Private Equity Investment in India: Efficiency vs Expansion

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Abstract

While private equity (PE) is expanding rapidly in developing countries, there is little academic research on this subject. In this paper I exploit two new data sources and employ two distinct empirical strategies to identify the impact of PE on Indian firms. I compare the investments made by one of India's largest PE firms to the investments that just missed (deals that made it to the final round of internal consideration). I also combine four large PE databases with accounting data on 34,000 public and private firms and identify effects using differences in the timing of investments. I find three results consistently in both databases. First, larger, more successful firms are more likely to receive PE investment. Second, firms that receive investment are more likely to survive and also have greater increases in revenues, assets, employee compensation, and profits. Third, somewhat surprisingly, these firms' productivity and return on assets do not improve after investment. This is consistent with PE channeling funding to high productivity firms rather than turning around low productivity firms. PE, at least in India, appears to alleviate expansion constraints and improve aggregate productivity through reducing misallocation rather than by increasing within-firm TFP.

Keywords: Private Equity, India, Developing Countries, Entrepreneurship, Productivity, Emerging Markets

1

1   Introduction

Emerging markets' share of total global private equity (PE) fundraising increased from 4% in 2004 to 12% in 2009 to 20% by 2012 (Prequin, 2012; EMPEA, 2014). India accounts for approximately 20% of emerging market private equity investment and capital invested via PE in the country went from less than $500 million in 1999 to over $15 billion in 2010, equivalent to 1% of the equity market capitalization of the Bombay Stock Exchange.[1]

Despite this growth, the impact of PE firms is a contentious issue. Some in the popular media claim that sophisticated PE investors can extract dividends, cash, and other resources from their investee firms in the short run, to the detriment of shareholders and the long-run functioning of the firm.[2]

A second view of PE sees practitioners as passive investors. This might be the case if firms are not especially capital constrained but financial markets for investors are underdeveloped. PE firms may seek to diversify their portfolios by investing in types of companies that are not well represented on stock exchanges. In this view, shareholders of the firm exchange bank debt or owner's equity for outside capital. Although these changes in capital structure may influence incentives and attitudes towards risk, the PE investors do nothing to directly impact firm size or performance.

A third view claims that PE investors benefit their target companies by providing capital infusions and transfers of technology such as management skill, process innovation, connections to customers and suppliers, and governance practices. While the view that PE is not harmful and may be helpful to the companies which receive investment is most consistent with the academic literature,[3] there has been relatively less work to disentangle exactly how PE companies help the firms in which they invest. Do PE firms help their investee companies by removing barriers to expansion and helping them to grow to the optimal size or do they help firms to become more efficient and use existing resources in the most productive way possible?[4]

To examine the effects of PE in India, I construct a novel dataset of the near universe of PE investments in India since the beginning of the industry in the early 1990s by combining four

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[1]As a comparison, PE investments in North America during this period totaled about $150 billion which was about 1% of the total market capitalization of the New York Stock Exchange.

[2]For example, in 2006, *Spiegel*, a prominent German newspaper wrote, "Private equity funds buy up companies, suck them dry, and spit them out again."

[3]See, among many, Davis et al. (2013); Bernstein and Sheen (2013); Bernstein et al. (2014); Acharya et al. (2013); Cohn et al. (2013); Kerr et al. (2011); Lerner et al. (2011); Bernstein et al. (2010); Cao and Lerner (2009); Leslie and Oyer (2008); Kevin Amess (2007); Keuschnigg (2004); Keuschnigg and Nielsen (2003); Desbrires and Schatt (2002); Kortum and Lerner (2000); Lerner (1995); Lichtenberg and Siegel (1990); Kaplan (1989).

[4]Consistent with my findings, Boucly et al. (2011) finds that PE funds in France relax credit constraints and help LBOs to take advantage of growth opportunities. Chung (2011) argues that growth and alleviation of investment constraints is especially important for private, as opposed to public, targets.

different datasets (VCCEdge, Venture Intelligence, Prequin, and Thompson). In order to explore firm outcomes, I then merge this combined dataset to Prowess, a database of financial information for large and medium-sized Indian firms.

However, identifying a causal effect of PE is difficult. The main challenge is that PE does not flow to firms randomly but, instead, flows to larger, more successful firms. Thus, differences between non-PE and investee companies post-PE may be entirely due to selection. There may also be omitted variables, such as good managers, which lead both to PE investment and to firm success. Because there are no randomized trials or natural experiments in this area, previous literature in developed countries relies on matching techniques to identify control firms with which to compare investee companies.

My identification strategy is two fold. To deal with selection, I limit the analysis to firms that will eventually receive PE and use the differential timing of the deals to examine the effects of the investment. The exact timing of the deals is arguably arbitrary because PE investors are unable to compare internal financial data across all prospective investees at the same time. Rather, they request and analyze internal financial data over time.

For a second identification strategy, I have obtained propriety data from a large PE firm in India. These data contain companies which were considered for investment by the firm and categorized into several different bins from D to A. With this data, I can compare the companies that received investment, category A, to the companies that were strongly considered but ultimately did not receive investment, category B. These "near-miss" companies are similar to investee companies on observables and likely also provide a good control group to the "winners" in terms of unobservables, allowing me to identify the effects of PE investment.

The Indian context is significant because, while relatively little is known about PE in the developed world, even less is known about PE in developing countries. Academic work on PE outside of OECD nations is almost non-existent.[5] The potential effects of PE companies are likely to be exacerbated in developing economies. If PE firms are extracting resources from unsophisticated companies, this is likely to be an even greater problem in developing countries where the rule of law is weaker, management quality is poorer, the majority of firms are family owned, and regulatory bodies are more easily corruptible. However, if PE companies are improving the firms in which they invest, the impact of well-funded, knowledgeable investors may be particularly large in developing countries, given the relatively greater constraints on firms and the resulting inefficiencies.[6] Whether

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[5]Exceptions include Lerner et al. (2014); Lerner and Schoar (2005).

[6]For more on constraints faced by developing country firms and organizational ways firms may overcome these constraints, see Bruhn et al. (2010); Desai et al. (2003); Mullins and Schoar (2013); Bertrand and Schoar (2006);

and how PE firms bring value to the firms in which they invest in developing countries is of central importance in policy debates about capital controls, entrepreneurship, and foreign direct investment.

My data confirm that PE firms select companies that are initially more productive, more profitable, and larger in terms of revenue, assets, and employee compensation. These firms have more people on the board of directors and hold more board meetings per year. Using data from the Indian survey of Bloom et al. (2012) I also find that investee firms are better managed before receiving investment than firms that never receive investment.[7]

However, in addition to selecting better companies, PE firms also have an impact on investees. For both the sample including all PE deals in India using the differential timing for identification as well as for the "near-miss" sample, I find that firms that receive PE investment spend more on labor and capital and have larger revenues and profits post investment. Using hand collected data for my "near-miss" sample, I show that firms that receive PE investment have more employees and are more likely to survive post investment than non-funded firms. These increases in the operational size and profits of the firm post-investment are inconsistent with PE as a passive investment strategy or PE as extractive for investors and value destroying for the companies receiving investment.

Contrary to PE as a story of leveraging up companies in order to receive tax breaks,[8] debt to equity ratios for the companies do not change significantly and, if anything, debt seems to be lower at these companies post investment. Note that, unlike in the US, acquisition financing is illegal in India and no change in the debt/equity ratio is consistent with the regulatory environment.

To distinguish whether PE investment is more consistent with expansion of the firm or improvements in efficiency, I construct two separate measures of revenue total factor productivity (TFPR) and also examine return on assets (ROA). TFPR captures how well firms transform inputs into outputs accounting for the change in output prices. TFPR does not significantly increase after investment for firms in the countrywide dataset and decreases post-investment for firms in the "near-miss" data. Across both datasets, ROA goes down after investment by PE firms. This decrease in ROA suggests that the marginal product of capital before investment was high due to capital constraints and, once constraints are eased, investee firms deploy the capital to expand the firm.

Chang and Choi (1988); Khanna and Palepu (1999, 2000a,b, 2004); Khanna (2000); Khanna and Rivkin (2001); Guillen (2000).

[7]This is consistent with Bloom et al. (2009) which documents a correlation between management practices and private equity investment across a wide range of industries in developed countries.

[8]For research on PE and leverage in other settings see Colla et al. (2012); Demiroglu and James (2010); Matsa (2010); Axelson et al. (2007).

This pattern of results in both the larger dataset of all PE deals as well as in the smaller "near-miss" dataset indicates that firm expansion rather than improvement in firm efficiency is the primary consequence of PE investment in India.[9] Because firms that receive investment are positively selected, PE in India seems to be allocating resources towards better firms by helping them to increase employment and assets. This reallocation has important implications for increasing macro total factor productivity and could be especially important in developing countries to catalyze the growth of productive firms more quickly than the economy otherwise would and thus raise per capita incomes.[10]

Unfortunately, the data available to examine the mechanisms of change in investee firms post-investment are sparse and these finding should be treated as speculative. I find little evidence of management improvement in Indian companies purchased by PE firms. I show that the number of people on the board of directors increases by one person after PE investment (mean of 9 people). However, there is no significant change in the number of meetings held per year. The exact mechanism through which PE firms effect change in Indian companies is an important area for future research.

The remainder of the paper is organized as follows. Section 2 provides a conceptual framework and Section 3 describes the private equity industry in India. Section 4 introduces the data sources and provides summary statistics. Section 5 discusses identification. Section 6 shows that investee firms are selected among all firms in the economy before analyzing how PE companies in India affect the firms in which they invest. Section 7 presents a discussion of results.

2 Conceptual Framework

This section will propose a simple model of firm behavior and will develop theoretical predictions that can then be tested in the data. Demand is determined in a monopolisticly competitive environment:

$$P = CY^{\rho-1},$$

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[9]This is consistent with anecdotal evidence. For instance, Bain claims that, "By providing a critical new source of patient capital, management expertise and deep networks of connections, PE has helped catalyze the growth and expansion of companies in which they invested. Included among the companies PE and VC investors discovered and backed are one-third of India's largest 500 companies today" (Bain and IVCA, 2011, p. 6).

[10]Differences in the allocation of resources across establishments that differ in productivity may be important in explaining cross-country differences in output per capita (Banerjee and Duflo (2004); Hsieh and Klenow (2009, 2014); Howitt (2000); Restuccia and Rogerson (2008)).

where P is price, Y is output, C is a constant and $\rho = \frac{\sigma-1}{\sigma}$ with σ representing the elasticity of substitution.[11]

The production technology is characterized by:

$$Y = (1 - \tau_a)AK^\alpha L^{1-\alpha},$$

where K is capital, L is labor, and A is exogenously determined potential TFP. The $(1 - \tau_a)$ term represents a TFP wedge, a drag to a firm's ability to productively use resources. Although τ_a may represent many things, one potential interpretation is poor management practices.[12]

Profits are then given by:

$$\pi = PY - wL - (1 + \tau_K)RK,$$

where R is the exogenous cost of capital and w is the wage. The $(1 - \tau_K)$ term represents a capital wedge, or a constraint on expansion, that keeps the firm below the optimal size. This constraint on expansion could be many things but may include a lack of capital, a preference of owner operated businesses for "the quiet life," or incomplete information on how to effectively scale up the firm.[13]

Taking first order conditions leads to the following expressions for revenue, profits, capital, labor, TFPR, and ROA:

$$Rev^*, \pi^* \propto w^{-\frac{\rho(1-\alpha)}{1-\rho}}[A(1-\tau_a)]^{\frac{\rho}{1-\rho}}[R(1+\tau_K)]^{-\frac{\alpha\rho}{1-\rho}}$$

$$K^* \propto w^{-\frac{\rho(1-\alpha)}{1-\rho}}[A(1-\tau_a)]^{\frac{\rho}{1-\rho}}[R(1+\tau_K)]^{-\frac{(1-\rho(1-\alpha))}{1-\rho}}$$

$$L^* \propto w^{-\frac{(1-\alpha\rho)}{1-\rho}}[A(1-\tau_a)]^{\frac{\rho}{1-\rho}}[R(1+\tau_K)]^{-\frac{\alpha\rho}{1-\rho}}$$

$$\text{TFPR}^* \propto w^{\rho(1-\alpha)}[A(1-\tau_a)]^{(1-\rho)}[R(1+\tau_K)]^{\alpha\rho}.$$

$$\frac{\pi^*}{K^*} \propto R(1+\tau_K).$$

This model provides different predictions for financial variables under different scenarios of the

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[11]Imperfect competition is important here to derive predictions for revenue total factor productivity. Foster et al. (2008) explain the distinction between revenue total factor productivity (TFPR) and quantity total factor productivity (TFPQ) and highlight the importance of distinguishing between the two when attempting to measure firm level productivity (See also Chevalier (1995)). While a better measure of the underlying productivity of the firm, TFPQ requires price data that are unavailable in most firm level datasets. The literature often imprecisely uses TFP without distinguishing between TFPR and TFPQ which can have implications for interpreting and analyzing results.

[12]That τ_a is likely positive in developing countries generally and India specifically due to management practices has been shown by Bloom and Van Reenen (2010) and Bloom et al. (2010).

[13]Banerjee et al. (2008) and Banerjee and Duflo (2008) argue that even fairly large firms in India are likely credit constrained.

effect of private equity on firms. If PE were extractive and harmful to the firm, we would likely see decreases in revenue, profits, capital, or labor. If PE firms are passive investors looking to simply diversity their portfolios, we would likely see no change in τ_a and no change in τ_K which would lead to no change in firm financials. However, if PE causes a decrease in either τ_a or τ_K then we would expect revenue, profits, capital, and labor to increase. If τ_a decreases, we would expect TFPR to increase. However, if τ_K decreases, we would expect TFPR to decrease. If τ_a decreases, we would see no change in ROA. If barriers to expansion are decreased (τ_K goes down) ROA would decrease because the marginal product of capital decreases as the capital constraints are eased and the firm expands. Examining the evidence of what happens to companies after receiving PE investment in the data can help determine which story of PE is more consistent with the empirical data in India. Table 1 summarizes the predictions of the model.

3   Firm financing and Private Equity in India

Financing for firms in India is limited. Outside of PE, enterprises that require finance which are not part of business groups or whose owners do not have access to wealthy family or friends, must turn to banks. However, regulations and rules make it difficult to get funding from banks. Due to rounds of nationalizations in 1960, 1969, and 1980, the industry is dominated by public sector banks. In India today there are only 89 commercial banks compared to 5,571 in the U.S. Further decreasing the amount of loanable funds, since 1985 the Reserve Bank of India has mandated that 40% of loans go to "priority sectors" - agriculture, micro and small enterprises, education, housing, export credit, and other "weaker sections." The conservative nature of Indian banks may exacerbate the problem. Banerjee et al. (2008) and Banerjee and Duflo (2008) find that loan officers are punished when they give out bad loans but not rewarded when they give out good loans. This incentive structure causes misallocation of credit by loan officers which leads to credit constrained firms. Large pension and insurance funds in India are only allowed to invest in government bonds and, without access to capital, the corporate bond market is underdeveloped. Because of the limited options for business financing before the rise of private investment sources in India in the late 1990s and early 2000s, several small firms chose to go through an initial public offering (IPO) on one of the two main Indian stock exchanges. This has led to a situation where only about 650 of the 5,300 companies on the Bombay Stock Exchange (BSE) are actively traded and provide liquidity to investors. Only about 500 companies constitute more than 90% of the BSE's market capitalization.

India began to liberalize its economy in 1991 following a balance of payments crisis. Although

the financial sector did not see a loosing of regulations to the same extent as the real sector, the opening of the economy set the stage for Western style PE in the country and by the late 1990s there were indigenous PE firms as well as domestic offices of large foreign PE firms. A PE firm is a specialized investment company where managers (general partners) pool money from investors (limited partners) to invest in firms.[14] Activity is often organized in funds; general partners raise a fixed amount of money from limited partners for a set number of years (usually 5 - 10). After the initial fund raising, capital is disbursed to several firms over the first few years of the life of the fund. PE firms may purchase the entire equity of a firm or take a majority or minority stake in the company. Investors often provide several resources to investee firms besides capital, including management and process expertise, high-powered incentives, labor and product market connections, and active governance. At or before the end of the specified fund length, PE firms must exit their investments and return the capital, along with gains, to the limited partners. Exits can take the form of sales to other PE firms, to strategic partners, to the general public through an initial public offering on a stock market, or back to the owners or manager of the firm. General partners receive management fees during the term of the fund and usually receive a share of the excess returns, called carried interest, upon completion of the fund. General partners typically receive around 20% of the profits of the fund after a previously agreed upon set rate of return, called the hurdle rate, is achieved (generally 7 - 8%). Many PE firms specialize in a certain industry sector or type of investment (venture, growth, mezzanine, buyout, distressed).[15]

Between 2000 and 2010, the Indian economy grew at about 7% a year; during the same time period, the number of PE deals in India grew at an average of 29% per year and total capital invested in the industry grew at about 60%. While the recession of 2008 did affect the Indian economy directly, it had an even larger effect on the PE industry as the majority of capital invested comes from the US and other developed countries, which were especially hard hit by the financial crisis. However, investment was quick to recover and growth has continued in recent years. Figure 1 shows the growth of the industry through time in both the number of deals done and the total amount invested.

While technology and health care have the highest concentrations of investment, PE activity spans across a wide range of industries in the Indian economy. Table 2 shows the number of investments by industry and also adjusted for firm revenue. Most of the companies that receive PE investment are in the South, West, and North of the country. Within these regions, firms are

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[14]For more on PE partnerships, see Kaplan and Schoar (2005); Lerner and Schoar (2004), and for more on investors and funding of PE see Lerner et al. (2007); Gompers and Lerner (2000); Djankov et al. (2007).

[15]For more about the growth of PE through time and characteristics of leveraged buyouts, see Stromberg (2008).

likely to be in Mumbai, Bangalore, Chennai, Delhi, and Hyderabad.

In developed countries, many PE deals are leveraged buyouts of large public companies. Venture capital funding for start ups also makes up a significant amount of private capital in the US. Conversely, most PE deals in India would be considered "growth capital." In the data, the average (median) company that receives investment from a PE firm has yearly total income of $58 million ($22 million). The typical (median) deal size is US$27 million (US$10) although this has been increasing through time from less than US$5 million in the early days of the industry to closer to US$50 million today.

Only about 20% of the data record the size of the stake in the company purchased. For those deals where this data is available, the typical (median) stake is 21% (15%). This is in contrast to US transactions which are often majority deals. PE managers in India report that this is in part to overcome a negative selection problem. Unlike in the US, many large Indian firms are family owned and the cultural norm is to pass the business to one's son or other male relative as an inheritance. Bloom et al. (2013) argue that this may be caused in part by an inability to sufficiently deter corruption and theft by managers and other employees through credible punishment in the Indian court system. Undeveloped financial markets and the inability to easily transfer wealth from one generation to another except through business assets may also have contributed to the prevalence of family owned firms. Consequently, many in the PE industry feel that only distressed firms are likely to come up for sale. Taking a minority stake in a firm and leaving the owner with a large share of equity helps to overcome this adverse selection. In addition, if firms are dependent on a network of connections to politicians and/or if bribes must be paid to guarantee continued successful functioning of the firm then it might be especially important to have the founding family, who knows from experience the unwritten norms, continue to hold a large stake in the business.

On average, firms receive 1.6 rounds of investment, often over a period of several years. Sixty-nine percent of firms receive only one investment in the data and 2% receive more than five. The number of PE investors per deal varies from 1 to 10 with the average deal consisting of 1.3 investors.

Presently there are about 315 total PE firms operating in India. Approximately 160 of these firms have their head offices in India and the others are foreign offices of a global private equity firm (ex. KKR India). There are approximately 200 limited partner investors participating in the market and over 90% of the invested capital is from foreign sources.[16]

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[16]This may be in part driven by the fact that large pension and insurance funds in India are prohibited from investing in asset classes such as PE which the government considers to be too "risky." By regulation these pools of money can not even invest in corporate bonds. High corporate taxes also cause many investment companies to set up off shore in places like Mauritius.

4   Data Sources

In order to examine the effect of PE investment on investee companies in India, I take advantage of several novel datasets. The first is a dataset of the near universe of PE transactions in India from the 1990s until today that I created by combining four different databases of Indian PE deals. The second is a proprietary dataset from a large PE firm operating in India which provides details of not only the investments that the company has made but also the companies that were considered for investment but did not receive funding. These data are then combined with an unbalanced panel of financial data for Indian companies called Prowess.

4.1   Data for the entire PE industry

To examine the effect of PE investment on firms in India I have combined four databases of private equity investment in India. These databases include two India specific PE databases, VCCEdge and Venture Intelligence, a global database of PE, Prequin, and a global database of many financial measures including PE, Thomson.[17]

Because deal information is often not well publicized and recording conventions differ for the different databases, it was necessary to manually compare the nearly 13,000 observations to determine overlap. Although there is a lot of variability in any given variable, two observations were determined to record the same deal based on some combination of similarity of date of investment, company name, name of investors, deal amount, city, and company description. After combining deals that appear in multiple databases, there are 6,887 PE transactions recorded in the data. This represents investment in 4,328 companies from 1990 to 2012.

Deals that appear in none of these four databases will be missing from my data. This is more likely to be true for very small deals and deals involving companies that are particularly concerned about privacy for strategic or other reasons. If there are many of these deals then I will be underestimating the total number and amount of capital invested by PE in India. However, combining several different, competing data sources allows me to construct the best dataset available, covering most PE deals done in the country.[18]

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[17]For more details about these databases, see the Appendix.

[18]Note that the total number of deals done and total amount invested by PE firms in my data is larger than some other sources that track PE in India (Bain and Emerging Market Private Equity Association (EMPEA), for instance). Two potential reasons could give rise to this discrepancy. Measurement error could exist if a given deal described in two or more databases is sufficiently different that I classified it as two separate deals. These false positives would cause an overestimate of the number of deals and amount of capital but will not affect the main results of the paper. However, if other sources are relying on only one or two PE databases then they are likely missing deals that are found exclusively in one of the other databases and these sources will underestimate the amount of PE in India.

4.2   Data from a specific firm

To complement the industry level data, I have detailed data from a specific Indian private equity firm on the investments that they have completed as well as the companies that were strongly considered for investment but ultimately not funded. The firm was started in the late 1990s and is one of the largest and oldest PE companies operating in India. They are sector agnostic, have more operations than investment professions and have launched several funds with a combined corpus of over $1 billion dollars.[19]

The PE firm has considered about 2,000 potential investees, screening them progressively through categories D to A. More than 25 investments have been made since 2000 (category A) and the data also include more than 160 companies that were strongly considered (category B). Variables include company name, industry, deal source, status, date change of status, proposal date, investment size, deal champion, and investment manager.

I have also hand collected data on survival and employment for all A and B firms. Firm websites, newspaper articles, and corporate directory sites were searched to determine whether the firm is still in business as well as some measure of employment post PE consideration.[20] Information was gathered on 162 of the 190 firms for employment and 177 for survivorship. These data allow me to examine outcomes which are not dependent on matching to Prowess and to use nearly all of the firms in this sample. The effects of PE on employment using this larger set of firms are similar to those found for the firms matched to Prowess.

4.3   Financial and other data

In order to examine the effect of PE investment on firm financial performance, I merge the PE data with a database of large and medium-sized public and private Indian firms called Prowess. Prowess is a firm level database of Indian companies created by the Centre for Monitoring the Indian Economy (CMIE), a private company headquartered in Mumbai which was established in 1976. It contains data on over 34,000 companies (representing almost 274,000 firm-year observations) in India and has up to 1,500 indicators for each company. The principal source of the data is Annual Reports of the individual companies. The database has tracked companies since 1988 and,

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[19]That the firm is indeed sector agnostic and has considered and made investments across a wide variety of industries can be seen in Appendix Table A.1.

[20]Information was also gathered on whether the firm had been purchased since investment. Being purchased by another company can be either a signal of bad performance or good performance for the firm. Struggling firms or their assets are often purchased at a discount by other firms in the industry. However, well-performing companies are often bought by successful companies looking to expand or enter new markets and sale to a strategic player or another PE firm is often an exit strategy for PE firms. In these data purchase by another company is uncorrelated with investment by the PE firm.

conditional on being in the database, it is possible to track company financial performance through time. Firms are in the data on average (median) for 8 (6) years (standard deviation of 6.06) with 4% of firms appearing only once and .02% appearing 27 times.

The database covers listed and unlisted companies although it is not a census of Indian firms;[21] larger, well-established firms are more likely to be in the database. However, the sum of the total revenue of all companies in Prowess is equivalent to 60% - 80% of Indian GDP for each year from 2000 - 2013; the majority of Indian economic activity is accounted for by the firms in Prowess.

Several variables from Prowess are used in the analysis. *Employee compensation* is the total amount paid to employees at the firm including wages, social security contributions, and benefits.[22] *Assets* is gross fixed assets and records the historical costs of all assets used for production of goods or services. *Expenditure* is the sum of all expenses incurred by a company during an accounting period. *Revenue* is called total income in Prowess and is the sum of all types of revenue generated by the enterprise during the financial year. *Profits* is called PBDITA, profits before depreciation, interest, taxes, and amortization and is similar to EBITDA in the US. *Debt/Equity* measures the proportion of borrowed funds to own funds used to finance a company's assets. *ROA* is profits after tax net of prior period and extra-ordinary transactions over fixed and other assets, including current assets such as inventories and cash. Nominal balance sheet data is adjusted to year 2000 rupees using the Indian wholesale price index. The Online Appendix provides detailed definitions of all Prowess variables used.

In addition to these variables, I construct two measures of productivity. I follow Petrin et al. (2004) to construct *TFP1* using the natural log of *value added* as the output variable, the natural log of *employee compensation* as the free parameter, the natural log of *raw materials* and the natural log of *power, fuel and water charges* as the proxy variables and an adjusted measure of *gross fixed assets* as the capital variable (see the Appendix for details of the adjustment of capital from historic costs to replacement costs).

Foster et al. (2001) use factor cost shares for labor and capital estimated from the data to construct measures of firm level TFP, assuming constant returns to scale and competitive markets. For the Prowess data, I construct *TFP2* using this method. β, the coefficient on labor, is estimated as the industry level (using the industry group code variable) sum of *employee compensation* divided

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[21] The Annual Survey of Industries (ASI), which is a census of manufacturing firms in India, could not be used for this project because (1) observations in the ASI are at the plant level, (2) company identifiers are not available in the ASI and firms could not have been matched to the PE databases and (3) the ASI contains information only for manufacturing firms.

[22] Employee compensation instead of employment is used because Indian accounting rules do not mandate reporting the total number of employees and Prowess has this number available for only about 6% of firm-year observations.

by the sum of *revenue*. γ, the coefficient on materials, is estimated as the industry level *raw materials* divided by *revenue* for the given industry. I then calculate $\alpha = 1 - \beta - \gamma$. *TFP2* is then:

$$TFP2 = ln\ value\ added - \beta * ln\ employee\ compensation - \alpha * ln\ adjusted\ gfa.$$

Because Prowess provides accounting information on the Rs. amounts spent or earned for a given category of business activity rather than the direct quantities of goods consumed and produced, it is only possible to calculate a measure of total factor productivity, TFPR, that includes input and output prices (see Foster et al. (2008)).

Financial information through time is available only for those firms that could be matched by name to the Prowess database. Of the 4,328 firms in the countrywide PE database, 1,043 were also found in the Prowess database (representing 12,564 observations). For the firm specific data, 88 out of the 189 companies were found in the Prowess database (876 observations), including 15 treatment firms. The number of years in the data for these firms ranges from [2, 25] with a mean of 13 and a median of 12. Larger and more sophisticated firms are more likely to match to the Prowess database. However, there is no reason to believe that control firms are more likely to match than treatment firms. It is possible that firms grow due to PE investment and are then more likely to enter the Prowess data post PE. The difference-in-difference specification will allow these firms to help establish the year fixed effects but they will not provide variation to identity the effect of PE investment.

In addition to these sources I also use data on management from the Indian survey of Bloom et al. (2012). Four waves of this survey were conducted in India in 2006, 2008, 2009, and 2010. Trained interviewers rated firms on a five point scale using several questions about operations, targeting, monitoring, and people management. These ratings were combined to create an overall management score for each firm as well as individual scores in each subsection. Indian observations in this survey include 937 firm-years representing 738 companies, 40 of which received PE funding at some point in my sample period.

5 Identification

It is difficult to estimate the effects of PE on investee firms. If PE firms are good at choosing investees that will eventually be successful (picking "winners") then a correlation in the data between firm outcomes and PE investment might represent reverse causation. Similarly, omitted variables, such as good management, might directly cause improvements in firm performance as

well as increases in outside investment from PE firms. A naive econometrician might attribute improvements in the firm to PE, not realizing that an omitted variable caused both. Because of the amounts of money and time involved, PE firms are not likely to allow a researcher to randomize investment in a controlled experiment and sharp policy changes affecting one area within the country but not other areas are difficult to find. Consequently, much of the PE literature has relied on matching techniques, using (sometime crude) observables to create a set of control firms with which to compare investee firms.

To identify the effect of PE, I first match the countrywide dataset of all PE investments in India to the Prowess data. Limiting this data to those companies that will ever receive PE, I use a difference-in-difference estimator to determine the effect of investment on various financial measures from Prowess. Because this is an unbalanced panel through time, firms that will eventually but have not yet received PE act as control firms for those that have already received investment. Since all firms in this sample receive PE investment, difference in unobservables related to selection by PE companies across firms should be reduced in this sample. The assumption that the timing of PE investment is orthogonal to firm characteristics and changes in outcome variables for the firm helps to identify the results. This assumption might be violated if different types of firms receive funding at different points in time or if PE firms are especially good at choosing firms immediately before they start growing or becoming more efficient.

Because I can not completely rule out a timing story, I provide a complementary identification strategy using a smaller sample of propriety data from a large PE firm in India. This sample includes firms that received investment as well as firms that were very strongly considered but ultimately did not receive funding ("near-misses").

Of the 1.3 million registered firms in India, only a certain subset of them would be good candidates for PE investment. In the case of my "near-miss" data over 2,000 firms were screened by this PE company as potential investment targets. Of this pool, 220 were chosen as companies suitable for investment and moved from category D to category C. At this point the firm expended significant resources to further screen out companies that would be good investment targets. A deal team was formed, investment calculations were performed, representatives from the PE firm visited the managers and owners of the companies several times to discuss the company and observe firm operations, industry analysis was done, and each deal was heavily debated at a deal meeting which included all the partners of the company. The cost of the time and energy devoted by the company in this due diligence suggests that these companies were strong candidates for investment. After this extensive review, companies thought to be good potential investments were moved into

category B. Of these companies, the firm ultimately invested in just over 25 companies which moved into category A (see Figure 2). The identification assumption is that firms in category B are similar to firms in category A but for the idiosyncratic choice of investment by the PE firm. The firm's data expert notes that: *"These are all very good companies. The companies in the B group may have made it except for some small factor like timing, competition, or the personalities of the people involved. Sometimes it just comes down to luck."*

Screening by the PE company as potential investment candidates ensures "near-miss" firms are more similar to investee firms on unobservables than other firms in the economy that might be used in a matching exercise. For firms also found in the Prowess database, I can compare financial variables for A and B companies before consideration by the PE firm.[23] Although standard errors are large, none of the differences are statistically significant. There is virtually no difference between expenditures or revenues between A and B companies and, if anything, employee compensation is lower for A firms.

Several firms in both category A and category B receive PE investment from other firms either before or after being considered by the firm from which I have data. Figure 3a shows the cross tab of the number of firms in category A and category B and the number of them that received PE investment from other PE firms. Figure 3b shows the same categories for the number of observations (firm-years) that were matched to the Prowess database. Receiving investment from one PE firm may provide a certification effect and make it more likely that the company receives additional funding from another PE firm. Conversely, investment from one PE firm may crowd out investment from another and make it less likely that a second firm would invest in the same company as there may be diminishing marginal returns to an additional PE dollar. Neither effect seems to dominate in these data and firms are split between the categories. In my main specification I will use investment by the firm for which I have data as an instrumental variable for PE. This instrument will identify the local average treatment affect (LATE) of PE for the firms that were induced into treatment by my firm.

6   Effects of PE investment on Indian companies

6.1   Result 1: Successful firms are selected for investment by PE

PE firms in India invest in companies that are bigger and better performing than the typical firm in the Prowess database. Panels A and B of Table 3 show the difference between firms in the

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[23]Appendix Table A.2 shows this difference controlling for year fixed effects.

Prowess database that never receive PE and firms that have not yet but will receive PE in the future. Across all of these measures, firms that will receive PE appear to be better firms: they have higher revenues and profits, more assets, pay more to employees, have lower debt/equity, higher TFPR, and higher returns on equity (ROE) and ROA.[24]

The Prowess database also records some information about board of directors for over 23,000 companies (representing 122,621 firm-year observations) and data on board meetings for approximately 1,250 firms. Nearly 900 of the companies in the board of director data received PE investment at some time during the study period as did 130 of the firms in the board meeting data. Comparing firms that will receive PE in the future but haven't yet to firms that never receive PE, future PE firms have 2 additional people on the board of directors and have more than 2 additional board meetings per year.

Merging data from the Indian portion of Bloom et al. (2012) to the PE database allows me to examine other firm characteristics. Compared to other firms in the survey, firms that have not yet but will receive PE investment have a .27 higher management score on a five point scale. The overall management score as well as scores for monitoring and targets are significantly higher for these firms. Panel C of Table 3 shows these results (controlling for year fixed effects) for board of director differences and management differences between firms that do not receive PE and firms that will receive PE.

Firms considered for investment by the firm for which I have data are also positively selected compared to the general firm in the Prowess database. Figure 4 shows a kernel density graph of ROA for firms in the Prowess database that never receive PE, firms that will eventually but have not yet received PE, and A and B firms that matched to Prowess before they were considered for investment. Firms that will receive PE and A and B firms perform better than other firms in Prowess, although A and B firms might be slightly less selected in terms of ROA than other firms that will receive PE investment.[25]

6.2 Result 2: Operational size increases after investment

Of the 4,328 companies that receive PE investment in my data, about 1,043 match to the Prowess database. Limiting the Prowess dataset to just these companies that receive PE, I run the following

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[24]These results are robust to controlling for industry as can be seen in Table B.1 in the Online Appendix.

[25]Table A.3 in the Appendix provides a comparison of A and B firms and non-PE Prowess firms for many other financial characteristics.

difference-in-difference regression:

$$y_{it} = \lambda_t + \gamma_i + \pi firm_i AfterInvest_t + \mu_{it},$$

where y_{it} is an outcome variable, λ_t is a year fixed effect, γ_i is a firm fixed effect, $firm_i AfterInvest_t$ is an indicator that turns to one when the firm receives PE investment, and μ_{it} is an error term. The differential timing of investment in the unbalanced panel dataset provides variation to identify π, the effect of PE on the given outcome variable.

Panel A of Table 4 shows the results of these regressions for the natural log of employee compensation, assets, expenditures, and revenue, and for the level (in millions of rupees) of profits.[26] All of these variables increase significantly after PE investment.[27] The coefficient on revenue, for instance, suggests that firms grow by approximately 40% after investment by a PE firm. Spending on both labor and capital increase, suggesting that the investment money is not simply increasing the cash reserves of the company.[28]

Panel B of Table 4 provides estimates for the same outcome variables from the "near-miss" dataset. These regressions use a similar difference-in-difference specification where firms in category B act as controls for firms in category A. Investment from the firm for which I have data is used as an instrument for PE so the coefficients should be interpreted as local average treatment effects.[29] Because I have hand collected data on survival, zero values are added back in for employee compensation, assets, expenditures, and revenues in order to control for selection. These variables are reported in $ln(x + x_1)$ where $x_1 = min(x|x \neq 0)$.[30] Because of the small sample size, standard errors are large. However, as with the countrywide dataset, all of these coefficients are positive and employee compensation, assets, expenditures, and revenues are all statistically significant. The

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[26]Profits takes on negative values for around 8% of observations in the data.

[27]Table B.2 in the Online Appendix provides these results in levels.

[28]Because Prowess is an unbalanced panel through time, the mix of firms in the data is also changing. Table A.4 in the Appendix shows the same regressions on a balanced panel of firms included in the data for every year between 2000 and 2010. All the coefficients on the outcome variables are positive and all except profits are statistically significant. Interestingly, the coefficients are about half as big as those in the unbalanced panel with employee comp at .20, assets at .30, expenditures at .21, revenue at .18 and profit at 68.68. Firms that are in the data consecutively for 10 years are likely to be older, more established firms. Not surprisingly, the effect of PE on these firms, while still large and positive, is not as big as the effect for smaller, growing firms, where PE may be especially important in expanding the size of the firm.

[29]OLS results can be found in Appendix Table A.5. In general, the OLS results are between those of the countrywide dataset regressions and the IV regressions for the "near-miss dataset. Employee compensation (column 1), for example is 1.24 and significant at the 5% level.

[30]Tables in the Online Appendix demonstrate that the results are robust to using several different specifications including $ln(x)$, $ln(x+1)$, and in the case of the OLS results, using a negative binomial regression. For example, the coefficient for column 1 in the various specifications is as follows: $ln(x + 1)$, 3.01; $ln(x)$, 3.25; $ln(x + x_1)$ and I_{zero}, 3.19; OLS $ln(x + 1)$, 1.08; OLS $ln(x)$, 1.14, OLS negative binomial, .90.

magnitudes are much larger here than in the estimates from the countrywide dataset. This is to be expected since these are LATEs. In addition, as was shown, these firms may be slightly smaller than the typical firm which receives PE and may, therefore, have more room to grow. While the magnitudes are large, they are not unreasonable. Of the more than 32,000 firms in the Prowess database that don't receive PE investment, over 7% of them increase revenues by more than 2 log points between 2005 and 2010 even after controlling for an average growth trend. Similar growth in these firms that benefited from a PE infusion is not unrealistic. The change in these variables from three years before PE investment to three years after can be seen in Figure 5 which plots the residuals for treatment firms after controlling for firm and year fixed effects and provides bootstrapped standard errors at the 10% level.

As with the countrywide dataset, the timing of when these firms were considered for PE investment may not be random. To explore this I include an indicator that turns to one after a company is considered for investment by the PE firm for both A and B companies. The effect of PE is identified from the difference in A and B companies that were considered at similar points in time. This specification also controls for company life cycle effects if PE firms always consider investees at a certain point in their growth trajectory. These results are similar in magnitude to those in the main specification.[31]

As a robustness check that it is actually PE that causes the difference between treatment and control firms, I do a placebo test where I artificially move the date of PE investment three years prior to the actual date and estimate the same regressions on the pre-PE consideration observations.[32] Profits in this specification are negative and, while the other variables are positive, none are statistically significant.

The hand-collected data for the "near-miss" dataset allow me to increase the sample size by including observations that do not match to the Prowess data and also allow me to examine firm survival. Because some of the B firms also received PE investment from other PE companies, I can determine the marginal effect of investment from my PE firm. Table 5 provides the results of this data for the natural log of employment and firm survival after investment. The difference between A and B firms is the effect of PE given the identification assumption (G3 vs G6 in the table; see Figure 3). The difference between A and B firms conditional on receiving other PE investment provides the marginal impact of my firm given other investment (G1 vs G4). As expected, the effect of additional PE is smaller than the OLS results, consistent with a story of diminishing marginal

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[31]See Appendix Table A.6. Coefficients are as follows: (1) 3.90; (2) 1.70; (3) 2.39; (4) 2.14; (5) 613.55.

[32]Appendix Table A.7 shows the results of these regressions.

return to PE. Similarly, we can see the marginal impact of investment from my firm given no other PE investment (G2 vs G5). Again, as expected, the impact of investment is larger given no other PE funding. Assuming that all other PE firms have the same choice set and similar ranking for companies seeking PE I can determine the effect of any PE compared to no PE (G1, G2, and G4 vs G5).[33] The effect of any PE funding is larger than the simple A vs B result which is attenuated by imperfect compliance (control companies treated by other PE firms). Given the same assumptions of similar choice set and common ranking and limiting to the companies that my firm categorized as B, I can determine the effect of receiving PE from another source by comparing B companies that didn't get PE to those that did (G4 vs G5). The results here are similar to the OLS results for survival and larger for employment. The last columns of the tables show the LATE instrumenting for PE with investment from my firm. As expected the LATE is larger than the OLS results. Across all of these specifications PE increases employment by between 1.1 and 3.2 log points and decreases the probability of exit by between 10% and 30%.

In the countrywide dataset revenue and profits as well as spending on labor and capital increase significantly after PE investment compared to firms that have not yet but will receive investment. These variables also increase in the "near-miss" dataset for firms that receive PE investment vs controls. These changes in the firm are inconsistent with PE as extractive or PE as a story of passive diversification by investors. However, these results do not disentangle whether PE in India operates primarily to reduce barriers to expansion or to improve firm efficiency. For this we now turn to the results on firm performance.

6.3   Result 3: Firm performance does not improve after investment

For the countrywide dataset, I use the same difference-in-difference specification to examine the effect of PE on debt/equity, TFPR, and ROA (see Table 6 Panel A for results). Notably, the debt/equity ratio is not significantly different post PE investment and, if anything, decreases after PE investment. This is evidence against PE as simply a mechanism to leverage the company in order to gain favorable tax treatment. The two measures of TFPR provide slightly different results but neither is statistically significantly different from zero. ROA is negative and statistically significant. These results are more consistent with a story of PE reducing barriers to expansion rather than barriers to efficiency.[34]

Results in the well-identified "near-miss" data are consistent with those of the countrywide

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[33]This is a strong assumption and is unlikely to be true.

[34]Similar results using the strictly balanced panel can be found in Table A.8 in the Appendix.

data: debt/equity is negative but not statistically significant, both measures of TFPR are negative and TFP1 is statistically significantly negative, and ROA is also negative as can be seen in Panel B of Table 6.[35] The evolution of these variables for the three years pre and post PE can be seen in Figure 5.[36]

6.4   Potential mechanisms

Along with providing capital and assisting in raising future capital, PE is often argued to help investee companies by improving operations, strengthening corporate governance, bringing rigor to business systems and processes, providing access to their business networks, and helping with hiring to fill key management roles (Bain and IVCA, 2011, p. v).[37]

Unfortunately, wide scale data are not available to track exactly what PE firms do in investee companies.[38] However, I use the Prowess data on board of directors and data from the Indian Management Survey to provide some suggestive directions for future research.

Firm governance is difficult to quantify and measure and there is mixed evidence on the effect of boards on firm performance.[39] Using the Prowess data, I find that the number of people on the board of directors increases by 1.15 persons after PE investment (mean of 9 people). This is consistent with PE partners taking a seat on the board of directors in the companies in which they invest. The change in the number of meetings per year of the board of directors is small and slightly positive (.27) but not statistically significantly different than zero (see Table A.12 in the Appendix).[40] Although the sample size is very small, I compare the firms in the Indian Management Survey that receive PE investment to those that don't using a difference-in-difference specification. Neither the overall management score nor its sub components are statistically difference from

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[35]OLS results can be found in Appendix Table A.9.

[36]Results from a placebo test where I artificially move the date of PE investment three years prior to the actual date and estimate the same regressions on the pre-PE consideration observations can be seen in Table A.10 in the Appendix. Debt/equity, TFP2, and ROA are all increasing after the pseudo investment date, opposite of the pattern seen after the actual investment date.

[37]There is increasing evidence that management practices and firm organization can have nontrivial effects on firm productivity. See, among many, Bloom et al. (2013, 2012); Bloom and Van Reenen (2010); Bloom et al. (2010, 2009); Gompers et al. (2009); Bloom and Van Reenen (2007); Bushnell and Wolfram (2007); Bertrand and Schoar (2003); Acemoglu et al. (2007); Atalay et al. (2012); Maksimovic and Phillips (2002); Schoar (2002); Black and Lynch (2001); Syverson (2011); Foster et al. (2008); Hortasu and Syverson (2007); Syverson (2004); Forbes and Lederman (2009); Lazear (2000); Ichniowski et al. (1997).

[38]Table A.11 in the Appendix provides information on what the firm for which I have data did in some of their investee companies. This limited data is consistent with a story of expansion rather than efficiency.

[39]For evidence on the effect of governance see Kramarz and Thesmar (2013); Landier et al. (2012); Schoar and Washington (2011); Giroud and Mueller (2010); Gompers et al. (2003). Lerner (1995) and Baker and Gompers (2003) provide data on how PE/VC firms interact with boards of directors in the US.

[40]These results come from restricting the sample to those that ever receive PE investment and using the differential timing of PE in a difference-in-difference specification as in the previous results.

zero and most of the point estimates are negative.[41] It does not appear that improvements in management are driving changes in investee firms.

Anecdotally, these firms seem to have a difficult time finding good managers and competent CEOs. The availability of high quality managers may be a constraint on the impact of PE firms in India. This is consistent with Bloom and Van Reenen (2010) which find that India was among the lowest performing countries on their measures of management practices. These constraints might also help to explain why Indian firms do not seem to grow as do firms in developed countries (see Hsieh and Klenow, 2014; Kothari, 2013). More evidence is necessary to test this possibility but it is consistent with the experience of the firm for which I have data. In a review of investments for this firm, 12/22 deals mentioned significant problems with management or the difficulty of finding good managers. In nine of the deals, problems with the CEO are noted and twice the company went through two CEOs in trying to find the right leader for an investee company. On two separate occasions, one of the PE firms' partners became interim CEO of a purchased company, in one case moving from Mumbai to Hyderbad for a year. It is hard to imagine a partner in a US firm becoming CEO of an investee company.[42]

7 Conclusion

The results from both the countrywide data and the better identified "near-miss" data are consistent with an explanation of PE as a mechanism for helping Indian companies to grow and encouraging the reallocation of resources across the economy through time. This reallocation function might be especially important for increasing macro TFP in developing countries.[43] Investee companies are growing in terms of revenue and profits and they are spending more on employees and assets. Because several financial indicators at these companies change post investment, these results are inconsistent with a story of PE as solely a tool of portfolio diversification by limited partner investors. The debt/equity ratio also does not change post investment and, if anything, debt is lower at the companies that receive PE investment. This argues against PE as purely a story of

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[41]See Table A.13 in the Appendix.

[42]See Table A.14 in the Appendix for some quotes on the difficulty of finding good managers.

[43]Banerjee and Duflo (2004) describe how the assumption of optimal resource allocation, important for traditional growth theory, fails radically in the micro-development literature and they show that there is enormous heterogeneity of rates of return to the same factor within a single economy.This within economy heterogeneity may dwarf cross-country heterogeneity. Hsieh and Klenow (2009) build on this idea and argue that if capital and labor in India were allocated as they are in the US, there would be a TFP gain of 40%-60%. Hsieh and Klenow (2014) show that plants in India exhibit little growth in employment or output compared to US plants and that they invest less in process efficiency, quality, and accessing markets. They estimate that the difference in life cycle dynamics between US and Indian plants could lower aggregate manufacturing productivity 25% relative to the US.

using leverage to receive tax shields. Further, TFPR does not seem to be significantly different post investment in the countrywide data and decreases in the "near-miss" data and ROA decreases after investment in both datasets. These decreases indicate that efforts to change the underlying operations of the firm do not seem to be driving PE investment in India. The overall pattern of results is consistent with a story of PE investors reducing barriers to expansion and encouraging manager-owners to expand the size of their firms. The role of PE in relaxing capital constraints for good firms may be especially important in India given banking regulations and the conservative nature of most Indian banks which make it difficult to get loans. PE firms may also provide investee firms with a "technology of expansion," providing concrete knowledge and expertise on how to effectively scale an enterprise.

The effect of PE on the Indian economy is potentially large. Using the estimated increase in gross fixed assets from the countrywide dataset together with the share of capital accounted for by companies that receive PE between 2005 and 2006, PE accounts for 4.3% of the growth in the capital stock per year. Given that the amount invested is equivalent to about 1% of the market capitalization of the Bombay Stock Exchange, PE seems to have an outsized effect on the growth of the capital stock in the country.

The data indicate that PE in India differs from the standard view of PE in the US today as a bundle of capital, management, and governance improvements which help firms to cut costs and become more productive (Davis et al., 2013). The PE industry itself might have a life cycle within a given geography (see Kaplan and Stromberg (2009) and Guo et al. (2011) for changes in US PE). With relatively inefficient capital, labor, and product markets, there may be more scope for PE firms to reallocate resources across the economy, taking advantage of arbitrage opportunities by taking the best firms and making them bigger. It may be easier to expand the size of the firm than change productivity within the firm. By reducing barriers to expansion for investee firms, PE may help to spur financial development that will reduce credit constraints and make it more difficult for PE firms in the future to exploit these barriers to achieve high returns.[44] As this happens, PE firms may become more operations-oriented and focused on improving the efficiency of the production process itself. Perhaps the development of the US PE industry, from the capital focused PE firms of the 1970s to Bain and TPG today, reflects this evolution of the industry.[45] Indian PE might be in the early stages of the development of the industry with a heavy focus on easier-to-implement growth rather than more difficult changes in firm operations. Thus, private capital may be an

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[44]Bertrand et al. (2007) find evidence that a more efficient banking sector can lead to reallocation in a similar manner and Rajan and Zingales (1998) argues that financial development can facilitate economic growth.

[45]See Jensen (2010).

important catalyst to increasing macro productivity and financial sophistication through time by identifying and arbitraging away the most important constraints that firms face at different levels of development. In this way, PE may be an especially important tool for economic growth.

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8 Figures and Tables

Figure 1: PE in India has grown significantly through time
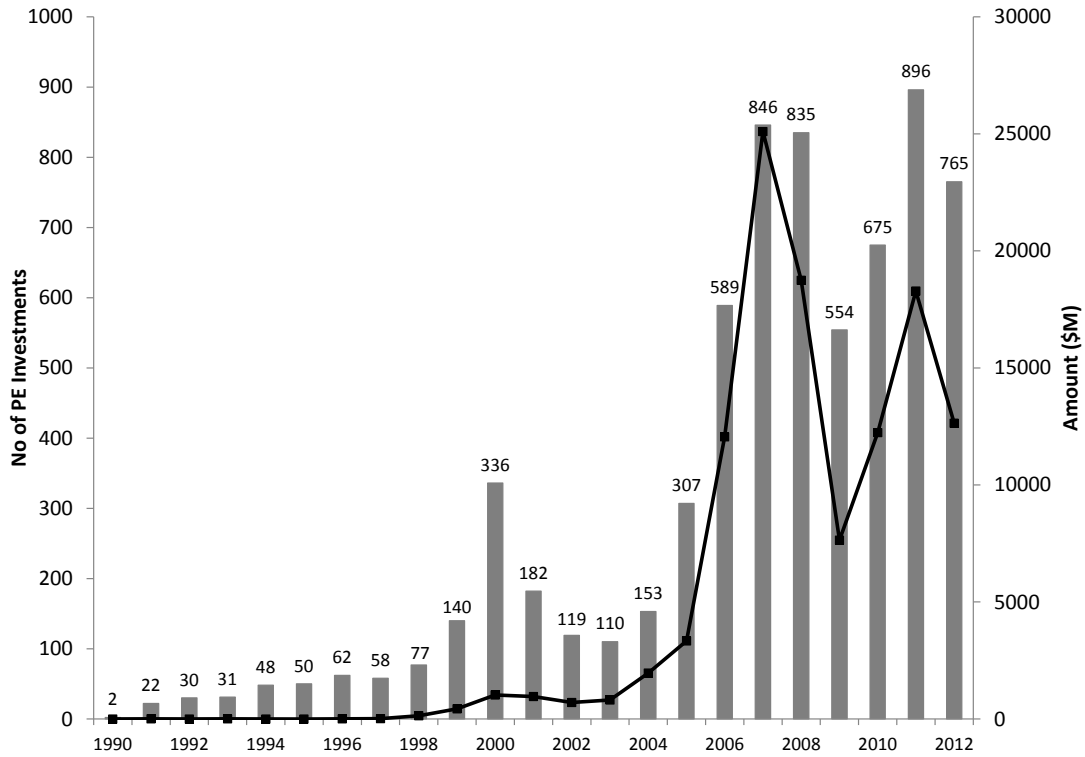
Notes: Number of deals (bars) and amount invested (line) from 1990 - Oct 2012 from countrywide database of PE deals in India constructed using VCCEdge, Venture Intelligence, Prequin, and Thomson. Amount invested is an underestimate as this variable is only available for about 70% of observations.

Figure 2: Using "near-miss" firms to identify the effect of PE

All companies in India – 1.3 m
Category D – 2,000
Category C - 220
Category B - 190
Category A - 26
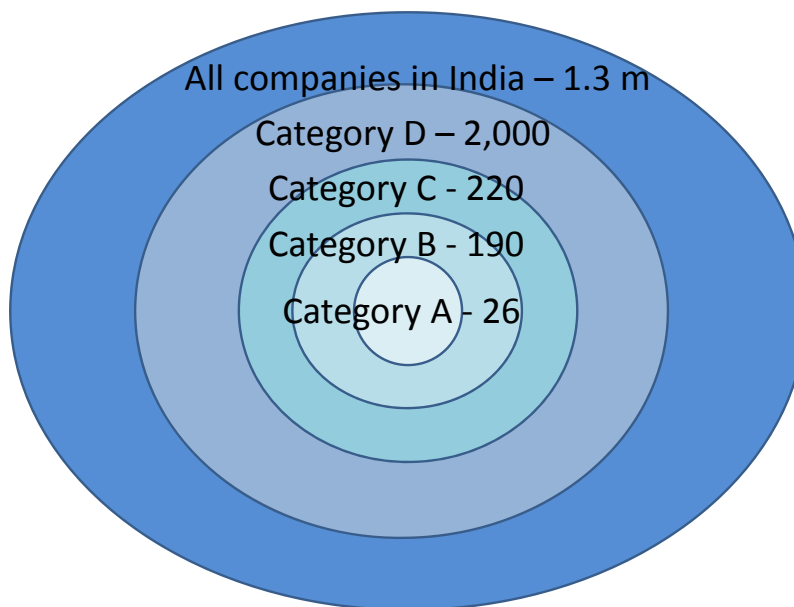
Notes: Screening down of companies by a large PE firm in India from all firms considered (Category D) to firms which received investment (Category A). Data provided by the company for 1999 - June 2013.

Figure 3a: Number of companies by PE investment

	Others	No Others	
My firm	G1 14	G2 12	G3 26
Not my firm	G4 83	G5 80	G6 163
	97	92	189

Notes: The first row denotes the number of companies that received investment from the PE firm from which I have data and the second row indicates the firms that did not receive investment from the PE firm from which I have data. The first column denotes the number of companies that received PE investment from one or more other PE firms and the second column denotes the firms that did not receive other investment. For example, box G5 (80) are firms which were considered for investment by my firm but received no PE investment from any source. Data on firms provided by the company and matched to a constructed countrywide database of all PE deals in India.

Figure 3b: Observations matched to Prowess by PE investment

	Others	No Others	
My firm	87	25	112
Not my firm	469	295	764
	556	320	876

Notes: The first row denotes the number of matched observations in Prowess for companies that received investment from the PE firm from which I have data and the second row indicates the observations that did not receive investment from the PE firm from which I have data. The first column denotes the number of matched observations in Prowess that received PE investment from one or more other PE firms and the second column denotes the observations that did not receive other investment. Data on firms provided by the company and matched to a constructed countrywide database of all PE deals in India and Prowess.

Figure 4: PE firms have higher ROA before selection

kernel = epanechnikov, bandwidth = 0.4240
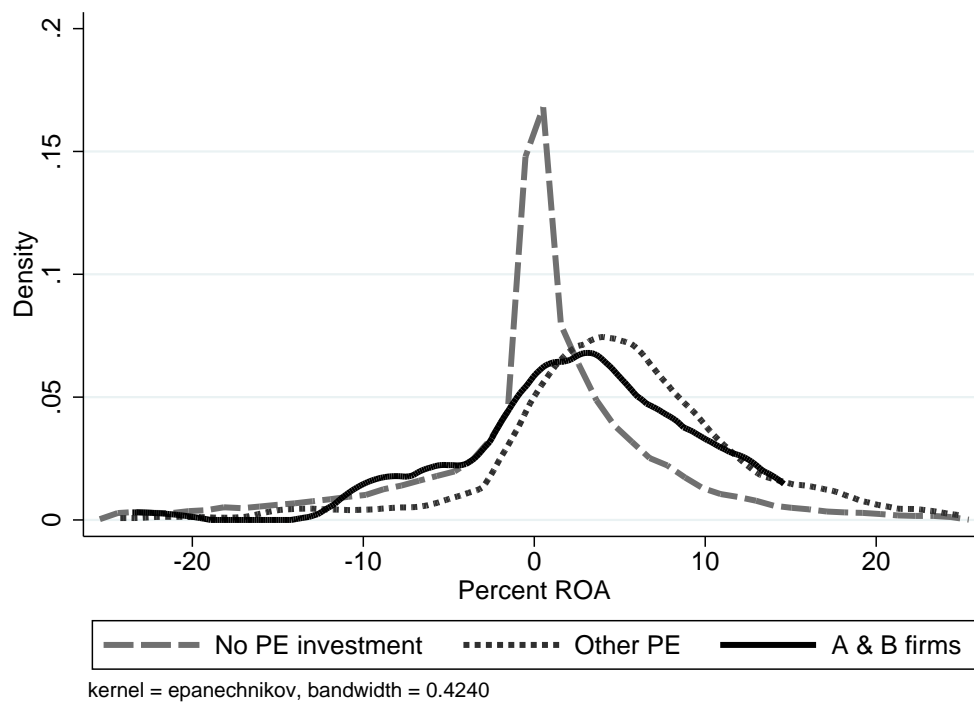
Notes: Kernel density plot of ROA for values between [-25, 25] for firms in Prowess that never receive PE (No PE investment; 32,383 firms), firms that will but haven't yet received PE (Other PE; 752 firms), and A and B firms (companies invested in by my PE firm and "near-misses"; 64 firms). Data on firms provided by the company and matched to Prowess and a countrywide constructed database of all PE deals in India.

Figure 5: Changes in financial and performance variables after PE investment
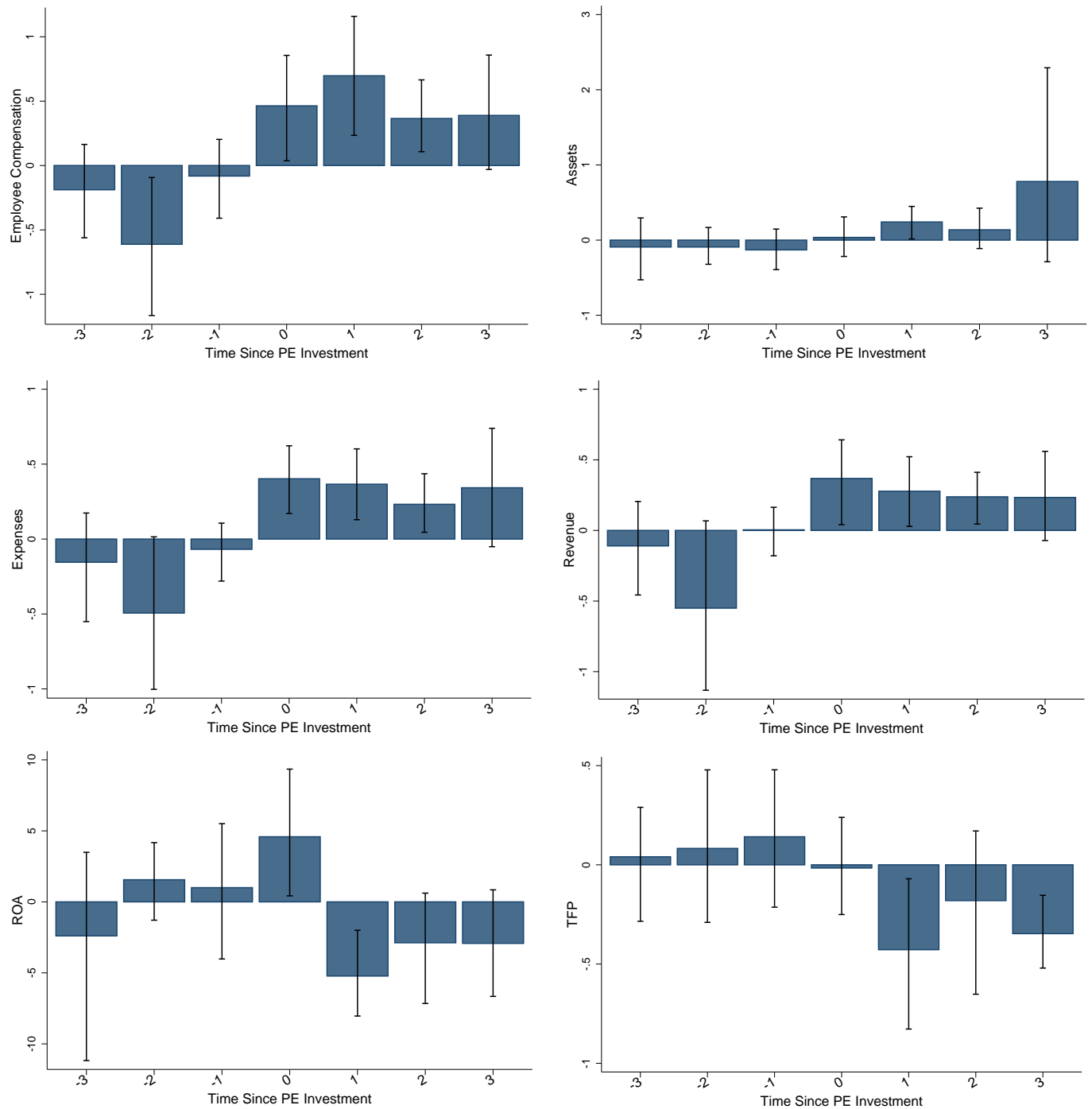
Notes: Average residuals since PE investment of the given variable for investee firms after removing year and company fixed effects from a regression of A and B firms. Standard errors are bootstrapped (500 iterations) at the 10% level. Data on firms provided by the company and matched to Prowess.

Table 1: Predictions from the model

	Rev^*, π^*	K^*, L^*	TFPR	$\frac{\pi^*}{K^*}$
No Change: $\triangle\tau_a = \triangle\tau_K = 0$	—	—	—	—
Efficiency: $\tau_a \downarrow$	↑	↑	↑	—
Expansion: $\tau_K \downarrow$	↑	↑	↓	↓

Table 2: Private equity investment by industry

Industry	Non PE	PE	Total	% PE	% Rev PE
Storage & Distribution	85	4	89	4.49%	37.48%
Health Care Equipment & Services	180	13	193	6.74%	33.23%
Pharmaceuticals, Biotechnology & Life Sciences	625	57	682	8.36%	32.63%
Construction & Engineering	1,096	70	1,166	6.00%	28.38%
Software & Services	983	91	1,074	8.47%	27.58%
Media	1,993	42	2,035	2.06%	25.70%
Telecommunication Services	274	28	302	9.27%	22.34%
Real Estate	1,464	43	1,507	2.85%	21.94%
Technology Hardware & Equipment	381	22	403	5.46%	17.84%
Retailing	139	12	151	7.95%	17.40%
Consumer Services	1,961	71	2,032	3.49%	15.28%
Transportation	375	23	398	5.78%	13.86%
Consumer Durables & Apparel	1,967	76	2,043	3.72%	13.72%
Capital Goods	1,159	59	1,218	4.84%	13.19%
Diversified Financial	8,043	121	8,164	1.48%	13.14%
Commercial & Professional Services	1,397	30	1,427	2.10%	11.92%
Food, Beverage & Tobacco	1,935	53	1,988	2.67%	8.53%
Automobiles & Components	525	32	557	5.75%	8.41%
Materials	3,730	110	3,840	2.86%	8.30%
Household & Personal Products	111	4	115	3.48%	7.63%
Diversified	344	13	357	3.64%	4.72%
Energy	661	21	682	3.08%	3.06%
Trading	2,979	48	3,027	1.59%	2.42%
Total	32,407	1,043	33,450	3.12%	11.59%

Notes: Data conditional on matching between the Prowess and PE databases. Industry classifications come from Prowess. PE includes all firms that receive PE investment at any time. Revenue represents the mean revenue for the firm across the years that it is in the Prowess database. Percent revenue is the sum of revenue for companies that will ever receive PE investment over total revenue for all companies in that industry.

Table 3: Selection: Investee firms appear to be positively selected

Panel A: Investee firms are larger before investment

	LnEmp	LnAssets	LnExp	LnRev	Profit
	(1)	(2)	(3)	(4)	(5)
Ever PE	1.78***	1.68***	2.37***	2.31***	248.00***
	(0.06)	(0.07)	(0.07)	(0.07)	(32.85)
Mean of Dep Var	1.84	3.75	3.82	4.00	183.37
N	207,841	226,164	242,361	231,246	244,265
N Clusters	26,284	27,670	30,925	29,360	31,063
R-Square	0.05	0.05	0.07	0.06	0.01

Panel B: Investee firms are better performing before investment

	Debt/Eq	LnTFP1	LnTFP2	ROA	ROE
	(1)	(2)	(3)	(4)	(5)
Ever PE	-0.10	0.40***	0.75***	5.89***	15.85***
	(0.19)	(0.03)	(0.05)	(0.44)	(1.03)
Mean of Dep Var	2.19	0.63	0.85	-0.74	1.49
N	227,328	186,440	184,060	226,154	194,029
N Clusters	30,852	23,954	23,743	32,381	29,861
R-Square	0.005	0.01	0.02	0.01	0.01

Panel C: Investee firms are better managed before investment

	No. BoD	Mtgs.	Man	Monitor	Target	People
	(1)	(2)	(3)	(4)	(5)	(6)
Ever PE	2.21***	2.17***	0.27**	0.36***	0.36***	0.22
	(0.14)	(0.23)	(0.12)	(0.13)	(0.14)	(0.17)
Mean of Dep Var	6.16	4.99	2.56	2.78	2.55	2.55
N	111,944	10,393	907	907	907	907
N Clusters	22,207	1,160	691	691	691	691
R-Square	0.06	0.14	0.01	0.005	0.01	0.01

Notes: $* < 10\%, ** < 5\%, *** < 1\%$. The difference between companies that will receive PE and others before PE investment. Panel A reports employee compensation, assets, expenditures, and revenue, in natural logs and profits (ebitda) in levels. TFP measures are in natural logs in Panel B. Panel C includes number of people on the board of directors, number of board meetings per year, overall management score and scores for monitoring, targets, and people skills. All regressions include year fixed effects. Observations are weighted by the inverse of the number of years the company appears in the data and standard errors are clustered at the firm level. Accounting and board of director data from Prowess. Management data from World Management Survey (Bloom, Sadun, and Van Reenen, 2012).

Table 4: Operational size increases after PE investment

Panel A: Increase in operational size in countrywide dataset

	LnEmp	LnAssets	LnExp	LnRev	Profit
	(1)	(2)	(3)	(4)	(5)
Invested*After	0.45***	0.57***	0.49***	0.41***	162.04***
	(0.06)	(0.06)	(0.06)	(0.06)	(49.97)
Mean of Dep Var	3.94	5.83	6.48	6.52	652.96
N	11,923	12,231	12,171	12,053	12,175
N Clusters	1,005	1,025	1,030	1,023	1,030
R-Square	0.80	0.79	0.77	0.76	0.71

Panel B: Increase in operational size in "near-miss" dataset

	LnEmp	LnAssets	LnExp	LnRev	Profit
	(1)	(2)	(3)	(4)	(5)
Invested*After	3.48***	1.60**	2.23***	2.04**	409.04
	(1.20)	(0.74)	(0.84)	(0.97)	(721.51)
Mean of Dep Var	3.76	5.53	6.06	6.04	333.02
N	847	856	859	858	847
N Clusters	85	86	86	86	86
N Treatment	15	15	15	15	15
N Identifying variation	12	12	12	12	12
R-Square	0.61	0.77	0.67	0.63	0.65

Notes: $* < 10\%, ** < 5\%, *** < 1\%$. Panel A: The given dependent variable regressed on treatment by PE firms. Employee compensation, assets, expenditures, and revenue are in natural logs and profit (ebitda) is in levels. Panel B: The given dependent variable regressed on treatment by PE firms using investment by my firm as an instrument for PE investment. Employee compensation, assets, expenditures, and revenue are in $ln(x + x_1)$, where $x_1 = min(x|x \neq 0)$. For both panels, all regressions include year and company fixed effects and standard errors are clustered at the firm level. Countrywide data taken from VCCEdge, Venture Intelligence, Prequin, and Thomson. "Near-miss" data from my firm.

Table 5: Size using different identification strategies

Panel A: Increase in the natural log of employment after PE investment

| | Ln Employment | | | | | |
	(1)	(2)	(3)	(4)	(5)	(6)
Specification	G3 vs G6	G1 vs G4	G2 vs G5	G1, G2, G4 vs G5	G4 vs G5	IV
Invested	1.35***	1.11**	1.76**	2.14***	2.03***	3.20***
	(0.48)	(0.50)	(0.77)	(0.44)	(0.46)	(1.13)
Mean Dep Var	5.58	6.44	4.46	5.58	5.40	5.58
N	161	92	69	161	137	161
R-Square	0.08	0.05	0.15	0.18	0.19	0.15

Panel B: Decrease in the probability of bankruptcy after PE investment

| | Bankruptcy | | | | | |
	(1)	(2)	(3)	(4)	(5)	(6)
Specification	G3 vs G6	G1 vs G4	G2 vs G5	G1, G2, G4 vs G5	G4 vs G5	IV
Invested	-0.14***	-0.10***	-0.21**	-0.16***	-0.14**	-0.31***
	(0.05)	(0.04)	(0.10)	(0.06)	(0.06)	(0.11)
Mean Dep Var	0.14	0.08	0.21	0.14	0.16	0.14
N	179	96	83	179	153	179
R-Square	0.06	0.04	0.08	0.08	0.08	0.04

Notes: $* < 10\%, ** < 5\%, *** < 1\%$. Controlling for the age of the firm. All standard errors are robust. Panel A: Employment is the natural log of (x+1) where x is the most recently available approximate employment (includes the 26 companies that have gone out of business). Panel B: Bankruptcy is an indicator variable for whether the company went out of business after being considered for investment by the PE company. Refer to Figure 3a for the various groups used in each specification. Column 6 reports the instrumental variable results. Outcome data collected by the author.

Table 6: Zero or negative impact on ROA after PE investment

Panel A: Decrease in ROA after PE investment in countrywide dataset				
	Debt/Eq	LnTFP1	LnTFP2	ROA
	(1)	(2)	(3)	(4)
Invested*After	-0.17	-0.03	0.06	-2.77***
	(0.19)	(0.03)	(0.04)	(0.56)
Mean of Dep Var	1.81	0.94	1.54	2.81
N	11,702	11,485	11,176	11,401
N Clusters	1,028	988	972	1,036
R-Square	0.33	0.59	0.78	0.47
Panel B: Decreases in TFP and ROA after PE investment in "near-miss" dataset				
	Debt/Eq	LnTFP1	LnTFP2	ROA
	(1)	(2)	(3)	(4)
Invested*After	-1.62	-1.33**	-0.31	-11.65
	(1.40)	(0.61)	(0.57)	(9.65)
Mean of Dep Var	1.35	0.77	1.09	2.04
N	803	806	793	759
N Clusters	83	84	83	87
N Treatment	15	15	14	15
N Identifying variation	12	12	11	12
R-Square	0.45	0.58	0.72	0.56

Notes: $* < 10\%, ** < 5\%, *** < 1\%$. TFP are in natural logs. Constants not shown. Standard errors are clustered at the firm level and all regressions include year and firm fixed effects. Panel A: The given dependent variable regressed on treatment by PE firms. Panel B: The given dependent variable regressed on treatment by PE firms using investment by my firm as an IV for PE investment. Countrywide data taken from VCCEdge, Venture Intelligence, Prequin, and Thomson. "Near-miss" data from my firm.

A Appendix

A.1 Data Sources

VCCEdge is a financial research platform used by clients for deal origination, deal structuring and valuations, gaining market insights, carrying out due diligence, and tracking competition. It was created in 2009 by VCCircle (founded in 2005) which provides news, information, and data for the investment ecosystem in India. The company is based in Noida, India and gathers data from public sources, industry insiders, and the firms themselves. This data contain 4,414 observations from 1990 - 2012.

A competitor to VCCEdge, Venture Intelligence was started in 2002 in Chennai, India to provide information to the growing number of entrepreneurs and PE firms in India. This dataset contains 3,536 observations of PE transactions from 1997 - 2012.

Prequin is a global database of alternative assets that also contains some information on Indian PE. It was started in 2003 and has offices in New York, London, Singapore, and San Francisco. It collects data directly from industry professionals, regulatory filings, Freedom of Information Act requests, and news sources. My data from Prequin contain 1,528 observations from 1995 - 2012.

Thomson Reuters, formed by a merger of the Thomson Corporation and Reuters Group in 2008, is headquartered in New York City, US and has offices throughout the world. One of its products, Thomson One, has data on a wide range of business activities, including PE, for various countries throughout the world. The PE data from India in this dataset contain 3,253 observations from 1990 - 2012.

While there is significant overlap between these database, all of them also provide information about deals not found in any other database. In fact, 53.2% of deals are found in only one of the four databases and only 9.7% are found in all four.

A.2 Estimating production functions

Estimating production functions is difficult due to the correlation between unobservable productivity shocks and input levels. A productivity shock causes the firm to either expand or decrease output, which also affects input usage. This can cause estimated productivity using ordinary least squares to be biased. Firm fixed effects can be included to overcome this problem if productivity is assumed to be time-invariant. However, this strategy is not useful in exploring productivity changes over time. Selection can also cause biased estimates since there is a relationship between the unobserved productivity variable and the firm shutdown decision.[46]

Olley and Pakes (1996) (OP) develop an estimator using investment as a proxy for these unobservable shocks and also carefully control for selection. Levinsohn and Petrin (2003) argue that investment is lumpy due to substantial adjustment costs and that the investment proxy of OP may not smoothly respond to the productivity shock, violating the consistency condition. They argue that intermediate inputs can be used to solve the simultaneity problem. Further, the investment proxy of OP is only valid for plants reporting nonzero investment and LP argue that a large percentage of developing country firms report zero investment and thus these samples would suffer from truncation that might be problematic for analysis. LP also argue that if adjustment costs lead to kink points in investment demand then plants may not entirely respond to productivity

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[46]Both Olley and Pakes (1996) and Levinsohn and Petrin (2003) find that the selection correction makes little difference once the simultaneity correction is in place and I have not implemented it here.

shocks and correlation with the error term may remain. The intermediate input may more fully respond to the entire productivity term if it is less costly to adjust than investment.

A.3 Adjusting capital and calculating value added for TFPR1

To allow for different vintages, I adjust capital to convert gross fixed assets (gfa) from the Prowess balance sheet figures at historic cost to obtain asset value at replacement cost. I then calculate investment as the difference between the current and lagged value of gross fixed assets and apply the perpetual inventory method to get current period capital. Specifically,

$$P_{t+1}K_{t+1} = P_{t+1}(1-\delta)P_tK_t + P_{t+1}I_{t+1},$$

where K is the quantity of capital, P is the price of capital, I is investment and δ is the depreciation rate (calculated as depreciation/gross fixed assets). To calculate the base year P_0K_0 (the first year in the data for a given firm), I follow Balakrishnan et al. (2000). Specifically, I use their adjustment factor,

$$R^G = \frac{[(1+g)^{\tau+1}-1](1+\pi)^{\tau}[(1+g)(1+\pi)-1]}{g([(1+g)(1+\pi)]^{\tau+1}-1)}$$

where τ is the life of the machine (here assumed to be 20 years), π is the average $\frac{P_t}{P_{t-1}}$ from 1983-2013 ($\pi = 1.067$ for this period), and g is equal to the average real GDP growth rate ($\frac{GDP_t}{GDP_{t-1}}$) of the Indian economy from 1983-2012 from the World Bank Tables ($g = 1.06159$ for this period). I then multiple R^G by gfa in the base year to convert capital to replacement costs at current prices. This is then deflated using the price index. Finally, capital in the next period is calculated as

$$(1-\delta) * adjusted\ base\ year\ gfa + deflated\ investment.$$

Three different measures of value added were used. In general,

$$value\ added = total\ income - materials.$$

However, materials is only present for about 45% of observations in the data. Following (rosell, compustat), value added is also calculated as,

$$value\ added = PBDITA + employee\ compensation$$

or

$$value\ added = total\ income - cost\ of\ goods\ sold + employee\ compensation.$$

A.4   Appendix tables

Appendix Table 1: Investments across many industries

Industry	Not Invested	Invested	Total
Missing	0	3	3
Agro based	2	0	2
Auto Component	2	1	3
Biotechnology	1	1	2
Brand Related Businesses	2	0	2
Construction Services	1	1	2
Education	5	0	5
Energy	2	0	2
Financial services	7	4	11
Foods	2	1	3
Furniture	1	0	1
Healthcare	10	3	13
Information Technology	33	0	33
Internet Based Service	5	0	5
Logistics/Supply chain	6	2	8
Manufacturing	18	2	20
Marketing Outsourcing	1	0	1
Media & Entertainment	16	3	19
Miscellaneous	12	1	13
Outsourcing - Animation	0	1	1
Outsourcing Services/BPO	19	2	21
Pharmaceuticals	1	0	1
Retailing	12	1	13
Speciality Chemicals	1	0	1
Telecom	5	0	5
Total	164	26	190

Note: Data on industry classification from a large PE firm in India for "near-miss" firms that were strongly considered for investment but ultimately not funded and investee firms.

Appendix Table 2: Treated firms not significantly different before consideration

	LnEmp	LnAssets	LnExp	LnRev	Profit
	(1)	(2)	(3)	(4)	(5)
Invested	-0.62	0.33	0.00	0.04	522.53
	(0.67)	(0.68)	(0.54)	(0.58)	(487.89)
Mean of Dep Var	3.27	5.38	5.95	5.92	238.40
N	278	288	283	284	284
N Clusters	53	55	54	54	54
N Treatment	10	10	10	10	10
R-Square	0.10	0.07	0.08	0.08	0.11

Notes: $* < 10\%, ** < 5\%, *** < 1\%$. The given dependent variable regressed on future treatment by PE firms. Employee compensation, assets, expenditures, and revenue are in $ln(x + x_1)$, where $x_1 = min(x|x \neq 0)$. Constant not shown. Standard errors are clustered at the firm level. Controls for year fixed effects. Data from my firm and Prowess.

Appendix Table 3: A & B firms are better performing than average firm

	Non PE	My Firm	Diff	T stat
Number of companies	32,383	87		
Number of yrs in data	8.1	9.9	1.8	2.9
Revenue (Rs. Mil)	586	684	98	0.3
Employee Comp (Rs. Mil)	45	68	22	0.9
Total Expenses (Rs. Mil)	536	664	127	0.5
Total assets (Rs. Mil)	940	1,277	337	0.6
Gross fixed assets (Rs. Mil)	351	447	97	0.5
Profits (Rs. Mil)	19	28	9	0.5
EBITDA (Rs. Mil)	96	160	64	1.0
Debt/Equity	3.03	1.51	-1.52	-1.4
TFP1	0.57	0.72	0.15	1.2
TFP2	0.56	0.88	0.32	1.7
ROE	-2.88	5.22	8.10	1.5
ROA	-1.58	1.74	3.32	1.9
ROCE	-2.51	2.76	5.27	1.7

Notes: Table reports the mean for the given variable for firms in Prowess that never receive PE, A and B firms found in Prowess, the difference between the two and the t stat of the difference. Variables are averaged across all the years in the data for a given firm. Data from my firm and Prowess.

Appendix Table 4: Operational size increases after PE investment controlling for entry and exit into the data

	LnEmp	LnAssets	LnExp	LnRev	Profit
	(1)	(2)	(3)	(4)	(5)
Invested*After	0.20***	0.30***	0.21***	0.18**	68.68
	(0.08)	(0.07)	(0.07)	(0.08)	(78.70)
Mean of Dep Var	4.28	6.38	6.96	6.99	926.00
N	3,790	3,835	3,825	3,817	3,825
N Clusters	350	350	350	350	350
R-Square	0.87	0.87	0.87	0.86	0.85

Notes: $* < 10\%, ** < 5\%, *** < 1\%$. The given dependent variable regressed on treatment by PE firms. Employee compensation, assets, expenditures, and revenue are in natural logs. Constant not shown. Standard errors are clustered at the firm level. Controls for year and firm fixed effects. Only firms with observations for all years between 2000 - 2010 are retained to create a balanced panel. Data from countrywide dataset and Prowess.

Appendix Table 5: Increase in operational size in "near-miss" dataset post PE (OLS)

	LnEmp	LnAssets	LnExp	LnRev	Profit
	(1)	(2)	(3)	(4)	(5)
Invested*After	1.24**	0.59*	0.84***	0.76**	151.46
	(0.53)	(0.33)	(0.29)	(0.32)	(269.35)
Mean of Dep Var	3.76	5.53	6.06	6.04	333.02
N	847	856	859	858	847
N Clusters	85	86	86	86	86
R-Square	0.64	0.73	0.63	0.59	0.62

Notes: $* < 10\%, ** < 5\%, *** < 1\%$. The given dependent variable regressed on treatment by PE firms. Employee compensation, assets, expenditures, and revenue are in $ln(x + x_1)$, where $x_1 = min(x|x \neq 0)$. Constant not shown. Standard errors are clustered at the firm level. Controls for year and firm fixed effects. Data from my firm and Prowess.

Appendix Table 6: Increase in operational size in "near-miss" dataset matched by date of consideration

	LnEmp	LnAssets	LnExp	LnRev	Profit
	(1)	(2)	(3)	(4)	(5)
Invested*After	3.90**	1.70*	2.39**	2.14*	613.55
	(1.55)	(0.94)	(0.98)	(1.14)	(845.44)
After consideration	-0.49	-0.15	-0.23	-0.15	-286.75
	(0.57)	(0.41)	(0.42)	(0.46)	(229.48)
Mean of Dep Var	3.76	5.53	6.06	6.04	333.02
N	847	856	859	858	847
N Clusters	85	86	86	86	86
R-Square	0.58	0.76	0.66	0.62	0.63

Notes: $* < 10\%, ** < 5\%, *** < 1\%$. The given dependent variable regressed on treatment by PE firms using investment by my firm as an IV for PE investment and matching by time of consideration. Employee compensation, assets, expenditures, and revenue are in $ln(x + x_1)$, where $x_1 = min(x|x \neq 0)$. Constant not shown. Standard errors are clustered at the firm level. Controls for year and firm fixed effects. Data from my firm and Prowess.

Appendix Table 7: Increase in operational size in "near-miss" dataset three years before PE (placebo)

	LnEmp	LnAssets	LnExp	LnRev	Profit
	(1)	(2)	(3)	(4)	(5)
Invested*After (Placebo)	0.67	0.42	0.49	0.52	-41.09
	(0.50)	(0.45)	(0.37)	(0.37)	(32.01)
Mean of Dep Var	3.33	5.43	5.99	5.96	255.82
N	296	307	302	303	303
N Clusters	55	58	57	57	57
R-Square	0.87	0.84	0.76	0.72	0.63

Notes: $* < 10\%, ** < 5\%, *** < 1\%$. The given dependent variable regressed on treatment by PE firms three years before investment occurred. Employee compensation, assets, expenditures, and revenue are in $ln(x + x_1)$, where $x_1 = min(x|x \neq 0)$. Constant not shown. Standard errors are clustered at the firm level. Controls for year and firm fixed effects. Data from my firm and Prowess.

Appendix Table 8: Decrease in ROA after PE investment (balanced panel)

	Debt/Eq	LnTFP1	LnTFP2	ROA
	(1)	(2)	(3)	(4)
Invested*After	-0.29	-0.04	-0.05	-3.15***
	(0.24)	(0.05)	(0.05)	(0.66)
Mean of Dep Var	1.48	1.03	1.69	3.98
N	3,680	3,727	3,573	3,817
N Clusters	347	350	336	350
R-Square	0.22	0.66	0.85	0.51

Notes: $* < 10\%, ** < 5\%, *** < 1\%$. The given dependent variable regressed on treatment by PE firms. TFP are in natural logs. Controls for year and firm fixed effects and standard errors are clustered at the firm level. Only firms with observations for all years between 2000 - 2010 are retained to create a balanced panel. Data from countrywide dataset and Prowess.

Appendix Table 9: Decrease in TFPR and ROA after PE investment (OLS)

	Debt/Eq	LnTFP1	LnTFP2	ROA
	(1)	(2)	(3)	(4)
Invested*After	-0.60	-0.44*	-0.10	-3.10
	(0.59)	(0.24)	(0.19)	(2.78)
Mean of Dep Var	1.35	0.77	1.09	2.04
N	803	806	793	759
N Clusters	83	84	83	87
R-Square	0.40	0.62	0.68	0.49

Notes: $* < 10\%, ** < 5\%, *** < 1\%$. The given dependent variable regressed on treatment by PE firms.TFP are in natural logs. Constant not shown. Standard errors are clustered at the firm level. Controls for year and firm fixed effects. Data from my firm and Prowess.

Appendix Table 10: Changes in "near-miss" dataset three years before PE (placebo)

	Debt/Eq	LnTFP1	LnTFP2	ROA
	(1)	(2)	(3)	(4)
Invested*After (Placebo)	0.41	-0.01	0.21	0.27
	(0.69)	(0.35)	(0.29)	(2.26)
Mean of Dep Var	1.71	0.70	1.14	2.22
N	292	291	280	244
N Clusters	59	55	54	50
R-Square	0.48	0.64	0.75	0.47

Notes: $* < 10\%, ** < 5\%, *** < 1\%$. The given dependent variable regressed on treatment by PE firms three years before investment occurred.TFP are in natural logs. Constant not shown. Standard errors are clustered at the firm level. Controls for year and firm fixed effects. Data from my firm and Prowess.

Appendix Table 11: Changes implemented by PE firm

Broad industry	Origin	Stake	Changes implemented
Construction	Direct	Majority	Added 18 plants (from an initial base of 4) in new geographies, especially where the company's existing clients were expanding; brought in new CEO and management team; corrected accounting and receivables issues; organized the sales team and rewrote sales process; deployed a specialist consultant in a sustained intervention for a two year period; plant improvements in landscaping and waste reduction; penetration went from 3% to 35% even in a declining market.
Construction	Direct	Majority	Initial 2 CEOs didn't work out; improvement of plants; adversely affected by industry downturn and regulations.
Financial Services	IB	Majority	Brought in a good CEO and management team; assisted in cost cutting, renegotiating terms of financing, and effectively managing new regulations.
Financial Services	IB	Minority	Passive investment.
Foods	IB	Majority	Helped to source a new management team; created a plan for scaling up the business.
Healthcare	Direct	Minority	Assisted in acquiring two greenfield positions in home market, constructing a unit in another state, searching for land in a third state, and bidding for an acquisition in a fourth state; expanded and refurbished existing locations; advised on an acquisition of a facility in Malaysia and a facility in an adjacent product space within India.
Healthcare	Direct	Minority	Company already had good quality management; PE firm persuaded family to provide equity shares for the CEO; helped locate a strategic buyer and position the firm for sale.
Healthcare	IB	Minority	Firm spent 3 - 4 days a week with the company; helped to develop first budget and introduced monthly accounting; expansion outside of original state; unable to professionalize management.
Healthcare	IB	Minority	Mostly passive; assisted in IPO; holding was too small to add much value to the business.
Healthcare	IB	Minority	Not able to identify attractive roll ups and only one was closed; supported and advised entrepreneur in business development, expansion, and additional round of capital raising.
Logistics	Direct	Majority	Expanded the business and acquired additional capital; initial CEO didn't work out; with new CEO, set up a highly competent management committee with strong sector knowledge; assisted to pay down debt and deleverage; adversely affected by regulations, government monopoly, and drop in demand.
Logistics	IB	Majority	Major scale up of business - launched business in several new cities, bought more productive assets, and invested in a capital project in Mumbai; initial 2 CEOs didn't work out and a partner from the PE firm became interim CEO until a CEO was found; hired second tier of managers.
Manufacturing	Direct	Minority	Assisted in business positioning activities and helped promoter focus on important aspects of the business; helped to identify and interest strategic buyer.

Manufacturing	Direct	Minority	Expanded production capacity by 50%; support of CEO and senior management.
Manufacturing	IB	Minority	Promoters unwilling or unable to carry out suggested improvements.
Media & Entertainment	IB	Majority	Additional capital used to acquire local operators and increase subscriber base; set up systems to quickly and effectively integrate new acquisitions; installed successful CEO and management team; helped company move into new technology.
Media & Entertainment	Direct	Majority	Following anticipated regulatory change, new licenses were acquired and operations set up in 16 new cities; replaced CEO and recruited a new sales team; funded extensive marketing expenses in new markets; bought out other investors and deleveraged the firm; growth of market share; adversely impacted by 2008 recession.
Media & Entertainment	Direct	Minority	Mostly passive; assisted with IPO and coordination of board; helped with merchandising.
Media & Entertainment	Direct	Minority	Recruited professional management team; advised on pricing, product, and other aspects of the business; developed employment contracts; involved in all key decisions of the firm; managed the IPO process.
Outsourcing/BPO	Direct	Majority	Capital used to acquire companies in the UK and US; change of CEO and management team.
Outsourcing/BPO	Direct	Minority	Ineffectual due to CEO and board disagreement.
Retail	Direct	Majority	Helped to acquire another company in an adjacent state to make the business one of the largest chains in India; forced out promoter for breach of trust; PE firm executive served as interim CEO; fixed inventory and operations problems, decreased SKUs from 10,000 to 4,000, and increased gross margins (from 15% to 21%); brought in new CEO and management team; expanded into two new states; opened 260 stores in 20 months.
Utilities	IB	Majority	Initial CEO didn't work out; helped company to improve operations, streamline systems, and centralize functions; assisted to pursue higher margin projects.
Utilities	IB	Majority	Regulatory approvals difficult and a lack of attractive acquisition projects led to this roll up initiative being wound down.

Notes: Changes implemented by the PE firm for which I have data in investee companies. IB is investment bank. Data from the company.

Appendix Table 12: Governance changes after PE investment

	No. BoD	BoD Mtgs.
	(1)	(2)
Invested*After	1.15***	0.27
	(0.16)	(0.38)
Mean of Dep Var	9.08	7.84
N	7,593	1,404
N Clusters	893	127
R-Square	0.63	0.53

Notes: $* < 10\%, ** < 5\%, *** < 1\%$. Difference-in-difference among those that do receive PE before and after PE using differential timing to identify the effect of PE. Constant not shown. Includes company and year fixed effects and standard errors are clustered at the firm level. Data from countrywide dataset and Prowess.

Appendix Table 13: No change in management after PE investment

	Man	Oper	Monitor	Target	People
	(1)	(2)	(3)	(4)	(5)
Invested*After	-0.44	0.13	-0.33	-0.73	-0.45
	(0.43)	(0.72)	(0.26)	(0.59)	(0.68)
Mean of Dep Var	2.56	2.04	2.78	2.54	2.55
N	936	928	936	936	936
N Clusters	709	702	709	709	709
R-Square	0.57	0.43	0.53	0.50	0.43

Notes: $* < 10\%, ** < 5\%, *** < 1\%$. Difference-in-difference between firms that receive PE and firms that don't receive PE. Constant not shown. Includes company and year fixed effects and standard errors are clustered at the firm level. Data from countrywide dataset and World Management Survey (Bloom, Sadun, and Van Reenen, 2012).

Appendix Table 14: Difficulty in finding good managers

Broad industry	Prev. PE	Management
Media & Entertainment	No	[PE firm] appointed a CEO who had previously had a career at Unilever, and who therefore was not a sector specialist. However, the selection worked very well, and he was able to set up a strong management team and to implement several acquisitions, highly professional systems, and the development of the business. The lesson learned is that in some businesses the personality and authority of a good manager can make the difference even without a strong technical and sectorial background. This may be especially true for early stage businesses.
Healthcare	Yes	The company already had a very good management team.
Healthcare	No	[Founder] has proved a strong leader, but has turned out to be less open to delegating functions and powers as his business grows. This means his management team is probably under-resourced for the current needs of his business and it has not been easy to attract talent.
Outsourcing/BPO	Yes	CEO managed to play off the four investors against each other and so they were stuck with him for the next two years...Ultimately, a new CEO was brought in but it was two years too late and again, it was a poor choice.
Manufacturing	No	[PE firm] had a very good relationship with the promoter. He was very strong in terms of vision and his ability to take and manage risk. He also represented a rare mix of entrepreneurial vim and ability to build a professional team around him. He did not mind paying a little extra for good people.
Outsourcing/BPO	No	Some changes at the management team level happened and the business has not achieved its milestones so far. It is generally considered a year behind plan. X is a good manager, but he is more a board member providing strategic guidance than the person managing the day-to-day functions of the business. The actual management team in charge of business development has so far disappointed, and there have already been some changes. The initial management team was replaced. The new CEO is now more focused on profitability than growth. As has been seen consistently with [PE firm]s portfolio companies, when new management teams are inducted, EBITDA is going to be hit as they come with a cost.
Financial Services	No	The deal team identified a good management team that has so far been very satisfactory.
Logistics	Yes	Upon closing the transaction, [PE firm] set up a highly competent management committee, with strong sector knowledge. However the CEO selected proved incapable of managing the relationship with the [regulator], and [PE firm]'s relationship with the founder soon started to become tense.
Manufacturing	Yes	The CEO of the business stayed for two years, and was later replaced by a CEO selected by [business group] from within their group. The company in any case had a good second tier of managers. The new CEO did not prove a great manager, and was not quick in cutting costs when the crisis hit. But he was technically good at [industry] and was well supported by [PE partner and business group].

Healthcare	Yes	Although the management team already in place at time of investment was of good quality, the existing CEO now reports to a Vice President hired by [PE firm]. The project management team has also been built out with new hires from Infosys. The company has a very good brand and is run by an extremely professional management team. The level of corporate governance here is high, as is the quality of its systems, budgets, minute books, etc. They are very prompt, very clear with how they deal with people and meet their obligations.
Logistics	No	The first CEO did not work out and left after a year. Following his departure, they tried to attract additional talent but struggled as there were no strong candidates available in the market, and the presence of the entrepreneur and the nature of the business discouraged top new hires. Moreover, [company] needed a large number of different skills... which was difficult to find. A second choice of CEO also did not work out, and both the CFO and COO left. Eventually, [partner from PE firm] effectively became the CEO and the team tried to concentrate on getting a decent second tier of managers...The team took the wrong decision twice with respect to the CEO, and getting the right CEO early is a key factor in a sector where it is not easy to attract talent. As a consequence of this instability and lack of leadership, the CFO and COO left as well. [Partner from PE firm] had to become the effective CEO and started to micro-manage the investment while being busy on other fronts as well, and this is only acceptable for a short period of time. The business is three years behind due to management issues and [PE firm] is still in the process of finalizing the organization...Having the right CEO from the beginning is also key for attracting second tier management talent and to implement the necessary changes to the business efficiently.
Media & Entertainment	No	The CEO originally in place at [company] was found to be upsetting his direct reports and was also making unreasonable demands. [PE firm] replaced him very soon after investment. The new CEO... was considered an excellent replacement. She already had considerable experience from her time with an Indian TV channel and a strong knowledge of media company management and advertising sales...[She] was also very reactive once the downturn hit in 2008. She received agreement from her management team to cut salaries across the board by 25% rather than cut jobs.
Construction	No	[PE firm] identified a new CEO, Y, to join the company on closing. There was general agreement from most investment professionals that industry experience was needed from the outset with respect to [company]. Although Y had not been a CEO before, he had strong operational expertise gained within the industry, which was what the company required most at the time. He was aware of best practice and was able to build a bridge between where the business started at and where it needed to be, choose the right people and equipment, and built best in class facilities. However he did not build a sales culture within the firm, which hurt. The assets were high quality, but there was not a sales engine to power growth of the business. He was subsequently bolstered with professionals who had financial, sales, and marketing acumen.

Construction	No	[PE firm] also found some challenges in their selection of the CEO and in attracting other key profiles. Their initial choice for CEO proved incorrect as the new professional - who came from a large company operating in a different industry - found it difficult to adapt to a less structured environment and left after one year. The second CEO was chosen from a correlated industry. He was technically okay, but left as he lacked the drive to implement the changes needed by the firm. More recently, [PE firm] asked the CEO of [related company] to move over to the new business...He has just started and [PE firm] is confident they have now found a very credible manager with strong credentials...They got it wrong several times, starting from empowering the founders who were unable to attract talent...It also proved challenging to attract second tier managers at the plant level...We should make clear that CXOs don't join a company, in one way or another they join [PE firm], and they should know that if they perform we will be willing to find other positions for them in other portfolio companies or future deals.
Manufacturing	No	Because it didn't have a good quality CEO the business suffered.
Media & Entertainment	No	The CFO was eventually persuaded to join on the basis that [PE firm] would find him a role in another portfolio company if [company] didn't work out for him.
Retail	Yes	Once [PE firm] was inside the company there was much more of a mess than anyone had anticipated. Initially, [PE firm partner] had stepped in as a pseudo CEO. He then managed to recruit a new CEO and with the latter in place [company] was able to bring in strong management to support him...Hats off to [PE firm partner], who moved to Hyderabad for a year. The sector was very good but the back end was a mess. At the time, no CEO wanted to come in because of the state of the business. They had a very good entrepreneur, who was great at finding good sites... - but very bad at operations and didn't think he could attract high quality management candidates to run operations. The new CEO came in because he knew [PE firm partner] well and because it was a good sector, and because of [PE firm]'s involvement.
Healthcare	No	The company had good quality management in place who were fully aligned.
Utilities	No	The initial choice of CEO was a bad one. He left after six months; the lack of a CEO has slowed down the recruitment of the rest of the management team, as well as the general scaling up of the organization. Connected to this fact was the difficulty [PE firm] found in identifying good talent for this sector...When building the investment case, it is prudent always to price in the cost, time and effort needed to find the right management team, and the time lag between the costs of scaling up the organization and the improvements in the bottom line...there is also a risk that when business managers become too absorbed by the management tasks in the companies they are monitoring, they may find it difficult to challenge follow on investments and other developments.

Notes: Quotes about management from an external review of investment deals for a PE company. Data from the company.