Determining the Characteristics of the Private Equity Targets: UK Evidence

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Academic research on private equity (PE) has been concerned with the management of PE funds, the returns to investors from investments in PE relative to the returns available in public equity markets and, more predominantly, the analysis of the post-investment performance of PE portfolio firms. There has been less research on how PE firms select their investments and the characteristics of their targeted firms. We derive hypotheses, from an agency perspective, on the firm-level characteristics of PE-targeted firms. Utilizing data on the population of private companies in the UK, we identify those firms that have received PE investment from the pool of potential investees within the population of private companies and known buyouts, and examine their pre-investment characteristics. Using panel logit regression, we estimate multivariate models determining the probability of PE acquisition and examine the multivariate profiles of targeted firms in relation to our hypotheses on PE selection.

Introduction

Private equity (PE) has been a major player in the provision of growth finance for restructuring in the UK over a long period (Toms, Wilson and Wright, 2015; Wright *et al.*, 2000a). PE investment and later-stage venture capital play an important role in enhancing performance, stimulating and sustaining the growth and employment creation of their targeted companies (Gilligan and Wright, 2014). PE investors typically invest in mature companies (growth finance) or acquire established companies (buyouts) to implement value-creation strategies that realize efficiency improvements and exploit entrepreneurial growth opportunities. PE investors may provide growth finance in exchange for a minority stake in the company, whilst buyouts involve a change in company ownership through the PE investor taking a *majority stake* and *managerial control*. In the UK, the vast majority of PE investments involve the acquisition of *private companies* via buyout mechanisms. Buyouts by PE firms have attracted much attention among researchers and policymakers (Block *et al.*, 2019; Castellaneta and Gottschalg, 2016; Kaul, Nary and Singh, 2018). However, existing research has paid little attention to the characteristics of the targets that PE firms pursue, within the pool of potential targets, and has instead focused predominantly on the post-investment performance consequences of PE-backed buyouts (Kaul, Nary and Singh, 2018).

In terms of PE-targeted companies, there are both demand and supply factors. On the *supply side* of potential investees, opportunities arise from the divestment of the subsidiaries of larger enterprises; the exit of current owners of owner-managed or family businesses; and from companies in financial distress. From examination of data on all PE-backed buyout deals in the UK, we have a broad profile of the characteristics of the 'supply pool' (i.e. the range of company types, ownership structures, size, age and sectors) that have historically attracted PE investments throughout the period under study. These characteristics can be used to screen the population of private companies

for all the potential investees that PE investors are likely to select from. On the *demand side*, PE investors seek targets that have potential for performance improvement. We focus on the demand side, that is, the characteristics that PE investors choose to invest in from the wide pool of potential investees in the private company population.

In this paper, we aim to identify, empirically, the distinct characteristics of PE-backed firms and specifically, identify the characteristics of the targeted firms in the UK within the population of companies that fit this broad profile of potential investees. Using multivariate logistic panel regression on the pool of UK companies from 1995 to 2013, we find that PE funds target established companies in terms of age and size, and companies which are more likely to have a higher proportion of tangible assets. The targeted companies are in stable industry sectors with a lower-than-average failure rate and are less likely to be diversified (single product). Amongst the riskier sectors, PE investors have a preference for advanced manufacturing technologies and the high-technology end of the services sector. The firms that PE investors target are generally cash generative, profitable and have high interest coverage ratios on existing debt. The targeted firms are likely to have raised finance by borrowing, as evidenced by charges on assets. These firms have lower levels of equity and lower-than-average productivity, thus providing opportunities for investors to realize performance improvement, and growth, post-investment.

The existing evidence suggests an 'entrepreneurial role' for buyouts (Berg and Gottschalg, 2005; Wright *et al.*, 2000b). We therefore contribute to the entrepreneurial finance literature in several ways. First, our research advances the existing understanding of PE buyouts (e.g. Block *et al.*, 2019; Gompers, Kaplan and Mukharlyamov, 2016; Kaul, Nary and Singh, 2018) by identifying the 'pre-investment' characteristics of companies that PE investors deem investable in the UK. This is particularly important given the recognized gap in the literature, as little is known about the investment criteria of PE firms (Block *et al.*, 2019; Kaul, Nary and Singh, 2018). Second, we believe, it is the first study that empirically analyses the firm-specific characteristics of the PE-targeted firms using data up to a 3-year period before the company received the funding. It therefore adds to the limited literature on PE investor preferences in portfolio firm

selection. In this study, multivariate models are estimated that explain the probability that a company will obtain PE funding using a wide range of firms' characteristics. Third, our last contribution relates to our unique database, which allows us to contribute to the field by investigating the entire corporate population of the private companies in the UK that can *potentially* become targets of the PE firms and profiling the target selection within this subpopulation.

The remainder of the paper proceeds as follows. The next section provides a background to the PE literature in the context of equity finance provision. The third section develops hypotheses related to target company selection. The fourth section presents the research design, including data, sample, methodology and descriptive statistics. The fifth section presents the results and the sixth section concludes.

Private equity portfolio companies: Background and literature

A number of academic studies in the UK and elsewhere have analysed the types of companies that attract PE investment and the outcomes of PE investment and governance, post-investment (see Gilligan and Wright, 2014). PE investors are specialized and sophisticated investors that undertake extensive and costly selection and screening processes of the investment strengths and risks in order to identify the 'right' targets with specific characteristics (Dawson, 2011; Gompers, Kaplan and Mukharlyamov, 2016; Kaplan and Stromberg, 2004) from within the corporate population.

Existing studies have focused on the post-investment period and provide mixed findings on the effect of PE investment on targeted firms (Cumming, Peter and Tarsalewska, 2020). Several studies suggest that PE investors add value to the targeted companies by improving operating performance (Cohn, Mills and Towery, 2014; Cumming, Siegel and Wright, 2007; Kaplan and Stromberg, 2009), increasing productivity (Davis *et al.*, 2014; Harris, Siegel and Wright, 2005), increasing innovation (Rubera and Tellis, 2014) and improving monitoring and incentives (Guo, Hotchkiss and Song, 2011). Bernstein, Lerner and Mezzanottie (2019) and Kaplan and Strömberg (2009) show that PE-backed firms exhibit post-investment performance improvement

and are more resilient through recession, in line with Wilson *et al.* (2012). However, there exist a number of studies that have cast doubt on the improvements of performance, productivity and innovation after PE investment (see e.g. Ayash and Schütt, 2016; Bharath, Dittmar and Sivadasan, 2014; Cumming, Peter and Tarsalewska, 2020).

Regardless of what the real outcome of buyout transactions are, little is known about the investment criteria used by PE firms in order to select their buyout targets (Block *et al.*, 2019; Kaul, Nary and Singh, 2018). There are limited papers that provide empirical evidence on PE investment criteria. These studies focus on surveying PE firms and asking their fund managers about their investing practices. For example, Gompers, Kaplan and Mukharlyamov (2016) survey 79 PE investors and find that PE investors choose their targets by relying on projected internal rates of return and multiples of invested capital rather than discounted cash flow (DCF) or net present value (NPV) techniques. They suggest that this could be due to practical deficiency in using DCF and/or NPV in a PE setting in which the investment horizon is limited and there is considerable information asymmetry between general and limited partners. Moreover, Block *et al.* (2019) conduct an experimental analysis by screening 19,474 decisions made by 749 PE investors, where participants of the study were required to evaluate several hypothetical portfolio companies and decide in which companies they were more likely to invest. They find that the most important investment criteria for PE investors are potential revenue growth, value added of product/service, the management team's track record and profitability. Furthermore, Kaul, Nary and Singh (2018) study the buyouts of businesses divested from larger firms using a sample of 1,711 divestments by publicly listed US manufacturing sector companies. They find that PE firms are more likely to acquire noncore businesses, businesses whose rivals spend more on R&D than their parents and businesses whose parents offer weak long-term incentives to their top executives.

Tykvova and Borell (2012), in a comprehensive study of European-based firms, suggest that the syndication pattern and investor experience determine the choice of buyout targets. They argue that syndicates are 'better able to manage high risks arising from investments in highly financially constrained companies than stand-alone investors' (p. 5). This is because syndicates of investors are better informed (have wider networks) and have a synergistic combination of skills to bring to the target firm. This leads to better target selection, effective monitoring of the investee and high-quality support for the company during the investment stages. All these factors, they suggest, reduce the risk of distress and bankruptcy.

Given the above discussions, it is apparent that there exists very limited evidence on the characteristics of targeted firms actually chosen by PE investors. In this study we try to fill this gap by carefully investigating the detailed firm-level characteristics of the PE-invested firms pre-investment from the pool of limited companies in the UK.

Private equity targets: Agency perspective and the development of hypotheses

The agency theory perspective has been applied usefully to explain how the PE firm's active role as an investor (owner) drives performance changes in their acquired firms (buyouts). The PE firm is seen as a *principal* in its governance relationship with the investee (Acharya *et al.*, 2013; Kaplan and Schoar, 2005; Manigart and Wright, 2013). The PE firm acts on behalf of shareholders to discipline (through leverage) and incentivize (through targets and share ownership) the buyouts' management team (agents). This theoretical lens can be extended to help us understand the PE firm's selection of target companies. Specifically, Meuleman *et al.* (2020) suggest that PE firms have a *role as agent* to their limited partners and to the banks that provide debt financing. PE therefore has a 'dual identity' (Arcot *et al.*, 2015; Pratt and Foreman, 2000), acting both as *principal* and *agent* in a buyout transaction. We argue that this dual role should influence both the criteria and the benchmarks used in the PE firms' non-random selection of target firms.

The PE model involves a PE firm raising capital from limited partners such as private individuals and a number of institutional investors to invest, on behalf of the providers, in a portfolio of target buyouts of privately owned companies. The goal is to create value for investors on exit. The PE firms do not have permanent funds, each investment fund has a predicted lifetime and therefore PEs have to raise and invest new funds periodically. Generally, every 4 or 5 years the PE

firm will go back out into the fundraising market and raise new capital to invest (Metrick and Ya-suda, 2010; Sahlman, 1990). PE firms are often active in raising new funds from their investors before the investment period of existing investment funds has expired (Meuleman *et al.*, 2020). Potential investors (*principals*) will scrutinize the performance of existing PE investments and the cash returned to investors when making their decision to provide follow-on funds (Cumming and Walz, 2010). Obviously, the PE firm needs to demonstrate a successful track record in order to build reputation with investors and be successful in raising follow-on funds (Chung *et al.*, 2012; Kaplan and Schoar, 2005; Kuckertz *et al.*, 2015).

The PE firms negotiate constantly with banks to raise debt finance for their acquisitions and essentially act as an agent for the banks (Meuleman *et al.*, 2020), with whom they often have long-standing relationships. Banks that provide loan finance will monitor incidences of loan default and financial distress amongst the portfolio of PE investments in their relationship with the PE firm (Citron, Robbie and Wright, 1997; Fang, Ivashina and Lerner, 2013). Establishing reputation and track record is important in reducing information asymmetries for prospective investors (Balboa and Marti, 2007). The PE firm's relationship, *as an agent*, with limited partner (LP) investors and debt financiers is therefore crucial for its own survival and growth. Consequently, in selecting target companies for each of the invested funds, the PE firms will balance the needs of the LP investors and the bank's lending criteria within each stakeholder's time horizon. The PE firm plays an important role in reducing potential agency problems between equity and debt investors (Meuleman *et al.*, 2020).

The time horizons of stakeholders place some pressure on the PE firm to find and select target companies that meet certain criteria with a view to creating exit returns (Ahlers *et al.*, 2016). The providers of the PE funds (*principals*) expect to see the monies invested within a certain time period and are seeking a return within an agreed period as the PE investors exit (Vanacker *et al.*, 2020). Having raised funds, the PE investor has a limited time to create the portfolio of investments in the selected target firm(s) and therefore to identify, evaluate, screen and undertake due diligence processes on potential investment opportunities (Dimov and Gedajlovic, 2010). Regarding timing, PE firms deploy the raised capital in the first 3 to 5 years (Kaplan and Schoar, 2005; Metrick and Yasuda, 2010). Typically, 'the (PE) funds are usually at least 10 year commitments', but it could be shorter or take longer depending on the strategic and economic circumstances (Gilligan, 2019, p. 32.). The lifespan of the PE fund is typically 10–12 years (Kaplan and Schoar, 2005; Meuleman *et al.*, 2020).

Altogether, PE firms are often believed to be transitory organizations and hence they aim to ensure they can service their debt obligations in a timely fashion (Kaplan, 1991; Rappaport, 1990) and offer the required return to their fund providers (Vanacker *et al.*, 2020). In this regard, PE firms try to reduce potential agency problems between equity and debt investors by balancing the needs of the LP investors and the bank's lending criteria within each stakeholder's time horizon (Meuleman *et al.*, 2020). In what follows we argue that PE firms deliberately target portfolio firms with a specific financial and performance background.

Private equity choice of targets: Hypotheses

PE investors' experience gives them superior selection and value-adding abilities through better monitoring and encouragement of entrepreneurial activities compared to other private investors (Acharya *et al.*, 2013; Amess, Stiebale and Wright, 2015; Bruining, Wervaal and Wright, 2013; Cumming and Zambelli, 2012; Tykvova and Borell, 2012). PE investors seek targets in sectors (Cressy, Malipiero and Munari, 2007) and with financial characteristics (Wilson and Wright, 2013) that have potential for performance improvement (Dawson, 2011) and, as discussed before, are able to service the debt and equity structures associated with such investment. Therefore, in our first hypothesis we aim to empirically test whether firms with specific historical or recent performance are better targets for PE investors. We conjecture that in order to generate an upside, the PE firm will target buyout acquisitions that are *underperforming relative to their peers* within their industry sector and size bands. However, although underperforming (relatively), the target firm will have the potential to generate cash and profit and show some historical stability in these metrics. Firms that are profitable and cash-generative may lack incentive, particularly in markets where competition is not intense, to control costs and innovate

in processes and products (i.e. have x-inefficiencies; Leibenstein, 1966). Thus, we further propose that, in appraising the target firms, the PE firm will look to understand the contributory factors underlying the relative underperformance. This may be related to operational issues arising from poor or low-calibre management (Balgobin and Pandit, 2001; Bruining, 2019), such as poor cash-flow management, poor stock control, poor customer service and failure to exploit new markets or due to longer-term structural problems and production inefficiencies (Campello, 2003; Gimeno *et al.*, 1997) arising from a lack of capital investment, cost control or failure to embrace new technology. Examples include family firms that have succession (management) problems and/or have been reluctant to raise equity finance for needed capital investment; subsidiaries that no longer fit with the parent company's strategy and have been neglected in terms of new investment and process change (*under-investment*). Such firms have long-term survival and low failure risk (Bertrand and Schoar, 2006; Bradley *et al.*, 2011) but can underperform relative to industry benchmarks. We therefore propose that the PE firm will, after acquisition, be able to implement a strategy of process improvement, management change and capital investment to generate growth and returns for the LP investors. Therefore, H1 is as follows:

H1:   Private equity targets are more likely to have a record of profit and cash generation but are underperforming relative to peer benchmarks.

As discussed earlier, the PE buyout activities are usually financed with additional bank debt (see e.g. Fang, Ivashina and Lerner, 2013; Ivashina and Kovner, 2011; Meuleman *et al.*, 2020). Leverage or debt is a PE strategy (as *principal*) used to discipline or incentivize the target firm's management team but as an *agent* for the bank, the PE firm will seek targets that have sufficient interest coverage to service this debt. This is because, if a bank makes significant losses as a result of investing in a distressed buyout, it will then be unwilling to provide future debt finance to the associated PE firm (Hotchkiss, Strömberg and Smith, 2014). The bank will appraise the creditworthiness of the acquisition target and may seek collateral and/or covenants on the loans (Citron, Robbie and Wright, 1997; Demiroglu and James, 2010; Fang, Ivashina and Lerner, 2013; Wright, Gilligan and

Amess, 2009). Indeed, PE firms, as active investors, will negotiate loan deals on behalf of many of their portfolio firms, have a closer relationship with the providing banks and perhaps more bargaining power to secure finance than an individual firm seeking a loan would have (Ivashina and Kovner, 2011). Nonetheless, we conjecture that the PE firm will seek targets that have a strong base of (*tangible*) *assets* and *stability in cash flow*, reducing default and ensuring provision of future loans on favourable terms. We further expect that targeted firms are more likely to be in stable industry sectors with relatively uncomplicated asset bases and product lines, such that risk assessment is relatively straightforward for the providing bank. As cash flow stability is a necessity to meet regular monthly interest payments (Larkin, 2013), and given PE firms' role as agent to reduce the target's default risk, we hypothesize that PE investors are more likely to invest in companies that have assets (collateral) for raising debt and the ability to generate cash and profit to cover interest payments. Given that banks desire to identify the existence of sufficient value in the target's assets to provide security for the debt finance (Wright and Robbie, 1998), we argue that PE investors select targets that are less likely to enter distress and end up in bankruptcy (i.e. have a low downside and therefore are attractive for debt providers). H2 is as follows:

H2:   Private equity targets are more likely to have a low failure risk, strong base of tangible assets (collateral) and exhibit stability in the ability to generate cash.

A number of studies point to the positive impact of specialized and experienced PE investors in turning around the performance of buyout targets (Acharya *et al.*, 2013; Meuleman *et al.*, 2020). This positive impact necessitates close monitoring and active involvement in the acquired company's operations through regular visits and/or board-level participation. However, as discussed earlier, the existing evidence provides conflicting results on the effect of the PE buyouts on productivity improvement of the target firms (Cumming, Peter and Tarsalewska, 2020). Several studies argue that target firms' productivity improves as a result of monitoring by PE investors and discipline imposed by debt providers (Ahlers *et al.*, 2017; Amess, Stiebale and Wright, 2015; Davis *et al.*, 2014), whereas several others find that PE targets are associated with lower post-investment productivity (Ayash

and Schütt, 2016; Goergen, O'Sullivan and Wood, 2014; Weir, Jones and Wright, 2015). Given the mixed findings on productivity improvement of the target firms, we investigate whether PE firms have specific preferences over choosing target firms with a relatively lower or higher-than-average productivity in their sector size range. Building on the arguments suggested by Kaplan (1991), as explained earlier, about the short-term vision of PE firms when it comes to investments and given the nature of PE funds to 'buy–improve–sell' the firms they acquire (Ayash and Rastad, 2017), we argue that PE investors are under short-term performance pressure and hence choose targets with lower-than-average productivity, where an increase in productivity can be achieved post-investment via capital expenditure on process and products. The targeted firms may be in sectors that lack the competitive pressures that generate efficiency and innovation. We therefore hypothesize that target firms are likely to have lower-than-average productivity, thus providing opportunities for investors to realize performance improvement, and growth, post-investment.

H3: Private equity targets are more likely to have lower-than-average productivity, thus providing opportunities for investors to realize performance improvement.

In investing specific funds, the PE firm is seeking to establish a portfolio of acquisitions and, as an active investor, has a close involvement in both strategy development and implementation, and the day-to-day monitoring of management (see e.g. Bruining and Wright, 2002; Bruining, Bonnet and Wright, 2004; Wiersema and Liebeskind, 1995; Wright, Gilligan and Amess, 2009). In order to minimize portfolio risk and costs, the PE firm will seek to establish synergies between portfolio investments (Klier, Welge and Harrigan, 2009). In other words, PE firms develop specialisms in relation to industry sectors and/or firm types or lifecycle stages, and therefore *familiarity* motivates the choice of targets (see Sinyard, Dionne and Loch, 2020).

The investment appraisal process and due diligence undertaken prior to investment can be time-consuming and costly. In line with the previous hypotheses, we suggest that PE firms will target companies with defined markets and uncomplicated services and/or product lines, where ap-

praisal and opportunity of improvement are clear, as is the valuation of assets and the identification of collateral. We argue that these are firms that are less diversified and have tangible rather than intangible assets. Recent years have seen a growth in 'knowledge-intensive businesses', where assets are predominantly *intangible* in nature (knowledge, expertise, relationships). The time period under scrutiny witnesses a 'rise in the intangible economy' (Haskel and Westlake, 2018), and growth in these knowledge-intensive sectors where firms often employ what Hal Varian refers to as 'combinatorial innovations' (reported in McKinsey, 2019). The combinations of products, services and Internet components, where 'the component parts are all bits. That means you never run out of them. You can reproduce them, you can duplicate them, you can spread them around the world, and you can have thousands and tens of thousands of innovators combining or recombining the same component parts to create new innovation at the same time, in various locations' (Hal Varian, reported in McKinsey, 2019). These types of business may attract venture capital investment but, even at later stages, are less attractive for PE investors and bank lending due to the complexities of due diligence and valuation.

PE firms typically possess more financially oriented expertise and may be limited regarding the expertise required to assess and add value to firms in sectors with knowledge-based activities (Wright, Jackson and Frobisher, 2010). Moreover, informational asymmetry is more acute in the knowledge-intensive sector (Coff, 1999), and this relates to the longer development period required by knowledge-intensive firms in order to reach the point of generating stable revenues and accessing mainstream finance. For knowledge-intensive firms, revenue generation takes longer after product/service development, since customer bases are more complex, necessitating greater sunk cost investment and oftentimes repositioning of the business in the process of developing sales before cash flows are generated (Wilson, Wright and Kacer, 2018). The often 'relationship-specific investment' in the customer base required to make sales and retain customers can be very high and long-term (Dass, Kale and Nanda, 2015).

The valuation of such knowledge-intensive businesses by PE firms poses major challenges in a sector with a large number of new entrants and evolving complex and combinatorial technologies

(Manigart *et al*., 2000). Absent clear information about the acceptability of the product in the market or the size of the market, or where assets are intangible, classic valuation techniques are of little use (Manigart *et al*., 2000). Knowledge-based businesses generate cash flows from investments in intangibles rather than from physical assets and labour. Investment includes R&D, design, brand equity, software and human/organizational (relational) capital. This is both difficult to value and does not provide clear collateral (or liquidation value) for investors (Wilson, Wright and Kacer, 2018). The challenges are exacerbated in rapidly changing environments, such as Internet technology, apps, etc. that are likely to require significant injections of equity funding (Wilson, Wright and Kacer, 2018). The above evidence supports the notion that PE investors have and continue to target companies outside the knowledge-intensive sector. The exceptions will be ventures with identifiable and saleable assets, such as manufacturing technologies in knowledge-intensive sectors and services with well-established customer bases. Therefore, our last hypothesis is as follows:

H4: Private equity targets are likely to be companies with defined markets and uncomplicated service or product lines, and outside of the sectors where firms have largely intangible knowledge-based assets.

Research design

Data and sample

The data used in this study is derived from annual returns and accounts and document filings at Companies House. It covers the population of limited companies in the UK, including all exits via insolvency or dissolution and all new entrants. This data source includes financial statements, auditor information, industry sector, company age, director and shareholder information that is filed at least annually. The dataset was constructed from bulk supply of data from credit reference agencies (CRAs) (ICC Credit to 2010 and Creditsafe, 2011–2014).[1] The CRAs source their data from Companies House and pre-process

and check the data fields for the purpose of constructing and reporting financial ratios, risk scores and providing clients with credit reports and/or due diligence data. Data fields are analysed and checked against other proprietary data providers (e.g. FAME, Datastream, Companies House) if a mistake/anomaly is found in a particular variable.

We investigate PE investments involved in the acquisition of private companies via buyout mechanisms. Although PE investors do now provide firms with growth finance without taking a majority stake (acquisition), these cases are very few and more recent and are not included in the analysis. In this study, the PE buyout sample covers the period 1995–2013 and we have looked at the targeted firm characteristics up to 3 years before investment, which provides an 'averaged' profile of the characteristics of the PE targets prior to investment. The data is constructed into a firm-level panel with company registration number as the company identifier and accounting data arranged in date order of submitted accounts up to and including all filings to the end of March 2015 which, because of the lag in reporting (up to 10 months after year end) and late filing, captures all filed accounts with year ends in 2013. The panel database is unique in its coverage since CRAs did not historically retain data on dissolved companies or full company histories, given that they were geared to providing 'current' information to clients. The dataset has no issues in relation to either *selection bias* or *survival bias*, unlike other research datasets or commercially available credit reference data. Accounting data has limitations; in particular, small companies are required to file only abridged accounts inclusive of balance sheet data ('modified balance sheets'). Around 40% of companies file accounts inclusive of profit and loss (P&L) information. For the purposes of analysis,

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[1]One of the authors ran a university spin-out company (2001–2010) involved in corporate risk modelling, in association with ICC Credit, and developed the company panel database via bulk access to the processed Companies House filings. ICC operated a 'disaster recovery service' for Companies House and therefore retained all filed information. Companies now submit their financial statements, annual returns and other required filings electronically (since around 2005), but historically this data resided on paper and microfiche. Hence, CRAs had to extract the data manually and process it before storing it in databases and creating added-value services (e.g. credit reports, calculation of performance ratios, credit scores). Individual CRAs differentiate themselves by the added-value services they provide, but process data from the same source. The authors continue to update the data panel using bulk feeds from a CRA but no longer have access to CMBOR data.

Table 1. Company panel database and estimation sample

| | | Sub-Samples | | | | | | | |
| | | All Firms (1) | | Full Accounts (2) | | Large Firms (3) | | Full Reporting (4) | |
Year	Population	Non PE	PE targeted	Non PE	PE targeted	Non PE	PE targeted	Non PE	PE targeted
1995	278656	170006	377	28201	277	17367	258	14583	242
1996	357211	213500	571	39084	450	24794	428	19676	390
1997	478111	279461	786	53411	622	33039	590	25432	530
1998	543707	312482	695	57044	540	34803	515	26211	471
1999	595446	337954	504	62170	399	36589	379	26968	345
2000	628509	363503	383	62772	299	37336	279	27017	248
2001	713233	412282	340	74287	258	42555	246	30311	224
2002	783490	455434	367	85306	282	46135	263	32191	230
2003	850933	491344	397	85320	309	45081	297	30517	248
2004	958484	547697	489	84571	360	42808	336	27870	289
2005	1030105	583795	595	82196	433	42171	402	26358	344
2006	1066865	608852	623	82671	452	42104	421	25508	362
2007	1090087	632023	575	82321	407	41974	378	24536	324
2008	1148565	650318	521	79726	357	41939	328	24354	285
2009	1179173	656276	434	104858	326	55173	302	30859	256
2010	1200326	659588	405	134291	314	67737	291	35205	255
2011	1252436	680079	453	122651	361	65802	339	33614	284
2012	1320083	705831	369	115232	279	65010	259	32807	212
2013	1394439	735058	265	107176	202	63579	184	31639	147
	16869859	9495483	9149	1543288	6927	845996	6495	525656	5686

The table describes the number of companies that have submitted accounts in the period 1995-2013, the active company population and the firm-year observations of known PE target within the population (PE targets). The PE targets are identified within the population of limited companies that has been screened to only include active companies. Subsamples are based on company size and the extent of financial reporting.

we reduce the panel to include companies that have submitted at least one set of accounts with reported assets. This effectively removes non-trading companies from the analysis sample. Table 1 describes the data and subsamples used in the analysis. Table 1, column 1 describes the number of companies that have submitted accounts in the period 1995–2013. From this we select the 'active' company sample and the firm-year observations of known PE-targeted (and invested) firms within the company population in columns 2 and 3. As shown in Table 1, the core database has 16.8 million firm-year observations and 9.5 million 'active' companies. For the purpose of creating a relevant subset of companies that are relevant to PE investors, the estimation sample of active companies is formed by screening the private company population to exclude companies that would be outside the range of PE known targets and buyouts,[2] which could be deemed investable by PE.

To the company population database, we match information, via registration number, on UK management buyouts and buy-ins (henceforth buyouts) formed during the sample period, and identify those that involved PE in the transaction. The Centre for Management Buyout Research (CMBOR) provided individual company buyout data from the quarterly survey of UK buyout activity and PE investments. This gives 43,780 observations on PE buyouts, including the pre- and post-buyout periods. In addition, and for robustness checking, we create subsamples based on the level of financial reporting related to company size (Table 1). If we analyse the data using only abridged account data fields (sample 1),[3] we have a sample of 9.5m company years, with 9,149 observations of firms that are acquired by PE investors prior to the acquisition. The average size of firms in this sample is

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[2]We exclude firms with less than £50,000 of real assets and over £500m and include firms that have filed at least three sets of financial statements and annual returns and fit the

sector (4-digit SIC codes), age and assets size profile of all known buyouts during the time period.
[3]We only use the variables that are available in both sets of abridged and full accounts (i.e. 'abridged fields').

£3.7m, total assets. Using data of firms that submit full accounts (sample 2), where we have some P&L data we have 1.5m company-year observations with 6,927 PE-targeted firms. The average size of firms in this sample is £14m, total assets. In order to calculate measures of productivity, we select firms that report additional detail, including number of employees. This subsample (sample 3) includes over 845,000 company-year observations and 6,495 PE observations. The larger firms have a mean asset size of £18m. The final subsample (sample 4) includes over 500,000 observations of firms (5,686 PE observations), where we have more detailed data on debt and interest payments. The mean total assets for this sample is £23.5m. We estimate models for each of these subsamples. The data includes records of other management buyouts and management buy-ins that have not used PE finance within the panel during the time period.

The pre-buyout observations are detailed in Table 1. These observations are coded as PE-targeted firms. The goal is to identify the characteristics of these targeted and invested firms against the population of buyouts that do not receive PE investment and the other private companies selected from the population but within the parameters of all known PE deals. Thus, an important feature is that the PE investors could choose targets from any company type and sector within the population. Having established, in the hypotheses, that the choice of PE targets is not random, we seek to establish some distinct characteristics of PE targets within the relevant active company population and subpopulations.

The database includes data on financial performance and constructed financial ratios for each firm over the time period. The accounting data is processed to provide information on the liquidity, profitability, leverage, asset composition, growth and efficiency of firms. The financial structure, debt/equity can be identified for all firms. Firms that have obtained some loan finance may have a 'charge on assets' (i.e. creditors use fixed or floating asset charges as collateral on the loan; this is typical when the loan is deemed risky and/or the firm has intangible assets). We identify all firms that have a charge on assets as an indicator that they have been able to raise some debt finance.

NACE codes can be used to identify knowledge-intensive sectors. The subclassification based on two-digit NACE codes was performed using the Eurostat indicators on high-tech industry and knowledge-intensive services (Table A1 in the online Supporting Information provides details). The classification used by Eurostat and the European Commission is similar to the older classification used by the Organisation for Economic Co-operation and Development.

Method

In order to test our hypotheses, we profile the PE target companies compared to the large group of selected firms and non-PE buyouts during the whole time period of our data and for subperiods: 1995–2001; 2002–2008; 2009–2013.[4] The period 1995–2001 was relatively turbulent, with recovery from the early 1990s' recession, and includes the dot.com boom and its aftermath. The period from 2002, with the exception of a short recession, was a stable period of low insolvency across all sectors and was also marked by growth in the buyout market culminating in a peak in 2007, before the credit crisis and recession of 2009 onwards. The period 2009–2013 saw the economy recovering from the recession resulting from the financial crisis. We are interested in whether there is a change in the characteristics of the target companies over these periods and in relation to our hypotheses.

The next stage of the analysis is the estimation of the logit profile of 'known targets' (i.e. the characteristics of the firms that were PE-invested from the screened population of all private firms).[5] For robustness checking, we re-estimate the model, including additional P&L variables for the other three subsamples based on size, financial reporting and data availability.

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[4]We have split the sample based on the buyout activity waves defined by Wright et al. (2019). The sample split in our study is also in line with the business cycle, given that the flow of funds to small businesses in PE depends significantly on fluctuations in the macroeconomic environment (Berger and Udell, 1998).

[5]The identification of potential targets in the population has utility for academic analyses that wish to propensity score match a sample of firms to use as control in investigations of relative PE performance (treated and treatment samples) after (post-) investment, but also for practitioners that might use such a model to screen the population of firms in order to identify a large sample of potential investees that may be subject to further investigation and due diligence. Given that PE investors are under time pressure to select their portfolios, this could be useful intelligence.

Model specification and variables

In the next step we estimate firm-level models explaining the probability of obtaining PE funding. The unit of analysis here is the company-year observation. The variables are described in more detail below. The approach taken in this study is to use panel multivariate logistic regression analysis to model the binary dependent variable (PE target) in relation to relevant explanatory variables. The model specification used for the target probability prediction is as follows:

$$P(target_{i,t} = 1 \mid \Omega_t) = 1/\{1 + \exp[-(\beta_0 + \beta_1 F_{i,t} + \beta_2 N_{i,t} + \beta_3 C_{i,t} + u_{i,t})]\}$$

where F stands for financial variables, N for non-financial variables, C means control variables and $u_{i,t}$ is the error term. The financial ratios are defined below and reflect a combination of size, asset tangibility, liquidity, leverage, performance and efficiency; non-financial variables are constructed to measure auditor opinion, asset charges, age, status and diversification; and control variables include industry sector, industry risk and technology. The aim is to model these characteristics simultaneously in a multivariate model in order to identify a broad profile of PE target companies.[6]

Dependent variable. Our binary dependent variable is known PE targets versus the population screened control group (1, 0). We estimate models using both abridged account fields and, where available, full accounts.

Independent variables. A range of financial and non-financial independent variables is used to model the characteristics of these targets. The data fields include statutory accounts (abridged or full accounts) inclusive of financial performance information, from which we construct financial ratios; non-financial information (age, size, industry and technology classification, auditors, audit qualifications, changes in auditor and firm location); and other documents filed (insolvency events, creditor charges on assets, changes in board or shareholders). The location of each company is identified by

registered and trading address postcode. The variables are described in Table 2a along with descriptive statistics, Table 2b (Panels A and B), of the variables included in multivariate models and tests for differences in means between subsamples (Cohen's D). The third column of Table 2a explains why each variable has been added to the model in respect to each of the hypotheses developed earlier and the last column shows their expected sign. In order to test for multicollinearity, we re-estimate the logit models (Tables 3 and 4) as an equivalent linear probability model and derive variance inflation factors (VIFs), reported in the final column of Tables 3 and 4, from which we can conclude that the multivariate models are not affected by collinearity issues.

Empirical results

Table 3 reports logistic panel regression estimates for the full sample of all firms, determining the probability of PE-backed buyout/firm compared to the screened sample for the whole time period and sub-time periods for firms submitting full accounts. The models cannot include variables capturing profitability and productivity. We repeated the estimation for the other subsample of all companies with additional independent variables of profitability, productivity and interest coverage, reported in Table 4, Panels A, B and C. In addition to the logistic regression coefficients, the tables report odds ratio[7] for the whole sample period.

Table 4[8] shows that PE investors select relatively larger and established buyout targets (*Ln Assets* and *Ln Age* attract positive signs) with retained profit (*Retained/TA*) and with some evidence of cash generation (*Cash/TA*) in the period since 2002. The earlier period was characterized

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[6]The dependent variable is unbalanced in that the target (1) represents a small proportion of the total company years. However, the logit estimator produces robust and unbiased coefficient estimates with disproportionate sampling (Allison, 2015). As Allison notes: '… it (logit) is extremely useful when dealing with very large samples with rare events. No other link function has this property'.

[7]The odds ratio represents the relative odds of the occurrence of the outcome of interest (being targeted by PE), given exposure to the variable of interest. In logistic regression it is the exponential function of the regression coefficient (e^{b1}). It shows the odds of being targeted given a one unit increase in the explanatory variable. Alternatively, $e^{b1*StdX1}$, where StdX1 is the standard deviation of X1, shows the odds of being targeted given one standard deviation increase in the explanatory variable.
[8]We focus on discussing the results in Table 4, as the results in Tables 3 and 4 are consistent and qualitatively the same.

Table 2a. Variable definitions

Variable name	Definition	Purpose	Expected sign
Ln Assets	Ln of total assets	Control variable	+
Ln Age	Difference between accounting reference date and incorporated date	Control variable	+
Intangibility %	Percentage of intangible assets	Testing H2	+
Cash/TA	Ratio of cash to total assets	Testing H1	+
Inventory/TA	Ratio of inventory to total assets	Testing H2	+
Equity/TA	Ratio of equity to total assets	Testing H1	−
Retained/TA	Ratio of retained earnings to total assets	Testing H1	+
Debt/TA	Ratio of total debt to total assets	Testing H2	−
Return on Assets	Ratio of pre-tax profits/total assets	Testing H1	+
Interest Coverage	Ratio of operating profit to interest payments	Testing H1	+
Productivity	Value added per employee	Testing H3	−
Diversified	Dummy variable indicating companies with more than one industry SIC code	Testing H4	−
Audited	Dummy variable indicating audited accounts	Control variable	+
Audit Qualification	Dummy variable indicating whether there is a going-concern qualification	Testing H2	−
Charge on Assets	Dummy variable indicating companies that have a creditor charge on assets in any accounting year	Testing H1	+
Industry Competition	Herfindahl–Hirschman Index of industry concentration by summing the squared market shares of each firm in the sector (27 sectors based on SIC 2007)	Control variable	+
Industry Risk	Failure rate in each of the 27 sectors expressed as the log odds of failure (negative values indicating higher risk, positive values lower risk)	Testing H2	+
Urban Area	Dummy variable capturing location information	Control variable	+
High Tech Manuf	Dummy variables reflecting the NACE code categorizations for high-tech manufacturing	Testing H4	+
Medium High Manuf	Dummy variables reflecting the NACE code categorizations for medium high-tech manufacturing	Testing H4	+
Medium Low Manuf	Dummy variables reflecting the NACE code categorizations for medium low-tech manufacturing	Testing H4	+
Low Tech Manuf	Dummy variables reflecting the NACE code categorizations for low-tech manufacturing	Testing H4	+
High Tech Services	Dummy variables reflecting the NACE code categorizations for high-tech services	Testing H4	+
K-I Market Services	Dummy variables reflecting the NACE code categorizations for knowledge-intensive market services	Testing H4	−
K-I Financial Services	Dummy variables reflecting the NACE code categorizations for knowledge-intensive financial services	Testing H4	−
Other K-I Services	Dummy variables reflecting the NACE code categorizations for other knowledge-intensive services	Testing H4	−
Less K-I Market Services	Dummy variables reflecting the NACE code categorizations for less knowledge-intensive market services	Testing H4	−

This table provides the definition of the variables – the purpose for having each variable with respect to hypotheses developed in the paper.

Table 2b. *Descriptive statistics*

		All Firms: Abridged and Full Accounts					Firms Filing Full Accounts			
		Panel A: Samples 1 and 2 (mean total assets £3.7m and £14m)								
Variables	Observations	Non-PE Mean	PE targets Mean	Pooled SD	Cohen's D	Observations	Non-PE Mean	PE targets Mean	Pooled SD	Cohen's D
Ln Assets	9,504,632	12.703	15.905	1.608	2.0	1,550,215	14.253	16.324	2.015	1.03
Ln Age	9,504,632	1.737	2.168	0.901	0.5	1,550,215	1.922	2.222	0.886	0.34
Intangibility %	9,504,632	0.669	0.620	0.348	0.1	1,550,215	0.692	0.626	0.325	0.20
Cash/TA	9,504,632	0.226	0.119	0.290	0.4	1,550,215	0.199	0.117	0.263	0.31
Inventory/TA	9,504,632	0.099	0.107	0.177	0.0	1,550,215	0.095	0.116	0.165	0.13
Equity/TA	9,504,632	0.249	0.214	0.425	0.1	1,550,215	0.246	0.186	0.419	0.14
Return on Assets	9,504,632	0.187	0.105	0.401	0.2	1,550,215	0.086	0.073	1.121	0.01
Retained/TA	9,504,632	0.149	0.220	0.247	0.3	1,550,215	0.011	0.006	0.242	0.02
Debt/TA	9,504,632	1.124	1.052	0.435	0.2	1,550,215	0.298	0.318	0.326	0.06
Diversified	9,504,632	0.456	0.893	0.498	0.9	1,550,215	1.066	1.031	0.326	0.11
Audited	9,504,632	0.010	0.025	0.098	0.2	1,550,215	0.029	0.026	0.167	0.02
Audit Qualification	9,504,632	0.081	0.373	0.274	1.1	1,550,215	0.126	0.389	0.334	0.79
Charge on Assets	9,504,632	205	254	231	0	1,550,215	218	263	233	0.19
Industry Competition	9,504,632	−0.011	−0.076	0.476	0.1	1,550,215	−0.003	−0.079	0.455	0.17
Industry Risk	9,504,632	0.887	0.927	0.316	0.1	1,550,215	0.916	0.931	0.277	0.05
Urban Area	9,504,632	0.007	0.025	0.081	0.2	1,550,215	0.011	0.024	0.102	0.13
High Tech Manuf	9,504,632	0.019	0.063	0.137	0.3	1,550,215	0.023	0.064	0.149	0.28
Medium High Manuf	9,504,632	0.025	0.075	0.157	0.3	1,550,215	0.023	0.072	0.150	0.32
Medium Low Manuf	9,504,632	0.048	0.108	0.213	0.3	1,550,215	0.050	0.109	0.218	0.27
Low Tech Manuf	9,504,632	0.064	0.084	0.244	0.1	1,550,215	0.059	0.085	0.236	0.11
High Tech Services	9,504,632	0.244	0.185	0.429	0.1	1,550,215	0.208	0.174	0.406	0.08
K-I Market Services	9,504,632	0.029	0.036	0.166	0.0	1,550,215	0.065	0.043	0.246	0.09
K-I Financial Services	9,504,632	0.070	0.054	0.255	0.1	1,550,215	0.104	0.061	0.304	0.14
Other K-I Services	9,504,632	0.198	0.155	0.399	0.1	1,550,215	0.185	0.169	0.388	0.04
Less K-I Market Services	9,504,632					1,550,215				

Table 2b. (Continued)

Panel B: Samples 3 and 4 (mean total assets £18m and £23.5m)

| | Large companies | | | | | | Large companies: Full reporting | | | | |
| | | Non-PE | PE targets | | | | | Non-PE | PE targets | | |
Variables	Observations	Mean	Mean	Pooled SD	Cohen's D	Variables	Observations	Mean	Mean	Pooled SD	Cohen's D
Ln Assets	852,491	14.920	16.405	1.863	0.80	Ln Assets	531,342	15.428	16.470	1.703	0.61
Ln Age	852,491	2.030	2.229	0.873	0.23	Ln Age	531,342	2.060	2.175	0.868	0.13
Intangibility %	852,491	0.694	0.624	0.306	0.23	Intangibility %	531,342	0.651	0.604	0.298	0.16
Cash/TA	852,491	0.190	0.114	0.250	0.31	Cash/TA	531,342	0.115	0.099	0.169	0.10
Inventory/TA	852,491	0.093	0.119	0.154	0.17	Stock/TA	531,342	0.122	0.125	0.167	0.02
Equity/TA	852,491	0.257	0.182	0.421	0.18	Equity/TA	531,342	0.174	0.157	0.385	0.04
Return on Assets	852,491	0.038	0.081	1.066	0.04	Return on Assets	531,342	0.014	0.074	0.988	0.06
Retained/TA	852,491	0.000	0.006	0.241	0.03	Retained/TA	531,342	−0.014	0.006	0.218	0.09
Debt/TA	852,491	0.300	0.319	0.317	0.06	Debt/TA	531,342	0.360	0.339	0.304	0.07
Productivity	852,491	42,842	45,980	32,219	0.10	Productivity	531,342	56,796	49,882	75,381	0.09
Interest Coverage	n.a.	n.a.	n.a.	n.a.	n.a.	Interest Coverage	531,342	29.307	32.410	66.082	0.05
Diversified	852,491	1.048	1.029	0.281	0.07	Diversified	531,342	1.042	1.028	0.262	0.05
Audit Qualification	852,491	0.034	0.026	0.180	0.04	Audit Qualification	531,342	0.041	0.027	0.199	0.07
Charge on Assets	852,491	0.139	0.392	0.348	0.73	Charge on Assets	531,342	0.176	0.400	0.383	0.58
Industry Competition	852,491	227.5	263.4	241.1	0.1	Industry Competition	531,342.0	226.8	262.2	250.7	0.14
Industry Risk	852,491	−0.003	−0.085	0.448	0.18	Industry Risk	531,342	−0.074	−0.094	0.447	0.04
Urban Area	852,491	0.924	0.932	0.266	0.03	Urban Area	531,342	0.919	0.934	0.273	0.06
High Tech Manuf	852,491	0.015	0.024	0.120	0.08	High Tech Manuf	531,342	0.018	0.025	0.132	0.06
Medium High Manuf	852,491	0.030	0.065	0.170	0.20	Medium High Manuf	531,342	0.038	0.065	0.192	0.14
Medium Low Manuf	852,491	0.027	0.074	0.164	0.28	Medium Low Manuf	531,342	0.037	0.078	0.189	0.22
Low Tech Manuf	852,491	0.058	0.111	0.235	0.23	Low Tech Manuf	531,342	0.074	0.113	0.262	0.15
High Tech Services	852,491	0.061	0.082	0.240	0.09	High Tech Services	531,342	0.060	0.074	0.237	0.06
K-I Market Services	852,491	0.188	0.174	0.391	0.04	K-I Market Services	531,342	0.221	0.180	0.414	0.10
K-I Financial Services	852,491	0.069	0.040	0.252	0.11	K-I Financial Services	531,342	0.045	0.033	0.207	0.06
Other K-I Services	852,491	0.124	0.060	0.329	0.19	Other K-I Services	531,342	0.067	0.060	0.250	0.03
Less K-I Market Services	852,491	0.178	0.172	0.382	0.01	Less K-I Market Services	531,342	0.212	0.176	0.408	0.09

This table presents descriptive statistics, means (SD) and Cohen's D, for the groups of variables of interest relating to the subsamples of interest, PE-targeted firms and potential target pool. We include both continuous and binary variables and calculate for each variable the Cohen's D size effect statistic. Because of the large sample size, univariate analysis can show highly significant differences between mean values even when the magnitude of the difference is small. Cohen's D statistic ((M1−M2)/pooled SD) provides information on the size difference in the mean values. The rule of thumb for calculated values is: ≥0.1, small effect; ≥0.3, medium effect; ≥0.8, large effect. Several independent variables have limited range (ratios, binary) such that the impact within multivariate analysis is likely to be more meaningful. The tables are organized by the estimation subsamples based on company reporting and size.

Table 3. Panel logistic regression determining probability of a PE target (abridged account fields)

	Panel logistic regression characteristics of private equity targets: All companies, abridged account fields									
	All firms (mean total assets £3.7m)									
	1995–2013		Odds ratio	1995–2001		2002–2008		2009–2013		VIF*
Independent	Coefficient	Significance		Coefficient	Significance	Coefficient	Significance	Coefficient	Significance	
Ln Assets	0.642	0.000	1.900	0.695	0.000	0.696	0.000	0.525	0.000	1.31
LN Age	0.322	0.000	1.380	0.316	0.000	0.354	0.000	0.420	0.000	1.11
Intangibility %	0.343	0.000	1.409	0.544	0.000	0.428	0.000	0.137	0.000	1.52
Cash/TA	0.087	0.166	1.091	-0.319	0.006	0.277	0.004	0.694	0.000	1.57
Inventory/TA	-0.158	0.034	0.854	0.091	0.426	-0.784	0.000	-0.481	0.006	1.36
Equity/TA	-0.687	0.000	0.503	-0.348	0.000	-0.991	0.000	-0.987	0.000	2.03
Retained/TA	0.399	0.000	1.490	0.132	0.070	0.709	0.000	0.677	0.000	1.14
Debt/TA	-0.202	0.000	0.817	0.088	0.279	-0.302	0.000	-0.401	0.000	1.31
Diversified	-0.263	0.000	0.769	-0.306	0.000	-0.277	0.000	-0.042	0.564	1.87
Audited	0.919	0.000	2.507	0.019	0.693	0.777	0.000	2.517	0.000	1.02
Audit Qualification	-0.136	0.048	0.873	-0.042	0.721	0.058	0.560	-0.535	0.001	1.04
Charge on Assets	1.333	0.000	3.792	1.161	0.000	1.340	0.000	1.499	0.000	1.05
Industry Competition	0.000	0.001	1.000	0.000	0.493	0.000	0.009	0.000	0.320	1.47
Industry Risk	0.462	0.000	1.587	0.343	0.000	0.423	0.000	0.403	0.000	2.23
Urban Area	0.124	0.002	1.132	0.400	0.000	-0.068	0.269	-0.147	0.062	1.01
High Tech Manuf	1.26	0.000	3.525	0.872	0.000	1.216	0.000	1.415	0.000	1.08
Medium High Manuf	1.416	0.000	4.121	1.092	0.000	1.341	0.000	1.233	0.000	1.31
Medium Low Manuf	1.781	0.000	5.936	1.574	0.000	1.480	0.000	1.632	0.000	1.37
Low Tech Manuf	1.33	0.000	3.781	1.162	0.000	1.163	0.000	1.306	0.000	1.43
High Tech Services	0.72	0.000	2.054	0.494	0.000	0.743	0.000	1.132	0.000	1.20
K-I Market Services	-0.553	0.000	0.575	-0.787	0.000	-0.399	0.000	-0.122	0.105	1.54
K-I Financial Services	-0.598	0.000	0.550	-1.455	0.000	-0.648	0.000	0.062	0.591	1.36
Other K-I Services	-0.099	0.064	0.906	-0.312	0.003	0.131	0.114	0.108	0.333	1.57
Less K-I Market Services	0.38	0.000	1.462	0.006	0.929	0.506	0.000	0.580	0.000	1.81
Constant	-17.657	0.000	0.000	-17.357	0.000	-18.441	0.000	-17.974	0.000	
Classification %	84.67%			84.20%		86.0%		87%		
Number of observations										
PE targets	9,149			3,656		3,567		1,926		
Other companies	9,495,483			2,089,188		3,969,463		3,436,832		

This table shows the estimation results of logistic panel regression for firms submitting abridged accounts. The dependent variable is a binary variable taking 1 for private equity target, and 0 otherwise. It estimates the probability of PE-backed buyout compared to the control sample for the whole time period and sub-time periods. The results contain variables from data reported in abridged accounts.

Table 4. Panel logistic regression determining probability of a PE target (full account fields)

	Panel A: Full accounts (mean total assets £14m)								
	Panel logistic regression characteristics of private equity targets: Full account fields								
	1995–2013			1995–2001		2002–2008		2009–2013		
Independent	Coefficient	Significance	odds ratio	Coefficient	Significance	Coefficient	Significance	Coefficient	Significance	VIF*
Ln Assets	0.515	0.000	1.674	0.505	0.000	0.579	0.000	0.577	0.000	1.307
LN Age	0.331	0.000	1.392	0.335	0.000	0.357	0.000	0.495	0.000	1.108
Intangibility %	0.089	0.063	1.093	−0.148	0.089	−0.019	0.808	0.300	0.002	1.521
Cash/TA	−0.027	0.736	0.973	−0.340	0.022	0.224	0.071	0.556	0.000	1.571
Inventory/TA	0.280	0.001	1.323	0.517	0.000	−0.043	0.775	−0.314	0.138	1.360
Equity/TA	−0.975	0.000	0.377	−1.030	0.000	−1.314	0.000	−1.130	0.000	2.030
Return on Assets	0.025	0.001	1.025	0.026	0.092	0.017	0.222	0.030	0.016	1.138
Retained/TA	0.262	0.000	1.300	−0.241	0.049	0.513	0.000	0.769	0.000	1.309
Debt/TA	−1.160	0.000	0.313	−1.416	0.000	−1.662	0.000	−1.254	0.000	1.867
Diversified	−0.131	0.017	0.877	−0.225	0.011	−0.024	0.806	0.022	0.818	1.017
Audit Qualification	−0.274	0.000	0.760	−0.304	0.017	−0.093	0.419	−0.487	0.011	1.035
Charge on Assets	1.250	0.000	3.490	1.036	0.000	1.284	0.000	1.439	0.000	1.050
Industry Competition	0.000	0.029	1.000	0.000	0.164	0.000	0.002	0.000	0.725	1.469
Industry Risk	0.478	0.000	1.613	0.485	0.000	0.407	0.000	0.303	0.006	2.230
Urban Area	0.117	0.015	1.124	0.323	0.000	−0.102	0.170	−0.072	0.449	1.012
High Tech Manuf	0.973	0.000	2.646	0.655	0.000	0.829	0.000	1.304	0.000	1.081
Medium High Manuf	1.233	0.000	3.432	0.980	0.000	1.094	0.000	1.068	0.000	1.308
Medium Low Manuf	1.698	0.000	5.463	1.593	0.000	1.333	0.000	1.467	0.000	1.369
Low Tech Manuf	1.211	0.000	3.357	1.113	0.000	0.983	0.000	1.230	0.000	1.426
High Tech Services	0.495	0.000	1.640	0.244	0.005	0.473	0.000	0.969	0.000	1.202
K-I Market Services	−0.411	0.000	0.663	−0.661	0.000	−0.219	0.001	−0.030	0.731	1.539
K-I Financial Services	−0.728	0.000	0.483	−1.587	0.000	−0.784	0.000	−0.179	0.166	1.356
Other K-I Services	−0.217	0.000	0.805	−0.361	0.001	0.108	0.257	0.059	0.649	1.566
Less K-I Market Services	0.371	0.000	1.449	0.014	0.841	0.493	0.000	0.599	0.000	1.810
Constant	−13.929	0.000	0.000	−12.867	0.000	−14.815	0.000	−16.282	0.000	
Classification %	80.10%			75.80%		73.80%		81.60%		
Number of observations										
PE targets	6,927			2,845		2,600		1,482		
Other companies	1,543,288			376,969		58,211		584,208		

Table 4. (Continued)

	Panel B: Large firms (mean total assets £18m)								
	Panel logistic regression characteristics of private equity targets: Large companies								
	1995–2013			1995–2001		2002–2008		2009–2013	
Independent	Coefficient	Significance	Odds ratio	Coefficient	Significance	Coefficient	Significance	Coefficient	Significance	VIF*
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Ln Assets	0.440	0.000	1.553	0.439	0.000	0.506	0.000	0.515	0.000	
LN Age	0.284	0.000	1.328	0.269	0.000	0.317	0.000	0.494	0.000	1.390
Intangibility %	−0.131	0.013	0.877	−0.280	0.003	−0.280	0.002	0.023	0.829	1.097
Cash/TA	−0.101	0.241	0.904	−0.428	0.008	0.071	0.606	0.617	0.000	1.563
Inventory/TA	0.351	0.000	1.420	0.429	0.003	0.022	0.890	−0.120	0.592	1.590
Equity/TA	−0.928	0.000	0.395	−1.014	0.000	−1.198	0.000	−1.191	0.000	1.393
Return on Assets	0.028	0.000	1.028	0.032	0.016	0.023	0.025	0.031	0.012	2.280
Retained/TA	0.541	0.000	1.718	0.321	0.018	0.812	0.000	0.855	0.000	1.156
Debt/TA	−0.979	0.000	0.376	−1.336	0.000	−1.414	0.000	−1.154	0.000	1.420
Productivity	−0.000003	0.000	1.000	−0.000007	0.000	−0.000004	0.001	−0.000002	0.880	2.055
Diversified	−0.048	0.408	0.953	−0.140	0.114	0.118	0.258	0.053	0.620	1.308
Audit Qualification	−0.317	0.000	0.728	−0.309	0.017	−0.094	0.422	−0.679	0.001	1.014
Charge on Assets	1.202	0.000	3.327	1.026	0.000	1.239	0.000	1.372	0.000	1.041
Industry Competition	0.000	0.035	1.000	0.000	0.403	0.000	0.000	0.000	0.769	1.040
Industry Risk	0.554	0.000	1.740	0.631	0.000	0.513	0.000	0.278	0.017	1.489
Urban Area	0.163	0.001	1.177	0.354	0.000	−0.021	0.789	−0.042	0.666	2.582
High Tech Manuf	0.746	0.000	2.109	0.567	0.000	0.546	0.000	1.030	0.000	1.011
Medium High Manuf	1.029	0.000	2.798	0.887	0.000	0.820	0.000	0.829	0.000	1.125
Medium Low Manuf	1.523	0.000	4.586	1.518	0.000	1.156	0.000	1.280	0.000	1.428
Low Tech Manuf	1.028	0.000	2.795	1.000	0.000	0.769	0.000	1.077	0.000	1.508
High Tech Services	0.359	0.000	1.432	0.164	0.064	0.264	0.003	0.850	0.000	1.593
K-I Market Services	−0.339	0.000	0.712	−0.577	0.000	−0.168	0.014	0.000	0.996	1.233
K-I Financial Services	−0.483	0.000	0.617	−0.944	0.000	−0.288	0.011	−0.226	0.093	1.523
Other K-I Services	−0.500	0.000	0.607	−0.644	0.000	−0.200	0.045	−0.107	0.430	1.394
Less K-I Market Services	0.243	0.000	1.275	−0.083	0.264	0.365	0.000	0.456	0.000	1.744
Constant	−12.181	0.000	0.000	−11.131	0.000	−13.208	0.000	−14.894	0.000	1.956
Classification %	73.3%			71.4%		73.9%		72.2%		
Number of observations										
PE targets	6,495			2,695		2,425		1,375		
Other companies	845,996			226,483		302,212		317,301		

Table 4. (Continued)

Panel C: Full reporting (mean total assets £23.5m)

Panel logistic regression characteristics of private equity targets: Large companies, full reporting

Independent	1995–2013			1995–2001		2002–2008		2009–2013		VIF*
	Coefficient	Significance	Odds ratio	Coefficient	Significance	Coefficient	Significance	Coefficient	Significance	
Ln Assets	0.404	0.000	1.498	0.408	0.000	0.486	0.000	0.483	0.000	1.209
LN Age	0.195	0.000	1.215	0.182	0.000	0.235	0.000	0.437	0.000	1.110
Intangibility %	−0.228	0.000	0.796	−0.279	0.007	−0.408	0.000	−0.199	0.114	1.579
Cash/TA	0.169	0.114	1.184	−0.227	0.227	0.367	0.032	0.858	0.000	1.344
Inventory/TA	0.197	0.055	1.218	0.315	0.044	−0.088	0.623	−0.099	0.685	1.432
Equity/TA	−0.814	0.000	0.443	−1.019	0.000	−1.137	0.000	−1.043	0.000	2.171
Return on Assets	0.029	0.000	1.029	0.033	0.020	0.020	0.106	0.097	0.000	1.165
Retained/TA	0.765	0.000	2.149	0.370	0.011	0.962	0.000	1.224	0.000	1.455
Debt/TA	−0.889	0.000	0.411	−1.336	0.000	−1.306	0.000	−1.024	0.000	1.993
Interest Coverage	0.001	0.000	1.001	0.001	0.003	0.002	0.000	0.001	0.001	1.227
Productivity	−0.000004	0.000	1.000	−0.000004	0.000	−0.000004	0.000	−0.000004	0.000	1.217
Diversified	−0.054	0.390	0.947	−0.088	0.320	0.072	0.552	−0.012	0.922	1.011
Audit Qualification	−0.308	0.000	0.735	−0.285	0.031	−0.084	0.494	−0.718	0.002	1.050
Charge on Assets	1.106	0.000	3.022	0.949	0.000	1.138	0.000	1.287	0.000	1.024
Industry Competition	0.000	0.150	1.000	0.000	0.165	0.000	0.035	0.000	0.679	1.479
Industry Risk	0.598	0.000	1.818	0.641	0.000	0.580	0.000	0.379	0.003	2.469
Urban Area	0.253	0.000	1.288	0.373	0.000	0.040	0.645	0.107	0.326	1.010
High Tech Manuf	0.678	0.000	1.970	0.590	0.000	0.550	0.001	0.830	0.000	1.142
Medium High Manuf	0.866	0.000	2.377	0.810	0.000	0.768	0.000	0.562	0.001	1.501
Medium Low Manuf	1.407	0.000	4.084	1.493	0.000	1.204	0.000	0.971	0.000	1.612
Low Tech Manuf	0.894	0.000	2.445	0.957	0.000	0.757	0.000	0.752	0.000	1.689
High Tech Services	0.228	0.000	1.256	0.077	0.418	0.182	0.069	0.585	0.000	1.255
K-I Market Services	−0.412	0.000	0.662	−0.571	0.000	−0.185	0.012	−0.233	0.017	1.680
K-I Financial Services	−0.073	0.376	0.930	−0.679	0.000	0.122	0.345	0.034	0.837	1.281
Other K-I Services	−0.308	0.000	0.735	−0.456	0.000	0.098	0.360	−0.221	0.145	1.494
Less K-I Market Services	0.141	0.005	1.151	−0.047	0.546	0.349	0.000	0.136	0.237	2.022
Constant	−11.246	0.000	0.000	−10.581	0.000	−12.530	0.000	−13.740	0.000	
Classification %	71.30%			72.30%		71.70%		71.00%		
Number of observations										
PE targets	5,686			517		637		513		
Other companies	525,656			100,117		137,174		137,401		

*VIF statistics are derived from linear probability estimation of the full sample model (1995–2013).

This table shows the estimation results of logistic panel regression for firms submitting abridged accounts. The dependent variable is a binary variable taking 1 for private equity target, and 0 otherwise. It estimates the probability of PE-backed buyout compared to the control sample for the whole time period and sub-time periods.

by a significant recession.[9] Moreover, *Return on Assets* is positive and significant across all models in Panels B and C, supporting H1 that PE targets have a record of profit. However, the sign of net worth (*Equity/TA*) variable is consistently negative and significant across all specifications and subsamples, giving support for the underperformance stated in H1. Furthermore, interest coverage (*Operating Profit/Interest payments*) is significant and positive (Table 4, Panel C)[10] (i.e. PE targets have better interest coverage ratios, supporting H1). Thus, PE investors target companies that are likely to be better able to service debt from cash and profit. PE targets are more likely to have a *Charge on Assets*, indicative of borrowing activity, and therefore may benefit from refinancing. This is consistent across all time periods and subsamples.[11] Overall, there is support for H1 in that the firms clearly have profit potential and are cash-generative with lower net worth, making firms more likely targets for PE investment.

The second hypothesis (H2) suggests that PE targets firms with tangible assets and lower failure risk. A number of variables in the multivariate models support this notion. For the subsamples of larger companies, the sign on debt levels (*Debt/TA*) is consistently negative and significant, suggesting that PE targets firms with lower levels of debt and therefore lower failure risk. Variables that control for industry competition (*Herfindhal–Hirschman Indices*) and industry risk (*Industry Weight of Evidence*, or log odds of failure in the sector, where negative values indicate higher risk sectors) attract the expected signs, suggesting that PE targets are more likely in lower-risk sectors (but the competition index is not often significant). Moreover, the variable for *Audit Qualification* is always negative and significant, indicating clean accounts and lower risk of financial distress for the targeted

firms across the time periods.[12] Finally, the sign on *Intangibility* in our analysis of the set of companies providing full accounts is negative and significant as we move to the subsamples of larger companies, indicating that PE investors avoid targets with higher levels of intangible assets, which gives further support for H2. As inventory is a tangible asset and can be used as collateral, a positive sign may suggest that target firms have a strong base of tangible assets. The variable *Inventory/TA* (which is the ratio of inventory to total assets) is positive and significant for the larger firms (Table 4) but not for all subperiods. Overall, there is much support for H2 that PE targets firms in stable sectors with low failure risk and high level of asset tangibility.

The targeted firms are profitable with cash generation but in low-risk and less competitive sectors. Consequently, it is possible that these firms have not had the incentive to seek out the most efficient and innovative practices, thus giving the PE the opportunity to change managerial incentives and invest in products and processes to both stimulate growth and value added via efficiency improvements. Regarding H3, the models inclusive of variables reflecting *Productivity* provide consistent results. We estimate models inclusive of productivity variables in Panels B and C of Table 4. Our measure of productivity is value added per employee. Value added is trading profit plus wages and salaries. Consistent with H3, the sign on the productivity variable is small but negative, suggesting that targets have lower productivity and consequently have scope for generating efficiencies through capital investment and restructuring going forward.

With respect to H4, the diversification variable (*Diversified*) is negative, suggesting that PE investors focus on single-product/service targets, but the variable is often insignificant so there is only very weak support for H4 that PE tends to target companies with defined markets and uncomplicated product lines. The variables reflecting high and low-technology manufacturing (*High Tech Manuf*, *Medium High Manuf*, *Medium Low Manuf*, *Low Tech Manuf*) have positive signs in all periods, suggesting that PE investors chose companies across all manufacturing but with a higher probability in medium to low technology. The

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[9]The results also suggest that firms located in urban areas are more likely to be targeted in the period before 2002.

[10]Interest coverage can only be calculated reliably for larger companies.

[11]We can also look at the odds ratios. For example, looking at the odds ratio for retained profit (*Retained/TA*), we can see that the odds of becoming a target increases by 30% (1 − odds ratio) for each unit increase in this variable. Moreover, one standard deviation increase in retained profit (0.242) increases the odds of becoming a target by 6% (1 − exp(0.262*0.242)), where 0.262 and 0.242 are the estimation coefficient and the standard deviation of the *Retained/TA* variable, respectively.

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[12]Table 3 also shows that firms with audited accounts are more likely to be targeted by PE investors.

signs on the variables on knowledge-intensive sectors (*K-I Market Services*, *K-I Financial Services*, *Other K-I Services*, *Less K-I Market Services*) are generally negative or insignificant throughout the period, providing support for H4 that PE investors have and continue to target companies outside of the knowledge-intensive sector. Although there is some evidence that PE investors choose to invest in the high-technology end of the knowledge-intensive sector (*High Tech Services*) and the coefficient on this variable is positive and significant and stronger in recent time periods. This may reflect opportunities in the evolving financial services and credit (debt) management sector during this time period.

Conclusions

Our results contribute to the literature on PE portfolio firm investment and target selection, an area where there is scant theoretical development and empirical evidence. In this study, we have attempted to understand the nature of and possible reasons behind the selection of targets by PE investors. The hypotheses draw on agency theory and specifically the observation that a PE firm's selection criteria will be driven by its role as an agent for LP investors; their relationship with banks as providers of debt finance and the time pressures to identify, select and add value to portfolio firms, providing returns to investors. As an active investor, the PE investor acts as principal in managing the relationship with the investee and seeks targets where it is clear that growth can be achieved via changes in incentives, governance and operational and capital investments.

The profiling of PE-targeted firms, using a multivariate technique that assesses all firm-level characteristics simultaneously, generates a range of significant characteristics. There is much support for our hypotheses. PE acquires established companies in terms of age and size that are more likely to have a higher proportion of tangible assets. These firms are in stable industry sectors with lower-than-average failure rate and are less likely to be diversified (single product). Amongst the riskier sectors, PE investors have a preference for advanced manufacturing technologies and the high-technology end of the services sector. The firms that PE investors target are generally cash-generative, profitable and have high interest cov-

erage ratios on existing debt. The firms are likely to have borrowed and have charges on assets. The acquisitions are in a good position to service debt after acquisition. These firms have lower levels of equity and lower-than-average productivity, thus providing opportunities for investors to realize performance improvement, and growth, post-investment. PE investors focus on single-product/service firms and/or tangible investments with high levels of collateral. This supports the hypothesis that PE tends to invest in companies with defined markets and uncomplicated product lines. The results support the notion that PE investors have and continue to invest in companies outside the knowledge-intensive sector and choose targets that are more established, cash-generative and profitable, but can benefit from restructuring and further capital investment.

Our study has limitations and indicates avenues for extending future research. Data limitations have prevented an analysis of the similarities and synergies between the portfolio firms of individual PE funds, and this would be a useful addition to our understanding of PE firms' target selection. Similarly, it would be useful to explore the geographical distance between investor and investee. Research on the provision of growth finance has shown that the geographical distance between the investor's location and the portfolio company has an influence on the equity finance investment patterns, known as 'local bias' (Sorenson and Stuart, 2001; Wilson, Wright and Kacer, 2019). The PE firm typically establishes networks within an industry or a geographic area and follows recommendations from close contacts in order to establish an advantage in finding and evaluating quality investment opportunities. Network advantages are likely to decline as geographic distance increases. Consequently, these networks will affect the location bias of PE investment activities. This is worthy of further investigation (i.e. if or how networks affect the location bias of PE investment activities). Moreover, further analysis could investigate more detail of the director and management characteristics of target companies. Clearly there is much scope for further work in relation to the analysis of sources and characteristics of targeted firms.

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Supporting Information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

Table A1. Industry technology-level definitions