al.* (2013), the standard investment strategy generally adopted in Italy by PE investors is “*one firm – one investment*”, which implies that PE funds do not frequently employ stage financing.

<sup>9</sup> It is worth noting that these percentages are not mutually exclusive. For example, a PE fund performing the majority of DD internally can still delegate some part of DD to external specialized agents. In case of delegation, the PE fund can employ different agents (e.g., specialized consultants and/or lawyers and/or accountants).

Table 1 also shows a wide set of other control variables aimed at capturing the impact of: market conditions (i.e., market returns); investment characteristics (e.g., investment values, which represents the transaction value and is used as a proxy for the investment size, and number of syndicated investors for each financing rounds); characteristics of the target firms (i.e. location and industry market to book values; and fund characteristics (i.e., fund-age and number of funds managed by the PE organization before investing in the investee, considered as proxies for fund manager experience; portfolio size, and fund-independency). Table 1 also includes variables that capture the different legal settings during the 1999-2006 investment period in Italy, as explained above in section 3.

[Insert Table 1 About Here]

## 5. Univariate Tests

Table 2 reports comparison of means and medians for our main performance measures described in Table 1 (ROA differences, EBITDA/Sales differences). These performance measures are reported in association with different DD time length (i.e., above or below 10 weeks<sup>10</sup>) and different types of DD (prevalent internal or external DD; consultants' DD; legal DD; accountants' DD). The comparison of means and median tests are reported for the entire sample (178 transactions).

As reported in Table 2 (Panel A), the target firms for which PE investors spent more time on DD (i.e., employing more than 10 weeks) show better performance, consistent with our first hypothesis (H1), even though the differences are significant only in terms of three-year ROA and EBITDA/Sales (the difference in the three-year ROA is significant at the 10% level for both the mean and the median; the difference in the tree-year EBITDA/Sales is significant at the 1% level only for median). Similarly, PE transactions for which PE funds implemented the majority of DD (Panel B) show better firm performance in terms of three-year differences (e.g., the difference in the three-year ROA is significant at the 5% level for the median, and the three-year EBIDTDA/Sale difference is significant at the 1% level for median and 10% level for mean), consistent with our second hypothesis (H2). Panels C–E focus on the performance associated with external DD: consultants' DD (Panel C), legal DD (Panel D), and accountants' DD (Panel

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<sup>10</sup> We also considered different cut-off periods (e.g., the median) and results did not materially change.

E). The transactions for which the DD was delegated to consultancy firms (consultants' DD) or legal firms (legal DD), do not show significant differences in terms of performance. It is instead puzzling to notice worse performance associated with the DD delegated to chartered accountants (accountants' DD). Only the three-year EBITDA/Sales ratios show a statistically significant difference at the 5% level (in terms of mean).

In Panels F-G of Table 2 we report the comparison tests of means and medians of the time spent on DD over the Dark period compared with the DD effort over the Hope and Sun periods. As expected, the Dark period is characterized by a weaker DD compared with the time spent on DD over the Hope and Sun periods and these differences are statistically significant in terms of mean and median. As explained in Section 3, over the Dark period the higher transaction risk regarding the possibility of entering into a legal dispute with the investee may distort the DD process by pushing PE investors to focus more on selecting non-hostile targets.

[Insert Table 2 About Here]

## **6. Multivariate Tests**

In this section we present a number of multivariate tests for the impact of DD on investment performance. First, we present evidence on the determinants of weeks of DD in subsection 6.1. Second, we present evidence of the impact of DD on ROA and EBITDA/Sales in subsection 6.2. Third, we present evidence from subsets of the data based on who carries out DD in subsection 6.3. Fourth, in subsection 6.4, we present and discuss the results of a number of additional regression specifications in order to evaluate and confirm the robustness of our main findings.

### *6.1. The Determinants of Due Diligence*

Because the impact of DD on investment performance may be affected by endogeneity, we first examine why DD is more intensive for some investments but not others. In Table 3 we present correlation statistics across select variables in the data to examine whether or not there are variables that are correlated with DD, but unrelated with ROA and EBITDA/Sales. The data highlight the importance of two such

variables: preplanned IPOs, and the number of funds managed by the PE firm at the time of investment. First, we expect that preplanned IPOs would impact the intensity of DD since an investor would want to more intensively examine a target firm that is supposed to hopefully undergo the scrutiny of a securities regulatory commission in an IPO (Megginson and Weiss, 1991; Levis, 2011; Cumming and Johan, 2013). But there is no reason that a preplanned IPO will necessarily be a better investment, because there is tremendous uncertainty associated with how investments will turn out, and Cumming and Johan (2013) show that preplanned IPOs often perform counter to what was expected (an IPO) at the time of investment.

Second, in line with Nahata (2008) and Yung (2009), more experienced investors are naturally more likely to be more diligent in their DD. More experienced investors also certify the quality of the entrepreneurial firm upon exit, which can give rise to improvement in performance upon sale of the company (Nahata, 2008). However, our performance measures are not recorded at the time of sale of the company but instead within the 1-3 year period after the initial investment (for ROA and EBITDA/Sales). More experience could lead to greater value added in the 1-3 year time period; however, such investor value added is more likely to be directed at long term performance to maximize the value of the investee firm at the time of its sale, and not at any point in the interim period (the only reason to maximize value in the interim period prior to exit would be to report inflated investment values to institutional investors, which is exactly something that more experienced investors would not do; see Cumming and Johan, 2013). In short, there is no reason to expect that more experience will affect performance in this 1-3 year time horizon other than through the channel of better and more DD. Therefore, since there is no reason to necessarily expect a direct correlation between these three instruments and our performance measures, and given these variables are not significantly correlated with our performance measures, we identify them as candidate instruments for our subsequent analyses of the relationship between DD and investee performance. Of course, instrumental variable methods allow consistent estimation when the explanatory variables are correlated with the error terms of a regression relationship, but the error term is unknown, so

we investigated the correlation with the dependent variable as a proxy. Our findings are quite robust to the use of different instruments and exclusion of any one of these three instruments. Note that in our second stage outcome regressions using instruments, we exclude the preplanned IPO and preplanned acquisition variables, and the number of funds variable; those results are reported in Table 5. As well, regressions with those variables show no significant relation between these variables and our performance measures, consistent with the correlation statistics.

[Insert Table 3 About Here]

Table 4 presents regressions for the determinants of natural log of the number of weeks of DD (in this Table we report first stage OLS estimates). We present two models: Model 1 includes fund dummy variables, year dummy variables, and double-clusters standard errors by fund and year, while Model 2 excludes these dummy variables and does not cluster standard errors.<sup>11</sup> These alternative models are presented merely for a robustness check in our subsequent analyses in Tables 5 and 6.

[Insert Table 4 About Here]

The regressions in Table 4 indicate two robust determinants of DD. First, buyouts require less DD and this effect is significant in both Models 1 and 2 at the 5% and 10% levels, respectively, which is expected since buyout transactions focus more on established target companies with more readily available information and a longer track record.

Second, investors that run more funds spend more time on DD. This result may be attributed to the value of experience that motivates PE investors to implement a more thorough DD of new deals (in line with Nahata, 2008 and Yung, 2009), or to the constrained attention due to a higher number of funds managed (in line with Jääskeläinen *et al.*, 2006). We note that this latter variable is an important one, and

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<sup>11</sup> We also considered different specifications of Models 1-2, available upon request, and the results did not materially change. For example, in Model 1, we excluded Dark and Hope variables and left the year dummies. Moreover, in Models 1-2, we controlled for other fund characteristics (e.g., number of partners, number of syndicated investors, international affiliation, lead investor status) and the results are in line with our expectations and quite robust with the models reported in this paper.

given that it is not correlated with investee performance as discussed above it may represent a useful candidate instrumental variable. Another useful candidate as an instrument is the location of the target firm (e.g., we considered whether or not the target is located in the same region of the PE funds) or, alternatively, the geographic proximity, measured in terms of kilometric distance, of the target to its investor (in line with Tian, 2011). As robustness check purposes, we also considered other instruments (see Section 6.4. for more details) and the results are not materially different from those reported in this Section.

Also, there is some evidence of less DD in the Dark period (Model 2) and this effect is significant at the 5 % level, but this effect is not significant in Model 1 due to the inclusion of the year dummy variables. Similarly there is evidence, significant at the 10% level, of more DD in the Hope period, but this effect is not significant in Model 2. Preplanned IPOs have more DD in Model 2, but this effect is not significant in Model 1 due to the inclusion of the fund and year dummies. Model 1 highlights that older funds carry out more DD, arguably due to more experience, and funds with larger portfolios per manager carry out less DD due to a dilution in the allocation of their time and attention (in line with the results highlighted by Hamdouni, 2011 and Jääskeläinen *et al.*, 2006). However, these effects are not significant in Model 2.

## *6.2. Relationship between Due Diligence and Investment Performance*

Table 5 presents second stage estimates and includes three panels examining the impact of DD on the subsequent 3-year ROA (Panel A), subsequent 3-year EBITDA/Sales (Panel B), and subsequent 1- and 2-year ROA and EBITDA/Sales (Panel C). Panels A and B each present 5 different regression models to check for robustness. We include three regressions with the use of the DD fitted values from Model 1 in Table 4 (Models 3-5 in Panel A and Models 8-10 in Panel B), one regression with the use of the fitted values from Model 2 in Table 4 (Model 6 in Panel A and Model 11 in Panel B), as well as one regression without fitted values (i.e., no control for possible endogeneity), in Model 7 (Panel A) and Model 12 (Panel B). The Panel C regressions for 1- and 2-year ROA and EBITDA/Sales use the Table 4 Model 1 fitted

values; for conciseness we do not report the same sets of models as in Panels A and B for 1- and 2-year ROA and EBITDA/Sales since the results were not materially different. Alternative specifications are available on request.

[Insert Table 5 About Here]

Our data consistently indicate that the number of weeks of DD is consistently associated with stronger 3-year ROA and EBITDA/Sales performance, consistent with H1. We model the effect with the use of logs to account for diminishing changes in returns associated with each extra week of DD. The effect is statistically significant, at least at the 10% level in each of the models in Panels A and B. The most conservative economic significance is obtained from the regressions without the endogeneity controls (Models 7 and 12). In those estimates, a 1-standard deviation increase in the weeks of DD from the average DD level of 8 weeks gives rise to a 197.44% increase in three-year ROA relative to the average three-year ROA in the sample (and this effect is smaller at 113.51% if one starts from the maximum level of weeks of DD of 15 weeks, and larger at 533.95% if one starts from the minimum level of DD of 2 weeks). Put differently, an extra four weeks of DD is on average associated with a doubling of three-year ROA performance.

The effect of DD on EBITDA/Sales is similarly consistent in all of the regression models, and the economic significance is most conservative in the models that do not correct for endogeneity. In those estimates, a 1-standard deviation increase in the weeks of DD from the average level of DD of 8 weeks gives rise to a 52.07% increase in three-year EBITDA/Sales relative to the average three-year EBITDA/Sales in the sample (and this effect is smaller at 29.94% if one starts from the maximum level of weeks of DD of 15 weeks, and larger at 140.82% if one starts from the minimum level of DD of 2 weeks).

Panel C of Table 5 shows that the impact of DD on EBITDA/Sales ratio is significant for the one- and two-years after investment, but the economic significance is higher with each year up to the three-year period after investment for the comparable model (Model 8) in Panel B. Due diligence, by contrast, is statistically unrelated to ROA in the one- and two-year period after investment.

The large economic significance and consistent statistical significance of the impact of DD in Panels A and B is contrasted by the weak economic significance and inconsistent statistical significance of all of the control variables.

Additionally, for robustness purposes, we have considered a number of different specifications by including, in the second stage, variables that may be related to the value of experience of PE investors and, as such, may have an impact on performance, e.g.: number of funds managed, or capital under managed, or portfolio size. We have also considered specifications controlling for the value added capacity of PE investors. Additionally, we have considered new instruments, e.g., the kilometric distance between the target and the PE investor (in line with Tian, 2011) or the time spent in performing the DD in other target firms belonging to the same industry and acquired in the same year. Results remain robust to the inclusion or exclusions of the above variables and do not materially change the main findings discussed in this Section (the robustness checks that we have performed are explained in greater detail in the Section 6.4.).

### *6.3. The Role of Different Agents Carrying Out Due Diligence*

In Table 6 we present second stage regressions for various sample-subsets according to the specific agent performing the majority of DD (e.g., the fund managers or external firms). The Models in Table 6 are comparable to the Models 5 and 10 in Table 5. The regressions highlight a more pronounced impact on performance associated with the DD carried out internally by the PE investment managers themselves, consistent with H2. When the majority of DD is performed externally by law firms, accounting firms and/or consulting firms there is an insignificant relation between weeks of DD and performance. These findings are consistent with Table 2 (Panel A). For example, when DD is primarily performed by accountants, on average the performances of investee companies are worse compared to the performance of the other transactions for which no accounting firm was hired to perform the DD, consistent with Models 31 and 32 in Table 6.

The evidence provided in Table 6 highlights the importance for PE firms to undertake an internal DD. Our results highlight the existence of apparent agency costs associated with the DD performed

externally by law firms, accounting firms, and consultancy firms, and call for future theoretical and empirical research to investigate the mechanisms to mitigate agency costs incurred in the delegation of DD.

[Insert Table 6 About Here]

#### *6.4. Additional Robustness Checks*

In the course of our analyses we carried out a number of preliminary robustness checks. First, we considered longer performance horizons, including four and five years. The findings were generally consistent, but to a much greater degree influenced by outliers that are more than likely unanticipated and unrelated to DD. Hence, we focus on 3-year performance. Second, we considered performance measures provided by the fund managers themselves versus financial statement information obtained from official sources filed in accordance with the Italian accounting rules. Our performance measures reported herein are those based on the AIDA database by Bureau Van Dijk, and we did not find major discrepancies with self-reporting in our surveys. Third, we considered other explanatory variables including but not limited to specific contractual terms described in Cumming and Zambelli (2013). The findings are robust (explicitly shown in the dedicated Online Appendix 2). We note DD is weakly positively correlated to more detailed contracts in our data, which in part is consistent with the findings herein. We do not include these contractual analyses in the results reported herein since the causal link between contracts and DD is in need of further empirical testing with other datasets. Fourth, in order to evaluate whether the length of DD is affected by the involvement of external actors, we have run a number of specifications on the determinant of DD, similar to those reported in Models 1 and 2 (Table 4), by including an additional variable to control for the impact of external agents performing the DD. Also, we have considered other control variables, such as the size of the investee firm and the control power of the PE investor (see Section 6.4.1. for details). We found no significant correlation between the time spent on DD and the involvement of external agents performing the DD process. For brevity reasons we did not report these results because they do not materially change the main findings discussed in the previous sections and

presented in Table 4 (they are available upon request). Fifth, we controlled for buyouts versus expansion deals in all of our analyses. The PE funds in the sample do both types of deals, and hence we include them all in the sample. The results are robust to excluding the expansion deals, although not robust to excluding the buyout deals as most of the deals are buyout deals (there are not enough observations of non-buyouts to reliably run regressions on that subsample with all of our control variables). Most of the funds in the sample do both buyout and expansion deals. Even in the U.S. there is substantial style drift across stages (Cumming and Johan 2013), and this style drift is typically more common outside the U.S. where funds are less often specialized by stage and/or industry. To include some of a fund's deals and not others would create a sample selection problem. We included the expansion results in our reported tests because the sample selection problem could raise more concerns than the mixing of deals. Moreover, the funds indicated to us that the nature of due diligence does not necessarily vary by deal type (buyout or otherwise) but instead can vary depending on the issues that arise and facts that are uncovered in carrying out the DD. Sixth, we run a number of different second-stage regression specifications in order to control for the cost of debt and the debt-to-equity ratio and results are in line with the main findings of Tables 5-6 discussed in the paper with reference to the impact on performance of DD duration and internal DD.

To further reinforce the robustness of our main results, we carried out a number of additional analyses and tests, as summarized below:

1. Isolating the effect of DD on performance:
  - a. Control for the value added capacity of PE investors;
  - b. Control for both the value added capacity of PE investors and size of Investee Firms;
2. Treatment Effect Model (similar to Heckman selection model);
3. Two-stage IV regression for the determinants of internal versus external DD;
4. Propensity Score Matching models, comparing the impact on performance of longer and shorter DD, as well as the impact on performance of internal and external DD;

5. Inclusion or exclusion of different instruments; adoption of a new instrument measuring the geographic distance between PE funds and their target companies (“distance km”); adoption of a new instrument created by considering the average time spent on implementing the DD in other target firms active in the same industry and acquired in the same year (“dd\_weeks\_OTHER”; and “ln\_dd\_weeks\_OTHER”);
6. Consideration of other performance measures: Return on Equity investment (ROE) and IPO exit outcomes.
7. Inclusion of performance measures (ROA, ROE, and EBITDA/Sales) recorded at the time of exit, and the time of investment.

In the following sub-sections we discuss the main results of the robustness checks mentioned above (since they are consistent with the main findings discussed in the text of the paper, for brevity reasons we show the details of the additional robustness tests in the dedicated Online Appendix 2, Tables A2-A7).

#### *6.4.1. Isolating the Effect of Due Diligence and Controlling for the Size of Target Firms*

As highlighted in the literature, PE fund managers are actively involved in the governance and management of their portfolio companies (see, e.g., Sorensen, 2007) and the screening process may depend on the size of the company (Yung, 2009). In order to isolate the impact of DD on investee performance, we performed a number of robustness tests aimed at considering the value added capacity of the PE investors, as well as the size of their target firms (see Tables A2-A3, included in the Online Appendix 2). Our results remain robust to the inclusion of these additional control variables. In particular, consistent with the models reported in Tables 4-5, in Table A2 we show first-stage estimates related to the determinants of DD and in Table A3 (Panels A, B and C) we report second-stage estimates on the impact of the DD on investee performance. In all Models shown in Tables A2 and A3, we included a variable that is aimed at capturing the level of involvement and control power played by the PE fund manager. In line with Cumming and Johan (2013), as a proxy for the PE involvement, we have considered an index

given by the sum of veto and control rights held by the PE investors (see Table 1 for more details on the specific control and veto rights included). Among the control rights, we have considered the right to choose and substitute the CEO, the right to add board members, the right to retain board control, as well as other exit rights, such as the first refusal in sale, and IPO registration rights. Among the veto rights, we have considered the veto power of the PE investor over various decisions, such as the issuance of equity, control changes, asset purchase or asset sale.<sup>12</sup> We have included the veto rights because they allow the PE fund manager to influence the outcome of a number of important business decisions. In Table A2 we show the first stage estimates, while in Table A3 we report the second stage estimates of the impact of DD on investee performance, after controlling for the PE involvement and the size of the target firms (in terms of log of the number of employees).<sup>13</sup> The results reported in Tables A2-A3 are consistent with our main findings discussed in the previous sections and further reinforce the results reported in Tables 4-5.<sup>14</sup>

#### *6.4.2. Considering Treatment Effect Models for potential sample selection biases*

The decision of performing the majority of DD internally (rather than externally) is a choice variable and this may raise sample selection biases.

In order to address the above issues, we have employed a treatment effect method (similar to a Heckman selection model)<sup>15</sup> by estimating, in the first step, the probability of having an internal DD (as a function of investee location and fund characteristics, such as portfolio size and legal structure) and, in the second step, the related outcomes in terms of impact on firm performance, given the results in the first step (for brevity reasons, the results are reported in the Online Appendix 2). In particular, in Table A4 of the

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<sup>12</sup> For a recent review of the control and veto rights held by PE investors, see Zambelli (2014).

<sup>13</sup> The number of employees was not available for all companies.

<sup>14</sup> Please see Tables A2-A3 in the Online Appendix 2. In Table A3 we show the impact of DD effort on investee performance, after controlling for the PE involvement and value added capacity. We also controlled for the size of the target firms (in terms of number of employees). The number of employees was not available for all companies. For space reasons, we decided to not include the additional robustness checks that control for the different size of target firms given the fact that the results from these additional robustness tests do not materially change the main findings discussed in the paper. Results are available upon request.

<sup>15</sup> The model is a treatment model (similar to a Heckman model) with the “treatreg” function in Stata. A nice feature of the treatreg function is that it does not have the same restriction as the Heckman regression to have all of the same variables in the first step regression, plus extra variables.

Online Appendix 2 we report the second stage estimates of the treatment effect model for the decision of implementing an internal DD (for space reasons, the first stage estimates for the selection equation are not included). In Models 1, 2 and 3 we show the impact of DD on ROA 3Y, 2Y, and 1Y differences; in Models 4, 5 and 6 we show the impact of DD on EBTDA/sales 3Y, 2Y, and 1Y differences, respectively. It is worth noting that in the first-step we have considered specifications with only one variable (e.g., the geographic distance between the PE fund and target) to keep the model parsimonious, as well as specifications with additional variables related to fund characteristics (e.g., lead investor, capital under management, fund legal structure, and number of portfolio firms). Given the recent evidence on the impact of spatial proximity on VC behavior (see, e.g., Tian, 2011) and contract design (e.g., Hirsch and Sharifzadeh, 2009; Cumming and Johan, 2013), it is reasonable to expect that the geographic distance between the fund and the target may affect the type of DD (internal versus external).<sup>16</sup> We have also considered specifications with additional selection criteria related to fund characteristics (e.g., capital under management) to take into account the evidence shown in Brown *et al.* (2008). The second-step results are extremely similar to what is reported in the paper without the selection equation. Likewise, the findings remain robust to the inclusion of one or more selection criteria to the first-step regression equation (for details, see Table A4 of the Online Appendix 2).

In order to take into account potential selection biases regarding the internal versus external DD, we ran additional robustness tests (not reported in the paper for space reasons, but available upon request). For example, we have considered two-step IV methods for the determinants of internal versus external DD, with the use of instruments (instead of a treatreg specification) as in the case discussed for the number of weeks of DD. The results do not materially change. In particular, we considered two-stage IV regressions by estimating, in the first step, the determinants of the internal versus external DD and, in the

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<sup>16</sup> In order to consider the recent evidence (see, e.g., Tian, 2011) on the positive impact of geographic proximity on the monitoring of target firms and their performance, in our treatment effect model the variable related to spatial proximity has been included both in the selection equation and in the outcome equation. In our data, the geographic proximity is significant only in the first step-regression (as a determinant of internal DD) but not in the second step.

second stage, the impact on performance of the internal DD predicted in the first step. In the second stage, we have also considered the predicted value of the DD time, driven from Models 1 and 2 reported in Table 4 of the paper. The first step regression on the determinants of internal DD shows (as the most robust finding) that bigger funds (e.g., funds with larger portfolio sizes per manager) are more likely to delegate the majority of the DD to external agents, and this is in line with the evidence shown by Brown *et al.* (2008). The results of the first-step estimates do not materially change the main findings of our study. Likewise, the second-step estimates always highlight a positive and significant relationship between DD time and firm performance. The fitted values for the internal DD included in the second step are statistically insignificant in all the specifications included in Table 5 Panels A, B and C, regardless of the specification adopted in the first step. Similarly, the simple variable for internal versus external DD (without fitted values) is statistically insignificant in Table 5, and does not change the inferences drawn regarding the weeks of DD. Hence, we do not include such a variable in the reported results to keep the models as parsimonious as possible (the results are available upon request).

Ultimately, as an additional robustness check, we considered Propensity Score Matching Models related to the impact of long DD (i.e., longer than 10 weeks) versus short DD (for brevity reasons the results are reported in the Online Appendix 2, Table A5). As shown in Table A5 of the Online Appendix 2, the Average Treatment Effect (ATE) of longer DD is positive and significant, in line with the main findings discussed in the paper.<sup>17</sup>

#### 6.4.3. Considering other Performance Measures

For robustness check purposes, we have considered other performance measures, such as IRR, Return on Equity (ROE), and IPO exit outcomes.

Regarding IRRs, however, we have information only for a subsample in our data, as many of the deals were not exited at the time of data collection and, at the time of our survey on investee performance,

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<sup>17</sup> We have also considered Propensity Matching Models with reference to the internal versus external DD and we obtained results in line with the main findings discussed in the paper.

the IRR was not provided (or not publicly available) for a number of exited investments. Therefore, we are effectively restricted to using ROA and EBITDA/Sales which were confirmed by AIDA database and auditor reports in order to use the full sample (and our choice is in line with Cao, 2013 and Richard *et al.*, 2009). It is worth noting that different measures of operating profitability can be adopted. For example, Florin (2005) employs the EBIT to Sales ratio; Kabir and Roosenboom (2003) employ both the EBIT to Sales ratio and the EBITDA to Sales ratio. However, the latter ratio is more appropriate to assess the operating profit margin from a strategic and managerial point of view, as the EBITDA represents the portion of firm's operating profit that is not affected by depreciation, amortization, interest and taxes. Moreover, since the EBITDA is adjusted to remove the impact of noncash expenses (e.g., depreciation and amortization), the profit margin expressed in terms of EBITDA/Sales is also more appropriate to better evaluate the firm efficiency (see, e.g., Richard *et al.*, 2009).

Given the relevant number of missing values related to IRRs, as an approximation, for robustness check purposes we have collected additional information from AIDA database on the Return on Equity (ROE) of all target firms included in our dataset and estimated the impact of DD duration on ROE. Additionally, we have considered other performance measures represented by the IPO exit outcomes (collected from our third survey and confirmed by the information publicly available in "Borsa Italiana"). For brevity reasons results are reported in the Online Appendix 2, Table A6 (Panel A). Ultimately, in Table A6 of the Online Appendix 2 (Panel B), we have considered the investee performance at the time of exit (instead of a three-year period). Since the decision to exit is a non-random event, we also included specifications with a treatment of potential sample selection for the exit decision by predicting, in the first step, the probability of an exit (as a function of the investment year) and estimating, in the second step, the outcome from that exit (in terms of investee performance).<sup>18</sup> The results reported in Table A6 of the Online Appendix 2 are in line with the main findings provided in the text of the paper. A thorough DD is

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<sup>18</sup> In the second stage, we have considered the predicted value of the DD time, driven from Models 1 and 2 reported in Table 4 of the paper.

associated with higher IPO exit outcomes, higher ROE, as well as higher firm performance at the time of exit.<sup>19</sup>

#### *6.4.4. Different Instruments*

For robustness check purposes, we have considered other specifications such as excluding year dummy variables in Models 3 and 4 while leaving the dark and hope dummies, and the effect of DD remains highly significant. Additionally, we considered different second-stage regression specifications, by including in the second stage variables related to investor characteristics (e.g., fund age, capital under management and number of funds managed by the PE organization at the time of the first investment in the target firm). We ran a number of different specifications and overall the impact of DD effort on firm performance remains highly significant (please see the Online Appendix 2, Table A7). The second stage estimates reported in the Online Appendix 2, Table A7 (Panel A) are in line with the findings discussed in the paper and presented in Table 5. Overall, our main findings are robust to the inclusion or exclusion of the above control variables.

We further considered other possible instruments to control for endogeneity and our findings are quite robust to the inclusion and exclusion of different instruments. For example, we ran the regression specifications shown in Tables 4-5 by including a new instrument based on the kilometric distance between the fund and the target company, in line with Tian (2011). The results from the first and second stage regressions are consistent with the main findings discussed in the paper (see Online Appendix 2, Table A7, Panel B). Ultimately, we considered the adoption of an alternative new instrument given by the time spent on performing the DD in other target firms belonging to the same industry and acquired in the

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<sup>19</sup> It is worth noting that, for robustness check purposes, we also considered the impact of DD on performance at the time of first investment. The findings do not show significantly different results and the external DD is associated with worse firm performance. Ultimately, with reference to the internal versus external DD, we have also considered the role of PE size in terms of capital under management, number of firms included in the portfolio and number of funds managed by PE investors. The results are consistent with our main findings discussed in the paper and internal DD remains associated with better firm performance (both in terms of ROA three-year difference and EBITDA/Sales three-year difference).

same year (see Online Appendix 2, Table A7, Panel C). The impact of DD effort on firm performance remains relevant and significant and the main finding discussed in the paper are confirmed.

## 7. Conclusions

In this paper we have investigated the efficacy of DD and quantified the time-value of DD in the context of PE investments. We have shown a link between the time spent on DD and the future performance of investee firms, measured in terms of changes in the return on assets (ROA) and EBITDA/sales ratios over the first three years of the investment.

Very few academic studies, if any, have analyzed the economic value of DD and its crucial role in predicting better future performance of the investee firms. Based on a novel and unique hand-collected dataset comprising the majority of PE investors in Italy, our results show that DD enables selection of better investees in the portfolio and strongly support the view that a diligent DD is associated with improved firm performance. Moreover, our data show that the DD carried out internally by fund managers has a more pronounced impact on performance. No significant impact emerges with reference to the DD performed by external agents, i.e., accounting firms, law firms or consultants.

Our study reinforces the evidence highlighted by Brown *et al.* (2008) who argue that DD is a source of alpha for hedge funds. Likewise, the DD has a crucial role and a high economic value in the context of PE. Overall, our findings contribute to advance the knowledge on the role of the selection and evaluation process underlying the acquisition of a target firm. One important implication for PE investors and advisors derived from our study is that, in a PE setting, the time spent on DD is a source of value in terms of observed better future performance of investee firms. A second important implication for PE fund managers is that the time spent on DD is especially worth it when the majority of that time is spent in implementing a DD internally. Ultimately, our findings suggest the existence of apparent agency costs underlying the DD delegated to external agents. More theoretical and empirical research is needed in order to enrich the knowledge on agency costs associated with the delegation of DD, especially in the context of PE where the opportunity cost of time is enormous and investors may be tempted to rush the evaluation

process underlying the DD or to delegate it outside in order to allocate more attention to managing and adding value to their existing portfolio firms. Further research could likewise examine bargaining over contractual terms during the DD process to better understand how contracts are negotiated in practice and their impact on performance.

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**Table 1. Definitions of Variables and Summary Statistics**

This table defines the variables and provides summary statistics. The full sample comprises of 178 observations, of which 116 are leveraged buyouts and 63 expansion financing deals. Summary statistics are provided for the entire sample. The data derive from the survey and interviews with the PE investors carried out in 2005, as described in the body of the paper.

Variable	Definition	Number of Observations	Mean	Median	Standard Deviation	Min	Max
<i>Dependent Variables</i>							
<b>Firm Performance Indicators</b>							
Return on Asset (Roa) Three-Year Difference	Difference (in %) between Roa at the third year after the investment and Roa at Investment Date. Source: AIDA database by Bureau Van Dijk	178	0.77	0.86	13.27	-71.16	55.80
Ebitda/Sales Three-Year Difference	Difference between Ebitda/Sales at the third year after the investment and Ebitda/Sales at Investment Date. Source: AIDA database by Bureau Van Dijk	178	2.65	1.87	12.12	-31.02	73.39
Return on Asset Two-Year Difference	Difference (in %) between the ROA at the second year after the investment and the Roa at the investment date. Source: AIDA database by Bureau Van Dijk	178	-0.27	0.10	9.90	-71	34.9
Ebitda/Sales Two-Year Difference	Difference between Ebitda/Sales at the second year after the investment and Ebitda/Sales at the investment date. Source: AIDA database by Bureau Van Dijk	178	1.58	1.38	8.62	-31.02	65.08
Return on Asset One-Year Difference	Difference (in %) between the ROA at the first year after the investment and the ROA at the investment date. Source: AIDA database by Bureau Van Dijk	178	0.73	0.21	7.59	-38.31	38.52
Ebitda/Sales One-Year Difference	Difference between Ebitda/Sales at the first year after the investment and Ebitda/Sales at the investment date. Source: AIDA database by Bureau Van Dijk	178	1.15	0.82	5.98	-18.87	53.65
<i>Key-Explanatory Variables</i>							
<b>Due Diligence Length and Types</b>							
Ln (Number of Weeks of Due Diligence)	Natural Log. of number of weeks actively spent on due diligence. Source: Author's surveys	178	1.93	1.95	0.54	0.69	2.71
Prevalent Internal Fund Due Diligence	A dummy variable equal to 1 if the PE investor spent more than half of the time doing due diligence checks themselves as opposed to using consultants, lawyers, and/or accountants. Source: Author's surveys	178	0.47	0	0.50	0	1
Prevalent External DD	A dummy variable equal to 1 if the majority of the DD was delegated to external agents, such as consultants, lawyers, and/or accountants. Source: Author's surveys	178	0.53	1	0.50	0	1
Consultants' Due Diligence	A dummy variable equal to 1 if the PE delegated the due diligence to a consultancy firm specialized in audit, tax, and advisory services (e.g., KPMG). Source: Author's surveys	178	0.66	1	0.48	0	1
Legal Due Diligence	A dummy variable equal to 1 if a legal due diligence was performed by a professional lawyer. Source: Author's surveys	178	0.68	1	0.47	0	1
Accountants' Due Diligence	A dummy variable equal to 1 if the PE investor delegated the due diligence to a professional chartered accountant. Source: Author's surveys	178	0.11	0	0.31	0	1
<i>Other Control Variables</i>							
<b>Market Conditions</b>							
12-Month Stock Market Return	The return on the stock market for the 3–12 month horizon preceding the investment date. Source: MSCI	178	0.08	0.14	0.17	-0.32	0.41
MSCI Annual Return over Investment Horizon	The annualized public equities return for Italy over the contemporaneous investment horizon. Source: MSCI	178	-0.05	-0.15	0.33	-0.57	0.72

<b>Legal Settings</b> (Source: Cumming and Zambelli, 2010, 2013)							
Dark Period	A dummy variable equal to 1 for the “Dark” period during which leveraged buyouts are illegal (January 1999– September 2001 for the transactions in the data set).	178	0.21	0.00	0.41	0.00	1.00
Hope Period	A dummy variable equal to 1 for the “Hope” period during which it is announced by the Italian Parliament that buyouts will soon be legal (October 2001 – December 2003).	178	0.31	0.00	0.47	0.00	1.00
Sun Period	A dummy variable equal to 1 for the “Sun” period during which buyouts are legal (January 2004, and ending at July 2006 in the data set).	178	0.48	0.00	0.50	0.00	1.00
<b>Investee Characteristics</b>							
Industry Market / Book	The industry market-to- book value for publicly traded firms at the time of investment.	178	2.42	1.88	1.66	0.38	11.58
Geographic proximity (Same Region)	Dummy variable equal to 1 if the investee firm is located in the same region of the PE investor.	178	0.31	0.00	0.46	0.00	1.00
<b>Deal Structure Characteristics &amp; Value Added Capacity of PE investors</b>							
Level of PE control and involvement (Sum of Control and Veto Rights)	The sum of control and veto rights contractually held by the PE investor (i.e., right to choose board members, right to retain board control, right to add board members, right to choose the CEO and other key managers, right to substitute the CEO and key managers, right to add coinvestors, drag along, redemption, right of first refusal, cosale, liquidation rights, ipo rights, veto on issuance of equity, veto on asset purchase, veto on asset sale, and veto on ownership changes).	178	10	12	3.7	1	16
<b>Investor Characteristics</b> (Source: Cumming and Zambelli, 2010, 2013)							
Age of PE investor	The age of the fund in years from date of formation to date of first investment in the investee firm.	178	5.68	4.00	8.51	0.00	74.00
No. of Funds Under Management	Number of funds managed by the same PE firm.	178	1.88	1.00	1.44	1.00	7.00
Limited Partnership	A dummy variable equal to 1 for a limited partnership fund.	178	0.545	1.000	0.499	0	1
Portfolio Size per Manager	The portfolio size (number of investees) per manager at the time of first investment	178	2.47	1.40	5.40	0.50	37.50
<b>Investment Characteristics</b> (Source: Cumming and Zambelli, 2010, 2013)							
Buyout	Dummy variable equal to 1 if the transaction is a leveraged buyout (LBO).	178	0.65	1.00	0.48	0.00	1.00
Investment Value	The total amount invested by the PE investor as at July 2006.	178	9685	4450	21254	90	183400
Preplanned IPO	A dummy variable equal to 1 if the PE investor preplanned the IPO.	178	0.31	0.00	0.46	0.00	1.00
Preplanned Trade Sale	A dummy variable equal to 1 if the PE investor preplanned a trade sale.	178	0.38	0.00	0.49	0.00	1.00
Ebitda/Sales at the Investment Year	Ebitda/Investment Ratio at the Investment Year.	178	10.33	10.00	8.61	-52.19	41.41
Syndication	The number of syndicated PE investors.	178	1.067	1.000	1.201	0	6

**Table 2. Comparison of Means and Median Tests**

This table compares the mean and median statistics for the differences on Return on Asset after 1, 2, or 3 years from the investment date. Variables are defined in Table 1. Panel A focuses on the length of due diligence; Panels B-E focus on the types of due diligence employed. Panels F-G focus on the due diligence time spent over the different legal setting characterizing the Italian market. For medians we use a Wilcoxon test; for means we adopt a standard t-test. The superscripts \*, \*\*, and \*\*\* indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Panel A		Group 1 -- Due Diligence > 10 weeks					Group 2 -- Due Diligence ≤ 10 weeks					Difference Tests		
Variable	Number of Observations	Mean	Median	Stand. Dev.	Min	Max	Number of Observations	Mean	Median	Stand Dev.	Min	Max	Mean	Median
Difference on Return on Asset (Roa) 3 year	44	3.54	1.22	10.64	-11.39	55.80	134	-0.14	0.22	13.94	-71.16	46.82	1.84*	3.019 *
Difference on Ebitda/Sales 3 year	44	4.73	2.25	13.98	-22.34	73.39	134	1.97	1.87	11.42	-31.02	64.39	1.19	12.2168***
Difference on Return on Asset 2 year	44	1.98	0.15	7.8	-9.39	31.06	134	-1.01	10.4	0.22	-71	34	2.02**	0.27
Difference on Ebitda/Sales 2 year	44	2.51	2.00	8.86	-23.02	47.46	134	1.27	1.37	8.55	-31.02	65.08	0.82	0.27
Difference on Return on Asset 1 year	44	2.43	1.27	8.02	-15.19	38.52	134	0.17	0.00	7.40	-38.31	37.56	1.66*	1.93
Difference on Ebitda/Sales 1 year	44	1.13	1.30	4.48	-18.87	6.62	134	1.16	0.81	6.41	-11.53	53.65	0.03	1.27

Panel B		Group 1 -- Prevalent Internal Due Diligence					Group 2 -- Prevalent External Due Diligence					Difference Tests		
Variable	Number of Observations	Mean	Median	Stand. Dev.	Min	Max	Number of Observations	Mean	Median	Stand Dev.	Min	Max	Mean	Median
Difference on Return on Asset (Roa) 3 year	83	1.332236	1.22	17.14046	-71.16	55.8	95	0.2759321	-0.39	8.641843	-42.72	29.37	0.51	5.08**
Difference on Ebitda/Sales 3 year	83	4.58179	2.25	16.42524	-31.02	73.39	95	0.9610022	1.83	5.93581	-10.64	28.25	1.90*	20.96***
Difference on Return on Asset 2 year	83	-0.81	0.84	13.46	71.16	34.09	95	-0.19	-0.39	5.13	-18.85	18.66	0.64	1.67
Difference on Ebitda/Sales 2 year	83	2.285619	2.13	11.87627	-31.02	65.075	95	0.9587632	1.30	4.015238	-8.72	13.78	0.97	1.7700
Difference on Return on Asset 1 year	83	0.8998241	1.27	9.633122	-38.31	38.52	95	0.5761868	0.00	5.252216	-19.45	26.85	0.27	2.7*
Difference on Ebitda/Sales 1 year	83	1.834251	0.81	7.904743	-18.87	53.65	95	0.5557874	0.80	3.47658	-9.84	8.7	1.36	0.2600

Table 2 continued

Panel C		Group 1 -- Consultants' Due Diligence					Group 2 -- No Consultants' Due Diligence					Difference Tests		
Variable	Number of Observations	Mean	Median	Stand. Dev.	Min	Max	Number of Observations	Mean	Median	Stand Dev.	Min	Max	Mean	Median
Difference on Return on Asset (Roa) 3 year	117	0.94	0.84	9.08	-42.72	46.82	61.00	0.43	1.17	18.97	-71.16	55.80	0.20	0.02
Difference on Ebitda/Sales 3 year	117	2.94	1.87	10.97	-22.34	73.39	61.00	2.10	0.53	14.16	-31.02	64.39	0.40	0.04
Difference on Return on Asset 2 year	117	0.49	0.10	5.68	-18.85	31.06	61.00	-1.6	1.27	14.98	-71	34.09	1.04	0.03
Difference on Ebitda/Sales 2 year	117	1.79	2.06	6.75	-23.02	47.46	61.00	1.17	1.34	11.44	-31.02	65.08	0.39	0.8000
Difference on Return on Asset 1 year	117	0.65	0.00	5.44	-19.45	38.52	61.00	0.87	1.27	10.63	-38.31	37.56	0.15	0.2200
Difference on Ebitda/Sales 1 year	117	0.93	0.80	4.07	-18.87	8.70	61.00	1.59	0.74	8.55	-11.53	53.65	0.57	0.2000

Panel D		Group 1 -- Legal Due Diligence					Group 2 -- No Legal Due Diligence					Difference Tests		
Variable	Number of Observations	Mean	Median	Stand. Dev.	Min	Max	Number of Observations	Mean	Median	Stand Dev.	Min	Max	Mean	Median
Difference on Return on Asset (Roa) 3 year	121	1.06	0.88	9.14	-42.72	46.82	57.00	0.15	0.68	19.42	-71.16	55.80	0.33	0.03
Difference on Ebitda/Sales 3 year	121	2.89	1.87	10.81	-22.34	73.39	57.00	2.13	0.53	14.62	-31.02	64.39	0.35	0.01
Difference on Return on Asset 2 year	121	0.65	0.09	5.87	-18.8	31.06	57.00	-2.24	0.10	15.19	71.2	34.09	1.38	0.26
Difference on Ebitda/Sales 2 year	121	1.77	1.80	6.68	-23.02	47.46	57.00	1.16	1.37	11.80	-31.02	65.08	0.37	0.35
Difference on Return on Asset 1 year	121	0.82	0.11	5.50	-19.45	38.52	57.00	0.53	1.26	10.83	-38.31	37.56	0.19	0.03
Difference on Ebitda/Sales 1 year	121	1.02	0.81	4.06	-18.87	8.70	57.00	1.42	0.18	8.82	-11.53	53.65	0.32	0.71

Table 2 – continued

Table 2 – continued														
Panel E														
Group 1 -- Accountants' Due Diligence							Group 2 -- No Accountants' Due Diligence						Difference Tests	
Variable	Number of Observations	Mean	Median	Stand. Dev.	Min	Max	Number of Observations	Mean	Median	Stand Dev.	Min	Max	Mean	Median
Difference on Return on Asset (RoA) 3 year	19	0.09	1.18	5.45	-11.39	10.17	159	0.85	0.68	13.92	-71.16	55.80	0.46	0.53
Difference on Ebitda/Sales 3 year	19	-0.28	0.70	5.38	-9.51	9.38	159	3.00	1.80	12.66	-31.02	73.39	2.06**	0.01
Difference on Return on Asset 2 year	19	-0.22	-0.17	4.45	-7.71	10.17	159	0.28	0.099	10.38	-71.16	34.09	0.04	0.004
Difference on Ebitda/Sales 2 year	19	0.31	1.40	4.97	-8.72	13.85	159	1.73	1.55	8.96	-31.02	65.08	1.06	1.23
Difference on Return on Asset 1 year	19	0.87	0.74	3.74	-8.85	10.17	159	0.71	0.00	7.94	-38.31	38.52	0.15	0.53
Difference on Ebitda/Sales 1 year	19	1.32	0.00	4.57	-7.84	8.70	159	1.13	0.81	6.14	-18.87	53.65	0.16	0.07
Table 2 – continued														
Panel F														
DARK period							SUN period						Difference Tests	
Variable	Number of Observations	Mean	Median	Stand. Dev.	Min	Max	Number of Observations	Mean	Median	Stand Dev.	Min	Max	Mean	Median
Weeks spent on DD	37	5.89	6	3.0	1	14	85	8.18	8	3.99	1	20	3.5***	18.8***
Panel G														
DARK period							HOPE period						Difference Tests	
Variable	Number of Observations	Mean	Median	Stand. Dev.	Min	Max	Number of Observations	Mean	Median	Stand Dev.	Min	Max	Mean	Median
Weeks spent on DD	37	5.89	6	3.0	1	14	56	7.47	6.5	3.36	1	14	2.37**	4.9**

**Table 3. Correlation Matrix**

This table presents correlations across select dependent variables, potentially endogenous due diligence variables, potential instruments and other explanatory variables. Correlations greater than 0.13, 0.15 and 0.20 in absolute value are statistically significant at the 10%, 5% and 1% levels, respectively. Correlations greater than 0.15 in absolute value are highlighted with an underline. Correlations among potential instruments that are significant at the 5% level with the number of weeks of due diligence but not the two main dependent variables (EBIT/Sales Difference and ROA Difference) are highlighted in bold.

		[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]	[13]	[14]	[15]
EBITDA / Sales Difference from 3 Years relative to Investment Year	[1]	1.00														
ROA Difference from 3 Years to Investment Year	[2]	<u>0.50</u>	1.00													
Number of Weeks of Due Diligence	[3]	<u>0.19</u>	<u>0.16</u>	1.00												
<b>Dark Period</b>	<b>[4]</b>	-0.14	-0.01	<b><u>-0.24</u></b>	1.00											
Hope Period	[5]	-0.04	0.02	0.06	<u>-0.35</u>	1.00										
Investment Value	[6]	0.01	0.03	0.05	0.00	0.05	1.00									
Buyout Dummy	[7]	0.14	0.06	0.03	-0.12	-0.11	<u>0.19</u>	1.00								
Industry Market / Book	[8]	-0.04	-0.03	-0.10	<u>0.45</u>	<u>-0.22</u>	-0.10	-0.13	1.00							
Same Region	[9]	0.00	-0.01	0.00	-0.07	-0.14	-0.04	0.00	-0.03	1.00						
Return 1 year prior	[10]	0.12	0.00	0.00	0.15	<u>-0.66</u>	0.11	0.02	0.07	0.00	1.00					
EBIT / Sales in Most Recent Period Prior to Investment	[11]	<u>-0.53</u>	<u>-0.31</u>	-0.11	0.05	-0.05	0.00	-0.12	0.08	0.02	0.01	1.00				
<b>Preplanned IPO</b>	<b>[12]</b>	-0.08	-0.04	<b><u>0.16</u></b>	0.08	0.04	-0.03	-0.10	0.14	-0.05	0.11	0.06	1.00			
Preplanned Acquisition	[13]	0.14	0.11	0.03	-0.14	-0.03	-0.02	<u>0.37</u>	<u>-0.17</u>	0.01	-0.12	-0.15	<u>-0.34</u>	1.00		
Fund Age	[14]	-0.01	-0.02	0.08	<u>-0.17</u>	-0.07	<u>0.23</u>	0.15	-0.07	-0.09	0.08	-0.06	-0.12	0.14	1.00	
Portfolio Size Per Manager	[15]	-0.04	0.00	-0.08	-0.08	0.14	<u>0.38</u>	0.05	-0.08	0.08	-0.07	-0.04	-0.04	0.00	-0.06	1.00
<b>Number of Funds</b>	<b>[16]</b>	0.14	0.14	<b><u>0.35</u></b>	-0.12	-0.08	0.11	<u>0.33</u>	0.01	0.06	0.02	-0.07	0.10	0.05	<u>0.22</u>	-0.07

**Table 4. First Stage Regressions to Explain the Number of Weeks of Due Diligence**

This table presents OLS estimates of the number of weeks of due diligence in Model 1, and the natural log of the number of weeks of due diligence in Model 2. Variables are as defined in Table 1. \*, \*\*, \*\*\* Significant at the 10%, 5%, and 1% levels, respectively.

	Model 1:		Model 2:	
	Ln (Number of Weeks Due Diligence)		Ln (Number of Weeks Due Diligence)	
	Coefficient	t-statistic	Coefficient	t-statistic
Dark Period	-0.1283	-0.51	-0.2946	-2.57**
Hope Period	0.1872	1.75*	-0.0312	-0.25
Investment Value	1.86E-06	1.12	2.30E-06	1.10
Buyout Dummy	-0.1927	-2.15**	-0.1687	-1.81*
Industry Market / Book	-0.0212	-1.00	-0.0099	-0.38
Same Region	-0.0072	-0.09	-0.0253	-0.30
Return 1 year prior	0.3544	1.18	-0.0202	-0.06
EBITDA / Sales in Most Recent Period Prior to Investment	-0.0018	-0.70	-0.0059	-1.32
Preplanned IPO	-0.0128	-0.10	0.1914	2.13**
Preplanned Acquisition	0.0747	0.67	0.0900	0.98
Fund Age	0.0490	2.12**	-0.0026	-0.52
Portfolio Size Per Manager	-0.0089	-4.15**	-0.0092	-1.17
Number of Funds	0.0256	1.89*	0.1285	4.39***
Year of Investment Dummies?		Yes		No
Fund Dummies?		Yes		No
Clustering by Fund and Year?		Yes		No
Constant	1.8385	55.15***	1.8898	12.36***
Number of Observations		178		178
Adjusted R2		0.4142		0.1542

**Table 5. Impact of Due Diligence on Three-Year ROA and Three-Year EBITDA/Sales**

This table presents second stage OLS estimates of the impact of due diligence on Three-Year ROA in Panel A and EBITDA / Sales in Panel B. Estimates are for the difference between the year 3 performance values versus the year of investment values. Variables are as defined in Table 1. \*, \*\*, \*\*\* Significant at the 10%, 5% and 1% levels, respectively.

Panel A. Three-Year ROA	Model 3 (With Outliers)		Model 4 (Outliers Removed)		Model 5 (No Year and Fund Dummies)		Model 6 (No Clustering)		Model 7 (No Endogeneity Controls)	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Ln Number of Weeks Due Diligence (Fitted, Table 4, Model 1)	<b>24.9441</b>	<b>1.67*</b>	<b>17.3146</b>	<b>2.09**</b>	<b>5.4510</b>	<b>3.10***</b>				
Ln Number of Weeks Due Diligence (Fitted, Table 4, Model 2)							<b>5.3885</b>	<b>2.28**</b>		
Ln Number of Weeks Due Diligence									<b>3.8341</b>	<b>2.03**</b>
MSCI Return Over Horizon	2.5370	0.59	3.4617	0.89	4.3838	1.54	4.5397	1.30	4.4879	1.28
Dark	-1.9701	-0.40	1.7224	0.32	2.4681	1.44	2.6100	0.88	2.0829	0.71
Hope	-4.5435	-1.10	0.5027	0.12	-0.7276	-0.34	-0.6766	-0.26	-0.7096	-0.27
Buyout Dummy	2.7514	0.86	-0.9458	-0.74	1.6932	1.03	1.6280	0.76	1.6205	0.76
Market / Book	0.2545	0.32	-0.2520	-0.46	-0.2635	-0.74	-0.2679	-0.40	-0.2623	-0.39
Fund Age					-0.0363	-0.52				
Portfolio Size Per Manager					0.0156	0.17				
Year of Investment Dummies?	Yes		Yes		No		No		No	
Fund Dummies?	Yes		Yes		No		No		No	
Clustering by Fund and Year?	Yes		Yes		Yes		No		No	
Constant	-49.6825	-1.57	-32.5327	-1.86*	-10.12083	-3.43***	-10.1514	-1.83*	-7.0361	-1.48
Number of Observations	178		175		178		178		178	
Adjusted R2	0.2565		0.2739		0.0461		0.0121		0.0061	

Table 5 continued

Panel B. Three-Year EBITDA / Sales	Model 8 (With Outliers)		Model 9 (Outliers Removed)		Model 10 (No Year and Fund Dummies)		Model 11 (No Clustering)		Model 12 (No Endogeneity Controls)	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Ln Number of Weeks Due Diligence (Fitted, Table 4, Model 1)	<b>51.6339</b>	<b>3.91***</b>	<b>31.75703</b>	<b>2.69***</b>	<b>5.8626</b>	<b>1.84*</b>				
Ln Number of Weeks Due Diligence (Fitted, Table 4, Model 2)							<b>5.8626</b>	<b>2.80***</b>		
Ln Number of Weeks Due Diligence									<b>3.4862</b>	<b>2.07**</b>
MSCI Return Over Horizon	1.6229	0.53	2.284831	0.81	5.2018	5.86***	5.5064	1.77*	5.5461	1.77*
Dark	7.2669	0.51	2.456892	0.57	-3.0799	-1.62	-2.7309	-1.04	-3.5275	-1.34
Hope	0.3077	0.10	-3.53788	-0.78	-3.8548	-3.09***	-3.8764	-1.67*	-3.9684	-1.69*
Buyout Dummy	11.2664	2.59***	6.336529	2.55**	2.8999	1.63	2.7054	1.43	2.6895	1.41
Market / Book	1.1934	1.98**	0.7217392	1.72*	0.1555	0.34	0.1563	0.26	0.1632	0.27
Fund Age					-0.0532	-1.73*				
Portfolio Size Per Manager					-0.0755	-1.80*				
Year of Investment Dummies?	Yes		Yes		No		No		No	
Fund Dummies?	Yes		Yes		No		No		No	
Clustering by Fund and Year?	Yes		Yes		Yes		No		No	
Constant	-105.5339	-3.93***	-63.4908	-2.50**	-8.2649	-1.32	-8.7494	-1.78*	-3.9619	-0.94
Number of Observations	178		175		178		178		178	
Adjusted R2	0.2887		0.2425		0.1065		0.0721		0.0533	

Panel C. One-Year and Two-Year ROA and EBITDA / Sales	Model 13 (Year 1 - Investment Year ROA)		Model 14 (Year 1 - Investment Year EBITDA/Sales)		Model 15 (Year 2 - Investment Year ROA)		Model 16 (Year 2 - Investment Year EBITDA / Sales)	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Ln Number of Weeks Due Diligence (Fitted, Table 4, Model 1)	<b>5.3909</b>	<b>0.51</b>	<b>29.6533</b>	<b>1.74*</b>	<b>8.0861</b>	<b>0.95</b>	<b>37.2893</b>	<b>2.03**</b>
MSCI Return Over Horizon	1.0449	0.68	-0.5575	-0.25	1.1450	0.42	0.7254	0.22
Dark	-0.8743	-0.24	5.3286	1.43	-1.9361	-0.42	3.8732	1.11
Hope	-3.8877	-2.17**	0.4274	0.26	-5.9671	-1.59	-2.8181	-0.99
Buyout Dummy	1.0697	0.34	7.2720	2.28**	2.3351	0.69	8.9877	2.17**
Market / Book	0.0490	0.07	0.5702	1.55	0.0947	0.2	0.8876	1.57
Year of Investment Dummies?	Yes		Yes		Yes		Yes	
Fund Dummies?	Yes		Yes		Yes		Yes	
Clustering by Fund and Year?	Yes		Yes		Yes		Yes	
Constant	-10.2356	-0.46	-60.7341	-1.72*	-17.4284	-0.94	-76.0893	-1.95*
Number of Observations	178		178		178		178	
Adjusted R2	0.3062		0.2813		0.2759		0.2925	

**Table 6. Regression Analyses for Different Agents Carrying Out Due Diligence**

This table presents OLS estimates of the impact of due diligence on Three-Year ROA in Panel A and EBITDA / Sales in Panel B. Regressions are based on the different subsamples for different agents carrying out due diligence: primarily the fund, whether or not consultants are used, whether or not external law firms are used, and whether or not external accounting firms are used. Estimates are for the difference between the year 3 performance values versus the year of investment values. Variables are as defined in Table 1. Where variables are excluded in the regressions it was due to necessity in the subsamples (e.g., in the case of consultants in the Dark period, for example). \*, \*\*, \*\*\* Significant at the 10%, 5% and 1% levels, respectively.

Panel A. Three Year ROA with subsets of the data by Due Diligence Types	Model 17 Prevalent Internal Fund Due Diligence		Model 18 Prevalent External Due Diligence		Model 19 Consultants' Due Diligence		Model 20 No Consultants' Due Diligence	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
<b>Ln Number of Weeks Due Diligence (Fitted, Table 4, Model 1)</b>	10.4179	2.38**	-2.0003	-0.83	1.2482	0.93	15.4722	2.92***
MSCI Return Over Horizon	1.7337	0.37	7.0056	2.90***	5.4701	1.44	1.9902	0.3
Dark	4.0836	1.5	-0.0685	-0.04	0.6783	0.17	7.6875	3.47
Hope	1.8136	0.33	-3.2929	-2.45	-3.3307	-2.03**	5.9219	0.52
Buyout Dummy	1.7968	1.03	-0.3378	-0.15	1.1721	0.72	2.6648	0.68
Market / Book	-0.4613	-1.06	-0.4333	-0.47	-0.7483	-0.88	0.5346	0.36
Portfolio Size Per Manager	-4.3185	-0.49	-0.0233	-0.18	-0.0247	-0.18	2.3067	0.66
Year of Investment Dummies?		No		No		No		No
Fund Dummies?		No		No		No		No
Clustering by Fund and Year?		Yes		Yes		Yes		Yes
Constant	-14.73654	-1.59	7.0884	1.33	0.7338	0.25	-36.0129	-3.64***
Number of Observations		83		95		117		61
Adjusted R2		0.0650		0.0560		0.0583		0.1350

	Model 21 Legal Due Diligence		Model 22 No Legal Due Diligence		Model 23 Accountants' Due Diligence		Model 24 No Accountants' Due Diligence	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
<b>Ln Number of Weeks Due Diligence (Fitted, Table 4, Model 1)</b>	1.4851	1.49	20.6433	3.87***	-2.9945	-1.38	7.3279	3.07***
MSCI Return Over Horizon	5.6285	1.6	1.1184	0.15	1.2143	0.52	5.2251	1.53
Dark	0.5670	0.14	7.6147	1.97**	-8.5574	-2.90***	4.0426	2.14**
Hope	-3.1003	-2.08**	5.9196	0.44	-0.2985	-0.08	-0.2108	-0.07
Buyout Dummy	1.4498	0.91	2.3813	0.72	7.1457	2.23**	1.8869	0.87
Market / Book	-0.6640	-0.87	0.9600	2.40**	1.8999	0.4	-0.3574	-0.83
Portfolio Size Per Manager	-0.0178	-0.13	9.6564	0.32	-0.0893	-2.15**	0.5490	1.09
Year of Investment Dummies?		No		No		No		No
Fund Dummies?		No		No		No		No
Clustering by Fund and Year?		Yes		Yes		Yes		Yes
Constant	-0.0978	-0.02	-55.6239	-1.31	-1.3937	-0.12	-14.9546	-4.03***
Number of Observations		121		57		19		159
Adjusted R2		0.0607		0.1530		0.3674		0.0650

Table 6 continued

Panel B. Three Year EBITDA/Sales with subsets of the data by Due Diligence Types	Model 25 Prevalent Internal Fund Due Diligence		Model 26 Prevalent External Due Diligence		Model 27 Consultants' Due Diligence		Model 28 No Consultants' Due Diligence	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
<b>Ln Number of Weeks Due Diligence (Fitted, Table 4, Model 1)</b>	8.6556	1.95*	-0.7937	-0.29	2.2609	0.57	14.5982	2.86***
MSCI Return Over Horizon	5.9963	1.13	4.4972	2.59***	7.0100	2.98***	2.0069	2.66***
Dark	-6.7325	-1.72*	-0.3567	-0.21	-3.4372	-0.95	-2.0532	-0.84
Hope	-8.7708	-2.68***	0.3611	0.32	-2.8506	-1.12	-5.0015	-0.43
Buyout Dummy	4.7131	2.23**	0.2005	0.12	2.5596	1.21	5.1071	1.61
Market / Book	-0.0235	-0.04	-0.0670	-0.13	0.5192	0.75	-0.2324	-0.82
Portfolio Size Per Manager	0.0123	0.00	-0.0750	-2.05**	-0.0775	-3.07***	-1.0594	-0.92
Year of Investment Dummies?		No		No		No		No
Fund Dummies?		No		No		No		No
Clustering by Fund and Year?		Yes		Yes		Yes		Yes
Constant	-11.8661	-1.76*	3.0945	0.54	-2.5726	-0.31	-20.8755	-2.90***
Number of Observations		83		95		117		61
Adjusted R2		0.1806		0.0663		0.0790		0.2438

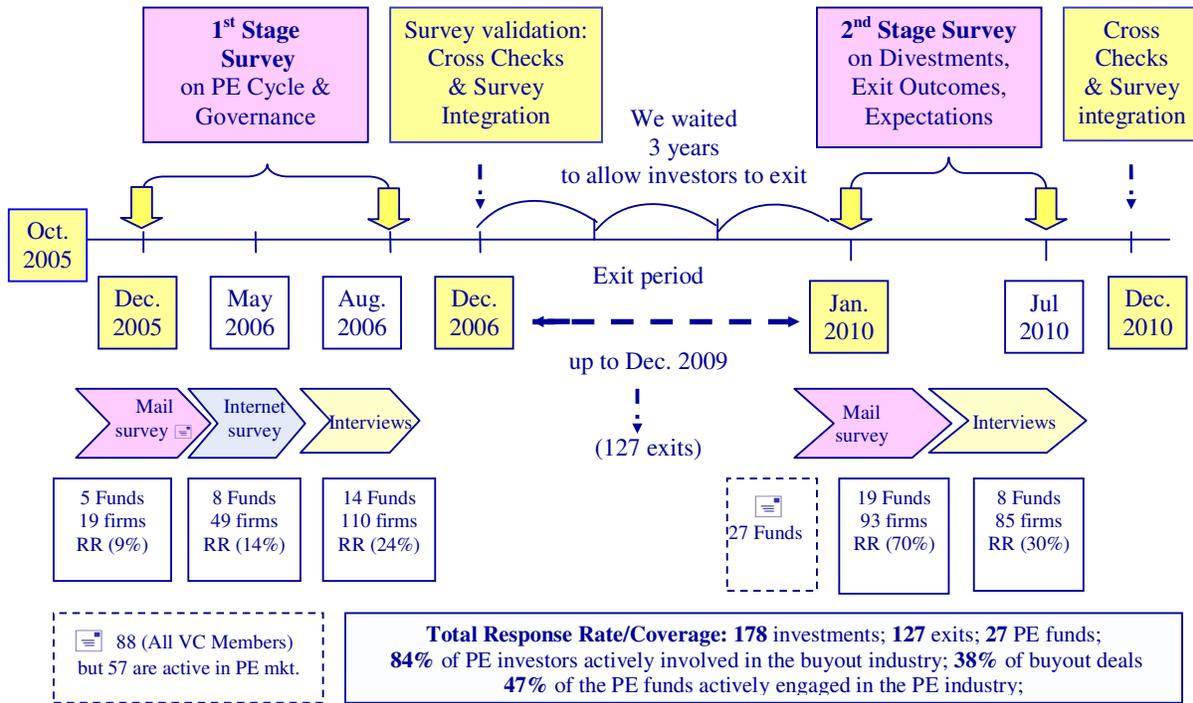
  

	Model 29 Legal Due Diligence		Model 30 No Legal Due Diligence		Model 31 Accountants' Due Diligence		Model 32 No Accountants' Due Diligence	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
<b>Ln Number of Weeks Due Diligence (Fitted, Table 4, Model 1)</b>	2.4960	0.79	19.6158	3.17***	-3.6668	-3.63***	7.6630	2.02**
MSCI Return Over Horizon	6.6034	3.05***	2.1164	0.6	7.2562	0.91	5.6062	1.77*
Dark	-3.2735	-0.92	-1.6074	-0.35	4.6261	1.41	-3.1858	-1.48
Hope	-2.6719	-1.14	-6.4581	-1.26	3.3402	1.2	-4.4112	-2.09**
Buyout Dummy	2.6306	1.15	3.4693	2.07**	7.4089	1.77	2.4935	1.99**
Market / Book	0.5042	0.76	0.0109	0.1	-0.1428	1.68	0.1458	0.37
Portfolio Size Per Manager	-0.0793	-0.51	6.4580	0.43	-0.1674	0.03	0.2693	0.24
Year of Investment Dummies?		No		No		No		No
Fund Dummies?		No		No		No		No
Clustering by Fund and Year?		Yes		Yes		Yes		Yes
Constant	-3.2395	-0.48	-39.5266	-1.44	1.1806	0.15	-11.7207	-1.67*
Number of Observations		121		57		19		159
Adjusted R2		0.079		0.2917		0.7432		0.1315

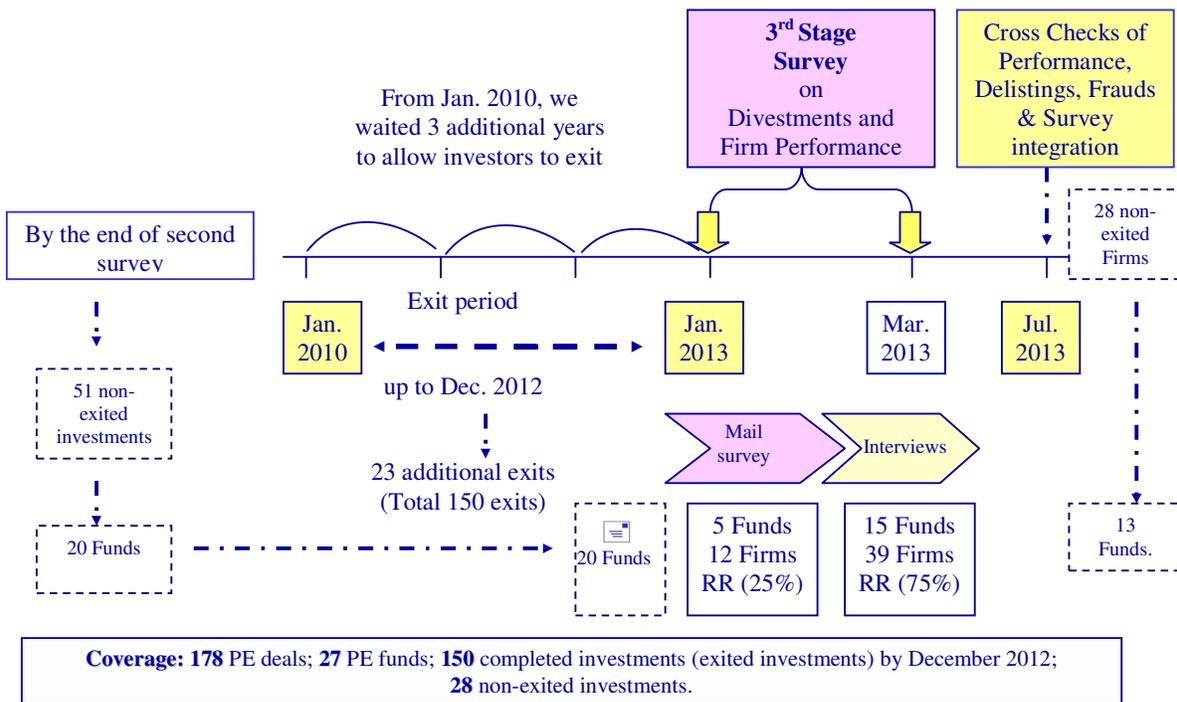
**Figure 1. Survey Procedure and Timing**

This Figure summarizes the three-stage survey employed to collect the data underlying this paper (the details on the data collection process are summarized on the dedicated Online Appendix).

*Part A*



*Part B*



## ONLINE APPENDICES

### DUE DILIGENCE AND INVESTEE PERFORMANCE

Douglas Cumming and Simona Zambelli

#### Appendix 1. Data Collection, Response Rate and Representativeness of our Database

In this section we describe the methodology employed to collect our data, as well as present summary statistics of the PE investments carried out in Italy over the 1999-2006 period, and the associated divestments occurred over the 2000-2012 period. Part A of this Appendix describes the methodology underlying our dataset. It describes in greater detail the survey procedure, the response rate we obtained and the survey-integrations we carried out to maximize the representativeness of our ultimate sample. Part B discusses sample representativeness by describing a number of representativeness tests and potential sample selection bias.

#### Part A. Data Collection Methods

The primary source of information underlying our database is represented by a three-stage survey of PE deals carried out from 1999 to 2006 (investment period), and PE divestments realized from 2000 to 2012 (divestment period).

##### *(a) Survey Procedure*

We collected the data by undertaking a three-stage survey of international and local venture capitalists actively involved in Italy over the 1999-2006 period. For each survey we employed a sequential mixed mode (SMM) survey approach (see De Leeuw 2005 and Dillman *et al.* 2009 for details), in combination with the “Total Design Method” (TDM), developed by Dillman (2000) specifically for mail and telephone surveys. The sequential mixed mode survey (SMM) is a particular survey procedure that recommends the adoption of a different survey mode in sequential phases.<sup>1</sup> To better highlight the research framework and time frame underlying our study, in the following sub-section we summarize the entire survey procedure employed to collect our database.

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<sup>1</sup> With the sequential mixed mode approach, the non respondents to a mail survey (phase 1) are contacted and requested to answer the questionnaire through a different survey mode, e.g., web survey (phase 2). Thereafter, the non respondents of phase 2 are contacted and requested to answer the questionnaire through a different mode (e.g., a telephone or a face-to-face interview). Recent studies show that this survey methodology significantly improves the response rate (see, e.g., De Leeuw, 2005; Dillman *et al.*, 2009).

**1<sup>st</sup> Survey** - In October 2005 we prepared a first survey on PE investment cycle (characterized by a four-page questionnaire) and conducted a pilot study in order to test its efficacy and clearness. The feedbacks on our pilot study helped us review the questionnaire. The ultimate version of the questionnaire was sent in December 2005. In order to minimize potential sample biases, we sent the questionnaire to all members of the Italian Venture Capital Association (AIFI), which at that time recorded 88 full members.<sup>2</sup> In the first place, we administered our survey by post and devoted particular attention to following all the steps highlighted by Dillman (2000). The purpose of our first survey was to gather detailed and unique information on investment characteristics, screening criteria of target firms, due diligence procedure, deal structure and governance mechanisms employed by international and local PE investors active in Italy, as well as exit rights and exit expectations. After eliminating double-counted investors and various non-applicable replies that we received in the subsequently weeks (e.g., some investors were new, other investors were not active in the PE sector but only in the early stage sector), we identified 57 investors actively involved in the PE industry. This number was in line with the number of active investors published by the PEM database and PEM Statistics in 2005. After performing our mail survey, only 5 PE investors replied (response rate of 9%) and provided us with detailed information on 19 target firms. In line with the suggestions of Dillman *et al.* (2009), a few months later we contacted the non respondents to the mail survey and asked them to answer the questionnaire via fax (or e-mail). Thereafter, 8 PE investors replied (response rate of 14%) providing us with complete information on additional 49 PE investee firms. In June 2006, we contacted the non-respondents once again in order to ask their permission to perform a face-to-face interview in their office. Additional 14 investors (response rate 24%) agreed to partake in our survey and provided full information about 110 target firms. By the end of August 2006, we completed the interview process related to our first survey and collected detailed data on PE investments in 178 target firms

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<sup>2</sup> According to AIFI statistics published in October 2005, the total number of AIFI members was 88. According to the PEM database, the total number of investors actively involved in the PE sector was lower (57). However, the information about the specific identity of the investors active in the PE sector was not publicly available. Therefore, we decided to send the questionnaire to all 88 AIFI members, being aware of the fact that this list was not entirely applicable to our survey (some investors were new, others were not actively involved in the PE industry because they were specialized in start-up financing only). For our mail survey, we followed all the steps and suggestions recommended by Dillman (2000), devoting particular attention on the content of the package that was sent to each investor along with the questionnaire. Each investor received a package containing: a four-page questionnaire, a cover letter containing the motivation underlying the research project and a presentation of the authors' main research; a signed confidential agreement; a glossary of the PE terminology included in the questionnaire, and a reward promise made by the authors in terms of follow-up reports summarizing the results of the survey.

acquired in Italy over the period from January 1999 to 2006 (second quarter). For each investee firm, we gathered information on target companies, screening procedure, investor rights and governance mechanisms employed by PE investors.

**2<sup>nd</sup> Survey** - Normally, PE fund managers exit their investments in 3-5 years (see, e.g., Cumming and Johan 2013). In order to investigate exit outcomes, we waited for another three years and a half to allow PE funds to exit their investee firms. In January 2010, we started a second survey of the same 27 PE investors included in our sample, with the aim of collecting information on the development of the investee firms included in our sample and gather additional information on exited investments, associated investment returns (in terms of IRR), and exit expectations for the non-exited investments. Upon request, 19 PE firms replied to our second survey directly via e-mail (response rate of 70%), providing us with information on the performance of their investments in 93 target firms. The remaining 8 PE firms (30%) agreed to answer the second survey only through a face-to-face interview. By the end of July 2010, we completed the scheduled interviews and we collected information on exit outcomes of additional 85 target firms. By the end of our second survey, we collected detailed information on 127 divestments, which occurred from January 2000 to December 2009. For each divestment we recorded the following information: exit routes (i.e., IPO, trade sale, secondary sale, buyback, write-off), divestment values, exit years, and associated investor returns (in terms of IRR). For each non-exited investment, we gathered information on exit expectations of PE investors (e.g., expected year, expected divestment route and value, as well as expected IRR returns). By the end of our second survey, in December 2010, our dataset included 51 non-exited investments performed by 20 PE funds.

**3<sup>rd</sup> Survey** - In order to have a more complete picture of the exited investments, we waited for three more years to allow the remaining PE funds to exit their investee firms. In January 2013, we started our third survey by contacting the remaining 20 PE investors included in our database. Our purpose was to collect information on additional divestments, exit routes, exit outcomes, and firm performances. Upon request, 5 PE investors replied promptly to our mail survey, providing us with detailed information on their divestments in 12 target firms. The remaining 15 investors accepted to answer the questionnaire through an interview, after which we collected information on 39 target firms. By the end of our third survey (March 2013), our database included 150 divestments, occurred over the period from January 2000 to December 2012. We also monitored the performance of the venture-backed firms that went public over the same divestment year, and

collected information on potential post-IPO bankruptcies, legal investigations, and the delisting occurred until December 2012.

*(b) Survey Integration and Response Rates*

In order to validate, correct and integrate the information gathered through our three-stage survey, we considered a number of secondary sources. First, we compared our data with the Statistics Report provided by the Italian Venture Capital Association (AIFI), available at the AIFI website, in combination with two additional private equity databases: a) the Private Equity Monitor (PEM<sup>®</sup>) dataset, developed by AIFI in association with Università Cattaneo – LIUC, and b) Venture Economics database. With this first comparison we cross-checked, and eventually corrected, the information we received on investment characteristics (i.e., target firm, location, investment year, industry, invested amounts and divestment values). Second, we considered the AIDA database by Bureau Van Dijk to collect information on financial performances of the target firms included in our database, e.g., Return on Assets (ROA) Ratios, and EBITDA to sales ratios, as well as the balance sheets of the target firms included in our database, their Debt to Equity ratios, and the cost of debt over the 1999-2006 period. Third, we collected further information on market conditions, by looking at Datastream by the Thomson Corporation, MSCI database, and Borsa Italiana. We integrated our database with important control variables related to market returns, and industry market to book values. Fourth, we considered additional sources of information in order to make sure that our dataset included the majority of the investments listed in each fund website, as well as minimize potential sample biases and avoid the risk of having a sample biased toward the most successful PE deals. Among these additional sources, we checked investor websites, financial reports provided by investors, and the most relevant economic press release. In so doing, we gathered important information about fund characteristics (i.e., age, location, portfolio size, capital under management, legal structure, independency, number of partners, executives and directors).

The response rates associated with our survey are reported in Table A.1, Panel A. Despite the difficulties associated with the implementation of a three-stage survey on confidential information, we obtained a high response rate. With reference to the PE market as a whole, we obtained a total response rate of 47% (27 over 57 investors actively involved in the PE industry in 2005). Considering the buyout sub-sector, our survey covers 84% of the buyout investors active in Italy by the end of 2005 (21 over 25 PE funds). Considering the total number of buyout transactions reported in the PEM<sup>®</sup> Statistics, our dataset comprises 38% of the buyouts carried out in Italy over the 1999-2006 period (see Table A.1, Panel A). These response rates compare favorably with

previous surveys in the finance field (e.g., Brau and Fawcett, 2006, who received a total response rate of 19%; Graham and Harvey, 2001, who obtained a 9% response rate).

## **Part B. Sample characteristics and Sample Representativeness**

Our ultimate dataset includes 178 target firms, acquired by 27 private equity organizations covering approximately 85% of the buyout investors operating in Italy from 1999 to 2006 investment period. The data include detailed information on 150 exits realized over the 2000-2012 divestment period. Our dataset includes both quantitative and qualitative information about: a) investment and divestment values; b) deal structure; c) valuation models employed by investors; d) returns associated with the exited investments; d) performance of the target firms (from the investment date up to three years after the investment); e) screening criteria employed by PE investors to screen out non attractive investment opportunities; these criteria are ranked on a scale of 1–5 in order to capture the level of relevance associated with each criterion, as perceived by PE investors; f) financial forms employed by PE investors, as well as the control and cash flow rights retained by them (including exit rights and events upon which a reallocation of cash flow and control right may occur).

To evaluate the representativeness of our sample, we compared our dataset with both AIFI Statistics Reports and the Private Equity Monitor (PEM<sup>®</sup>) database, which includes generic and standard information about all PE deals realized in Italy. Table A.1 shows the various comparison tests we performed between the PEM data (or AIFI data) and our sample to ensure the representativeness of our dataset (see Table A.1 Panels B–G). In particular, Panels B-D compare our database with the PEM sample, while Panels E–G compare our data with the AIFI Statistics Reports. We performed several comparison tests with respect to various sample characteristics: target firm location (Panel B); industry distribution of PE transactions (Panel C, part 1) and buyouts (Panel C, part 2); yearly distribution of PE investments over the 1999-2006 period (Panel D); exit distribution of PE divestments over the 2000-2012 period (Panel E); IPO distribution over the 2000-2012 time horizon (Panel F); and write-off distribution (Panel G). As highlighted in Table A.1 (Panels B–G), our sample is quite similar to the datasets provided by AIFI and PEM. Apart from a few exceptions, no statistically significant differences exist between our dataset and the PEM database (Panels B–D). Similar patterns emerge when comparing our dataset with the AIFI Statistics Reports (Panels E–G): the comparison tests do not show statistically significant differences, apart from a few rare cases. For example, Panels B and C focus on the location distribution of target firms (Panel B) and industry distribution of PE investments realized in Italy (Panel C). The comparison tests show no significant differences between Private Equity Monitor

(PEM) data and our sample.<sup>3</sup> Similar trends are observed in Panel E, which focuses on distribution of divestments realized from 2000 to 2012. In terms of exit distribution, the comparison tests in Panel E do not show statistically significant differences. In terms of yearly distribution of buyout investments (Panel D), IPO distribution (Panel F) and write-off distribution (Panel G), the comparison tests indicate scant statistical significance in terms of differences between our sample and the PEM<sup>®</sup> or AIFI data. Panel D shows that the proportion of buyouts is similar in both datasets, apart from the years of 2000 and 2004, for which our sample comprises a higher proportion of buyouts. The comparison tests in Panels F do not highlight significant differences except for the years of 2003 and 2004, for which AIFI Statistics report higher proportion of IPO exits. Similar conclusions can be driven by looking at Panel G, which compares the write-off distribution related to AIFI dataset with the one related to our sample. In Panel G, no relevant differences emerge, aside from the sole exception of the year 2007, for which our database report a higher percentage of write off.

[Insert Table A.1 About Here]

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<sup>3</sup> It is worth noting that the PEM<sup>®</sup> data highlighted in Panels B–D cover the period 1999–2003, the years for which the information is available. For Panels B–D, comparison tests in our sample are reported for the 1999–2006 period. We also performed comparison tests with reference to the shorter period (1999–2003) and did not observe materially different results.

**Table A.1. Representativeness Tests**

This Table presents comparison of proportions tests between the survey data used in this paper relative to the data reported by the PEM® database, published by the Italian Venture Capital and Private Equity Association (AIFI) in association with the “Masters in Merchant Banking” team of Università Carlo Cattaneo (LIUC). To show that the data are representative of the population, we perform various comparison tests (see Panels B-G). Panel A summarizes the response rate and coverage for our sample. Panel B compares the proportion of investments by location, Panel C compares the industry sectors for all types of PE investments and buyout transactions, Panel D compares the years of investment, Panel E compares the exit year distributions of investments, Panel F compares the IPO exit years, Panel G compares the write-off exit years. The \*, \*\*, \*\*\* indicate statistical significance at the 10%, 5% and 1% levels, respectively.

<b>Panel A: Response Rate</b>	<b>PEM &amp; AIFI STATISTICS REPORTS</b>	<b>OUR SURVEY</b>	<b>RESPONSE RATE &amp; COVERAGE</b>
Total number of AIFI members in Oct. 2005, including new funds, VC funds and PE funds (source: AIFI statistics, October 2005)	88	27	31%
Total number of buyout deals carried out within the 2000-06 period (source: PEM database)	284	109*	38%
Total number of PE firms actively involved in the PE industry at the time of our survey (source: PEM Report 2005)	57	27	47%
Total number of PE firms actively involved in the buyout industry at the time of our survey (source: AIFI statistics, 1st term 2005)	25	21	84%
		* with reference to the 2000-06 period	

<b>Panel B: Location Comparison</b>	<b>PEM SURVEY</b>		<b>OUR SURVEY</b>		<b>COMPARISON</b>
Location of target firms - Area of investment (within Italy)	Total # of Transactions in PEM (1999-2003)	Proportion ALL Transactions IN PEM (1999-2003)	# TOTAL Transactions in Our Data (1999-2006 2nd quarter) *	Proportion ALL transactions in our Data	Comparison of Proportions Test
North	317	0.81	173	0.78	0.79
Center	317	0.15	173	0.17	-0.58
South	317	0.04	173	0.05	-0.32
	Source: PEM 1999-2003				
	* From our database we excluded 5 transactions carried out abroad to ensure comparison with the AIFI data				

<b>Panel C: Industry Distribution Comparison</b>	<b>PEM SURVEY</b>		<b>OUR SURVEY</b>		<b>COMPARISON</b>
(1) All PE transactions	Total # of Total Transactions in PEM (99-2003)	Proportion of transactions in PEM (99-2003)	Total # Transactions in Our Data (1999-2006 2nd quarter)	Proportion of PE deals in our Data	Comparison of Proportions Test
Industrial / Basic Material	317	0.45	178	0.46	-0.21
Consumer Goods	317	0.20	178	0.16	1.02
Services / Financial Services	317	0.24	178	0.22	0.45
Telecommunication / Utilities	317	0.06	178	0.05	0.46
Technology	317	0.03	178	0.06	-1.62
Healthcare	317	0.02	178	0.05	-1.85
		1.00		1.00	*
	Source: PEM 1999-2003				

Table A.1 continued

(2) Buyouts transactions	Total # of Total Buyouts in PEM (1999-2003)	Proportion Buyouts PEM (99-2003)	Total # Buyouts Transactions in Our Data (1999-2006 2nd quarter)	Proportion of Buyout deals in our Data	Comparison of Proportions Test
Industrial / Basic Material	134	0.57	115	0.56	0.16
Consumer Goods	134	0.19	115	0.16	0.62
Services / Financial Services	134	0.15	115	0.18	-0.64
Telecommunication / Utilities	134	0.04	115	0.03	0.43
Technology	134	0.03	115	0.04	-0.22
Healthcare	134	0.02	115	0.04	-0.73
		1.00		1.00	

Source: PEM 1999-2003

	PEM SURVEY		OUR SURVEY		COMPARISON	
Panel D: Yearly Distribution Comparison	Total # of Transactions in PEM (1999-2006) °	Proportion Buyouts PEM (1999-2006)	# TOTAL Transactions in Our Data (1999-2006 2nd quarter)	Proportion Buyouts our Data	Comparison of Proportions Test	
Buyouts						
1999	56	0.45	14	0.50	-0.34	
2000	69	0.33	16	0.63	-2.18	**
2001	60	0.20	8	0.38	-1.12	
2002	61	0.56	26	0.62	-0.48	
2003	71	0.56	29	0.55	0.08	
2004	55	0.71	29	0.90	-1.94	*
2005	89	0.70	42	0.67	0.38	
2006 2nd quarter °°	95	0.36	14	0.36	0.02	
			178			

° Source: PEM 1999-2003; PEM 2005 for years 2004-2005.

°° Source: AIFI Statistic Report 2006, 2nd quarter (where the total number of expansion, replacement and buyout deals is 48, 13, and 34 respectively).

	AIFI DATABASE		OUR SURVEY		COMPARISON	
Panel E: Exit Distribution Comparison	Total # of exit in AIFI database (1999-2012)	Proportion of exits through trade sale in AIFI	# Exits in Our Dataset (1999-2012)	Proportion of exits through trade sale in our Database	Comparison of Proportions Test	
EXIT DISTRIBUTION-ALL TRANSACTIONS (2000-2009)						
2000	188	0.58	3	0.67	-0.31	
2001	148	0.55	3	0.66	-0.38	
2002	149	0.52	3	0.33	0.65	
2003	222	0.52	10	0.50	0.12	
2004	137	0.36	11	0.45	-0.60	
2005	150	0.47	10	0.70	-1.41	
2006	181	0.38	22	0.52	-1.27	
2007	207	0.51	25	0.50	0.09	
2008	181	0.54	21	0.53	0.09	
2009°	143	0.6	19	0.47	1.05	
2010	123	0.51	3	0.66	-0.51	
2011	139	0.44	2	1.00	-1.58	
2012°°	44	0.5	18	0.33	1.22	
		Source: AIFI statistics	150			

° It is worth noting that in 2009, Aifi Annual Report excludes write off from the proportion of exits through Trade Sale.

°° It is worth noting that the total number of Exits recorded in AIFI in 2012 refers to the first semester only.

Table A.1 continued

<b>Panel F: IPO distribution comparison</b>		<b>AIFI DATABASE</b>		<b>OUR SURVEY</b>	
ALL TRANSACTIONS (2000-2012)	Total # of exit in AIFI database (99-2007)	Proportion of exits through IPO in AIFI	# Exits in Our Dataset (99-2012)	Proportion of exits through IPO in our Database	Comparison of Proportions Test
2000	188	0.33	3	0.33	0.00
2001	148	0.20	3	0.00	0.86
2002	149	0.56	3	0.25	1.07
2003	222	0.56	10	0.10	2.86 ***
2004	137	0.71	11	0.09	4.19 ***
2005	150	0.11	10	0.00	1.11
2006	181	0.13	22	0.13	0.00
2007	207	0.08	25	0.12	-0.68
2008	181	0.04	21	0.00	0.93
2009 <sup>o</sup>	143	0.16	19	0.05	1.24
2010	123	0.02	3	0	0.25
2011	139	0.06	2	0	0.36
2012 <sup>oo</sup>	44	0.02	18	0	0.65

Source: AIFI statistics 150

<sup>o</sup> It is worth noting that in 2009, Aifi Annual Report excludes write off from the proportion of exits through Trade Sale.

<sup>oo</sup> It is worth noting that the total number of Exits recorded in AIFI in 2012 refers to the first semester only.

<b>Panel G: Write off Distribution</b>		<b>AIFI DATABASE</b>		<b>OUR SURVEY</b>	
ALL TRANSACTIONS (2005-2012)	Total # of exit in AIFI database (2005-2009)	Proportion of exits through write off in AIFI	# TOTAL exits in Our Data (2005-09)	Proportion of exits through Write-off in our Database	Comparison of Proportions Test
2005	150	0.06	10	0	0.80
2006	181	0.10	22	0.04	0.87
2007	207	0.04	25	0.17	-2.66 ***
2008	181	0.20	21	0.11	0.99
2009 <sup>o</sup>	143	0.39	19	0.37	0.17
2010	123	0.11	3	0.00	0.61
2011	139	0.20	2	0.00	0.71
2012 <sup>oo</sup>	44	0.09	18	0.00	1.32

Source: AIFI statistics 120

<sup>o</sup> It is worth noting that in 2009, Aifi Annual Report excludes write off from the proportion of exits through Trade Sale.

<sup>oo</sup> It is worth noting that the total number of Exits recorded in AIFI in 2012 refers to the first semester only.

## **Appendix 2. Additional Robustness Check Estimates**

In this section we report the results of additional robustness checks that we discussed in the text of the paper in Section 6.4. As highlighted in the paper, we performed a number of additional robustness tests in order to:

1. Isolate the effect of due diligence on performance and control for the value added capacity of PE investors;
2. Consider potential sample selection biases, by implementing a Treatment Effect Model (similar to Heckman selection model);
3. Employ a two-stage IV regression model for the determinants of internal versus external due diligence;
4. Consider Propensity Score Matching models, comparing the impact on performance of longer and shorter DD, as well as the impact on performance of internal and external DD;
5. Include or exclude different instruments in the first stage regressions reported in the paper, such as the geographic distance between PE funds and their target companies (“distance km”, or the average time spent on implementing the due diligence in other target firms active in the same industry and acquired in the same year (“dd\_weeks\_OTHER”; and “ln\_dd\_weeks\_OTHER”);
6. Include other performance measures: Return on Equity investment (ROE) and IPO exit outcomes;
7. Consider the performance measures (ROA, ROE, and EBITDA/Sales) recorded at the time of exit, and the time of investment.

**Table A2. First Stage Regressions on the determinants of Due Diligence duration, controlling for the value added capacity of PE investors**  
 This Table presents First-stage OLS estimates of the log of the number of weeks considering the impact of the controlling power of the PE investor and the size of target firms. Variables are as defined in Table 1. \*, \*\*, \*\*\* Significant at the 10%, 5%, and 1% levels, respectively.

<b>Table 7</b>				
<b>Due Diligence Determinants controlling for the impact of the different value added capacity of PE investors and target size</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
<i>(First Stage Estimates)</i>	<b>Ln (Number of Weeks Due Diligence) Coefficient (t-statistic)</b>	<b>Ln (Number of Weeks Due Diligence) Coefficient (t-statistic)</b>	<b>Ln (Number of Weeks Due Diligence) Coefficient (t-statistic)</b>	<b>Ln (Number of Weeks Due Diligence) Coefficient (t-statistic)</b>
Dark Period	-0.129 (-0.502)	-0.301*** (-2.649)	-0.0795	-0.317*** (-2.729)
Hope Period	0.185* (1.668)	-0.0754 (-0.588)	0.174 (0.590)	-0.0889 (-0.673)
Investment Value	1.76e-06 (1.067)	2.72e-06 (1.296)	1.78e-06 (0.989)	2.54e-06 (1.195)
Buyout Dummy	-0.193** (-2.136)	-0.168* (-1.819)	-0.190** (-2.201)	-0.160* (-1.707)
Industry Market-to-Book Value	-0.0215 (0.00)	-0.00699 (-0.269)	-0.0213	-0.00664 (-0.254)
Same Region	-0.00772 (0.00)	-0.0364 (-0.430)	-0.00629	-0.0359 (-0.421)
Return 1 year prior	0.358 (1.146)	-0.100 (-0.319)	0.320 (1.148)	-0.129 (-0.399)
EBITDA / Sales in Most Recent Period Prior to Investment	-0.00180 (-0.671)	-0.00554 (-1.243)	-0.00200 (-0.704)	-0.00574 (-1.279)
Preplanned IPO	-0.0122 (-0.0914)	0.188** (2.112)	-0.0238 (-0.186)	0.186** (2.068)
Preplanned Acquisition	0.0756 (0.671)	0.114 (1.238)	0.0707 (0.636)	0.123 (1.325)
Fund Age	0.0473 (1.585)	-0.00232 (-0.479)	0.0484 (1.544)	-0.00334 (-0.655)
Portfolio Size Per Manager	-0.00879*** (-4.253)	-0.00835 (-1.071)	-0.00886*** (-6.322)	-0.00880 (-1.120)
Number of Funds	0.0252 (1.583)	0.117*** (3.947)	0.0328 (1.460)	0.120*** (3.978)
Sum of veto and control rights	0.00237 (0.204)	-0.0193* (-1.784)	0.00146 (0.116)	-0.0196* (-1.807)
Ln Employees of Investee Firm			0.0190 (0.637)	0.0220 (0.643)
Year Dummies	YES	NO	YES	NO
Fund Dummies	YES	NO	YES	NO
Double Clustering by Fund and Year	YES	NO	YES	NO
Constant	1.819	2.103*** (10.87)	1.718*** (8.629)	1.999*** (8.073)
Observations	178	178	177	177
R-squared	0.653	0.1653	0.654	0.234

**Table A3. Second-step estimates showing the impact on investee performance, after controlling for the value added capacity of PE investors and target size**

This Table presents second-stage estimates of the impact on investee performance considering the effect of . Panel A shows the impact on three-year ROA; Panel B shows the impact on three-year Ebitda/Sales. Variables are defined in Table 1. T-statistics in parentheses. \*, \*\*, \*\*\* Significant at the 10%, 5%, and 1% levels, respectively.

3Y ROA DIFFERENCE												
TABLE 8 – PANEL A												
IMPACT ON 3Y ROA Difference <i>(Second-stage estimates)</i>	5	6	7	8	9	10	11	12	13	14	15	16
	Coefficient (t-stat)											
Ln Number of Weeks Due Diligence (Fitted, Table 7, Model 1)	32.07*	23.00**	4.903***	4.826**								
	(1.845)	(2.000)	(2.909)	(1.980)								
Ln Number of Weeks Due Diligence (Fitted, Table 7, Model 2)					10.87**							
					(2.196)							
Ln Number of Weeks Due Diligence (Fitted, Table 7, Model 3)							34.66**	25.56**	5.115***	5.036**		
							(2.020)	(2.298)	(2.809)	(2.066)		
Ln Number of Weeks Due Diligence (Fitted, Table 7, Model 4)											11.76**	
											(2.395)	
Ln Number of Weeks Due Diligence						3.436*						3.397*
						(1.790)						(1.766)
MSCI Return Over Horizon	2.516	3.444	3.905	4.055	3.308	3.920	1.109	3.165	3.382	3.770	2.926	3.686
	(0.583)	(0.883)	(1.360)	(1.144)	(0.929)	(1.103)	(0.258)	(0.734)	(1.111)	(1.060)	(0.821)	(1.032)
Dark	-1.008	3.353	2.298	2.419	4.369	1.947	5.242	0.0273	1.688	2.125	4.345	1.561
	(-0.189)	(0.548)	(1.517)	(0.811)	(1.329)	(0.661)		(0.00457)	(0.900)	(0.702)	(1.305)	(0.522)
Hope	-4.183	1.643	-0.833	-0.762	-0.152	-0.798	-3.556	-1.605	-1.018	-0.930	-0.236	-1.002
	(-0.993)	(0.343)	(-0.393)	(-0.290)	(-0.0573)	(-0.304)	(-0.208)	(-0.514)	(-0.457)	(-0.353)	(-0.0890)	(-0.379)
Buyout Dummy	3.888	-0.0184	1.761	1.712	1.733	1.720	4.652	0.666	2.353	2.096	2.084	2.112
	(1.090)	(-0.00952)	(0.961)	(0.801)	(0.812)	(0.803)	(1.317)	(0.475)	(1.173)	(0.965)	(0.963)	(0.969)
Market / Book	0.538	-0.0246	-0.238	-0.244	-0.262	-0.235	0.588	0.0511	-0.224	-0.231	-0.253	-0.221
	(0.689)	(-0.0453)	(-0.677)	(-0.361)	(-0.389)	(-0.348)	(0.652)	(0.0935)	(-0.489)	(-0.342)	(-0.377)	(-0.327)
Sum of veto and control rights	-0.963	-0.758	-0.261	-0.259	-0.0940	-0.300	-1.047	-0.800	-0.266	-0.268	-0.0836	-0.317
	(-1.486)	(-1.297)	(-1.300)	(-0.922)	(-0.309)	(-1.081)	(-1.622)	(-1.352)	(-1.168)	(-0.954)	(-0.275)	(-1.137)
Ln Employees Investee Firms							1.483	0.0133	1.107	0.936	0.891	0.950
							(0.761)	(0.0119)	(0.611)	(1.175)	(1.122)	(1.189)
Fund Age			-0.0332						-0.0857			
			(-0.471)						(-1.024)			
Portfolio Size Per Manager			0.0306						-0.00815			
			(0.352)						(-0.113)			
Fund dummies	YES	YES	NO	NO	NO	NO	YES	YES	NO	NO	NO	NO
Year dummies	YES	YES	NO	NO	NO	NO	YES	YES	NO	NO	NO	NO
Clustering by Fund and Year	YES	YES	YES	NO	NO	NO	YES	YES	YES	NO	NO	NO
Constant	-53.37*	-35.60*	-6.550*	-6.528	-20.48*	-3.344	-66.53*	-40.57**	-12.50	-11.86	-27.16**	-8.172
Observations	178	175	178	178	178	178	177	174	177	177	177	177
Adjusted R squared	0.265	0.282	0.0508	0.011	0.0162	0.0070	0.294	0.287	0.063	0.060	0.068	0.054

TABLE 8— PANEL B												
3Y EBITDA/SALES DIFFERENCE												
IMPACT ON 3Y EBITDA/SALES (Second-stage estimates)	Model 17 Coefficient (t-stat)	Model 18 Coefficient (t-stat)	Model 19 Coefficient (t-stat)	Model 20 Coefficient (t-stat)	Model 21 Coefficient (t-stat)	Model 22 Coefficient (t-stat)	Model 23 Coefficient (t-stat)	Model 24 Coefficient (t-stat)	Model 25 Coefficient (t-stat)	Model 26 Coefficient (t-stat)	Model 27 Coefficient (t-stat)	Model 28 Coefficient (t-stat)
Ln Number of Weeks Due Diligence (Fitted, Table 7, Model 1)	59.64*** (3.991)	56.72*** (3.695)	5.367* (1.908)	5.330** (2.471)								
Ln Number of Weeks Due Diligence (Fitted, Table 7, Model 2)					8.932** (2.023)							
Ln Number of Weeks Due Diligence (Fitted, Table 7, Model 3)							63.42*** (3.998)	60.45*** (3.656)	5.469* (1.930)	5.441** (2.513)		
Ln Number of Weeks Due Diligence (Fitted, Table 7, Model 4)											9.582** (2.177)	
Ln Number of Weeks Due Diligence						3.064* (1.79)						3.038* (1.768)
MSCI Return Over Horizon	1.607 (0.555)	1.672 (0.622)	4.754*** (9.464)	5.033 (1.604)	4.461 (1.404)	4.945 (1.562)	1.033 (0.321)	1.546 (0.515)	4.467*** (3.350)	4.914 (1.556)	4.279 (1.339)	4.875 (1.529)
Dark	8.344	8.061* (1.763)	-3.233* (-1.756)	-2.911 (-1.103)	-1.759 (-0.599)	-3.671 (-1.400)	7.680*** (2.883)	5.629 (1.451)	-3.649** (-2.064)	-3.088 (-1.150)	-1.730 (-0.580)	-3.907 (-1.463)
Hope	0.652 (0.194)	1.045 (0.184)	-3.953*** (-2.804)	-3.958* (-1.704)	-3.552 (-1.503)	-4.062* (-1.735)	0.989 (0.0752)	1.800 (0.588)	-4.053*** (-3.009)	-4.019* (-1.720)	-3.553 (-1.496)	-4.153* (-1.761)
Buyout Dummy	12.58** (2.530)	11.16* (1.947)	2.963 (1.586)	2.787 (1.473)	2.805 (1.474)	2.795 (1.465)	13.41** (2.492)	11.98* (1.967)	3.332* (1.683)	2.980 (1.544)	2.977 (1.536)	2.999 (1.540)
Market / Book	1.495** (2.562)	1.282* (1.746)	0.180 (0.393)	0.180 (0.301)	0.171 (0.285)	0.192 (0.319)	1.589** (2.326)	1.390* (1.769)	0.192 (0.385)	0.189 (0.315)	0.177 (0.293)	0.202 (0.333)
Portfolio Size Per Manager	0.123 (1.399)	0.129 (1.528)	-0.0391 (-0.983)				0.137 (1.372)	0.143 (1.651)	-0.0608** (-2.634)			
Sum of veto and control rights	-0.969 (-1.355)	-0.895 (-1.225)	-0.243 (-0.902)	-0.252 (-1.015)	-0.155 (-0.573)	-0.318 (-1.287)	-1.017 (-1.449)	-0.927 (-1.272)	-0.248 (-0.885)	-0.257 (-1.029)	-0.145 (-0.531)	-0.327 (-1.314)
Ln Employees Investee Firm							-0.226 (-0.186)	-0.796 (-0.859)	0.617 (0.652)	0.383 (0.542)	0.357 (0.502)	0.403 (0.565)
Fund Age			-0.0726* (-1.798)						-0.102** (-2.116)			
Fund dummies	YES	YES	NO	NO	NO	NO	YES	YES	NO	NO	NO	NO
Year dummies	YES	YES	NO	NO	NO	NO	YES	YES	NO	NO	NO	NO
Clustering by Fund and Year	YES	YES	YES	NO	NO	NO	YES	YES	YES	NO	NO	NO
Constant	-111.4*** (-4.082)	-105.8*** (-3.780)	-4.967 (-1.124)	-5.252 (-0.875)	-13.58 (-1.265)	-0.0484 (-0.00929)	-117.6*** (-4.804)	-108.8*** (-4.156)	-8.261 (-1.034)	-7.507 (-1.074)	-16.94 (-1.517)	-2.094 (-0.329)
Observations	178	175	178	178	178	178	177	174	177	177	177	177
R-squared	0.300	0.290	0.112	0.0724	0.0616	0.0569	0.316	0.299	0.117	0.112	0.104	0.096

**Table A4. Treatment Effect Models for the decision of implementing an Internal DD (second-stage estimates)**

This Table shows the estimates from a treatment model, with the first stage (not reported) modeling the probability of having an internal DD as a function of the kilometeric distance between the target and the fund, the portfolio size, and fund characteristics, and the second stage (reported) determining the factors that affect the performance of investee firms, given the results in the first stage. T-statistics in parentheses. \*, \*\*, \*\*\* Significant at the 10%, 5%, and 1% levels, respectively.

Treatment Effect Models	Second-Stage Treatment Effect Models											
	(1) ROA 3Y Diff.		(2) ROA 2Y Diff.		(3) ROA 1Y Diff.		(4) Ebitda/Sales 3Y Diff.		(5) Ebitda/Sales 2Y Diff.		(6) Ebitda/Sales 1Y Diff.	
<i>Second-stage estimates</i>	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
<b>Ln Number of Weeks Due Diligence (Fitted, Table 4, Model 1)</b>	5.621	2.37**	4.837	2.75**	3.100	2.30**	6.120	2.92**	4.323	2.90**	2.400	2.30**
<u>MSCI total return</u>	4.182	1.20	2.005	0.77	1.301	0.65	4.819	1.57	1.811	0.83	-0.0426	-0.03
<u>Dark</u>	2.309	0.76	1.526	0.68	2.395	1.39	-2.536	-0.93	-2.866	-1.47	-1.008	-0.74
<u>Hope</u>	0.625	-0.24	-1.216	-0.63	0.848	0.57	-3.432	-1.50	-2.512	-1.54	1.590	1.39
<u>Buyout</u>	1.614	0.76	1.955	1.24	1.396	1.15	2.545	1.36	1.568	1.18	0.776	0.83
Market / Book	-0.279	-0.42	-0.155	-0.32	-0.187	-0.50	0.1624	0.28	0.0410	0.10	-0.010	-0.03
<u>Fund Age</u>	0.029	-0.24	-0.015	-0.17	-0.103	-1.52	-0.064	-0.61	-0.0218	-0.29	0.009	0.17
<u>Portfolio Size</u>	0.048	0.25	0.039	0.27	0.040	0.37	-0.028	-0.16	0.0153	0.12	0.069	0.80
<u>Distance Km</u>	0.003	0.78	0.001	0.57	0.001	0.63	0.0032	1.07	0.0041	1.97**	0.003	1.92**
<u>Internal DD</u>	1.280	0.37	-1.015	-0.40	-0.106	-0.06	0.533	0.15	-0.6443	-0.24	0.776	0.45
<u>Constant</u>	-11.849	-2.04	-10.297	-2.39**	-6.228	-1.89*	-10.111	-1.98	-7.245	-1.99	-5.663	-2.22
Number of Observations	178		178		178		178		178		178	

**Table A5. Propensity Score Matching for long DD versus shorter DD**

This Table shows results of Propensity Score Matching models for long DD (grater than 10 weeks) versus shorter DD. Models 1-2 and 5 consider the following observable matching information: MSCI return over horizon, Dark, Hope, buyout dummy, Market / Book, fund age, distance in km between target and fund, lead investor dummy; Models 3-4 and 6 consider the following observable information: MSCI return over horizon, Dark, Hope, buyout dummy, Market / Book. Model 6 considers the following observable information: MSCI return over horizon, and Market / Book.

<b>Long vs. short DD</b>		<b>Impact on Firm Performance using Propensity Score Matching Model</b>					
<b>Average Treatment Effect (ATE)</b>		(1)	(2)	(3)	(4)	(5)	(6)
		<b>ROA 3Y difference</b>	<b>ROA 2Y difference</b>	<b>ROA 3Y difference</b>	<b>ROA 2Y difference</b>	<b>ROA 1Y difference</b>	<b>EBITDA/SALES 3Y difference</b>
<b>Long DD (ATE)</b>	4.370**	4.970***	4.406*	3.134*	4.624***	5.197*	
	(2.75)	(3.49)	(1.93)	(1.88)	(4.57)	(1.65)	
<b>Number of Observations</b>	178	178	178	178	178	178	

**Table A6. Impact of DD Duration on Other Performance Measures and Other Performance Timing**

This Table presents second-stage estimates of the impact of DD duration on other performance measures. Panel A shows the impact on IPO exit outcomes (Models 1-3), as well as the impact on three-year ROE differences (Model 4 is similar to the specification presented in Model 5 of Table 5; Models 5-6 are similar to the specification presented in Model 6, Table 5). Panel B shows the impact on ROA, ROE and EBITDA/SALES recorded at the time of exit. Variables are defined in Table 1. T-statistics in parentheses. \*, \*\*, \*\*\* Significant at the 10%, 5%, and 1% levels, respectively.

Table 11 - Panel A : IPO and ROE		Second-Stage Estimates											
Second-Stage Estimates		Impact of DD duration on IPO exit outcomes						Impact of DD duration on ROE 3Y difference					
Second-Stage Estimates		(1) logit		(2) logit		(3) Heckman Probit Selection		(4) Double clustering by fund and year, No Year and Fund Dummies		(5) No double clustering, no year and fund dummies		(6) No double clustering, no year and fund dummies	
Second-Stage Estimates		Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic
<b>Ln Number of Weeks Due Diligence (Fitted, Table 4, Model 2)</b>		7.013	2.08**	6.970	2.06 **	2.440	1.71 *	25.429	2.52**	23.692	2.57**	25.429	2.66**
<u>MSCI total return</u>		2.165	1.87*	2.082	1.79	1.091	1.70*	-8037	-0.22	-0.196	-0.03	-0.804	-0.11
<u>Dark</u>		3.575	2.43**	3.412	2.27*	1.192	1.00	7.5268	1.99*	7.374	1.13	7.527	1.14
<u>Hope</u>		-0.391	-0.43	-0.4126	-0.45	-0.408	-0.72	2.458	0.72	2.785	0.53	2.458	0.46
<u>Buyout</u>		0.9283	1.05	0.8739	0.98			1.273	0.55	1.213	0.28	1.273	0.29
<u>Market / Book</u>		0.093	0.63	0.090	0.60	0.033	0.38	-0.800	-	-0.832	-0.62	-0.800	-0.59
<u>Portfolio Size</u>		-0.573	-0.64	-0.645	-0.68	-0.474	-0.92	0.231	0.86			0.230	0.60
<u>N. of funds</u>		-1.035	-1.88*	-0.965	-1.69*	-0.308	-1.30						
<u>Fund Age</u>				-0.047	-0.40	-0.030	-0.46	-0.099	-0.73			-0.099	-0.40
<u>Fund Dummies</u>		NO		NO		NO		YES		NO		NO	
<u>Year Dummies</u>		NO		NO		NO		NO		NO		NO	
<u>Double Clustering by Fund and Year</u>		NO		NO		NO		NO		NO		NO	
<u>N. of syndicated investor</u>						0.045	0.33						
<u>Constant</u>		-15.197	-2.23 **	-14.834	-2.17**	-5.081	-1.69	-51.233	-2.49**	-47.785	-2.44**	-51.233	-2.52 **
Number of Observations		150		150		157		178		178		178	
R-squared		1.1668		0.1692				0.0458		0.0428		0.0458	

Table A6 - Panel B: Performance at Time of Exit		Impact on Firm Performance , measured at time or exit - Second-Stage Estimates							
Second-Stage Estimates	(7) Impact on ROA recorded at the time of exit (double clustering by fund and year, no Year and Fund Dummies)		(8) Impact on ROA at the time of exit, with control for sample selection biases for the decision of exit (using the “treatreg” command in Stata)		(9) Impact on EBITDA/SALES recorded at the time of exit (OLS, Clustered SE by Fund)		(.10) Impact on EBITDA/SALES recorded at the time of exit with control for sample selection biases for the decision of exit (using the “treatreg” command in Stata)		
	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic	Coefficient	t-Statistic	
Ln Number of Weeks Due Diligence (Fitted, Table 4, Model 1)					4.292666	2.55**	3.011046	1.69*	
Ln Number of Weeks Due Diligence (Fitted, Table 4, Model 2)	5.403774	4.38***	5.393153	2.51**					
<u>MSCI_total_return</u>	8.074677	2.23**	8.388335	2.00**	6.37659	1.13	7.886671	2.81**	
<u>Dark</u>	1.706252	0.66	2.079738	0.79	-5.396404	-1.75*	-4.313342	-1.73*	
<u>Hope</u>	-1.633067	-1.63	-1.488414	-0.68	-6.626974	-2.04*	-6.086175	-2.97**	
<u>Buyout</u>	-.0344121	-0.02	.0052219	0.00	1.43396	0.93	.456812	0.28	
Market / Book	.2777362	2.21**	.2755038	0.78	.4608759	1.69	.4015963	0.79	
<u>Portfolio Size</u>	.0315435	0.27	.0337145	0.74					
<u>Fund Age</u>	-.1605734	-1.50	-.1709404	-1.83	-.1681064	-3.08**	-.1160093	-1.28	
<u>Financial_crisis_dummy</u>	7.256506	1.90*	7.445651	1.52	1.066826	0.37			
<u>Constant</u>	-5.982094	-3.81***	4.950598	0.48	7.432412	1.95*	9.750145	1.59	
Number of Observations		131		131		131		131	
R-squared		0.0675				0.1311			

\* p<0.1, \*\* p<0.05, \*\*\* p<0.01.

**Table A7. Robustness checks considering different type of instruments**

This Table reports second-stage estimates showing the impact of DD duration on firm performance by considering different instruments. Panel A considers the inclusion in the second stage of different types of fund characteristics (e.g., number of funds managed, number of portfolio firms). Panel B considers the impact on firm performance derived by the adoption of a new instrument (i.e., the kilometeric distance between the fund and the target company). Panel C considers the adoption of another alternative new instrument given by the time spent on performing the due diligence in other target firms belonging to the same industry and acquired in the same year. T-statistics in parentheses. \*, \*\*, \*\*\* Significant at the 10%, 5%, and 1% levels, respectively.

Second-Stage Estimates	IMPACT ON ROA 3Y DIFFERENCE					IMPACT ON EBITDA/SALES 3Y DIFFERENCE					
	(1) Double Clustering	(2) Double Clustering	(3) Double Clustering	(4) Double Clustering	(5) OLS	(6) OLS	(7) Double Clustering	(8) Double Clustering	(9) Double Clustering	(10) OLS	(11) OLS
<b>Ln Number of Weeks Due Diligence (Fitted, Table 4, Model 1)</b>	41.73**	42.34*	4.525**	5.967***	4.525*		72.77***	69.61***	70.76*		
<b>Ln Number of Weeks Due Diligence (Fitted, Table 4, Model 2)</b>	(2.028)	(1.987)	(2.599)	(4.542)	(1.699)	15.85***	(3.213)	(3.025)	(1.931)	24.76***	15.15***
MSCI_total_return	2.331 (0.542)	2.157 (0.501)	4.103 (1.538)	4.514 (1.471)	4.103 (1.145)	3.679 (1.030)	1.161 (0.413)	1.208 (0.477)	1.194 (0.481)	4.456 (1.404)	4.842 (1.530)
Dark	-3.107 (-0.452)	-1.728 (-0.291)	2.439 (1.437)	2.814** (2.281)	2.439 (0.802)	5.991* (1.762)	7.562 (0.924)	-4.188 (-0.924)	-4.193 (-0.928)	1.832 (0.534)	0.0724 (0.0240)
Hope	-8.913** (-2.416)	-8.911** (-2.372)	-0.550 (-0.276)	-0.577 (-0.236)	-0.550 (-0.206)	-0.00216 (-0.000817)	-4.999 (-1.313)	-15.88*** (-2.907)	-16.49** (-2.200)	-3.734 (-1.590)	-3.201 (-1.365)
Buyout	5.083 (1.422)	5.279 (1.309)	1.090 (0.699)	0.829 (0.490)	1.090 (0.474)	1.002 (0.438)	14.34** (2.514)	12.89** (2.013)	13.19 (1.470)	5.509** (2.412)	2.465 (1.216)
Market / Book	0.831 (1.159)	0.833 (1.063)	-0.316 (-0.914)	-0.126 (-0.824)	-0.316 (-0.463)	-0.0645 (-0.0949)	1.896** (2.058)	1.676 (1.610)	1.692 (1.476)	0.366 (0.604)	0.364 (0.605)
Preplanned IPO	-1.068 (-0.656)			-1.906 (-1.108)		-4.238 (-1.602)			0.218 (0.155)		-5.343** (-2.280)
Preplanned Acquisition	-0.290 (-0.126)			2.190 (0.710)		1.553 (0.654)			-0.293 (-0.0772)		0.596 (0.283)
Fund Age	-2.733** (-2.634)	-2.775*** (-3.026)	-0.0530 (-0.765)	-0.0555 (-0.870)	-0.0530 (-0.426)	-0.0887 (-0.721)	-3.371 (-1.650)	-3.236 (-1.594)	-3.304 (-1.326)	-0.0458 (-0.417)	-0.126 (-1.157)
Portfolio Size	0.272 (1.344)	0.264 (1.643)	0.0209 (0.228)	0.0183 (0.215)	0.0209 (0.110)	0.0992 (0.110)	0.213 (1.271)	0.216 (1.336)	0.221 (0.836)	0.0639 (0.366)	0.0142 (0.0835)
N. of Funds		0.0148 (0.0154)	0.677 (1.241)		0.677 (0.799)		-2.787 (-1.408)	-2.582 (-1.237)		-2.769** (-2.058)	
Fund dummies	YES	YES	NO	NO	NO	NO	YES	YES	YES	NO	NO
Year dummies	YES	YES	NO	NO	NO	NO	YES	YES	YES	NO	NO
Clustering by Fund and Year	YES	YES	YES	YES	NO	NO	YES	YES	YES	NO	NO
Constant	-73.56* (-1.846)	-74.71* (-1.838)	-9.066*** (-3.204)	-11.13*** (-9.309)	-9.066 (-1.557)	-30.46*** (-2.766)	-132.7*** (-3.399)	-126.6*** (-3.176)	-131.3* (-1.930)	-43.39*** (-2.714)	-25.79*** (-2.643)
Observations	178	178	178	178	178	178	178	175	175	178	178
R-squared	0.271	0.270	0.050	0.058	0.050	0.073	0.313	0.303	0.303	0.116	0.128

PANEL B: Adoption of a new instrument given by the kilometric distance between funds and their target firms	IMPACT ON ROA 3Y DIFFERENCE				IMPACT ON EBITDA/SALES 3Y DIFFERENCE				
	<i>Second-Stage Estimates</i>	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Double Clustering	Double Clustering	OLS	OLS	Double Clustering	Double Clustering	Double Clustering	OLS
<b>Ln Number of Weeks Due Diligence (Fitted, Table 4, Model 1, with the adoption of the instrument “km distance” instead of “same region”)</b>		4.748***	5.873***			38.41***	46.41**	5.740*	
		(3.817)	(4.510)			(3.651)	(2.051)	(1.843)	
<b>Ln Number of Weeks Due Diligence (Fitted, Table 4, Model 2, with the adoption of the instrument “km distance” instead of “same region”)</b>				10.91**	15.94***				9.461**
				(2.374)	(2.938)				(2.304)
MSCI_total_return		4.203	4.566	3.873	3.657	2.171	1.945	5.258***	5.036
		(1.439)	(1.475)	(1.098)	(1.024)	(0.655)	(0.665)	(5.251)	(1.599)
Dark		2.770**	2.788**	4.417	6.018*	5.305	2.570	-3.115	-1.557
		(2.405)	(2.235)	(1.363)	(1.770)		(0.674)	(-1.634)	(-0.538)
Hope		-0.365	-0.597	-0.262	0.00757	0.357	-3.464	-3.876***	-3.594
		(-0.156)	(-0.244)	(-0.0995)	(0.00286)	(0.114)	(-1.111)	(-3.057)	(-1.528)
Buyout		-0.00129	0.826	1.687	1.004	8.607**	8.962	2.897	2.745
		(-0.000829)	(0.494)	(0.791)	(0.439)	(2.045)	(1.387)	(1.650)	(1.441)
Market / Book		-0.182***	-0.127	-0.276	-0.0638	0.930	1.324	0.155	0.152
		(-2.711)	(-0.843)	(-0.409)	(-0.0939)	(1.536)	(1.365)		(0.252)
Preplanned IPO		-1.916	-1.887		-4.258		-0.798		
		(-1.158)	(-1.114)		(-1.610)		(-0.529)		
Preplanned Acquisition		2.438	2.194		1.548		1.611		
		(0.775)	(0.710)		(0.652)		(0.575)		
Fund Age		-0.0767	-0.0550		-0.0891		-2.110	-0.0750*	
		(-1.125)	(-0.861)		(-0.724)		(-1.108)	(-1.800)	
Portfolio Size		0.0245	0.0175		0.1000	0.0225	0.0854	(0.329)	
		(0.301)	(0.204)		(0.522)	(0.283)	(0.572)	-0.0543*	
N. of Funds		0.831*					-2.059		
		(1.830)					(-1.134)		
Fund dummies		NO	NO	NO	NO	YES	YES	NO	NO
Year dummies		NO	NO	NO	NO	YES	YES	NO	NO
Clustering by Fund and Year		YES	YES	NO	NO	YES	YES	YES	NO
Constant		-9.723	-10.94***	-21.40**	-30.63***	-78.22***	-83.79**	-8.008	-16.08*
			(-8.807)	(-2.195)	(-2.779)	(-3.766)	(-2.051)	(-1.313)	(-1.847)
Observations		178	178	178	178	178	178	178	178
R-squared		0.063	0.058	0.048	0.073	0.269	0.285	0.105	0.091

PANEL C: Adoption of a new instrument in given by the time spent on DD in other firms in the same industry and same year	IMPACT ON ROA 3Y DIFFERENCE				IMPACT ON EBITDA/SALES 3Y DIFFERENCE	
	<i>Second-Stage Estimates</i>	(1) Double Clustering	(2) Double Clustering	(3) OLS	(4) NO	(5) Double Clustering
<b>Ln Number of Weeks Due Diligence (Fitted, Table 4, Model 1, with the adoption of a new instrument "Other DD")</b>	4.601***	3.537**			5.285*	
	(2.740)	(2.064)			(1.685)	
<b>Ln Number of Weeks Due Diligence (Fitted, Table 4, Model 2 with the adoption of a new instrument "Other DD")</b>			7.294*	9.348**		6.169*
			(1.968)	(2.268)		(1.864)
MSCI_total_return	4.577	4.211	4.676	4.719	5.679***	5.740*
	(1.547)	(1.533)	(1.330)	(1.317)	(4.318)	(1.828)
Dark	2.207	2.185	3.262	3.949	-2.911	-2.609
	(1.210)	(1.217)	(1.041)	(1.218)	(-1.543)	(-0.932)
Hope	-0.805	-0.581	-0.662	-0.545	-3.956***	-3.948*
	(-0.359)	(-0.285)	(-0.251)	(-0.205)	(-3.025)	(-1.678)
Buyout	1.681	0.959	1.634	0.871	2.695	2.698
	(1.038)	(0.600)	(0.762)	(0.377)	(1.536)	(1.409)
Market / Book	-0.265	-0.327	-0.276	-0.111	0.156	0.152
	(-0.739)	(-0.970)	(-0.408)	(-0.162)	(0.323)	(0.251)
Preplanned IPO				-2.739		
				(-1.079)		
Preplanned Acquisition				1.950		
				(0.816)		
Fund Age	-0.0337	-0.0539		-0.0646		
	(-0.477)	(-0.752)		(-0.523)		
Portfolio Size	0.00785	0.0146		0.0459		
	(0.0806)	(0.154)		(0.240)		
N. of Funds		0.812				
		(1.594)				
Fund dummies	NO	NO	NO	NO	NO	NO
Year dummies	NO	NO	NO	NO	NO	NO
Clustering by Fund and Year	YES	YES	NO	NO	YES	YES
Constant	-8.372***	-7.207**	-13.96*	-17.64**	-7.553	-9.317
	(-2.892)	(-2.532)	(-1.746)	(-2.059)	(-1.210)	(-1.305)
Observations	178	178	178	178	178	178
R-squared	0.039	0.044	0.038	0.055	0.097	0.081

## References for the Online Appendices

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