Value Creation in Private Equity in Emerging Markets

vom Fachbereich für Rechts- und Wirtschaftswissenschaften

der Technischen Universität Darmstadt

zur Erlangung des Grades

Doctor rerum politicarum

(Dr. rer. pol.)

genehmigte Dissertation

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Darmstadt, 2022

Biesinger, Markus: Value Creation in Private Equity in Emerging Markets
Darmstadt, Technische Universität Darmstadt
Jahr der Veröffentlichung der Dissertation auf TUprints: 2023
URN: urn:nbn:de:tuda-tuprints-230744
Tag der Einreichung: 19.05.2021
Tag der mündlichen Prüfung: 03.02.2022

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List of abbreviations

BvD	Bureau van Dijk
CAPEX	Capital expenditure
CEO	Chief executive officer
CFO	Chief financial officer
CIS	Commonwealth of Independent States
COGS	Cost of goods sold
e.g.	exempli gratia
et al.	et alii
EBIT	Earnings before interest and taxes
EBITDA	Earnings before interest, taxes, depreciation and amortization
EBRD	European Bank for Reconstruction and Development
GMM	Generalized method of moments
HHI	Herfindahl-Hirschman index
HR	Human resources
i.e.	id est
ICT	Information and communications technology
IPO	Initial public offering
IRR	Internal rate of return
IT	Information technology
LBO	Leveraged buyout
M&A	Mergers and acquisitions
MBO	Management buyout

MOIC	Money on invested capital
MSCI	Morgan Stanley Capital International
NACE	Nomenclature statistique des activités économiques dans la Communauté européenne
OLS	Ordinary least squares
p25	25th percentile
p75	75th percentile
PE	Private equity
PME	Public market equivalent
R&D	Research and development
ROA	Return on assets
ROE	Return on equity
S.D.	Standard deviation
SBO	Secondary buyout
SUTVA	Stable unit treatment value assumption
TFP	Total factor productivity
U.S.	United States
USD	U.S. Dollar
VC	Venture capital
VCP	Value creation plan

Acknowledgements

I would like to express my deepest gratitude to the numerous people who have made this dissertation possible. First and foremost, I would like to thank my supervisor Professor Dr Dirk Schiereck for his supervision and valuable advice. Professor Schiereck has been very supportive throughout the development of my dissertation and has provided me with the necessary guidance, motivation, and freedom to develop my ideas.

Second, I would like to thank Professor Dr Alexander Groh for his advice and support. Professor Groh made possible my work placement at the European Bank for Reconstruction and Development (EBRD) to gather the data for this dissertation. Professor Groh, together with Professor Dr Heinrich Liechtenstein and Dr Karsten Lieser offered me to take part in their joint research project "The Venture Capital and Private Equity Country Attractiveness Index", which also provided me with valuable insights into the asset class.

Third, I would like to thank the EBRD for granting me access to their proprietary databases. I am thankful to colleagues who assisted me in identifying and extracting the relevant data. Special thanks go to Dr Cagatay Bircan and colleagues from the Office of the Chief Economist who supported my research efforts at all times. I would like extend further thanks to Professor Dr Alexander Ljungqvist and other colleagues in the field of private equity research for their advice and support and constructive comments at various academic conferences. I am also thankful to several limited partners who provided constructive feedback from a practitioner's point of view.

Lastly, my inexpressible gratitude goes to my parents, my family, and all friends for their love, encouragement, and support throughout the process of writing this dissertation.

Mainz, 31 March 2021 Markus Biesinger

Zusammenfassung

Diese Dissertation liefert neue Erkenntnisse über die Wertschöpfung durch Private Equity (PE) Gesellschaften in privaten Unternehmen in Zentral- und Osteuropa. Diese Arbeit thematisiert hauptsächlich den Inhalt und das Erreichen von Wertschöpfungsstrategien, und ob diese Strategien zur Verbesserung von Portfoliounternehmen führen und zu höheren Renditen beitragen.

Im Verlauf dieser Arbeit beantworte ich folgende Forschungsfragen: Wie sieht der Wertschöpfungsplan einer PE-Gesellschaft aus? Gibt es einen atypischen Plan mit einheitlichen Elementen oder passen PE-Gesellschaften ihre Wertschöpfungsstrategien an die jeweiligen Bedürfnisse und Umstände der Portfoliounternehmen an? Verbessern sich die Portfoliounternehmen durch die Beteiligung von PE-Gesellschaften? Wenn ja, spiegeln diese Verbesserungen die anfänglichen Pläne, Maßnahmen und Reaktionen der PE-Gesellschaften wider? Überdauern diese Verbesserungen auch die Zeit nach der PE-Beteiligungsperiode? Welche Renditen werden durch die Veräußerung eines Portfoliounternehmens erzielt? Welchen Einfluss hat das Nichterreichen einer Wertschöpfungsstrategie auf die erzielten Renditen? Generieren bestimmte Wertschöpfungspläne eine höhere Rendite für Investoren als andere? Die Antworten auf diese Fragen können sowohl Aufschluss über die tatsächlich zugrundeliegenden Wertschöpfungsquellen für Anleger in PE als auch Einblicke auf die Auswirkungen von PE-Finanzierung auf das wirtschaftliche Wohlergehen geben.

Diese Dissertation gliedert sich in drei Aufsätze mit dem Ziel, jeden Aufsatz in einer Fachzeitschrift zu veröffentlichen. Den Aufsätzen sind eine Einleitung und eine allgemeine Beschreibung des Datensatzes vorangestellt. Die Einleitung skizziert den theoretischen und konzeptionellen Rahmen für diese Arbeit und beinhaltet eine Literaturübersicht der beiden Hauptzweige in der PE-Forschung: Operative Verbesserungen von Portfoliounternehmen und Renditen von PE-Investoren. Die Beschreibung des Datensatzes bietet einen allgemeinen

Überblick über die in der Dissertation verwendeten Datensätze. Im Anschluss an die Aufsätze fasse ich die Ergebnisse zusammen und beende die Dissertation mit einem Fazit.

Im ersten Aufsatz zeige ich, wie ein Wertschöpfungsplan einer PE-Gesellschaft aussieht und welche Elemente dieser enthält. Diese Informationen sind in der Regel nicht öffentlich zugänglich und wurden daher noch nicht systematisch in der PE-Literatur erfasst und analysiert. Ich zeige, dass PE-Gesellschaften eine Vielzahl von Wertschöpfungsplänen verfolgen, um einen Mehrwert in ihren Portfoliounternehmen zu schaffen. Die drei häufigsten Elemente eines Wertschöpfungsplans beinhalten den Kauf neuer oder die Veräußerung existierender physischer Vermögenswerte (zum Beispiel Maschinen), die Verbesserung der Produktpolitik beziehungsweise des Dienstleistungsangebots sowie das anorganische Unternehmenswachstum durch Unternehmensübernahmen. Ich berücksichtige insgesamt 23 verschiedene Elemente, die ich in fünf Strategien unterteile: Finanzsteuerung, operative Verbesserungen, Liquiditätsmanagement, Umsatzsteigerung und Unternehmenskontrolle. Ein Wertschöpfungsplan enthält durchschnittlich 4,5 Elemente und umfasst 2,5 Strategien. Die PE-Gesellschaften geben an, dass sie die meisten davon während der Halteperiode erfolgreich erreichen.

Wertschöpfungspläne sind im Laufe der Zeit praxisnaher geworden. Die PE-Gesellschaften verfolgen zunehmend Strategien die auf Finanzsteuerung, Umsatzsteigerung und Unternehmensführung abzielen. Welche Pläne eine PE-Gesellschaft verfolgt, hängt von dem Portfoliounternehmen ab in das sie investieren. Einerseits konzentrieren sich PE-Gesellschaften in Buyout-Transaktionen in der Regel auf die Optimierung der Kapitalstruktur, Unternehmensübernahmen, die Veränderung der Produktpolitik beziehungsweise des Dienstleistungsangebots und den Austausch der Geschäftsleitung. Auf der anderen Seite verfolgen PE-Gesellschaften opportunistischere Pläne in Wachstumskapital- und Venture Capital Transaktionen. In der Regel beinhalten die Pläne bei

einer Mehrheitsbeteiligung deutlich mehr Elemente im Vergleich zu einer Minderheitsbeteiligung. Dies trifft auch auf Transaktionen zu, die Unternehmensübernahmen und den Austausch der Geschäftsführung als anfängliches Ziel haben.

PE-Gesellschaften berichten vierteljährlich über die Umsetzung und das Erreichen ihrer Wertschöpfungspläne. Diese Daten zeigen, dass PE-Gesellschaften die meisten ihrer gesetzten Ziele erreichen. Einige Wertschöpfungspläne sind leichter zu verwirklichen als andere. Einerseits gelingt es PE-Gesellschaften in mehr als 95% der Fälle physische Vermögensgegenstände zu veräußern oder den Finanzvorstand zu ersetzen. Andererseits können PE-Gesellschaften in weniger als 75% der Fälle den Marktanteil erhöhen, die Unternehmensführung verbessern, eine internationale Expansion vorantreiben oder durch zusätzliche Akquisitionen wachsen.

Ich zeige in meiner Arbeit auch, dass PE-Gesellschaften ihre Investitionen aktiv überwachen und neue Elemente in ihren Wertschöpfungsplan aufnehmen, um zusätzlichen Wert zu schaffen oder um Abweichungen vom ursprünglichen Plan zu korrigieren. Die am häufigsten neue-eingeführten Elemente unterscheiden sich von den ursprünglichen Wertschöpfungsplänen und umfassen: Kostensenkungen, die Optimierung der Kapitalstruktur und den Wechsel des Geschäftsführers. Die Daten zeigen zum Beispiel, dass in jedem fünften Portfoliounternehmen der Geschäftsführer ausgetauscht wird, wenn dieses Element nicht Teil des ursprünglichen Wertschöpfungsplans war.

Im zweiten Aufsatz untersuche ich die Auswirkungen einer PE-Beteiligung auf die Verbesserung von Portfoliounternehmen während der Haltedauer der Beteiligung und darüber hinaus und vergleiche die Ergebnisse mit einer Kontrollgruppe. Ich berücksichtige hierbei eine große Anzahl unterschiedlicher Unternehmenskennzahlen. Die Grundlage hierfür bilden detaillierte Jahresabschlüsse und Daten über die Entwicklung der Mitarbeiteranzahl.

Anhand dieser Daten bestätige ich frühere Erkenntnisse in der Literatur, dass eine PE-Beteiligung zu positiven Veränderungen bei Portfoliounternehmen führt.

Die Ergebnisse zeigen, dass PE-finanzierte Unternehmen im Durchschnitt mehr Schulden aufnehmen und dadurch mehr von den Vorteilen des „Tax Shields“ profitieren als vergleichbare Kontrollunternehmen. Portfoliounternehmen stellen im Durchschnitt mehr Mitarbeiter ein, erhöhen die Durchschnittslöhne, verbessern die Produktivität und steigern die Kapitalintensität im Vergleich zu Kontrollunternehmen. PE-finanzierte Unternehmen entwickeln auch ein verbessertes Liquiditätsmanagement, da sich ihr Bedarf an Betriebskapital während der Halteperiode verringert. PE-Gesellschaften haben auch einen erheblichen Einfluss auf die Umsatzsteigerung, die Rentabilität und wirken sich auch positiv auf die Kunden der Portfoliounternehmen aus. Die von Portfoliounternehmen berechneten Kosten-Aufschläge sinken während der PE-Beteiligung, wodurch die Unternehmen auch erhebliche Marktanteile gewinnen können. Dieses Ergebnis deutet darauf hin, dass Kostensenkungen über niedrigere Preise an die Kunden weitergegeben werden.

Eine neuartige Erkenntnis ist, dass die meisten dieser Veränderungen auch dann bestehen bleiben, nachdem die PE-Gesellschaft ihre Eigenkapitalbeteiligung wieder veräußert hat. Insbesondere verzeichnen die ehemals von PE-Gesellschaften finanzierten Unternehmen weiterhin ein signifikantes Umsatzwachstum und steigern ihre Effizienz weiter. Dieses Ergebnis deutet darauf hin, dass der Besitz durch eine PE-Gesellschaft eine langfristige Auswirkung auf ein Portfoliounternehmen hat. Dies bekräftigt die Vermutung von Kaplan und Strömberg (2009), dass die Private Equity Finanzierung „eine wesentliche dauerhafte Komponente darstellt.“

Im dritten Aufsatz dieser Dissertation untersuche ich die Zusammenhänge zwischen Wertschöpfungsplänen, der Verbesserung von Portfoliounternehmen während der Halteperiode und Investorenrenditen. Ich beginne mit der Überprüfung der von den PE-

Gesellschaften selbst gemeldeten Erfolge, indem ich Wertschöpfungspläne mit den Verbesserungen von Portfoliounternehmen während der Halteperiode in Beziehung setze. Eine solche Analyse erfordert einen Maßstab, anhand dessen beurteilt werden kann, ob die beobachteten Verbesserungen plausibel mit der PE-Beteiligung verbunden sind oder auch unabhängig von der PE-Beteiligung stattgefunden hätten. Ich orientiere mich an früherer Literatur und vergleiche Portfoliounternehmen mit Kontrollunternehmen, die basierend auf Faktoren wie Land, Branche, Investitionsjahr und anderen beobachtbaren Finanzdaten ähnlich sind.

Anhand der Kontrollgruppe zeige ich, dass Portfoliounternehmen während der PE-Beteiligung die Art von Veränderungen durchlaufen, die auf eine erfolgreiche Umsetzung des Wertschöpfungsplans der PE-Gesellschaft schließen lässt. Portfoliounternehmen erhöhen ihren Verschuldungsgrad und profitieren durch das dadurch entstehende Tax Shield, verbessern ihre operative Tätigkeit und steigern ihren Umsatz. Portfoliounternehmen bei denen die PE-Gesellschaft ihre anfängliche Wertschöpfungsstrategie erreicht, schneiden im Durchschnitt besser ab als Portfoliounternehmen bei denen die PE-Gesellschaft ihren Plan nicht erreicht hat.

Im Anschluss untersuche ich ob bestimmte Elemente und/oder Strategien eines Wertschöpfungsplans mit höheren Renditen für Investoren verbunden sind. Diese Analyse zeigt neue Erkenntnisse: Das erfolgreiche Erreichen eines Wertschöpfungsplans ist der Schlüssel zur Erzielung von hohen Renditen. Ich stütze diese Schlussfolgerung auf die Ergebnisse zweier komplementärer Analysen.

Die erste Analyse ist eine LASSO-Analyse. LASSO ist ein Vorhersagemodell aus dem Bereich Maschinelles Lernen. Ich verwende LASSO, um aus einer Vielzahl von möglichen Wertschöpfungsstrategien die Strategie-Kombinationen zu bestimmen, welche die Renditen in der Stichprobe am besten vorhersagen. Die Analyse zeigt, dass keine Strategie-

Kombination mit höheren oder niedrigeren Renditen verbunden ist. Stattdessen scheint es wichtiger zu sein, wie unterschiedliche Strategien miteinander kombiniert werden. Die höchsten Renditen werden jedoch für seltene Strategie-Kombinationen in der Stichprobe prognostiziert (und realisiert). Zum Beispiel liegt die Kombination die Finanzsteuerung, Umsatzwachstum und Unternehmensführung umfasst nur auf dem 17. Platz (von 32). Die Umsetzung dieser Kombination führt jedoch zu den höchsten Renditen.

Die zweite Analyse basiert auf einer traditionellen OLS Regressionsanalyse. Die Ergebnisse der Regressionsanalyse bestätigen diese Schlussfolgerung der LASSO Analyse: Die erfolgreiche Umsetzung der Wertschöpfungspläne korreliert signifikant mit PE-Renditen. Dies ist insbesondere bei Wachstumskapital-, Buyout- und Sekundär-Transaktionen der Fall. Weder die Anzahl der Elemente im anfänglichen Wertschöpfungsplan noch die Anzahl der neueingeführten Elemente während der Halteperiode haben einen signifikanten Einfluss auf die Anlegerrenditen.

Im letzten Teil dieser Arbeit untersuche ich ob die beobachteten Veränderungen bei Portfoliounternehmen während der PE-Halteperiode zur Erklärung der Renditen beitragen. Diese Analyse zeigt, dass Anleger höhere Renditen erzielen, je mehr ein Unternehmen während der PE-Haltedauer die Beschäftigung, die Kapitalintensität, den Umsatz und den operativen Gewinn steigert. Das Umsatzwachstum hat die höchste Erklärungskraft unter allen Ergebnisvariablen. Dies kann erklären, warum das Umsatzwachstum als Strategie zur den wichtigsten Wertschöpfungskanälen in der Stichprobe zählt. Allerdings verschwindet dieser Effekt beim Benchmarking mit Kontrollunternehmen. Der Steigerung des operativen Gewinns bleibt jedoch eine Schlüsselgröße für hohe Anlegerrendite.

1. Introduction

Academic research on private equity (PE) has grown mainly into two strands: The first body of work has documented that PE leads to operational changes at companies (e.g., profitability, employment, and productivity). The second body of work has studied the drivers (e.g., leverage, market timing) and characteristics (e.g., risk, persistence) of investor returns. Although these two strands have developed independently, they both imply that PE "creates value" for portfolio companies and investors. Kaplan and Strömberg (2009) suppose: "The empirical evidence is strong that PE activity creates economic value on average. We suspect that the increased investment by PE firms in operational engineering will ensure that this result continues to hold in the future. Because PE creates economic value, we believe that PE has a substantial permanent component."

Against this background, this dissertation provides new evidence on the black box of value creation in PE. Specifically, I ask: How do PE firms create value? How does a value creation plan (VCP) look like? Is there a typical plan with certain operational changes, or do PE firms tailor their VCPs to individual portfolio companies' needs and circumstances? Do portfolio companies improve while being under PE ownership? If so, do these improvements reflect the plans and actions of the PE firm? If PE has a substantial permanent component, do company-level changes persist beyond the PE firm's ownership? Do investors benefit? How are investor returns affected if the VCP is not achieved? Are certain plans better for investors than others? The answers to these questions can shed light on the actual underlying sources of value creation in PE and have profound implications for assessing the overall impact PE has on economic welfare.

This dissertation is structured into three essays with the aim of publishing each in an academic journal. The essays are preceded by a general introduction and a description of the data. The introduction features a theoretical and conceptual framework, and a literature

review of the two most popular strands in PE: operational improvements and investor returns both of which form the foundations of the analyses in this dissertation. The description of the data provides a general overview of the main datasets used in the essays, which otherwise would have been too overwhelming in a single paper. Following the essays, I summarise the overall results and conclude.

In the first essay, I show that PE firms follow a rich variety of plans to add value. The three most popular "plan items" identified by PE firms before the time of the investment are buying or upgrading fixed assets, changing the mix of products or services, and pursuing acquisitions. In total I record 23 different plan items, grouped into five value creation "strategies". A PE firm typically sets out to achieve 2.5 strategies and 4.5 plan items on average in each deal and manages to achieve most of them.

PE firms in the sample have become more hands-on over time, pursuing financial engineering, revenue growth, and governance engineering strategies in an increasing fashion. Which individual plans a PE firm follows depends on the type of the deal. On the one hand, buyouts tend to focus on optimizing capital structure, pursuing acquisitions, changing mix of products or services, and replacing senior management. On the other hand, growth capital or early-stage deals tend to focus primarily on capital expenditures and pursue other plan items more opportunistically. PE firms also tend to be more hands-on when they hold a majority stake in a portfolio company. In an inorganic deal, PE funds focus more actively on financial engineering, revenue growth and management strategies. Similarly, when they plan to replace existing management, they are more active in all areas of value creation.

I document that PE firms report achieving most of their plans. Some plans appear to be easier to achieve than others are. On the one hand, PE firms managed to sell existing assets or replace the CFO in more than 95% of the deals in which these plan items were part of the initial plan. On the other hand, they could increase market share, improve corporate

governance, pursue international expansion or grow through acquisitions in less than 75% of the deals.

I show that PE firms actively monitor their investments and introduce new plans to create additional value or turn around deals that are not performing according to the initial plan. The most popular new plan items—introduced a few years into the life of a deal—differ from the initial plans, and include cutting costs, optimizing the capital structure, and changing CEO. One in every five deals sees a new plan item to replace the CEO when this plan item was not part of a PE firm's initial VCP.

In the second essay, I investigate the effects of receiving PE funding on changes in a broad range of company-level economic outcomes during the holding period and beyond the PE firm's tenue (i.e., after the PE firm's exit). I obtain detailed data on companies' financial statements as well as on employment from Orbis. Using these data, I confirm prior findings that PE funding leads to the expected changes at portfolio companies when compared with a control group of companies.

PE-backed companies see an increase in their use of debt and a reduction in their effective tax rate. PE-backed companies also see substantial improvements in their operations: Employment, average wages, productivity, and capital intensity increase over and above the contemporaneous changes at matched control companies. PE-backed companies also develop improved methods of cash management, as their working capital needs are lower. PE has a significant impact on revenue growth, profitability, and positive outcomes for consumers too. During the time a company spends in a PE fund's portfolio, its revenues and profitability increase substantially. I also find that price-cost markups charged by PE-backed portfolio companies fall during that period, which allows them to gain substantial market shares. This suggests that cost reductions achieved through operational improvements are passed on to consumers via lower prices.

A novel finding is that most of these changes persist even after the PE firm has exited the investment. Notably, these formerly PE-backed companies continue to enjoy strong revenue growth and maintain higher levels of efficiency in the years relative to their matched peers. This finding suggest that PE ownership has long-lasting effects and supports Kaplan and Strömberg's (2009) conjecture that PE "has a substantial permanent component."

In the third essay, I document the links between PE firms' VCPs and their achievement, changes in company-level economic outcomes, and eventual financial success or failure of a PE deal (as measured by deal-level investor returns).

To this end, I first check on funds' self-reported achievements by relating PE firms' VCPs to changes in company-level outcomes. Such analysis requires a reasonable benchmark against which to compare whether the observed company-level changes can be plausibly attributed to the PE investment or would have happened regardless of the PE firm's participation. I follow prior literature and compare the portfolio companies in the sample to a set of narrowly constructed control companies matched by country, industry, year, and company financials.

Using this matched sample, I show that during the PE holding period, portfolio companies experience the kinds of changes that reflect the successful implementation of a PE firm's VCPs. Specifically, I find that portfolio companies increase their leverage, significantly improve their operations, and increase their revenues. Funds planning to introduce a value creation strategy and not achieving it see a lower or decreasing effects in company-level outcomes compared to funds planning to introduce and achieving a related value creation strategy.

As a next step, I document whether certain value creation plan items or strategies are associated with higher investor returns than others. This analysis reveals a novel finding:

Execution of a VCP is the key driver to achieving investor returns. I base this conclusion on the results of two analyses:

I use LASSO to identify strategy combinations that best predict investor returns. LASSO uses shrinkage methods to deal with the problem of dimensionality which helps as PE firms in the sample can choose any possible combination out of a total of 32 strategy combinations. The LASSO analysis shows that no single value creation strategy is associated with significantly higher or lower investor returns. Instead what matters more is how certain strategies are combined. The highest investor returns are predicted (and realized) for strategy combinations that are not particularly popular in the sample. For example, a VCP that features financial engineering, revenue growth, and governance engineering is predicted to generate the highest returns, but rank only 17th out of 32.

The second analysis is based on a traditional OLS regression analysis. The results confirm the conclusions from the LASSO analysis: Successful implementation of planned plan items as measured by the share of plan items achieved is an important predictor of investor returns. This is especially the case in growth capital, buyout, and secondary transactions. Neither the number of planned plan items nor the number of new plan items introduced a few years after the investment was made, correlate significantly with investor returns.

In the last part, I investigate whether the changes portfolio companies experience during the PE-holding period can help explain investor returns. This analysis reveals that investors earn higher returns the more a portfolio company increases its employment, capital intensity, sales, and EBITDA during the holding period. Sales growth has the highest explanatory power amongst all outcomes variable to explain the variation in investor returns. This can help explain why revenue growth has become the most prominent value creation strategy in the sample. However, when benchmarked to observably similar matched control

companies, this latter effect vanishes. An increase in EBITDA above contemporaneous changes at the control companies remains a strong driver of investor returns.

The analyses contained within this dissertation are based on three unique datasets each spanning 1,580 deals by 178 PE funds over a 25-year period in 20 transition economies in primarily Central and Eastern Europe. This somewhat unusual setting has several advantages. First, as large active shareholders, PE firms have "skin in the game" and thus an incentive to engage in value creation and active monitoring of their investments.

Second, as an approximation, I know what PE firms know. I have been given unrestricted access to confidential summaries of the hard and soft information PE firms have about their portfolio companies and the conclusions they draw from them. I use these data to capture each fund's intended strategy to create value at the outset and track the achievement of the plan over time. To this end, I hand-collect textual information on VCPs for more than 1,000 deals. For each deal in the sample, I quantify textual information on PE firms' operational practices from confidential pre-investment documents and quarterly reports they provide to their investors.

Third, I also know what actions PE firms take in response to the information they collect. Specifically, the fund's quarterly reports provide comments on how well the PE firms does during the implementation of their VCPs.

I complement the textual information with hard information from the annual balance sheets and income statements. In order to do so, I manually match each portfolio company to Orbis, a global database provided by Bureau van Dijk. Orbis provides harmonized balance sheet information on a rich set of public and private companies. Using Orbis, I calculate changes in company-level outcomes, construct measures of efficiency and market power, and also to create comparable control groups for the econometric analysis.

I also have access to precisely dated cash flows between funds and their portfolio companies, which I use to construct investor return measures. In contrast, investor returns on PE-backed portfolio company are impossible to compute with any certainty from commercial databases, because the exact contractual structure of the investments is not recorded. Commercial databases also often only have quarterly information which further skews these measures.

This dissertation contributes to the literature on the operational performance of PE-backed companies by showing that PE investment has a long-lasting (and positive) effect on portfolio companies. This dissertation also contributes to the literature on value creation in PE based on evidence collected from surveys and qualitative studies.

The results in this dissertation differs in four ways from the prior work. First, the findings are based on the coding of textual information obtained from inside PE firms. The coding reflects the actual VCPs that PE firms set out to achieve in a deal. This uniqueness allows me to sidestep issues related to the survey methodology, in particular the worry that PE firms portrait themselves in a positive light or respond selectively.

Second, this dissertation adds to the growing evidence on the operational implications of receiving PE funding by providing direct estimates of key outcomes such as total factor productivity and market power. Unlike previous studies, this dissertation provides evidence on whether operational changes persist beyond the PE ownership period and how PE firms time their exits. The findings are consistent with PE firms implementing structural changes, the effects of which persist beyond their investment horizon. In addition, the findings suggest that the PE firms' exits coincide with industry-wide downturns in demand.

Third, by combining unique data on VCPs, company-level changes, and investor returns, this dissertation provides new evidence on the conditions under which PE creates value and the level of risk such efforts entail. The findings indicate that the successful

implementation of a VCP is a key driver of a high return, while no single value creation strategy emerges on its own as the best predictor for eventual success or failure. This has a potentially important implication for investors in PE: Rather than selecting which PE funds to invest in based on their intended strategies, the findings suggest that investors should base their fund selection on a track record of successful execution of VCPs.

Fourth, so far academic researchers have focused predominantly on the mature U.S. or Western European (predominantly the U.K.) PE markets. The data used in this dissertation builds on PE deals in emerging Europe. In addition to its focus on transition economies, a distinct feature of the data is the focus on growth capital. A growth capital deal usually involves the acquisition of a minority stake in a growing company that is looking for capital to expand its operations. Historically, academic researchers in PE have relied mostly on data on (leveraged) buyout deals. Buyouts usually involve the majority acquisition of mature companies with relatively stable cash flows. In this dissertation, I provide new evidence on how emerging market PE investments, and especially growth capital investments, fare while under PE ownership.

2. Related literature

2.1. Background

The modern PE industry has developed from the mid-1970s with the transfer of ownership from publicly listed companies, divisions of larger groups, and family-owned businesses to newly created and privately-owned entities. These transactions were usually funded by substantial amounts of debt and small amounts of equity provided by specialist investors and also involved management participation with significant equity stakes (see, e.g., Coyne and Wright, 1982; Kaufman and Englender, 1993; Wright et al., 2000).

The fundamental drivers of "value creation"[1] emerged in the 1970s and the 1980s: reduced opportunity cost of capital, increased operating cash flow, and accelerated financing payments (Castellaneta et al., 2018). However, these mechanisms provide only little insight into how value creation can be achieved. This led researchers to explore more fine-grained value drivers.

Acquiring a company with substantial amounts of debt and benefitting from the tax shield became widely known as "financial engineering" (Lieber, 2004). A particular form of financial engineering, "financial arbitrage", was to take advantage of the conglomerate discounts. This term denoted the discount by which a multi-business company was valued at a lower multiple compared to the sum of its parts. By divesting non-core assets or business units, financial investors could remove the discount and benefit from value appreciation.

By the late 1980s new evidence was mounting that buyout deals experience significant improvements in operating performance and productivity (see, e.g., Baker and Wruck, 1989; Bull, 1989; Kaplan, 1989). The various techniques for achieving such improvements became widely known as "operational engineering". Since the 1990s, strategic

[1] I put value creation in inverted commas since the term may be taken to imply that PE causes an increase in value. Whether or not PE does that is an open empirical question.

redirection emerged as another key value driver with the focus on a business' core operations and organic and inorganic growth strategies (see, e.g., Wright et al., 1992; Zahra, 1995; Meuleman et al., 2009; Ughetto, 2010; Lerner et al., 2011; Amess et al., 2015). For the remainder of this dissertation, I will refer to this key driver as "revenue growth".

Another stream of research emphasized the importance of "corporate governance" to reduce agency costs (Jensen and Meckling, 1976; Lowenstein, 1985) through a realignment of interests between owners and managers and by disposing of the excess free cash flow to put discipline on corporate managers (see, e.g., Jensen, 1989a; Jensen, 1989b; Kaplan, 1989a; Kaplan, 1989b).

2.2. Theoretical framework

In the 1980s and 1990s researchers examined whether the high returns observed in buyouts stem from an actual increase in the value of the company (referred to as "value creation hypothesis") or are due to the redistribution of wealth from the other stakeholders (referred to as "value capture hypothesis"). The value creation hypothesis assumes that the increased valuation of the portfolio company is due to efficiency improvements and revenue growth after the buyout (Jensen, 1989a). In contrast, the value capture hypothesis assumes that the increase in value is due to transfer of capital from existing bondholders, previous shareholders, employees, and the state (Lowenstein, 1985). Empirical studies often support the value creation hypothesis as a primary source of added value. However, in most cases, the observed increase in value consists of both value creation and value capture.

2.2.1. Value creation hypothesis

Agency cost of free cash flow

The dominant paradigm to explain value creation in leveraged buyouts (LBOs) is Jensen (1986)'s theory that acquisition target firms suffer from agency problems: "the interests and incentives of managers and shareholders conflict over such issues as the optimal

size of the firm and the payment of cash to shareholders". Agency theory concerns "a contract under which one or more persons (the principal(s)) engage another person (the agent) to perform some service on their behalf which involves delegating some decision-making authority to the agent. If both parties to the relationship are maximise their utility, there is good reason to believe that the agent will not always act in the best interests of the principal" (Jensen and Meckling, 1976).

A number of governance mechanisms can limit this conflict including improved monitoring, a reduction of the agent's ability to make certain decisions, and managerial equity ownership (see, e.g., Fama, 1980; Demsetz, 1983; Jensen 1988). However, each of these mechanisms is costly to the principal. The sum of these cost and the residual loss from divergent behaviour has been referred to as "agency costs" (Jensen and Meckling, 1976). These agency costs are not exogenous to the firm, but depend to a large extent on factors, such as governance structure, senior management incentives, among others (Smith, 1990a). In a buyout, several of the determinants of agency cost change considerably (Jensen, 1986), and buyouts are expected to have a significant impact on the firm's agency costs (Kaplan, 1989b).

Buyouts typically make use substantial amounts of debt. A higher amount of debt (also referred to as "leverage") can lower the agency cost substantially. Agency cost of free cash flow arises when cash flow exists in excess of what is required to fund all of the company's positive net present value projects, and when discounted at the relevant cost of capital rate (Jensen, 1986). According to Jensen, "conflicts of interest between shareholders and managers over pay-out policies are especially severe when the organization generates substantial free cash flow." Therefore, substantial amounts of debt help force management to allocate free cash flow to principal repayments and interest payments and thereby reducing

the amount of cash that is at management's own discretion. Consequently, the substantial amounts of debt used in buyouts is assumed to lead to value creation.

Jensen (1986b) argues that substantial amounts of debt motivate management to run the company more efficiently in order to avoid financial distress, which is also costly for the managers because they would lose control and damage their own reputation. Consequently, the risk of financial distress can incentivise management to work harder and more efficiently. However, because of substantial amounts of debt a company can be also more sensitive to unforeseen external events such as market shocks. Such an external shock increases the risk of financial distress (Singh, 1990) and reduces the company's flexibility to respond accordingly (Rappaport, 1990). Moreover, Palepu (1990) points to the vulnerability that stems from the risk of financial distress and thus could make a company more short-term oriented and disregard positive net present value projects in the long-term.

Mentoring and control

Baker and Montgomery (1994) argue that a monitoring and control function over management can reduce agency cost and has been seen a major advantage in buyout deals. Grossman and Hart (1980) argue that investments in monitoring activities are limited in companies with dispersed ownership. After a buyout, however, as the number of shareholders will be fewer, stakeholders will have stronger incentives to invest in monitoring (Admati et al., 1994). Fewer shareholders and a higher ownership concentration also imply that a main source of wealth gains is a reduction in agency costs (Renneboog and Simons, 2005).

Smith (1990b) argues that buyout firms exert control over their acquisition targets and closely monitor management teams. As new majority shareholders, PE firms often control the senior management as well as the board of directors such that a possible misalignment of interests can be solved more easily than in public companies (Jensen and Murphy, 1990). PE firms often have the rights to replace management. There is an ongoing debate on the effects

of replacing management. Part of the literature supports the hypothesis of the "market for corporate control" (Manne, 1965; Jensen and Ruback, 1983), according to which different management teams compete for the control over companies. Based on the agency theory, this view sees corporate takeovers primarily as a mean to exchange inefficient management teams, thereby improving the company's performance.

The control function of a company rests with its board of directors. According to Acharya et al. (2009), the board of directors of PE-owned companies tends to be more active and meet more frequently compared to publicly traded companies. Acharya et al. argue that PE firms pursue a hands-on approach through active ownership which would partially explain high investor returns.

Ownership and incentive schemes

Management ownership and incentive schemes eliminate a potential misalignment between the PE firm and the target company's senior management and thereby reduce agency costs and generate value. Jensen and Meckling (1976) argue that management participation in form of equity ownership can improve financial performance because managers would have greater stakes in their own value increasing activities. Following a buyout, managers are likely to focus on value maximizing procedures that lead to better investment and operational decisions (Kaplan, 1989). An equity participation also increases manager's personal cost of inefficiency, which further reduces their incentives to shirk the business (DeAngelo et al., 1984). Manager's motivation may be strengthened further through "equity ratchets", which adjust managerial ownership conditional upon meeting performance targets set by PE firms (Wright et al., 1994).

Opponents of the hypothesis argue that increased management equity ownership can exacerbate financial performance due to manager's risk aversion. Risk-averse managers can reject high-risk but more profitable projects in favour of low-risk but less profitable projects

(Holthausen and Larcker, 1996). Increased management equity ownership can also delay the restructuring process that often takes place following buyout (Franks et al., 2001). Demsetz (1983) and Fama and Jensen (1983) argue that concentrated management equity ownership can give managers effective control over the organisation and disciplining mechanisms, resulting in monitoring mechanisms becoming ineffective.

2.2.2. Value capture hypothesis

Value capture (also referred to as "wealth transfer") is fundamentally different from value creation. No new value is created, but won or lost in what constitutes a zero-sum game. The hypothesis assumes the transfer of wealth from one stakeholder to another.

Wealth transfer to shareholders may occur in the form of higher dividend payments, issuance of debt or equal or granting higher seniority (Jensen, 1989; Renneboog and Simons, 2005), false valuation through earnings manipulation prior to buyout transaction (Perry and Williams, 1994), and asset stripping behaviour (Wright et al., 2009).

The most common case are wealth transfers between bondholders and shareholders. The transfer of wealth from employees to shareholders has also received attention in the literature (Palepu, 1990). Consequently, the wealth transfer hypothesis is often the centre of criticism in the media that argue that PE firms create value by reducing wages and laying off employees (Shleifer and Summers, 1988). Although a substantial amount of research has been devoted to examine the wealth transfer hypothesis, the overall empirical evidence does not support the hypothesis (Renneboog and Simons, 2005).

Existing bondholders

Empirical research provides some evidence of wealth expropriation, mainly from bondholders who are not protected by covenants (see, e.g., Asquith and Wizman, 1990; Travlos and Cornett, 1993; Warge and Welch, 1993). Billett et al. (2008) demonstrate that wealth expropriation of bondholders that are not protected by covenants can be as large as

7%. However, bonds protected by covenants against leverage increases or against reduction in net worth through mergers as well as convertible bond and preferred stock holders generally record significant amounts of wealth gains (Marais et al., 1989).

These results show that bondholders with covenants offering low protection against corporate restructuring lose some percentage of their investment. However, this type of wealth expropriation does not necessarily mean that it is a driving factor in the decision to go private, or that it is reflected in the premium paid to pre-buyout shareholders. According to Amihud (1989), bonds that suffered losses have not been well protected. Therefore, wealth transfer does not represent a loss for bondholders, but a recuperation of greater protection granted compared to the original contract.

Existing shareholders

Another source for value transfers are the existing shareholders from whom PE firms buy their shares. The transfer of value assumes information asymmetries between the existing management of the company and its new owner. As buyout transactions generally involve equity capital in order to improve the incentive structure, conflicts of interest arise. The company's managers can take advantage of an informational advantage regarding the true value of the company or its future prospects by (i) either taking the initiative to buyout itself in order to benefit from this advantage or by (ii) keeping the takeover value artificially low in order to benefit from the subsequent increase in value.

A party that possesses superior information compared to a counterpart can use it to gain from the losses sustained by the other party, especially in a management buyout where the incumbent management is part of the equity investors and can take direct advantage of their information advantage vis-a-vis the previous owners. For instance, managers may have an incentive to suppress profits prior to a buyout (Lowenstein, 1985; DeAngelo, 1986; Hite and Vetsuypens, 1989) to drive down the price to buy out the company for less than what a

similarly informed buyer would be willing to pay, and an informed owner would be willing to accept (Kaplan, 1989b). This exploitation of private information, often also labelled as "undervaluation hypothesis", has been studied particularly in the early 1980s during the first wave of buyouts. Studies have concluded that in practice favourable inside information may be a motivator for the management to propose a management buyout, but private information is not an exclusive reason for these transactions.

While under-pricing may have been common in the 1980s, subsequent observations on buyout performance should have alerted vendors about the need to anticipate gains and to price transactions accordingly (Wright and Coyne, 1985; Thompson et al., 1992). It appears unlikely that the management of buyout targets has hidden information about earnings and prospects and has been able to monopolize the bidding process (see, e.g., Lowenstein, 1985; Palepu, 1990; Singh, 1990). Acquisitions usually underlie extensive disclosure requirements and need to be evaluated by the board of directors and not only by the managers themselves (Lee, 1992; Magowan, 1989; Palepu, 1990).

Additionally, the increase in buyout activity, the associated professionalization of vendors, and the increased activity of security analysts, as well as the establishment of open auctions as de-facto standard selling process should have minimized the importance of insider information as source of value capturing (Jensen, 1989b; Wright and Robbie, 1996; Wright et al., 2001). These additional offers increase the purchase price and force the management to offer a fair market price without being able to exploit the asymmetry of information (Kaplan, 1989a; Singh, 1990).

Employees

The wealth transfer from employees to the new equity owners is often alleged to create value in buyouts. PE investors are often accused for laying off employees and reducing wages to create value. Shleifer and Summers (1988) argue that the new equity owners in

hostile takeovers can break the contract between the firm and stakeholders (in particular employees, by reducing employment and wages). Weston et al. (1998) note that such hostility against employees is not observed in public-to-private transactions.

In general, the existing evidence does not support a wealth expropriation from an employee point of view. Kaplan (1989a) and Smith (1990) find that improvements in efficiency and performance following a buyout are not related to wealth transfers from employees and shareholders. Amess and Wright (2007) show that LBOs pay lower wages than non-LBOs, however, they do not lay off employees. In contrast, Jelic and Wright (2011) show that more jobs are generated following MBO transactions.

The state

As the vast majority of public to private transactions take place with a substantial increase in leverage involved, the increase in interest rate deductions may constitute an important source of wealth gains, depending on the fiscal regime and the marginal tax rate. Tax deductibility of the interest on the new loans create a major tax shield, increasing the pre-transaction value. Kaplan (1989b) estimates the tax benefits of U.S. public to private transactions to be between 21-72% of the premium paid to shareholders to take the company private.

To assess the overall impact on the state, other stakeholders must be considered as well. For instance, gains from the buyout can trigger capital gains tax payments from existing owners. Furthermore, through acquisition financing, banks gain interest income on which in turn they have to pay taxes on. At the same time, value creation may lead to an increase of a company's future profits, which in turn will lead to higher tax payments in the medium to long term. A sale by existing owners or investor can also result in tax payments.

2.3. Conceptual framework

In this subsection, I present a conceptual framework to synthesize the various value creation drivers based on previous work from Kaplan and Strömberg (2009), Kaserer et al. (2007), Berg and Gottschalg (2005), and Castellaneta et al. (2019).

Kaplan and Strömberg (2009) provide an overview of the effects of PE ownership and categorise the literature along three dimensions: financial, operational, and governance engineering. This categorization has also been used by other studies (see, e.g., Berg and Gottschalg, 2005; Davidson, 2005; Bergström et al., 2007; Kaserer et al., 2007; Acharya et al., 2013) and will constitute the foundation I use to identify and analyse the value creation effects of PE on portfolio companies. I add two additional dimensions, which I have frequently encountered in the more recent literature as well as in the documents that PE firms share with their investors: cash management and revenue growth.

Kaserer et al. (2007) categorise value creation and value capture drivers by the sub-type of PE investment: venture capital and buyout investment. In addition to these two deal types, I add on to Kaserer et al.'s systematisation by providing new evidence on growth capital investments, secondary transactions, and turnarounds. Growth capital investments usually involve acquisition of a minority stake, in growing companies that are looking for capital to expand or restructure their operations, enter new markets, or finance a significant acquisition without a major change of control of the business. Secondary transactions involve the sale of a portfolio company from one PE firm to another PE firm. Turnaround deals involve the restructuring of underperforming businesses.

Berg and Gottschalg (2005) differentiate between the time when value creation decisions are taken and when value creation eventually takes place. Accordingly, Berg and Gottschalg distinguish between three phases of the investment: acquisition phase, holding period, and divestment phase. To this end, I provide new evidence on what PE firms initially

plan to do, by documenting detailed pre-investment value creation plans, and what they do and achieve by observing soft information from quarterly reports PE funds share with their investors. I also provide new evidence on whether the company-level changes that take place during the PE-holding period persist beyond the PE's involvement.

Based on a wide literature review, Castellaneta et al. (2019) identify seven distinct value creation drivers: the financial, operational, strategic, governance, cultural, commercial, and institutional drivers.

Table 1 provides overview these findings and draws a conceptual framework, which will be used in this dissertation. The table summarises empirical evidence on the effects of receiving PE funding on financial engineering, operational improvements, cash management, revenue growth, and governance engineering as well as value capture during the acquisition, the holding period, the divestment phases, and the time period post-divestment.

Table 1: Conceptual framework

The table provides an overview of the value creation and value capture theories. Author's own depiction based on the classifications provided by Berg and Gottschalg (2005) and Kaserer et al. (2007).

	Asset class			Phase				Cause	
	Venture	Buyout	Growth	Acqui-sition	Holding period	Exit	Persis-tence	Value creation	Value transfer
A1: Financial engineering									
Optimise capital structure		X		X	X				X
Reduce taxes		X		X	X				X
Inventive systems	X	X		X	X			X	
A2: Financial arbitrage	***X***	***X***		***X***		***X***		***(X)***	***X***
Operational improvements									
Productivity		X		(X)	X			X	
Cost cutting		X		(X)	X			X	X
Reducing capital requirements		X		(X)	X			X	
Cash management									
Working capital	(X)	X		(X)	X			X	
Revenue growth									
Corporate refocusing	X	X		(X)	X			X	
Buy and build strategies		X		(X)	X				
Governance engineering									
Removing managerial inefficiencies	X	X		(X)	X			X	
Agency costs	(X)	X		X	(X)			X	
Monitoring and controlling	X	X			X			X	
Parenting	X	X		X	X	(X)		X	

2.4. Value creation drivers

2.3.1. Financial engineering

Innovations in the financial system in the U.S. in the 1980s were crucial to the emergence of today's modern PE. With the emergence of new financial instruments, PE firms were able to acquire companies using substantial amounts of debt. This debt in turn could be used to optimize the capital structure of the portfolio company and take full advantage of the resulting tax shield. This strategy became widely known as "financial engineering" (Lieber, 2004). In financial engineering, a PE firm seeks to make excess use of leverage to put discipline on corporate managers not to waste money. For instance, Edgerton (2012) finds that PE-owned firms have 40% smaller jet fleets on average than similar public firms. Similar fleet reductions are observed within firms that undergo leveraged buyouts. At the same time, PE firms provide equity incentives to the management teams of their portfolio companies.

Leverage

The main function of an increase in leverage is to permit the PE firm to acquire a larger acquisition target. When an investment generates sufficient levels of stable cash flows, there is support for the notion that increased leverage can be a source of value generation. Valkama et al. (2013) find that leverage significantly inflates equity returns. Leverage also incentivise corporate managers to behave in ways that beneficial to investors by mitigating agency costs (Jensen, 1986). The reason is that high levels of debt expose managers to the personal costs of bankruptcy, which forces them to efficiently run the company and avoid financial distress (Cotter and Peck, 2001).

Zarutskie (2010) finds evidence that buyout fund teams with more experience in finance outperform funds teams that lack these skills. Demiroglu and James (2010) find that more reputable PE firms pay narrower bank and institutional loan spreads, have longer maturities, and have access to larger amounts of debt. Ivashina and Kovner (2011) find that

bank relationships formed through repeated transactions reduce inefficiencies stemming from information asymmetry between banks and PE firms and allow PE firms to secure favourable loan terms.

PE firms may also attempt to take advantage of the mispricing between debt and equity capital markets (Baker et al., 2003). Buyout funds seem to accelerate their investment pace and the quantity of leverage used when credit conditions are loosened, which increases competition and raises valuations, which in turn cause average returns to decline. Demiroglu and James (2010) find evidence that PE firms capitalizing more on favourable credit market conditions and thus are more likely to take advantage of market timing when credit spreads are low and lending standards in the credit markets are lax. Axelson et al. (2013) find that highly leveraged deals achieved consistently lower returns for investors. The authors argue that acquirers tend to overpay for the acquisition target when access to credit is easier, therefore lowering their returns.

PE functions as a substitute for weak capital markets by enabling capital allocation for companies with growth potential. There is also evidence that PE firms have alleviated capital market constraints. Boucly et al. (2011) find that PE-backed companies become more profitable, grow faster than their peers, issue more debt, and increase capital expenditures. Boucly et al. argues that PE funds create value by relaxing credit constraints, allowing leverage buyout target firms to take advantage of unexploited growth opportunities. Amess et al. (2015) and Ughetto (2016) also find evidence suggesting that the relaxation of financial constraints spurs target company's innovation capacity.

Optimal capital structure

Capital structure refers to the mix of debt and equity instruments that finances a company in the short and long term. The optimal capital structure is, in simple terms, the one that strikes a balance between debt and equity while minimizing the overall cost of capital.

While debt tends to minimize the cost of capital because of its tax deductibility, it also increases the company's risk of financial distress due to external market shocks and sudden shortfalls in demand (Palepu, 1990).

There are three theories on how companies set their optimal capital structures: First, in perfect and efficient markets, Modigliani and Miller (1958) show that the capital structure is irrelevant. Kraus und Litzenberg (1973)'s trade-off theory determines an optimal capital structure by adding several imperfections but retaining the assumption of efficient and symmetric information. According to their theory, the optimal amount of debt balances the expected cost of financial distress and the benefits of the tax shield. In the context of buyouts, a substantial amount of debt puts discipline on corporate managers and forces them to run the company efficiently to avoid the risk of financial distress (see, e.g., Jensen, 1989b; Wruck, 1990; Andrade and Kaplan, 1998).

Second, in the pecking order theory described by Myers and Majluf (1984), adverse selection leads corporate managers to "issue [more] safe securities than risky ones". Their theory predicts that corporate managers will follow a pecking order by prioritize internal sources of funds over external sources of funds. If external funds are required, then companies prefer raising new debt over raising new equity.

Third, Baker and Wurgler (2002) suggest a theory that the capital structure is the cumulative outcome of corporate managers' past attempts to time equity markets. They find that companies with low leverage tend to be those that raise equity capital when their valuations are high. Conversely, companies with high leverage tend to be those that raise equity capital when their valuations are low.

Tax shield

Early LBO studies argue that taxes are one of the key sources of value creation. A substantial increase in debt to finance the buyout increases the tax shield, in particular when

the debt remains at a high level following the transaction. For instance, Lowenstein (1985), Bull (1989), Kaplan (1989), and Singh (1990) among others provide evidence on tax incentives in buyouts. Singh (1990) shows that the increase in debt makes high tax-deductible interest payments necessary and provides a tax shield with a positive impact on cash flows. Kaplan (1989b) shows that tax benefits are an important source of wealth gains, and that these gains are reflected in the premiums paid to pre-buyout shareholders. Newbould et al. (1992) find that a significant proportion of the premia paid on buyouts appears to be caused by a reduction in taxes due to the additional benefits of the tax shield from an increased amount of debt.

Opler (1992) finds that many of the firms in his sample took on much more debt than was required to eliminate their taxable earnings and that approximately 50% of those same companies paid no income tax after going private. In addition, if the tax benefits of debt were the only motivator for undergoing a buyout, the degree of leverage would not have been reduced as significantly in the post buyout period as they have been shown to be (Hite and Owers, 1983).

Jensen et al. (1989) challenges the argument that buyouts result in net losses of tax revenues to the U.S. Treasury. They show five ways in which LBOs can generate incremental revenues to the U.S. Treasury: increased capital gains taxes for shareholders; increased operating revenues; interest income earned by LBO creditors; more efficient use of capital; and asset sales triggering additional corporate taxes on the capital gains. Incremental revenue is offset by: increased interest deductions on the LBO debt and lower tax revenues on dividends foregone. Jensen et al. conclude that the U.S. Treasury's revenues from LBO firms have increased over the time period examined and that policies that restrict LBOs likely will reduce future tax revenues received by the Federal government.

Renneboog et al. (2007), Weir et al. (2009), and Guo et al. (2011) analyse the tax effects in U.S. public-to-private transaction. Renneboog et al. (2007) find no significant relationship between taxes paid and sales. Weir et al. (2009) find that tax paid is significantly below the industry average in each year post going private. However, the authors reckon that lower tax paid is partly because of a lower profitability reported after the public-to-private transaction rather than from the tax shield element of going private. Finally, Guo et al. (2011) find that realized tax benefits from increasing leverage while private are economically as important as operating gains in explaining realized returns.

Incentive schemes

Jensen (1989) argues that LBOs create value in their portfolio companies through a combination of high leverage and incentive schemes. PE firms typically give the management team a significant equity upside through stock options (Jensen and Murphy, 1990). PE firms also require manager to make a meaningful investment in the company, so that manager do not only participate with significant upside, but face a significant downside risk as well. The increased management ownership provides strong incentives for managers to improve operating performance. Leverage creates pressure on managers not to waste money, because they must make interest and principal payments. In addition, PE funds' active participation in the management of the companies improves monitoring. Moreover, because the companies are private, management's equity is illiquid until the exit (Jensen et al., 2006)—that is, management cannot sell its equity or exercise its options until the value is proved by an exit transaction.

In an early study, Lowenstein (1985) proposed a "carrot and stick" to reduce agency costs. In this context, incentives align interests between managers and owners and reduce agency costs (Jensen, 1989b; Bull, 1989; Lichtenberg and Siegel, 1990). PE firms encourage managers to increase their equity ownership to a significant level, usually at favourable terms

(Muscarella and Vetsuypens, 1990; Baker and Montgomery, 1994). Manager's equity investment produces high personal costs of inefficiencies and the sizeable investment made by management relative to their personal net worth means there is a financial risk too (see, e.g., Smith, 1990; Thompson et al., 1992; Baker and Smith, 1998; Beaver, 2001; Samdani et al., 2001). The rationale is that managers share the burden of loss, which results from poor performance.

Manager's participation also gives them a greater stake in value-increasing actions and the level of interest alignment determines how much of a firm's potential performance will be realized (Gottschalg and Zollo, 2007). The assumption is that as executives get more incentives to support firm goals, they become more likely to make decisions that leverage the firm's capabilities and resources to raise economic performance (Castellaneta, 2016).

Kaplan and Strömberg (2009) find that the median CEO receives 5.4% of the equity upside (stock and options) while the management team as a whole gets 16%. Acharya et al. (2009) report that the median CEO gets 3% of the equity, and the median management team as a whole gets 15%. Gompers et al. (2016) conduct a survey and confirm results of previous work. PE firms on average allocate 17% of company equity to management and employees. The CEO obtains an average of 8%. These percentages are significantly higher than equity ownership of senior management in public companies. For instance, Page (2011) finds that the average CEO of a public company held 3.6% of the company's equity and the median CEO held only 1.6%.

Other forms of compensation often used in PE transactions are performance ratchets. Valkama et al. (2013) show that the use of an equity ratchet positively relates to both equity and enterprise value returns, when management achieves a pre-specified performance target.

2.3.2. Operational engineering

By the late 1980s the evidence was increasing that buyouts are associated with significant operating and productivity improvements (see, e.g., Baker and Wruck, 1989; Bull, 1989; Kaplan, 1989). The techniques for achieving efficiency improvements became widely known as "operational engineering". A variety of papers has examined the effects of PE on the productivity and operating performance. In this subsection, I summarize the literature on the effects of PE on productivity and operational performance.

Several researchers have suggested the industry experience and managerial expertise in the PE firm constitute a knowledge transfer to the portfolio firm. Operating gains and improved profitability are significantly associated with PE firms' sector expertise and geographic proximity to the portfolio company (see, e.g., Cressy et al., 2007; Nikoskelainen and Wright, 2007; Scellato and Ughetto, 2013; Bernstein and Sheen, 2016). Schmidt et al. (2004) find that the experience and skills of individual PE partners significantly affects portfolio fund performance.

More recently, Acharya et al. (2013) report that GPs with an operational or consulting background achieved positive abnormal returns when pursuing an organic growth strategy. The increased importance of operational improvements has resulted in PE firms hiring executives with industry experience (Matthews et al., 2009). The skills of the PE director on the board of a portfolio company rather than at the fund level is critical, especially if this human capital involves financial and consultancy expertise to assist profitability and growth (Jelic et al., 2018).

Productivity

Productivity improvements can be reached by readjusting the way how the company's resources are put to work, while leaving unchanged the strategic positioning of the company. Lichtenberg and Siegel (1990) identify two factors that contribute to the productivity

increase: the increased utilization of employees due to performance rewards and penalties, and the reduction of misallocation to inefficient activities due to curtailment of free cash flow. Another cornerstone of productivity improvements is to increase asset utilization. A more efficient use of corporate assets frees up resources, which is the primary cause for the reduction of capital requirements in buyouts (Bull, 1989).

Amess (2002) and Amess (2003) presents U.K. evidence on the effects of full-firm MBOs on productivity, based on company-level data. U.K. management buyouts enhance productivity for up to four years post-buyout compared to non-buyout firms, although the main effect appears to be in the first two years. However, researchers have argued that it is more desirable to assess the productivity at the establishment or plants level before and after a buyout rather than using firm level data. Establishments and plants data on physical output and inputs, or resources consumed in production, such as labour, physical capital, and intermediate goods and materials can be used to construct indicators of productivity, which measure the efficiency of resource utilization.

U.S. plant establishment-level data shows that buyout plants had higher total factor productivity (TFP) than representative establishments in the same industry before they changed owners (see, e.g., Lichtenberg and Siegel, 1990; Harris et al., 2005; Davis et al., 2014). For instance, Lichtenberg and Siegel (1990) analyse data on U.S. manufacturing plants for the years 1972-1988, and find that management buyout plants had higher total factor productivity (TFP) than representative establishments in the same industry after the buyout, which the authors could not be attributed to reductions in R&D, wages, capital investment, or layoffs of blue-collar workers.

Harris et al. (2005) find that MBO establishments were less productive than comparable plants before the transfer of ownership. They also reported that MBO plants experienced a substantial increase in productivity after a buyout (+70.5% and +90.3% more

efficient in the short and long run, respectively) and that these post-buyout productivity gains are pervasive across industries. These results imply that the improvement in economic performance may be due to measures undertaken by new owners or managers to reduce the labour intensity of production, through outsourcing of intermediate goods and materials. This evidence suggests that MBOs may be a useful mechanism for reducing agency costs and enhancing economic efficiency.

More recent U.S. evidence from Davis et al. (2014) suggests that buyouts increase TFP at target firms, mainly through accelerated exit of less productive establishments and greater entry of highly productive ones. Bharath et al. (2014) finds that public firms that go private do not experience operational efficiency gains relative to similar peers but extensively restructure their portfolios of plants and close plants more quickly. Similarly, Bernstein and Sheen (2016) examine the effect of buyouts on restaurant chain and report significant improvements in store-level operational practices in chain-owned stores relative to franchised locations, where presumably PE owners had limited influence. However, Smith (2014) uses Indian data to suggest that PE firms already select productive target firms, rather than turning around low productivity firms, and provides them with financial support to grow.

Divisional buyouts show higher efficiency improvements than private and secondary buyouts and more experienced PE firms have a greater impact on post-buyout efficiency (Alperovych et al., 2013). U.K. evidence suggests that secondary buyouts on average perform worse than primary buyouts in terms of productivity levels. Secondary buyouts also have lower efficiency than buyouts of private firms or divisional buyouts. The positive effects of secondary buyouts on firms' operating cash flows seem to be achieved through expansions, not by running the firms more efficiently. Similarly, Chemmanur et al. (2011) associates VC-backed start-ups' higher productivity growth to VC firms' screening and monitoring and find that it primarily stems from improvement in product market performance.

Cost cutting

Several studies have found that the profitability gains in PE transactions were directly associated with cost savings. The savings accrued by a swift tightening of corporate spending, the reduction of capital expenditures, and divestment of under-utilized assets. In manufacturing firms, there has been ample evidence for a reduction in production cost and an increase in plant productivity. Asset divestiture could also lead to the redeployment of capital and new investments in plant and equipment, which should have a positive impact on the cost structure of the firm. What is noteworthy is that the cost savings from reduced employment levels are typically peripheral. While modest employment reductions are typically observed in the short-term, over the long-term the effect cancel out or even reverse.

An acquisition by a PE firm often substantially changes the way the target company is organized and managed, with the goal to reduce the cost base (Muscarella and Vetsuypens, 1990; Wright et al., 2001). After the acquisition, the new owners start to tighten corporate spending (see, e.g., Kaplan, 1989; Magowan, 1989; Anders, 1992; Holthausen and Larcker, 1996). PE firms also initiate a series of cost reduction programmes (Muscarella and Vetsuypens, 1990; Baker, 1992) that reduce production cost and significantly increase plant productivity (see, e.g., Lichtenberg and Siegel, 1990; Muscarella and Vetsuypens, 1990; Harris et al., 2005). Besides that, the reduction of overhead costs is a key driver in achieving higher efficiency. Buyout companies typically create a less bureaucratic corporate structure with lower overhead cost (Easterwood et al., 1989; Samdani et al., 2001).

In this context, the effects of PE on research and development (R&D) is less clear. Findings tend to be contradictory. A number of researchers report a reduction of R&D expenses after the buyout (see, e.g., Hall, 1990; Smith, 1990b; Opler, 1992; Long and Ravenscraft, 1993b, Long and Ravenscraft, 1993c; Hoskisson and Hitt, 1994), whereas other studies do not find support the hypothesis (see, e.g., Bull, 1989; Lichtenberg and Siegel 1990;

Zahra and Fescina, 1991). More recently, Yang et al. (2018) show that some PE firms cut the target firm's investment on product innovation to boost their short-term earnings at the cost of its long-term performance, and other PE funds cut the investment on new products to reduce agency costs.

Capital investment

In addition to cutting costs, PE-backed companies often adopt stricter regimes regarding capital expenditure, cut investment programs and divest underutilized assets (Magowan, 1989; Phan and Hill, 1995). U.S. evidence supports the view that capital investment falls immediately following a buyout because of the increased leverage. Easterwood et al. (1989), Kaplan (1989), Singh (1990), Smith (1990), Opler (1992), Long and Ravenscraft (1993b) and Holthausen and Larcker (1996) find a reduction in capital investment after the buyout. In contrast, Boucly et al. (2011) finds that companies increase their capital expenditure. Boucly et al. argue that PE firms help relax credit constraints, allowing the LBO targets to take advantage of hitherto unexploited growth opportunities.

Divestment of non-core business units

The reason for focusing on the core business is that several empirical studies have shown that firms consisting of unrelated, diversified business units underperform (Rumelt, 1982). Moreover, there is evidence that shows that a reduction of the diversification is positively associated with increases in operating performance and firm value (Gadad and Thomas, 2004). Unsurprisingly, there is research reporting a reduction of business complexity in the post-buyout firms (Phan and Hill, 1995). A consequence of the focus on the core and divestment of unrelated businesses is post-buyout firm value increasing (Kaplan and Weisbach, 1992). Wright et al. (1992) report that asset sales are offset by new capital investment, particularly in plant and equipment.

Buyouts are often seen as mechanisms for breaking up public corporations and selling the pieces to related acquirers. Indeed, there is ample evidence for asset sales and divestment of non-core operations following a buyout. Studies have documented greater reduction in surplus land, buildings, and equipment (Wright et al., 1992), number of plants (Liebeskind et al., 1992), lines of businesses (Seth and Easterwood, 1993), and subsidiaries (Wright et al., 2007). These reductions are also consistent with the argument that buyout firms provide managers with incentives to downsize and prune lines of business, resulting in reduction in overall firm size and diversification (Wiersema and Liebeskind, 1995). Pyo (2007) finds that changes in managerial incentives and compensation are a significant motive for corporate spinoffs. Easterwood (1998) investigates the wealth effects of divestments by firms that underwent leveraged buyouts and finds that the losses suffered by bondholders in distressed sellers are large and significant when core assets are divested.

The balance of the evidence indicates that restoring strategic focus is an essential function of the buyout for these large firms. However, evidence also suggests that the buyout organization continues to operate significant parts of the pre-buyout firm (Seth and Easterwood, 1993). Finally, the evidence indicates that asset sales to related acquirers derive more from efficiency considerations than market power (Seth and Easterwood, 1993).

Asset utilization

Another common way to reduce capital investment is to increase asset utilization (see, e.g., Lowenstein, 1985; Bull, 1989; Baker and Smith, 1998). A more efficient use of corporate assets frees up resources, which is the primary cause for the reduction of capital requirements in buyouts (Bull, 1989). Asset divestiture could also lead to the redeployment of capital and new investments in plant and equipment, which should have a positive impact on the cost structure of the firm (Wright et al., 1992).

Is important to keep in mind, however, that all these organizational changes need to be such that they do not negatively affect the company's ability to compete in the market place (Easterwood et al., 1989). It should also be mentioned that the generally increased efficiency and tighter cost control, which has developed in many corporations over the last decade, might mean that the scope for obtaining significant short-term benefits from restructuring is more limited (Wright and Robbie, 1996).

Operating performance

While little research has identified the key operating levers that PE managers pull to improve performance, several papers have examined the effects of PE on the operational performance of the companies they own.

Apart from returns to investors, other evidence on PE performance has focused on accounting measures of the target firms themselves. Studies frequently discuss operating performance metrics. Most studies investigate accounting measures over time, usually from before the PE investment to a few years thereafter. Accounting measures include size (e.g., sales, total assets, number of employees), growth (e.g., sales growth), profitability (e.g., EBITDA margin, return on assets, return on equity), liquidity (e.g., current ratio, quick ratio), efficiency (e.g., asset turnover, working capital, sales per employee), and capital structure (e.g., debt to equity ratio, net debt to EBITDA ratio).

Kaplan (1989) was the first to find improved operating performance after firms undergo a leveraged buyout. For U.S. public-to-private deals in the 1980s, he finds that the ratio of operating income to sales increased by 10% to 20%. The ratio of operating income less capital expenditures to sales increased by roughly 40%. The ratio of capital expenditures to sales declined. These changes are coincident with large increases in firm value. Kaplan and

Strömberg (2009) summarize subsequent research and largely confirm that PE investments are associated with improvements in operating performance.[2]

Most post-1980s empirical work on PE and leverage buyouts has focused on buyouts in Europe, largely because of data availability. This work includes Harris et al. (2005), Boucly et al. (2011), and Bergström et al. (2007). Consistent with the U.S. results from the 1980s, Cumming et al. (2007) summarize much of the literature from the post-1980s and conclude that there "is a general consensus across different methodologies, measures, and time periods regarding a key stylized fact: LBOs and especially MBOs enhance performance and have a salient effect on work practices."

More recently, Acharya et al. (2013) show that sales grow significantly under PE ownership, but similar to the industry. However, margins show an abnormal improvement of 1%. Davis et al. (2014) find that buyouts are associated with increased productivity and profitability. Cohn and Towery (2013) use income tax data to study a large sample of U.S. buyouts and find improvements in operating margins. Weir et al. (2007), Acharya et al. (2009), Guo et al. (2011), and Cohn et al. (2014) find modest, but insignificant, increases in operating margins in public-to-private transactions in the U.S. and the U.K. respectively.

A small minority of studies also document negative effects on profitability following the PE acquisition (Scellato and Ughetto, 2013). Despite this evidence, researchers have simultaneous found positive effects on target firm's growth, efficiency, working capital, and liquidity (Weir et al., 2015; Hammer et al., 2018). Secondary buyouts seem to perform worse in terms of profitability than primary buyouts (Bonini, 2015). Zhou et al. (2014) argue that none of the value creation mechanisms (i.e., financial, governance, operating) normally associated with performance improvements generate growth during the secondary buyout

[2] See, e.g., Muscarella and Vetsuypens (1990), Smith (1990), Singh (1990), Opler (1992), Wright et al. (1996), among others.

phase. At best, Achleitner and Figge (2014) find that secondary buyouts show similar operational improvements than other buyouts.

Overall, while the empirical evidence is consistent overall with significant operating improvements for leverage buyouts, Kaplan and Strömberg (2009) caution that results should be interpreted with some reservations. First, some studies, particularly those in the United States, are potentially subject to selection bias because performance data for private firms are not always available. Second, the decline in capital expenditures found in some studies raises the possibility that leveraged buyouts may increase current cash flows, but hurt future cash flows.

The reported results indicate a largely positive impact of PE ownership on target firms' operating performance. At the same time, these studies reveal numerous influencing factors. For instance, company characteristics (Cohn et al., 2014), industry characteristics (Boucly et al., 2011), country characteristics (Desbrieres and Schatt, 2002), deal characteristics (Guo et al., 2011), PE sponsor characteristics (Acharya et al., 2013; Scellato and Ughetto, 2013), and modes of entry and exit (Achleitner and Figge, 2014; Bonini, 2015; Boucly et al., 2011).

Employment effects

A PE acquisition typically serves as catalyst for a major transition in the target firm. Despite this academic research has offered an inconclusive picture on the effects of PE on employees. Media often criticises PE firms for laying off workers, reducing wages, and changing working conditions. Trade unions have also accused PE firms for changing industrial relations by demonstrating an unwillingness to recognize and work with them, and by downgrading information and consultation.

These views likely describe the experiences of many employees affected by buyouts, but it does not completely describe the effects of PE ownership on employees. In particular,

studies that document productivity enhancements at target corporations suggest that many workers may actually benefit from the spill over effects of operational upgrades facilitated by PE investors (see, e.g., Bernstein et al., 2010; Boucly et al., 2011; Davis et al., 2014).

Some early studies report small increases in employment following a buyout (see, e.g., Opler, 1992; Kaplan, 1989; Smith, 1990). However, when considering industry effects, studies by Kaplan and Smith find that employment falls. Wright and Coyne (1985), Wright et al. (1990a), among other early studies, find that employment falls following a buyout. Lichtenberg and Siegel (1990) reports that white-collar workers experience the largest fall, while employment of blue-collar remained unchanged.

More recent work suggests that employment declines initially post-buyout, but subsequently increases (see, e.g., Wright et al., 2007; Weir et al., 2009; Amess et al., 2014; Goergen et al., 2014). Cressy et al. (2007) find that both profitability and sales growth have positive elasticities with respect to future employment. Thus, buyouts generating higher operating profits from initial job cuts are associated with compensating job creation as profitability and sales increase. In contrast, for management buy-ins, employment remains below pre-buyout levels (Wright et al., 2007; Amess and Wright, 2007). Employment growth is particular notable in divisional deals and secondary buyouts (Meuleman et al., 2009; Boucly et al., 2011). Further evidence suggests that PE-backed buyouts have no significant impact on employment while traditional corporate acquisitions have negative effects on employment (Amess et al., 2008).

At the individual level, Agrawal and Tambe (2016) document that employees of companies acquired by PE investors gain transferable, IT-complementary human capital. Olsson and Tag (2017) show that workers that perform routine or “offshorable” jobs in low productive firms tend to get laid off. Antoni et al. (2019) find that managers and older employees fare far worse after buyouts compared with the average target employee. Antoni et

al. argue that employees who are less likely to find new employment are most negatively affected. Cohn et al. (2018) present evidence that financing frictions adversely affect investment in workplace safety, with implications for worker welfare and firm value.

Wages effects

Lichtenberg and Siegel (1990) document evidence that wages of white-collar workers (but not blue-collar workers) decline after a buyout. Evidence from the U.K. shows that the average growth in wages in both MBOs and MBIs is marginally lower than in firms that have not undergone a buyout (Amess and Wright, 2007). In a subsequent study, Amess, Girma, and Wright (2008) find that PE backed buyouts have no significant impact on wages, whereas traditional corporate acquisitions increase in wages. Davis et al. (2014) document that earnings per worker at continuing target establishments fall by an average of 2.4% relative to controls.

Human resource management effects

Evidence from the U.K. suggests that human resource management practices improve at target firms following a buyout. Bacon et al. (2004) find that buyouts result in the adoption of new reward systems and increased employee involvement, whereby "insider" and "growth-oriented" buyouts experience more commitment-oriented employment policies. Employees in management buyout firms also tend to have more discretion over their work practices than comparable workers at non-MBO firms (Amess et al., 2006). Pendleton et al. (1998) highlight that a "sense of ownership" and opportunities for participating in decision-making are significantly associated with higher levels of commitment and satisfaction.

Broader evidence from Europe suggests that PE ownership does not affect union recognition, union membership density, and attitudes towards union membership (see, e.g., Wright et al., 1984; Wright, et al., 1990a; Bacon et al., 2009). Managers in firms recognising unions after a PE buyout do not report reductions in the terms and conditions. Target firms

also report the presence of consultative committees and indicate increased consultation over firm performance and its plans (Bacon et al., 2009). Comparing industrial relations different social models in Europe, evidence suggests that PE firms adapt to national systems and traditional national industrial relations differences persist after buyout (Gospel et al., 2011).

2.3.3. Cash management

In many industries, both debt and equity funding remain difficult to access. This creates a challenge for companies that require cash to remain competitive, maintain financial flexibility and pursue growth opportunities. Companies often forget a large, hidden source of capital: their own balance sheets. The amount of cash tied up in a business as working capital is broadly determined by the relative speed of being paid by customers compared to the speed at which suppliers are paid. Inventory, accounts receivable, and accounts payable are all components of working capital that companies can streamline to access cash "trapped" on their own balance sheets. However, when approached holistically, proper management of these three levers all fall under effective cash management.

There has been some empirical evidence on the effects of PE on working capital management (see, e.g., Baker and Wruck, 1989; Magowan, 1989; Smith, 1990a; Singh, 1990; Long and Ravenscraft, 1993c; Samdani et al., 2001; Gaspar, 2012; Weir et al., 2015). The practical methods for improving working capital are typical industrial engineering practices, such as Six Sigma and Lean Enterprise (Castellaneta et al., 2018). However, there is also evidence that buyouts do not improve working capital and that lower levels of working capital possesses the risk of financial distress (Long and Ravenscraft, 1993).

Among the three working capital levers, researchers have found evidence that working capital is primarily tied up in inventory. Singh (1990) finds that buyouts coming back to the market via an initial public offering had significant reductions in inventory. Both Easterwood et al. (1989) find that by streamlining inventory management, the post-buyout

firm can dramatically reduce its working capital requirements. Holthausen and Larcker (1996) found that post-buyout firms have, on average, significantly smaller amounts of working capital than their industry counterparts. Gaspar (2012) finds that following a strong decrease in inventory, working capital utilization of buyout target firms improves.

Another common method for improving cash management is to accelerate the collection accounts receivables, for instance by enforcing payment terms or shortening the payment period. This leads to sharply reduced levels receivables compared to pre-buyout levels (Easterwood et al., 1989). Singh (1990) finds that reverse buyouts had better performance in accounts receivable compared to their peers in the three years preceding the public offering.

Prolonging the terms for supplier payment and renegotiating prices among other strategies can lead to an improvement of accounts payable. In a case study, Baker and Wruck (1989) describe how O.M. Scott & Sons Company extracted concessions from its corporate suppliers after its LBO. Wright et al. (1992) find that management buyout targets in their sample increased creditor days. Gaspar (2012) also finds some evidence that supplier financing is increased compared to matching firms. Brown et al. (2009) find that suppliers to buyout target firms experience significantly negative abnormal returns at the announcements of the transaction.

2.3.4. Revenue growth

PE firms strive to engage actively and participate in the redirection of their portfolio company (see, e.g., Seth and Easterwood, 1993; Phan and Hill, 1995; Rogers et al., 2002). The logic behind the active participation in the strategic redirection and refocusing process is that it can be a substantial source of value generation. The activities can encompass the geographic target markets, market niche, product mix, customer segments, pricing strategy,

distribution channels, after-sales services, and the future direction of the firm (Muscarella and Vetsuypens, 1990).

Market expansion

Firm growth is a parameter that affects firm value. Thus, growth and market expansion can be an important component of value creation, particularly when margins are not deteriorating. Access such fine-grained information from published sources is challenging and studies have relied on proprietary data. One study of 32 private-equity companies in the portfolios of seven European private-equity firms based on proprietary data collected by Boston Consulting Group revealed that almost half of the total internal rate of return (IRR), or 22% of the total 48%, was attributable to sales growth (Meerkatt et al., 2008). Another academic study based on proprietary data from McKinsey finds that buyout firms both achieve higher sales growth and margin improvements relative to peers (Acharya et al., 2013).

A secondary effect is that a track record of growth tends to raise the valuation multiple. In the study by Meerkatt et al., 2008, another 10% of the IRR was attributed to an increase in valuation multiples, which although primarily the result of systematic increases in multiples across the markets, was in part caused by improved performance prospects at the time of exit.

An extensive research project on the different strategic approaches to organizational growth by McGrath and MacMillan (2005) found a number of key components, such as using the metrics of cash-flow velocity, asset utilization, customer performance, customer productivity, customer cash flow, and customer asset intensity. Representative survey evidence based on investor responses suggests that a shortcut to achieving growth is to recruit dynamic executives who can seek out and exploit growth opportunities, as opposed to

recruiting executives with organizational skills to monitor the firm (Lockett, Murray, and Wright, 2002).

In Davila et al. (2003) and Engel and Keilbach (2007), VC-backed start-ups were found to grow faster compared to non-VC-backed companies in terms of staff count in, respectively, U.S. and Germany. Peneder (2010) finds comparable effects for Austrian firms and attributes these results to the monitoring activities of VCs and their ability to select companies displaying particularly high growth potential. Puri and Zarutskie (2012) also confirm North American VC-financed firms are on average larger and grow faster, in terms of both employment and sales. Finally, examining the Spanish VC market, Alemany and Martí (2005) find positive effects of VC on firm growth with respect to a series of outcomes — employment, assets, intangibles, and revenues. Pavlova and Signore (2019) document the positive effects of EIF-supported VC investments on start-up performance, as measured through various financial indicators (e.g. assets, revenue, employment) and find that VC financing enables start-ups to prioritise long-term growth, trading off short- to medium-term profitability if necessary.

Product mix

Firms generate revenue from the sales of products. Given the central role of products in firm operations, the PE firm's operational changes are likely to be reflected in the target firm's range of products and services. For instance, if the PE firm increases (cuts) investment on product innovation, the target firm will announce more (fewer) new products.

There is a notion that target firms announce fewer new products after the buyout. One explanation is that target firm managers overinvest on product development before the buyout because they have incentives to build an empire with more products; PE firms then cut the overinvestment after the buyout in order to raise the value of the target firm (Jensen, 1986). In contrast, Stein (1989) suggests that PE firms have incentives to boost the target

firm's short-term earnings at the cost of long-term investment on product development. The third explanation is that PE firms select target firms that they anticipate to announce fewer new products in the future. In contrast to the first two explanations, the third explanation assumes that PE firm play a passive role in the buyout target firm rather than actively change the products of the target firm.

Early studies by Wright et al. (1992) and Zahra (1995) find that buyouts result in more effective use of R&D expenditure and new product development. Robbie et al. (1992) report extensive changes to product portfolios post buyout. Bruining and Wright (2002) find that management buyouts result in more entrepreneurial activities such as new product and market development. Wright et al. (2002) find that venture firms focusing upon a diversified product range and/or advertising were significantly more likely to be exporters and were significantly more likely to report high percentages of sales exported.

More recently, Bloom et al. (2015) find that plant managers working in PE owned firms also report greater autonomy from headquarters over sales, marketing, and new product introduction. Gompers et al. (2016) find that PE firms increasingly turn to generating returns by realigning businesses into higher margin products. Fracassi et al. (2017) find that target firms increase sales by launching new products compared to matched controls.

In contrast, Yang et al. (2018) find that the target firm significantly reduces the number of new product announcements after the buyout. Some PE firms even cut the target firm's investment on product innovation to boost its short-term earnings at the cost of its long-term performance, and other PE firms cut the investment on new products to reduce agency costs.

Pricing strategy

New or better products might be more expensive. On the contrary, leaner manufacturing or more skilful bargaining with retailers could lead to lower prices and the quantity of products

sold will likely increase. Last, liquidity constraints imposed by increased leverage could also lead to higher prices. Despite this central role, the impact of PE on product pricing is something that is less understood.

Chevalier (1995) documents that supermarket LBOs have incentives to raise prices, but the overall market impact depends on competitive structure: local market grocery price indices rise when rivals have high leverage but fall when rivals are concentrated and in stronger financial positions.

More recently, Fracassi, Previtero, and Sheen (2017) investigate the effects of PE on product markets. They find that target firms increase sales by 53% compared to matched control firms. Price increases—roughly 1% on existing products—do not drive this growth. The launch of new products and geographic expansion do. Competitors lose shelf space and marginally raise prices themselves. These growth results hold in particular for private firms, while public targets in fact contract. PE thus appears to ease financial constraints, provide expertise to manage growth, and reduce investment where needed. The findings question the common view that PE substantially increases prices, harming consumers.

Eaton et al. (2020) studies how PE buyouts create value in higher education, a sector with opaque product quality and intense government subsidy. With novel data on 88 PE deals involving 994 schools, I show that buyouts lead to higher tuition and per-student debt. Exploiting loan limit increases, I find that PE-owned schools better capture government aid. After buyouts, I observe lower education inputs, graduation rates, loan repayment rates, and earnings among graduates. Neither school selection nor student body changes fully explain the results. The results indicate that in a subsidized industry maximizing value may not improve consumer outcomes.

Inorganic growth

In the 1990s, the buy and build strategy became increasingly popular. The strategy constitutes an initial acquisition of a firm, serving as a "platform" for follow-on acquisitions. The follow-on acquisitions of companies or divisions that are strategically aligned with the platform company ("add-ons") are usually facilitated by the PE investor as well. The PE firm then merges the platform and add-ons into a single entity.

Academic studies are sparse but some industry evidence suggests that buy and builds outperformed competing corporate strategies both in terms of growth profits and value for primary buyouts. Despite the relevance of inorganic growth strategies for the PE market, there has been very limited research up to date and the few existing studies focus on small-scale evidence on the return potential of acquisitions.

In most cases, the buy and build is structured as a horizontal acquisition strategy in which the platform company and the add-ons operate in the same industry. Buy and build tend to occur in fragmented industries with no clear market leader (see, Smit, 2001). By investing in fragmented industries, PE firms are able to avoid antitrust concerns, and, additionally, maintain a plethora of potential targets at their disposal. In such cases, the buy and build serve as a vehicle to consolidate fragmented industries of considerable size, similar to roll-up transactions (Brown et al., 2005).

The core business logic lies in market consolidation and thus amassing the advantages of scale economies, which concurrently leads to multiple expansion (Wright et al., 2001a). The second group of sources for value adding, might be associated with the classical advantages and synergy effects from mergers and acquisitions (M&A). The market position of the involved companies can be improved significantly; firms could benefit from knowledge and technology transfers, companies may gain access to new markets for their products, may add new products to their portfolio or new technologies to their production processes. According to Ross et al. (2002), beyond the strategic advantages and the new

market power stemming from the increased company size, the sources of synergy from M&A include cost reductions (e.g., economies of scale or scope) and tax gains (e.g., use of tax losses from net operating losses or use of free debt capacity).

In addition to the possibility of gaining post-transaction synergies, the displacement of inefficient managers implies a positive development of operating profitability relative to the pre-takeover situation (Ravenscraft and Scherer, 1987). On the other hand, if mergers take place because managers pursue growth rather than profits, or because of managerial hubris and herd behaviour, they can lead to decreasing efficiency and decreasing profitability (e.g., Gugler et al., 2003). In their review article, Martynova and Renneboog (2008) state that mainly authors using earnings-based performance measures tend to find a negative post-M&A development of profitability while authors looking at cash flow measures find more positive results.

The investors bring together platforms with lower capacity utilization and lower returns, and add-ons with higher utilization and higher returns in order to allocate resources and capacity more efficiently and to improve firms' performance (Borell and Heger, 2013). B&B originate a joint acquisition relationship, in which a financial buyer can provide access to capital, financial engineering and deal-making techniques. In return, the platform company, as a strategic buyer, can provide management expertise and an increased return on investment through synergies and other business arrangements involving the target (Borell and Heger, 2013)).

Such joint acquisitions may allow the acquiring parties to complement each other and capitalize on acquisition opportunities that neither party would be willing to pursue on its own (Rousseau, 2010). Therefore, as M&A supported by PE investors, buy and build open value- adding potential for the participating companies, resulting from both the PE

transaction (e.g., Kaplan, 1989, Guo et al., 2011) and the firms' strategic mergers (e.g., Devos et al., 2008).

As to corporate performance after M&A, several studies use ex post accounting performance or plant-level productivity to examine potential operating improvements in the combined firms. The results are ambiguous. Ravenscraft and Scherer (1987) find little or no evidence whereas Healy et al. (1992) and Heron and Lie (2002) find that mergers induce an improvement in operating performance which results from increases in asset productivity of the merged firms relative to their industries (Healy et al., 1992).

Valkama et al. (2013) find that deals with acquisitions outperform those without in terms of IRR. Acharya et al. (2013) document outperformance of deals with acquisitions in terms of margin and multiple improvement. Nikoskelainen and Wright (2007) document the importance of buy and build and show that acquisitions carried out during the holding period of the PE target contribute to enterprise value uplift.

A small-scale in-depth study by Hoffmann (2008) finds that buy and build strategies were highly successful in generating value with 75% of the firms generated an excess of 25% IRR. The process of implementing a buy and build strategy begins with the acquisition of a nucleus firm in a fragmented industry, after which a series of successive roll-up acquisitions take place to create a market leader. The core business logic lies in market consolidation and thus amassing the advantages of scale economies, which concurrently leads to multiple expansion (Wright et al., 2001a).

Hammer et al. (2018) find that the probability for acquisitions is high if the PE sponsor is experienced and has reputational capital, if the portfolio firm is large, has M&A experience at entry and operates in an industry with moderate degree of fragmentation, as well as in case of favourable financing conditions. Hammer et al. (2018) also find that on average, cross-border/industry diversifying inorganic growth strategies are more likely if the

portfolio company already draws upon international/inter-industrial M&A experience at entry and if the PE firm frequently invests across borders/industries. Acquisitions also increase the probability for exiting through IPO and secondary buyout.

With respect to secondary buyouts, Wang (2012) finds in a rigorous academic study that performance improvements largely stem from acquisitive rather than organic growth.

2.3.5. Governance engineering

Governance engineering has been another major area of research in corporate finance. In governance engineering, PE investors control the boards of their portfolio companies, and are more actively involved in governance than public company directors and public shareholders. In an early study, Baker and Wruck (1989) attribute operating improvements to changes in the incentive structure, the monitoring system, and the governance structure. Lichtenberg and Siegel (1990) identify two factors which contribute to the productivity increase: increased intensity of effort by labour due to increased sensitivity of their financial rewards (and penalties) to their performance, and the reduction of resources misallocated to inefficient activities, due to cutbacks of free cash flow and more intensive monitoring of managers by investors.

In particular agency theory has long been the cornerstone of research on buyouts. Jensen and Meckling (1976) were among the first to note that agency conflicts exist between managers and outside shareholders. Governance engineering involves creating a better alignment of incentives between managers and shareholders or providing better oversight that can limit empire building and opportunistic behaviour. Jensen and Murphy (1990) create a framework to measure the incentive effects of equity ownership for firm managers. Kaplan (1989) examines management ownership changes in a sample of leveraged buyouts from the 1980s and finds that ownership substantially increases on average.

Incentive compensation has been a particularly important area of governance

research. Jensen (1986) argues that managers of publicly traded firms typically own too little equity to make them sensitive to maximizing shareholder value. PE managers who are aware of these issues seek to align incentives through increases in managerial equity ownership. Another seminal study identified two factors that contribute to the productivity increase: the increased utilization of employees due to performance rewards and penalties, and the reduction of misallocation to inefficient activities due to curtailment of free cash flow (Lichtenberg and Siegel, 1990).

Empowering the management team

Already in the 1960s, Manne (1965) proposed in his market for corporate control that equity markets could be the principal mechanism for facilitating corporate takeovers. In an efficient market, a firm would become more attractive as a target for a takeover, the lower its stock price became compared to the value potential with more efficient management. This corrective market mechanism to dispose of underperforming management is still a common method for buyout value creation. A cause for firm underperformance prior to a buyout is often the incumbent top management team, which is a cause remedied when the PE firm replaces the inefficient team (Jensen and Ruback, 1983).

Buyouts can thus function as vehicles to improve market efficiency by rapid and decisive action to remove poorly performing managers (Gilson, 1989). Perhaps most importantly, Bertrand and Schoar (2003) report evidence confirming that CEOs affect firm performance significantly. Interestingly, the disruption caused by forced CEO replacement is associated with higher post-succession firm performance (Cornelli et al., 2013). As for buyouts, in a study by Acharya et al. (2013), a third of CEOs were replaced within 100 days of the buyout and a total of two-thirds within a four-year holding period. Huson et al. (2004) and Denis and Denis (1995) find such improvements after CEO replacements.

Hellman and Puri (2002) find that venture capital-backed companies are also more

likely and faster to replace the founder with an outside CEO, both in situations that appear adversarial and those mutually agreed to. Kaplan and Strömberg (2004) show that venture capital firms demand more control over the board of directors when "CEO quality" is uncertain. They also find that venture capital firms rely more controlling the board of directors than on equity ownership when replacing the CEO, while Lerner and Schoar (2005) find that venture capital firms rely more on majority ownership rather than on sophisticated contracts in countries with difficult legal enforcement.

Changing the board of directors

The board of directors is often viewed as an important governance tool to monitor managers on behalf of shareholders to reduce of agency costs. This includes providing managers with equity ownership stakes that realign incentives and instigating a regime of closer monitoring that reduces their discretionary decision power. Moreover, the principal control function of the board is to allow the owner to exert power in determining the composition of the management team. Besides often replacing the CEO at the time of ownership change, boards tend to replace underperforming managers more swiftly than traditional firms.

Fama and Jensen (1983) discuss the role of boards and how boards should ideally function. Hermalin and Weisbach (1998) examine the determinants of board structure and argue that board structure tends to be endogenously determined to minimize conflicts with shareholders. Coles et al. (2008) find that board size relates to firm characteristics and their performance. Several studies have emphasized the contribution of boards of venture capital-backed firms too, in particular in terms of their supervisory function (Cornelli and Karakas, 2008), and their strategic guidance (Gompers et al., 2016).

A fair amount of research concludes that the optimal board size should be limited to 5-7 board members (Gompers et al., 2016). Other studies find a significant negative

correlation between increased board size and profitability (Eisenberg et al., 1998), between board size and firm value (Yermack, 1996), and board size and performance as measured by profitability (Guest, 2009).

PE firms typically appoint one to two of their partners to represent the firm. Moreover, PE firms take the role of the chairman (Rogers et al., 2002; Jensen et al., 2006). Aside from the CEO and the PE firm representatives, the new board tends to be composed mostly of outside directors (Millson and Ward, 2005; Jensen et al., 2006; Cornelli and Karakas, 2008). PE firms prefer active ownership and thus participating boards that meet frequently. A related characteristic is the accelerated decision making compared to non-PE-backed companies.

2.3.6. Other value drivers

Apart from the value drivers discussed previously, researchers have also examined other sources of value creation and value capture. For instance, Castellaneta et al. (2019) survey the literature along three additional dimensions: commercial, cultural, and institutional value drivers.[3] In this section, I summarise the related literature. However, due to lack of data, I this set of value drivers as part of this dissertation.

PE professionals often emphasize the advantage of having access to proprietary deal flow. Empirical evidence is limited though. For instance, Schmidt et al. (2004) speculate that access to a superior deal flow has led to outperformance of buyout funds. Kaplan and Schoar (2005) suggest that having access to better performing investments could lead to performance persistence observed among fund managers. Loos (2006) finds that a proprietary deal flow leads to substantial returns.

[3] Castellaneta et al. (2019) propose a framework for examining the heterogeneous opportunities of value creation in PE buyouts comprising of financial, operational, strategic, governance, commercial, cultural, and institutional value drivers.

When it comes to deal selection, Opler and Titman (1993) report that target firms are more diversified than their peers. Conversely, target firms in high capital expenditure and in R&D intensive industries are less likely to be targets. Puche et al. (2016) find that value creation has been the highest in industrials and consumer service industries, while the lowest in technology. Singh (1990) finds that management buyouts targets have had higher cash flow as percentage of sales than their peers prior to the PE investment. Masulis and Thomas (2009) report that targets for public-to-private transactions are likely to have a diffused ownership base, low levels of management equity ownership, no incentive schemes, deficient boards, and exhibit underperformance.

Gompers et al. (2016) find that PE investors put somewhat more weight on the business than on the management team, and stress the importance of the PE firm's ability to add value when making an investment decision. Industry experience and focus as well as track record within an industry seems to matter too. Gompers et al. conclude that different PE firms are likely to target and value investments differently.

An important research question has been whether PE firms are good at identifying inefficiently managed firms (see, e.g., Jensen and Meckling, 1976; Rumelt, 1982; Fox and Marcus, 1992). Nikoskelainen (2006) proposes an underperformance hypothesis as it could be argued that underperformance could not be entirely explained by either the free cash flow or the private information hypotheses. An underperforming target company could be identified if it generated sufficient cash flows, but had a lower Tobin's Q than its peers, and the reasons for the underperformance could often be incompetent management teams, managerial mistakes, or organizational problems (Nikoskelainen, 2006). In his study, Nikoskelainen (2006) finds support for the underperformance hypothesis in target firms as compared to industry peers by lower levels of gearing, EBITDA margins, and a more volatile

cash flow. A low level of gearing can thus signal that the company is unable to raise the funds for an optimal capital structure.

PE practitioners often refer to “multiple expansion” as a source of value creation (Fraser-Sampson, 2010; Gilligan and Wright, 2014). Valuation multiples (e.g., enterprise value to EBITDA) typically vary across industries and countries. Companies in mature industries trade at lower multiples than companies in growth industries. Public companies trade at higher valuation multiples than private companies as investors typically apply an illiquidity discount. Larger companies trade valuations at higher valuation multiples than smaller firms within the same industry. Furthermore, multiples tend to vary in accordance with business cycles. Finally, industry growth or improved future prospects both tend to increase the firm multiples.

While all of these factors influence multiples, two factors in particular rely on having superior market expertise: industry growth and business cycles. Unsurprisingly, several academic studies have documented that GDP growth and industry growth substantially increase the likelihood for achieving a positive and abnormal return (see, e.g., Phalippou and Zollo, 2005a; Bergström et al., 2007; Valkama et al., 2013).

Achleitner et al. (2012) find that multiple expansion is the key driver in explaining PE returns. Acharya et al. (2013) finds that greater growth in multiple relates to a higher “alpha” (or abnormal deal-level performance). Gompers et al. (2016) survey PE investors. Gompers et al. document that PE investors on average 44.3% of the respondents expect to be able to buy at attractive prices and 50% expect to be able to facilitate a “high-value exit”. This suggests that PE investors believe they create value by being able to “buy low and sell high”.

A number of academic studies have examined whether PE firms can time the market as well as their preferred mode of entry and exit. Phalippou and Zollo (2005) find that a high

GDP growth rate, high public stock market returns, and low credit spreads at the time of PE investment substantially improve fund performance.

Thomsen and Vinten (2007) find that buyout activity increases in bear markets with low valuations, whereas M&A activity seems to peak in bull markets. When comparing PE investment to M&A transactions, researchers have shown that PE firms typically pay less compared to competing acquirers (see, e.g., Kaplan, 1989b; Wright et al., 2006). These results suggest PE firms do pay a premium to shareholders, but substantially less compared to the premium that is paid by public firms.

Evidence suggests that an auction is the preferred mode of entry and optimizes the value for the vendor, which conversely means that an auction is the least favourable mode of entry for the buyer. Moreover, the more restricted a transaction is from buyer competition, the lower the resulting transaction price (Wright et al., 1996; Baker and Smith, 1998).

All else being equal, an IPO will typically result in the highest valuation multiples of all exit routes (Chapman and Klein, 2011). An IPO is also the preferred exit route for the most successful firms (Schwienbacher, 2005; Schmidt et al., 2009). Lopez-de-Silanes et al. (2015) show that IPOs perform best, followed by trade sales. Nikoskelainen and Wright (2007) confirm this preference of exit channels, while their sample of U.K. deals from 1995-2004 shows an average of 70% IRR, markedly above the results mentioned before.

Achleitner, Bauer, Figge, and Lutz (2012) provide evidence that secondary buyouts can produce returns comparable to those achieved by IPOs. In a subsequent study, Achleitner and Figge (2014) find that the price premium for SBOs is 6% to 9%, which is higher than those of other buyouts are.

Several researchers have reported on the changed corporate culture following a buyout, including the open and direct communication, the alleviated corporate bureaucracy, and the less-constrained atmosphere (see, e.g., Lowenstein, 1985; Jensen, 1989a; Hoskisson

and Turk, 1990; Anders, 1992; Taylor, 1992). The changed modus operandi under the PE ownership unfetters management from the grip of corporate bureaucracy and allows it to act without interference (see, e.g., Jensen, 1989a; Butler, 2001; Wright et al., 2001a).

A framework frequently employed in conjunction with the PE industry is the parenting advantage, which originally was proposed as an explanation for how diversified corporations can succeed. Campbell et al. (1995) argued that when the multi-business corporation created more value for the unrelated unit than rivals could, the unit benefited from a parenting advantage. In contrast, the unit ought to be divested when the incurred costs by the increased organizational complexities outweigh the advantages (Wright et al., 2000). From the parenting advantage framework, it appears that PE firms often excel in implementing common services in monitoring, mentoring, and learning.

Central to this approach is the adoption of an active ownership model, where constructive interaction is facilitated by direct communication channels and decreased levels of bureaucracy (Kester and Luehrman, 1995). Often the deal partners of the PE firm discuss things directly with management on a daily or weekly basis, which is vastly different from the traditional context of a corporate board or conglomerate headquarters.

Buyouts are often viewed as a creative vehicle to reintroduce an entrepreneurial spirit in public companies (Singh, 1990). The change in sentiment that follows in the wake of the buyout can re-energize firms and spur management to make any effort that is necessary (see, e.g., Houlden, 1990; Beaver, 2001; Butler, 2001). Unsurprisingly, the increase in entrepreneurship is positively associated with performance improvements (Wright et al., 1996).

There are several reasons for the lethargy that ails pre-buyout firms. For instance, divisional management can suffer from limited discretion (Weir, 1996; Beaver, 2001), receiving lower attention (Wright et al., 2001a), and agency problems, as structures for

incentive mechanisms and control functions are lacking (see, e.g., Fama and Jensen, 1983; Hill, 1988; Thompson and Wright, 1995).

In contrast, a family-owned business can suffer from not being able to make necessary investments due to financial constraints (Meuleman et al., 2009), lack management competence (Bloom et al., 2015), or face succession problems (Howorth et al., 2004). Agency problems can also exist (see, e.g., Schulze et al., 2001; Howorth et al., 2004). Under these circumstances, a buyout can help transform a family-owned business to a professional organization, while at the same time retaining some elements of the family firm culture (Howorth et al., 2016).

A further aspect of cultural change in buyouts concerns performance management: PE firms often set ambitious goals that raise expectations and incentivise management to excel (see, e.g., Jensen, 1989a; Baker and Montgomery, 1994; Butler, 2001). Moreover, PE firms force management to reach aggressive targets—for instance by setting stretch budgets—to serve interest payments to cope with the higher leverage and risk of financial distress (Easterwood et al., 1989; Smith, 1990). Consequently, firm managers are willing to make unpopular decisions, e.g. reducing employment levels and disposing business units (see, e.g., Singh, 1990; Butler, 2001).

2.5. Persistence in value creation

Due to the lack of data on private companies, researchers have not been able to study how companies fair after the PE ownership. However, related streams of research offer at least some insight how formerly PE-backed companies might fair in the long run and if the changes instigated by PE firms are short or long-term: the literature on the longevity of PE ownership and the literature on PE exits.

Attention to exits and the long-term effects of PE-backed firms has been limited. Exceptions are Strömberg (2008) and Jelic (2009). While there has been evidence that

reverse buyouts' stock performance is at least as good as that of other IPOs and the stock market as a whole (Cao and Lerner, 2007), there is no evidence concerning the longer-term post-exit operating performance. Moreover, prior evidence relating to exits has tended to focus on IPOs, yet the vast majority of PE backed buyouts exit by means of either a strategic sale or a secondary buyout (Cumming et al., 2007; Kaplan and Strömberg, 2009).

Secondary buyouts helps distinguishing effects between continued PE ownership compared to discontinued PE ownership

2.4.1. Longevity

In order to assess the effect of PE it is important to understand how long firms stay in PE ownership. The academic discussion can be summarized in two extreme views: One view is provided in Jensen (1989) who argues that the buyouts are a long-term governance structure, which imposes strong investor monitoring and managerial discipline through a combination of ownership concentration and substantial amounts of debt. The other view sees buyouts as a short term "shock therapy", which allows inefficiently performing firms with inferior corporate governance to enter a quick but intense period of corporate and governance restructuring, in order to return to public ownership in a few years (Rappaport, 1990). Kaplan (1991) find a median time in private ownership of 6.8 years, and concluded that leveraged buyouts are "neither short-lived nor permanent."

After these original academic contributions, a common view of buyouts has been that it is a temporary governance structure, particularly aimed at improving governance in public companies with dispersed ownership structures that suffer from excess free cash flow relative to investment opportunities. After management performance incentives are imposed, previous inefficient investments are divested, and free cash flow is being paid out to investors, the firm is then ready to return to the public market. Strömberg (2008) reports that the holding periods of buyouts are longer than what has been documented in previous research. The median firm

stays in private ownership for about 9 years. Buyouts sponsored by more experienced PE partnerships tend to stay in private ownership for a shorter period of time, are more likely to go public, and are less likely to end in bankruptcy or financial restructuring.

As Kaplan (1991), Bacon et al. (2013) and Hoskisson et al. (2013) suggest that PE firms and buyouts are heterogeneous in their approach. Some are long-term oriented whereas others are more short term, depending upon the contextual features of the financiers, the firm and the management team (Wright et al., 1994). Often the PE firms develop an investment strategy including a 100-day plan for reshaping the business model, which determines the firm's direction for the holding period (Rogers et al., 2002). This is consistent with the evidence of heterogeneous longevity found by Kaplan (1991), Wright et al. (1994), and Wright et al. (1995). Some deals involve short term turnaround and rebounding strategies, while others involve strategies with longer term investment and payoffs (Bacon et al., 2013). Similarly, with respect to PE firms, Castellaneta and Gottschalg (2016) suggest that some firms that have short holding periods need to have particular selection expertise, whereas those with long holding period need expertise to add value over the long term.

2.4.2. Performance of IPO exits

The performance of PE-backed initial public offering (IPO) has been frequently discussed in the literature. When a company goes public, it has to disclose publicly its financial statements in the IPO prospectus, covering several years of operation under PE ownership. Therefore, IPO exits offer a unique opportunity to study the effects and outcomes of PE, and how these companies perform once listed.

Early studies on U.K. buyouts have focused on the short and long-term financial performance of buyouts that went public through an IPO (Jelic et al., 2005; Levis, 2007). In the U.S., researchers separately analysed reverse leverage and/or management buyouts (see, e.g., Muscarella and Vetsuypens, 1990; DeGeorge and Zeckhauser, 1993; Holthausen and

Larcker, 1996; Kaplan, 1991) and venture capital-backed IPOs (see, e.g., Megginson and Weiss, 1991; Lerner, 1994; Brav and Gompers, 1997). The studies of reverse leverage and/or management buyouts, however, did not specifically examine the role of the PE funding.

Singh (1990) finds that reverse buyouts had better performance in accounts receivable compared to their peers in the three years preceding the public offering.

The operating performance of buyouts exited via stock market flotation has been examined as a part of larger samples in the IPO literature. For instance, Khurshed et al. (2003) report long-term reductions in operating performance for U.K. IPOs. Jain and Kini (1994) and Mikkelson et al. (1997) report long-term deterioration in operating performance for U.S. IPOs. Mikkelson et al. argue that the drop in the performance was associated with the firms timing ability to go public during periods of exceptionally good performance. A common feature of these studies, however, is that they have examined both early stage and buyout stage investments combined. Buyout firms, however, are quite distinct and are not representative of a typical firm going public, and it is important to study them separately (Jelic et al., 2005).

Barber and Lyon (1996) provide an alternative explanation for operating "underperformance" after IPO. They report that the results of some studies could be biased due to the fact that authors did not track the performance of IPO firms long enough after coming to market. They also suggest that cash flow, rather than accrual based, measures of performance should be used since the use of accruals tends to overstate earnings pre-event.

Lin and Smith (1998) hypothesize that VC firms balance the cost of continued monitoring involvement (i.e. inability to redeploy advisory talent to other ventures) against the adverse market reaction to insider selling during IPO. To expedite redeployment of investments, companies backed by VC are brought to the market sooner than non-VC backed companies. The authors also report a decline in VC's board seats after the IPO exit from

13.6% to 4.9%. This further may imply that one should expect deterioration in performance after the exit. In the context of the governance and incentive systems in PE backed LBOs, IPOs may experience both a reduction in monitoring by PE firms and a decline in managerial equity holdings (Holthausen and Larcker, 1996).

Empirical evidence on stock price performance seems to contradict this view, and documents no statistically significant underperformance for PE-backed IPOs (Espenlaub et al., 1999; Jelic et al., 2005; Levis, 2007). Mian and Rosenfeld (1993) study the long-term stock price performance of firms that experience a reverse leveraged buyout, and find that the return performance of reverse buyouts behaves quite differently from those of IPOs with firms recording significantly positive cumulative abnormal returns over the initial two-year trading period. Cao and Lerner (2007) find that reverse buyouts' three- and five-year stock performance is at least as good as that of other IPOs and the stock market as a whole. Von Drathen and Faleiro (2008) investigate the long-term stock price performance of PE backed-IPO firms in the U.K. and find that PE-backed IPOs outperform non-PE-backed IPOs. The authors ascribe outperformance to the percentage of equity retained by buyout firm following the IPO.

DeGeorge and Zeckhauser (1993) find that the accounting performance of reverse buyout firms exceeds their peers prior to going public, and then deteriorates thereafter. They also find no evidence that reverse buyout stocks underperform the market. Holthausen and Larcker (1996) find that the accounting performance of reverse buyouts following their IPO is significantly better than their peers for up to four years following the IPO, although there is some evidence of a decline in performance. Change is positively related to changes in the equity ownership of management, but not to leverage. Muscarella and Vetsuypens (1990) find significant improvements in firms' profitability resulting from their ability to reduce costs. They also find that these firms gradually reduce their leverage ratios. Jelic and Wright

(2011) find improvements in employment, leverage, sales efficiency and sales up to five years following an IPO.

Bruton et al. (2002) find that performance explanations based on a reduction of agency costs generally applies throughout the public-private-public buyout cycle. When firms return to public trading, agency costs that were eliminated or minimized during the PE holding period did not reappear immediately following a reverse buyout. It took several years for the predicted performance declines associated with the agency costs of public ownership to re-emerge. Jelic et al. (2005) argue that PE firm reputation plays an important role in financial long-term performance of reversed buyouts that were subsequently floated.

2.4.3. Performance of secondary buyouts

As part of the general discussion on whether PE ownership constitutes a long-term organisational form and whether the changes instigated by PE firms persist or reverse under a second PE buyer, I review the literature on secondary buyouts. Secondary buyouts have evolved from a rarity in the 1990s to almost parity with primary buyouts in 2018.[4] A secondary buyout constitutes a sale from one PE firm (the primary buyout) to another PE firm. Consequently, target firms remain under PE ownership—although under a different owner.

Jensen (1989) argues that the buyout organisational form would eventually become the dominant organisational form that leads to an ongoing better performance. This observation could imply that secondary buyouts perform just as well as primary buyouts. However, Rappaport (1990) argues that the structural benefit of PE ownership is a one-off effect and that the portfolio company should eventually return to its former, non-PE-backed form.

[4] See Bain Global Private Equity Report 2019, https://www.bain.com/insights/topics/global-private-equity-report/.

The reasons to engage in a secondary buyout are not obvious though. Wang (2012) provides evidence indicating that PE firms are more likely to sell to another PE firm when the public equity market is "cold", debt market conditions are favourable, and sellers face a high demand for liquidity. Jenkinson and Sousa (2013) find that the longer the holding period in the primary buyout the more likely it is to exit as a secondary buyout. Axelson et al. (2009) note an agency conflict between the PE firm and its investors: if the fund has excess capital near the end of the investment period, then the PE firm has an incentive to "burn money" by taking bad deals. Secondary buyouts are plausibly a preferred investment channel for such a fund as they have lower search costs than other buyouts and lower adverse selection problems. Indeed, Arcot et al. (2015) find that secondary buyouts are more likely if the buyer fund is under pressure to invest or the seller fund under pressure to exit.

Achleitner and Figge (2014) argue that a portfolio company, which has not been fully optimised during the primary buyout, could provide additional sources of value creation. There are several reasons why there is still an opportunity for the secondary buyer to create value. First, some researchers have suggested that performance in secondary buyouts may improve because of PE firms' early exit. As PE funds have limited lives, some primary buyers may have to sell their investments before they achieve realizing all potential improvements to particular portfolio company and when approaching the end of the fund life (Jenkinson and Sousa, 2013). Alternatively, PE firms may exit their portfolio companies prematurely to create a track record to enhance their reputation and facilitate raising new moneys for their next fund (Strömberg, 2008; Harford and Kolasinski, 2010; Achleitner and Figge, 2014).

Second, PE firms may also exit prematurely when the expected marginal value- add is less than the expected marginal costs (Cumming and MacIntosh, 2003). This could imply that the PE firms' skills are exhausted and further value appreciation under the current owner no

longer is possible. An IPO or a trade sale would be the natural first choice of exit (Schwienbacher, 2005; Jelic, 2011). However, if such exit routes are not feasible, a secondary sale may be one of the few options left.

Kitzmann and Schiereck (2009) find that different financial investors engage in different lifecycle phases of a company. For instance, a smaller PE firm may lack the experience and resources to create value once the portfolio company reaches a certain size. In the secondary buyout phase, a larger PE firm with specific complementary knowledge and skills may realize further improvements (Wang, 2012; Jenkinson and Sousa, 2013; Acharya et al., 2013; Degeorge et al., 2016). Such skills include specialisations in industries, technologies, and geographies (Rigamonti et al., 2016). Financial rather than operational experience appears to have a substantial impact on profitability, while business education is especially important in growth performance enhancement (Jelic et al., 2019). The PE firms' reputation is expected to be an important determinant of performance too (Zhou et al., 2014).

Studies from Wang (2012), Jenkinson and Sousa (2013), and Bonini (2015) find that, on average, secondary buyouts exhibit smaller gains in operating performance when compared to primary buyouts. As discussed previously, evidence from primary buyouts suggests that profitability, productivity, and efficiency increase during the buyout compared to the time before the buyout. However, the speed of these improvements seems to decline during the time of PE ownership (Jelic and Wright, 2011). For instance, the performance improvements are likely to last for only 2-3 years after buyout and the benefits from squeezing out productivity improvements may gradually be exhausted (Wiersema and Liebeskind, 1995; Wright et al., 2009).

U.K. evidence shows that secondary buyouts on average perform worse than primary buyouts in terms of profitability, labour productivity, and growth. For instance, Zhou et al. (2014) do not find support that financial, operational, and governance engineering, which are

normally associated with performance improvements, generate growth during the secondary buyout phase. High debt and a high percentage of management equity tend to be associated with poor performance measured by profitability and labour productivity.

Management investments in secondary buyouts are usually higher because of their greater bargaining power from the performance in the primary buyout (Manchot, 2010; Achleitner and Figge, 2012). This could lead to a search and pursuit for more growth opportunities that are riskier especially outside areas of existing expertise, with adverse implications for performance. Thus, evidence on underperformance of secondary buyout would be consistent with the hypothesis that agency cost reduction and other benefits associated with the buyout model are exhausted during the primary buyout (Arcot et al., 2015; Degeorge et al., 2016).

2.6. PE performance

2.6.1. Performance measures

The organizational form of PE and its exemption from public disclosure requirements complicates performance measurement. A key problem is that the inherent illiquidity of the equity of PE portfolio companies means that there is no completely objective way to mark a PE fund's investments to market except when the fund makes or sells an investment. The interim assessments of the fund's net asset value (NAV) are rather subjective. Further, fund NAVs do not necessarily adjust for any transaction costs the fund would bear if it actually tried to sell the underlying investments.

Consequently, industry practice as well as most academic work has shied away from performance evaluation based on factor pricing models, which require periodic returns that would lean heavily on the self-reported NAVs.[5] Instead, practice has been to measure

[5] NAVs are the product of some appraisal process and generally exhibit serious smoothing and lagging (see, e.g., Jenkinson et al., 2013; Brown et al., 2013).

performance using the objective cash flows between the fund manager and investors. For active funds, it is usually assumed that the last observed NAV is a fair measure of the true value of the fund, so the last observed NAV is treated as a liquidating distribution for the purposes of calculating performance. An investor's cash outflows consist of management fees and capital called for investments, while inflows result from cash distributions from exiting investments (net of the applicable carried interest the fund managers withholds from these distributions).

Traditionally, the most widely used measures of returns among funds and investors are the internal rate of return (IRR) and the multiple of invested capital (MOIC). The former is an annualized time-weighted return on invested capital and measures the discount rate which, when applied to all cash flows, produce a net present value of zero. Until an investment is fully realized, the calculation includes the fund's estimate of the portfolio company's NAV as a final "cash flow". The MOIC (also known as investment multiple) compares the sum of all proceeds, dividends, and, if unrealized, the NAV, to the sum of all investments made.

While useful, both IRR and MOIC both have several drawbacks. Most importantly, both IRR and MOIC are absolute, not relative, measures of performance. They do not control for movements in the overall market or any other source of risk. Although most practitioners have historically focused on IRR and MOIC, one of the key questions regarding PE is how returns compare with those to public equity. To perform such a comparison requires timed cash flows that many data providers either do not have or do not make available to researchers.

Comparisons with public markets can be performed in various ways each of which has its own advantages and disadvantages. Long and Nickels (1996) propose the first of various PME methods: Index Comparison Method (ICM)—a market-adjusted IRR. The ICM

has the advantage that many investors think in terms of IRRs. In response to some perceived shortcomings of ICM/PME[6], certain extensions have been proposed, including PME+ by Rouvinez (2003) and Capital Dynamics, and mPME by Cambridge Associates (2013). Gredil et al. (2014) propose an alternative method to market-adjust the IRR. They calculate the differential return or alpha to the relevant benchmark that discounts the PE fund cash flows to a net present value of zero.

Kaplan and Schoar (2005) propose a related method to market-adjust the multiple on invested capital rather than the IRR. The so-called Kaplan-Schoar (KS) PME is calculated as the ratio of the sum of discounted distributions to the sum of discounted capital calls, where the discount rate is the total return on the relevant public equity benchmark from an arbitrary reference date to the date of the cash flow in question. A fund with a KS PME (hereafter, simply PME) greater than one outperformed the benchmark; a fund with a PME less than one underperformed. For instance, a PME of 1.15 (0.85) means that the investor ended up with 15% more (fewer) by investing in the PE fund instead of the public benchmark. The PME has the advantages that it can always be calculated and has an intuitive interpretation. One practical disadvantage for practitioners is that it provides a cumulative measure rather than an annualized return measure.

2.6.2. Risk adjustment

When analysing the performance of investments into PE, risk is a crucial factor. The difficulty in measuring risk is that PE investments are illiquid. On the deal-level, there is no market price available during the holding period. On the fund-level, the same problem exists, but for an even longer period, as PE funds usually have a fund life of ten years or more. Thus, risk measures differ strongly based on valuations and by what measure for risk is used.

[6] The LN PME has two disadvantages. First, it shares with the IRR the unattractive attribute of being unusually sensitive to investment sequencing, particularly the success of a fund's early investments. Second, the LN PME calculation is not possible for some funds, particularly those that are very successful and return capital quickly.

Andrade and Kaplan (1998) value the cost of financial distress of leveraged buyouts at 10%-20% of total firm value. Groh et al. (2008) calculate the idiosyncratic risk of buyouts and use Sharpe-ratios to measure risk. However, they do not find empirical results due to the limited sample available to them. Ewens et al. (2013) argue that the principal-agent conflict between fund managers and their investors is the reason for investors' returns to strongly depend on diversifiable risk. However, as they analyse venture capital transactions, findings cannot easily be applied to other PE investments. Franzoni et al. (2012) focus on liquidity risk and value the risk premium at 3% annually. Robinson and Sensoy (2013a) examine the cyclical and diversifiable variation in fund manager-investor cash flows, arguing that cash flow variation is the salient source of risk for PE investors. They find a strong cyclical component of both capital calls and distributions, with distributions being more cyclical than capital calls. At the same time, they find that most cash flow variation is diversifiable.

Since Kaplan and Schoar (2005) introduced the KS-PME, it has been the standard performance measure in the literature measuring PE returns. A natural question is to whether the market-adjustment embedded in the PME suffices risk adjustment. Theoretical work by Sorensen and Jagannathan (2013) and Korteweg and Nagel (2013) has sought to link PE performance measurement to asset pricing theory. These papers establish that the PME suffices to adjust for risks, regardless of the beta of PE with respect to the benchmark, under the assumption that investors have log utility. However, the asset pricing literature has found that these implications are hard to reconcile with the equity premium and risk-free rate in the data.

Other strands of the literature have attempted to measure risk of PE funds with respect to public equity factor portfolios such as the Fama-French (1993) factors, and/or to account for the impact of other risks such as illiquidity. The different studies also find widely different estimates for beta. Jones and Rhodes-Kropf (2004) estimates a beta of 1.8 for

venture funds versus 0.6 for buyout funds. Using weighted Fama-French betas, Ljungqvist and Richardson (2003) only find small differences (1.12 for venture funds versus 1.08 for buyout funds). Based on a dynamic discount rate in the IRR calculation, Driessen et al. (2012) estimate that the market beta of venture funds is about 2.5 and that buyout funds is about 1.3. Ang et al. (2014) adopt a similar approach and estimate market betas of about 1.6 for venture funds and 1.3 for buyout funds. Jegadeesh et al. (2012) take a different approach and find an average buyout beta of close to one based on the observable market prices of publicly traded fund-of-funds.

Cochrane (2005), Korteweg and Sorensen (2010), Franzoni et al. (2012), and Axelson et al. (2014) all propose methods to measure the betas of portfolio companies rather than funds. Cochrane (2005) uses a maximum likelihood estimate that corrects for selection bias and reports a beta of 1.9 and an annual alpha of 32%. Korteweg and Sorensen (2010) extend Cochrane's approach. Using Bayesian Markov chain Monte Carlo methods to estimate their model, they find a monthly alpha of 3.3% and a beta of 2.8. Franzoni et al. (2012) estimate an annualized alpha of 9.3% in the log-CAPM and 3.1% in the Fama-French model. Axelson et al. (2014) have data on all deals of a single buyout fund-of-funds, and find an alpha of 8.3%-8.6% annually, and a beta of 2.2-2.4.

2.6.3. Fund-level performance

The academic literature on PE performance is still relatively young. Evidence from papers written in the early 2000s are the earliest contributions to the understanding of PE fund performance. Despite their different samples and methodologies, the studies reach similar conclusions about average fund performance.

Ljungqvist and Richardson (2003) find an IRR of 19.8% for all funds (14.1% for venture funds and 21.8% for buyout funds), compared to a return of 14.1% for the S&P500. They do not calculate PMEs. Kaplan and Schoar (2005) use data from Venture Economics

(VE) and report an equal-weight average PME of 0.96 for venture funds and 0.97 for buyout funds. They find higher buyout PMEs in the 1980s, reconciling results with Ljungqvist and Richardson (2003), whose sample is mostly from that period. Jones and Rhodes-Kropf (2003) also use VE and estimate alphas of 5% for venture funds and close to zero for buyout funds (IRRs are 19% and 9%, respectively). They also find considerable heterogeneity in buyout returns. Phalippou and Gottschalg (2009) find that the average PME decreases from 0.99 to 0.92, when adjusting for overstated net asset values.

Until around 2010, Kaplan and Schoar (2005) and Phalippou and Gottschalg (2009) were the most cited papers on PE fund performance. However, Stucke (2011) reports that due to flaws in the VE data, returns based on VE data are biased downward and those results of those studies should be interpreted with caution.

Evidence from new cash flow data sources indicates that PE funds have outperformed the S&P 500 net of fees on average. Despite different data sources, Robinson and Sensoy (2013), Harris et al. (2014), Higson and Stucke (2014), and Phalippou (2013) all find almost identical average PMEs using the S&P 500 as the benchmark. Performance of venture funds is mixed though. Both Robinson and Sensoy (2013a) and Harris et al. (2014) find that venture funds raised in the 1990s outperformed the S&P 500 while those raised in the 2000s underperformed.

Robinson and Sensoy (2013a) use data from a single large investor and report an equal-weight average PME of 1.06 for venture funds and 1.19 for buyout funds. Harris et al. (2014) use data from Burgiss and report an equal-weight average PME of 1.36 for venture funds and 1.22 for buyout funds. Higson and Stucke (2014) use data comes from Cambridge Associates and CalPERS, and report an equal-weight average buyout PME of 1.22. Using data from Preqin, Phalippou (2014) finds an average PME of 1.20. Because fees in PE funds are approximately 3%-4% per year, evidence also strongly suggest that buyout funds

outperform the S&P 500 gross of fees (see, e.g., Kaplan and Rauh, 2012; Metrick and Yasuda, 2010; Kaplan and Sensoy, 2014).

2.6.4. Deal-level performance

While most papers focus on fund-level performance, as small number of papers examine deal-level gross returns. The main advantage to analysing deal-level data is that returns are computed before investor fees are taken out (i.e., management fee and a profit share called carried interest), affording a direct assessment of a PE firm's skill. In addition, one can estimate risk-return profiles by industry (e.g., healthcare versus internet technology), stage of investment (e.g., seed, early stage, growth, buyouts), or geography, which are often mixed inside PE funds.

Obtaining data on individual PE investments, as opposed to fund-level data, is very challenging though. Historically, academic researchers considered predominantly venture capital datasets, as start-up company returns have been more readily available (Korteweg, 2018). VC returns are also easier to reconstruct as start-ups rarely pay dividends and VCs do not charge fees to their portfolio companies, unlike buyout firms, and data on dividends and fees are difficult to collect (Phalippou et al., 2018). However, in recent years researchers have gained access to large data sets of buyout deal returns.

Kaplan (1989) finds an average market-adjusted return of 42% (median 28%) to 25 public-to-private U.S. buyout deals from the early 1980s. He argues that buyout returns have come down since the 1980s as the industry has grown and become more competitive. Nikoskelainen and Wright (2007) report an average (median) IRR of 70.5% (17.8%) for U.K. buyout transactions. Groh and Gottschalg (2011) collect data from private placement memoranda (PPM), which fund managers provide to potential investors when fundraising, and report an average (median) gross IRR 50.1% (35.7%) for U.S. buyouts. There may be

some bias due to the identity of investors who are willing to share data, and because more successful fund managers are more likely to raise a follow-on fund in the first place.

Acharya et al. (2013) report a sector-adjusted PME of 1.9 for buyout deals sourced from McKinsey, a consulting firm, and a single large investor. Lopez-de-Silanes et al. (2015) collect data from fundraising prospectuses. For their full sample, they find a median PME of 1.27, a money multiple of 1.9, and an IRR of 21%. Realized deals have a median PME of 1.4, a money multiple of 2.1, and an IRR of 26%. They also report that one in ten investments does not return any money, whereas one in four has an IRR above 50%. Using data from three large fund-of-fund managers, Braun et al. (2016) find a median PME of 1.3 and a money multiple of 1.5 for all deals. For fully realized they find a median PME of 1.4 and a money multiple of 1.9. These aggregated gross performance figures are generally consistent with the net-of-fees returns documented in Robinson and Sensoy (2011), Harris et al. (2014), or Phalippou (2014). There is much greater dispersion of individual investment returns than of fund returns (Kaplan and Schoar, 2005).

Fang et al. (2015) report weighted average PMEs for direct investments, co-investments, and solo investments of 1.36, 1.38, and 1.42, respectively using the S&P 500 index as benchmark. Fang et al. also find that co-investments underperform the corresponding funds with which they co-invest. In contrast, Braun et al. (2018) report weighted PMEs of 1.60 for buyout investments and 1.35 for venture investments. Both buyout and venture co-investments outperform traditional deals and have weighted PMEs of 1.76 and 1.55, respectively.

2.6.5. Deal-level performance determinants

Even though numerous empirical studies on both operating performance of PE-backed companies and the drivers and characteristics of PE returns exist, there is still a lack of research linking these two strands. Only a few academics papers and practitioner-led

studies have attempted to uncover this relationship. The most widely used way to measure value creation in PE is based on accounting measures. A common term for it is the "value bridge". The value creation model differentiates between three basic value creation drivers: EBITDA growth, EBITDA multiple expansion and debt repayments. Often EBITDA growth is further split into sales growth and EBITDA margin improvements. Pindur (2007) provides a discussion of the theoretical background of this model.

When it comes to what it is supposed to be measuring, the value bridge is misleading. It does not explicitly consider that the return expectations of the owners of a levered company consist of two components: the operational risk and the financial risk. This shortcoming has two major implications. First, the impact of leverage on the return to equity holders cannot be quantified and, second, as debt-to-equity ratios vary from transaction to transaction, a comparison across deals is not possible. The value bridge also ignores what is happening in the stock market and the wider economy, and measures debt repayment rather than the boost that comes from higher debt (Morris, 2015).

Some studies provide insights into the underlying drivers of value creation at the enterprise level. Other studies assess the sources of PE returns by controlling for leverage and public equity market performance. Studies have also tried to isolate "alpha". Alpha is this context represents the outperformance of PE investments after controlling for leverage and public equity market returns. Some studies isolate the full impact of leverage and compare the return of the unlevered portfolio company to public market returns. Others isolate the portfolio company leverage in excess of that employed in public markets to quantify the effect of increased leverage. The proxies included in the public market returns also vary, from bottom up selection of single publicly listed peer to a top down selection of a group of comparable companies in the same industry sector.

While this approach provides a more comprehensive evaluation of performance than individual value drivers isolated in other academic studies do, it has several shortcomings (Duff and Phelps, 2011). Comparing performance to public equity market returns does not provide any insights into changes in the underlying operating performance and introduces a host of public market biases that can distort measurement of company value. Indeed, the various methods to isolate the impact of leverage and public market return suggest a lack of accepted best practice, as well as the difficulty of identifying meaningful comparable benchmarks. Finally, the approach employs a formulaic assessment of the impact of leverage rather than directly analysing the impact of leverage on company cash flows.

Loos (2006) reports an average IRR of 78% for leverage buyout transactions. Eighty three percent of the value creation is driven by the leverage and multiple expansion, and 25% comes sales growth. The EBITDA margin effect is negative 8%. Pindur (2007) reports a median IRR of 58% and outperformance of 50% (median) compared to the DJ Stoxx index. Growth in EBITDA accounts for 45% of value creation, followed by 22% from the free cash flow generated during the holding period, 28% from multiple expansion and 5% from combination effects. Brigl et al. (2008) report that the average IRR of 48%. Performance is driven by 46% sales growth, 10% margin improvements, 21% multiple expansion and 23% de-leveraging. When analysing the sources of value creation over time the authors find a shift away from leverage in the 1980s to multiple expansion in the 1990s, earnings growth in the 2000s, and operational improvements in the 2010s.

Achleitner et al. (2010) report a median IRR of 33% and money multiple of 2.8x, and decompose the return of a leveraged company into the return of equity of an unleveraged company and the leverage effect. They find that one-third of the value creation is driven by EBITDA growth, mostly through sales growth (79%) and less by margin expansion (21%), 15% of value creation comes from the free cash flow effect, and 18% of value creation comes

from an increase in valuation multiples. Another four percent of the value creation comes from a combination of EBITDA growth and multiple expansion. Puche and Braun (2014) attribute 30% of value creation to leverage and 70% to operational improvements. The latter driver decomposes into 37% EBITDA growth effect, 13% free cash flow effect, 15% multiple expansion effect, and 6% combination effects.

Guo et al. (2011) find that improvements in performance accounted for 23% of the pre-buyout return, while changes in industry EBITDA multiples over the PE holding period account for 18%, and 26% in case of an IPO. Changes of the returns to total pre-buyout capital and 12% to total post-buyout capital. The impact of leverage on returns depends on whether the increase in leverage was sustained after exit, though on average companies' realised annual tax benefit accounted for a median of 3.4% of the return to pre-buyout capital.

Achleitner et al. (2012) and Acharya et al. (2013) both employ regression analysis to identify performance determinants. Achleitner et al. (2012) find that besides leverage and operational improvements, EBITDA multiple expansion is a fundamental factor in explaining equity returns and the result of skills rather than pure luck. Acharya et al. (2013) disentangle the effect of how much of the excess returns generated by PE firms comes from pure financial leverage and genuine operational improvements.[7] They find that, on average, about 34% of average deal IRR comes from abnormal performance, another 50% is due to higher financial leverage, and the remaining portion is due to exposure to the quoted sector itself. EBITDA margin and multiple also appear to be significant determinants of abnormal performance: a change in either measure has a positive and economically meaningful impact on abnormal performance. Sales growth also relates to abnormal performance, even though it does not generally improve above industry sector growth.

[7] In order to do so, Acharya et al. un-lever the IRR and benchmark the un-levered return to returns for the quoted peers of the deal, unlevered in the same way. The resulting difference in un-levered returns is what the authors call "abnormal performance" (or alpha).

The literature review revealed that the various samples vary significantly. In terms of IRR, results range between 26% and 78%. Acharya et al. (2013) find that PE outperforms public equity by 15.4%, while Pindur (2007) even finds an outperformance of 50%. In contrast, Guo et al. (2011) conclude that PE deals are either performing on benchmark level or only slightly exceeded benchmark performance. In terms sources of value creation, operational improvements appear to be the main driver.

In two white papers published in 2009 and 2014, Capital Dynamics and Technische Universitaet Muenchen presented a framework attributing PE returns to financial and operational risk. The framework first quantifies the return attributed solely to financial risk by un-levering the realised return and, in a second step, attributes the unlevered return generated via changes in EBITDA, changes in the valuation multiple, and the free cash flow. The Capital Dynamics approach determines alpha by controlling for leverage and public markets returns. While the 2014 report provides an explanation for the source of alpha at the enterprise level, its detailed breakdown does not consistently differentiate between industry, capital market, and company specific sources.

Duff and Phelps (2011) developed the Created Value Attribution (CVA) framework. The CVA links the change in specific drivers of operating performance directly to changes in both enterprise and investment performance. It deconstructs investment performance and isolates sources of operation value creation in terms of internal and external drivers. In a second step, it identifies and recombines these individual drivers into four fundamental sources of value creation: industry, capital market, deleveraging, and alpha.

3. Data and sample

3.1. EBRD

The first dataset comes from the European Bank for Reconstruction and Development (EBRD). The EBRD is an international financial institution and was established in 1991 to assist countries in the former Soviet Union in transitioning to market economies. Over time it has expanded its operations and is currently active in nearly 40 countries from central Europe to central Asia and the southern and eastern Mediterranean region. As part of its mission, the EBRD has sought to help establish the PE industry by being an anchor investor in funds with a geographic focus on transition economies. These funds are managed by professional third-party managers, have standard profit-maximizing objectives, and raise most of their capital from institutional investors. Apart from their focus on transition economies, they are no different from funds studied in the PE and venture capital literatures.

The dataset has several advantages over others used in the literature. First, unlike commercial databases such as Venture Economics, Pitchbook, Preqin, or Burgiss, the EBRD dataset is free of a survivor bias resulting from only the best and/or the largest fund managers contributing data. I know the complete portfolio composition of every single fund in the sample and the ultimate fate of each of their investments. This eliminates the need to address concerns about survivor bias through the use of structural econometric models as in Cochrane (2005), Hwang et al. (2005), or Phalippou and Gottschalg (2009), among others.

In general, PE funds are not required by law to report performance to their investors. Unlike mutual funds, banks, or insurance companies, PE funds are only subject to minimum mandatory reporting requirements depending on the type of partnership they have chosen to administer their funds. Reporting obligations regarding frequency or quality of information depend on the terms of the contract agreed between the fund and its investors. In case of the

EBRD, all funds in which it invests in are contractually bound and obliged to regularly report a certain amount of information.

Second, as an approximation, I know what fund managers know. I have access to pre-investment memoranda and post-investment quarterly reports of the hard and soft information that fund managers have about their portfolio companies and the conclusions they draw from it. I use this data to capture each fund's intended value creation strategy at the time of investment and if they achieve a plan over time. I also know what actions fund managers take in response to the information they collect. Specifically, the quarterly reports that I have access to provide comments on how fund managers change their strategies when intended VCPs are not realized on time or at all.

I complement the soft information from quarterly reports with hard information from balance sheets and income statements of each portfolio company. In order to do so, I manually match each deal to a company in Orbis, a global database provided by Bureau van Dijk. Orbis provides harmonized balance sheet information on a rich set of companies. Using Orbis data, I calculate measures of efficiency and market power in a consistent manner across countries, and also to create comparable control groups for the econometric analysis. I discuss the construction of the Orbis dataset in Section 3.2.

Third, I can map every target company to an identifiable fund and track each fund's precise investment choices over time. Commercial databases typically do not report which fund in a manager's family of funds made an investment and so credit many investments to a category of 'unspecified funds' instead. I also know the exact date and amount of cash flows between the fund and a portfolio company. I use this information to compute company-level performance measures. In contrast, portfolio company returns are impossible to compute with any certainty from commercial databases, because the exact contractual structure of the investments is not recorded. Commercial databases often only have quarterly information.

3.1.1. Fund reporting and fund documents

Investor reporting is needed on a timely basis to enable PE fund investors to perform their investment analysis and monitor the status of their investment appropriately. The nature of PE funds means that valuing a fund investment on an ongoing basis is difficult and, without information from the fund manager, fund investors cannot effectively monitor the performance of the fund in a satisfactory manner.

It is typical for a PE fund manager to develop standardised reporting of information for their investors at the outset. The fund's establishment documents typically contain certain provisions regarding the fund manager's obligations to provide reports to their investors. These provisions include the frequency of fund reports, the information to be contained, the form and frequency of investment reporting; the basis of valuation that will be used, ad hoc reporting and disclosure, among others.

Fund managers typically provide quarterly information in one reporting package which includes both narrative and financial information. The current market practice is for quarterly reports to be issued no later than 60 calendar days after the quarter end and for annual accounts to be issued no later than 90 days after the year end (Invest Europe, 2018). Quarterly reports typically cover the current period (i.e., the quarter or the six months depending on the frequency of reporting) and data with either financial year-to-date or the last twelve months. The extent to which information requires an audit will be determined by the fund formation documents and depends on local regulation.

It is also common practice for fund managers to provide regular updates to their investors on new investments, divestments, and major portfolio company events such as an initial public offering or a major acquisition.

3.1.2. Hard and soft information

Information is an essential component in all financial transactions and markets, but it can arrive in multiple forms. Liberti and Petersen (2018) define what is meant by hard and soft information. Hard information is quantitative, easy to store, and transmit in impersonal ways, and its information content is independent of its collection. Accounting numbers, such as a firm's income statement and balance sheet, are a classic example of hard information.

In contrast, soft information is difficult to completely summarize in a numeric value, requires knowledge of its context to fully understand it, and becomes less useful when separated from the environment in which it was collected. Soft information is often communicated as text. It includes opinions, ideas, rumours, statements of management's future plans, and market commentary. One can always create a numerical value from soft information. For instance, one can create a five-point scale of how honest a potential borrower is. However, this in itself does not make the information hard. The interpretation of a "three" must be the same among two independent persons.

Thus, a second dimension of hard information is the unimportance of the context under which the information is collected (Liberti and Petersen, 2018). One can collect and code hard information and then transmit it to someone else. The meaning of the hard information depends only upon the information that is sent. It does not depend upon dimensions of the environment under which it was collected but which are not encoded in the data (Ijiri, 1975). Thus, the receiver of the data knows all what the sender knows (or at least all that is relevant).

With soft information, however, the context under which the information is collected and the collector of the information are part of the information. It is not possible to separate the two. This constrains the environments in which the data is collected and used. Consequently, the environment has to be well-defined and predictable.

A firm's sales revenue or their stock return are examples of hard information. There is wide agreement as to what it means for a firm to have had sales of $10 million last year or the firm's stock price to have risen by 10%. However, if I say the owner of the firm is trustworthy, there is less agreement about what this means and why it is important. The definition of trustworthy can be different and the context under which to evaluate trustworthiness can be relevant.

The importance of context for soft information is related to the distinction in the contracting literature of whether a signal that is observable by outsiders is also verifiable by outsiders (Hart, 1995; Aghion and Tirole, 1997; Baker et al., 2002). For a signal to be verifiable, the interpretation of the signal by the two contracting parties—and any third party who may be required to enforce the contract—must be the same. This is a characteristic of hard information.

By contrast, soft information is private and not verifiable as it involves a personal assessment and depends upon its context, neither of which can be easily captured and communicated. Previous lenders can produce records showing that a borrower has paid their bills on time (hard information), but they cannot fully document for an unknown third party that a borrower is honest as this relies on multi-dimensional observations and on each party's personal assessment and standards.

3.1.3. Cash flow and fair value data

I have access to the complete sequence of cash flows between funds and portfolio companies, and between investors and funds. Using these data, I calculate gross returns and net returns. Gross returns are the returns a fund obtains from a portfolio company investment, without any deductions. By contrast, net returns are the returns investors obtain from a fund investment, after deducting management fees, expenses and carried interest.

For each fund and portfolio company, I observe the sequence of gross cash flows. A typical data record consists of the exact date, amount, and the type of transaction. Transaction type includes “disbursements” (the fund’s initial investment and subsequent investments, if any), “disposals” (cash receipts from the portfolio company’s IPO, trade sale or liquidation event), dividend payments, and interest paid by portfolio companies. For unrealized portfolio companies, I also observe the fund’s estimated value of any unrealized amount (the residual net asset value, or NAV) as of 31 December 2017.

Historically, the most widely used measures of returns among funds and investors are the internal rate of return (IRR) and the multiple of invested capital (MOIC). The former is an annualized time-weighted return on invested capital and measures the discount rate which, when applied to all cash flows, produce a net present value of zero. Until an investment is fully realized, the calculation includes the fund’s estimate of the portfolio company’s NAV as a final “cash flow”. The MOIC (also known as investment multiple) compares the sum of all proceeds, dividends, and, if unrealized, the NAV, to the sum of all investments made.

Neither IRR nor MOIC provide a direct way to assess how PE performance compares with returns of public equity investments (i.e., in listed stocks). There are, however, a variety of measures that compare private and public returns and these have been increasingly used in both research and practice. Gredil et al. (2014) provides a comparison of such methods which are referred to collectively as public market equivalent (PME).

In the PME calculation each cash flow is mirrored by an equivalent amount invested into and divested from a public stock index. That is, an investment made by the fund into a portfolio company is matched with an investment into the public index on the same date and proceeds from a sale of the fund’s stake, dividends, and NAV are matched with withdrawals from the public index on the same date.

I construct the PME in the spirit of Kaplan and Schoar (2005) (also known as the KS-PME). The KS-PME discounts all cash flows in the MOIC calculation by the returns to a public index since the fund's investment. If the resulting ratio is in excess of 1, then the fund is deemed to have outperformed the selected benchmark and where the ratio is below 1, then the fund is deemed to have underperformed the index. I use the MSCI Emerging Markets index as main benchmark and the narrower MSCI Emerging Markets Europe and the broader MSCI World index for robustness checks. In practice, the choice of PME benchmark has little impact on the inferences one draws, especially in a setting like ours where most of the comparison is implicitly cross-sectional in nature (see Harris, Jenkinson, and Kaplan, 2015, and Robinson and Sensoy, 2016).

3.1.4. Value creation plans

What do PE firms plan to do, and what do they actually do? To this end, I quantify soft information about value creation strategies as reported by the fund managers themselves. Of particular interest are fund managers' confidential comments regarding their VCPs and their ability to put their plans into action. Unlike accounting data, such comments are difficult to verify, and thus constitute soft information.

Figure 1: Example of an anonymised fund report

The figure shows an anonymised example of VCPs.

[COMPANY NAME]

COMPANY PROFILE	
Sector	Industrials
Head quarters	[City], [Country]
Primary country of operations	[Country]
Company website	[Website]

BUSINESS DESCRIPTION

[Company] is a leading European designer and producer of electric machines, mainly power generators and their components, for renewable and non-renewable energy generation

INVESTMENT THESIS

- Undermanaged asset with potential for operational improvements and add-on opportunities
- Achieve a more attractive sales mix and strategic fit at exit by
  - focusing on machines of their own designs,
  - increase the exposure to renewables segment, and
  - expanding to markets outside of Europe
- Strong operating partner
- Solid cash flow generation to support LBO debt

VALUE CREATION PLAN	
Element	**Status**
New products and segments: Extension of current product portfolio to larger/higher machines and increased exposure to wind power industry	Several landmark projects were won in 2015-2017 and the positive trend of increasing average capacity per machine is continuing as the company is working in the 15+MW space for the first time. [Company] has delivered its largest ever hydro generator project in July. The next significant project is to be delivered in September with destination Norway. [Company] has additionally sourced a contract to manufacture and assemble motors for machine applications with a major industrial group. Successful delivery could open doors to a substantial new market.
International expansion: Expansion in new markets outside Europe (U.S., Russia, Turkey)	In the hydro sector, expansion into North America, Turkey and Russia was established within the first three years after the acquisition. A major project was signed for Indonesia, marking the first reference in Asia. Markets of Central and South America, as well as Africa, have also been successfully entered. In Europe new countries and accounts for the component businesses have also been opened, including expansion into Russia.
Focus on renewable energy, especially small hydro and wind, increase market share	Hydro generators are the strategic segment and remain the key focus of business development activities and R&D. Besides sales activities, successfully rolling out Modular Design is key to increasing the lagging order intake especially in the very competitive segment of small and medium-sized machines. An important milestone is the current launch of service division, which will aid acquisition of new and retention of current customers, while itself being a high-margin business activity.

Figure 1 (continued)

Further penetration of existing customers in non-renewable power supply segment	Challenges remain as low power prices lead to reduced capacity additions in power generation. The company's focus has been adjusted to the optimization of the profitability of the core customer and product portfolio. Nonetheless, several new blue-chip logos were added to the client base over the last 24 months with attractive potential to enlarger the "key customer" group and the recent order intake in line with the budget.
Operational improvements: Improve supply chain management, material and workflow and integrate [competitor]	[Competitor] has been integrated as an electric drives division. Procurement activities are now managed centrally under a new supply chain department. New quality management processes are in place. Cost of non-quality decreased from 3.3% of sales in 2013 to 2.2% in 2016, while still remaining a focus area to improve cash and margins.

DEAL FACTS	
Initial investment date	[Date]
Currency	[Currency]
Type	Leveraged buyout
Source	Cold call
Process	Auction
Fund role	Lead investor
Fund deal team	[Investment Manager 1], [Investment Manager 2]
Fund board seats	2 of 3, [Board Member 1], [Board Member 2]

COMMENTARY / RECENT EVENTS

- A further strengthening of the management team has taken place by the on boarding of [Name], a veteran with considerable experience in the industry of machine and plant construction. In a first step [Name] will look to drive the company's new service business line. The CEO remains focused on managing key client relationships while keeping tight cash control and working closely with the lending banks. Despite the modest improvement in performance, and some sign of stability in cash flow generation, the overall cash situation remains tight.

- The company has managed working capital well and successfully deal with pressure from suppliers, credit insurers and customers alike. Further support from the lending consortium has come in form of the release of the second tranche of blocked cash in February. The debt restructuring documentation negotiations with the banks are in the final stage, as a result of which there will be no scheduled debt repayments and only minimal interest service for the next approximately 18 months, which will give [company] additional flexibility.

- May YTD trading remains encouraging. Sales and EBITDA were 16% and 25% above the same period last year, respectively. Sales are also 8% above budget, while EBITDA is 9% below budget due to higher costs and overheads.

- Management continues to focus on cost control and on the tracking of savings. May YTD EBITDA margin of 10% is 1.7ppts below budget driven by higher maintenance and repair cost during the last quarter. Potential legacy issues with 2014/15 vintage plant installations remain a risk factor. The market remains highly competitive in hydro, with sufficient supply keeping pressure on margins and commercial terms.

- Management initiatives continue to focus on optimizing profitability with the existing client base by targeted pricing/product management for key customers in the components division. On winning projects within the technological sweet spot that can be won at high margins in the generators division while at the same time ensuring the growth in earnings will not be put at risk via the installation of prudent risk management.

Data collection

I select the value creation indicators based on a combination of previous literature findings and an initial scan of fund documents. I first identify variables following Gompers et al. (2016)'s survey of PE firms on their sources of value creation and return drivers. I then randomly select 50 deals in the sample and read their fund documents to identify additional sources of value creation. Similar to the survey of Gompers et al. (2016), I design a template to fill in soft information. I focus on changes at the portfolio company-level over the course of PE ownership, which can be objectively captured in a binary fashion and two independent readers of the reports could agree on.

I end up with 23 distinct plan items as reported in Table 2. Table A.1 in the Appendix provides a description for each indicator. I group plan items into three categories identified by Kaplan and Strömberg (2009) and Gompers et al. (2016)—financial engineering, operational improvements, and governance engineering—plus two categories that I have encountered in fund documents: Cash management and revenue growth.

Table 2: Example of an anonymised value creation plan

Strategy / plan item	Example
Financial engineering	
Optimize capital structure	"To manage the liquidity gap this year, [company name] has successfully renegotiated its existing debt agreements, and all principal repayments scheduled for 2017 have been postponed."
Improve incentive systems	KPI-based performance tracking has been the key to optimise top and mid-level management productivity and we will continue to (improve and) rely on the KPI-based performance management and incentives system that was introduced as of January 2013 and has been functioning properly since Q2 2013.
Operational improvements	
Buy or upgrade fixed assets	"One of [company name]'s key ongoing projects is to enlarge stores from the current average of 300 sq.m. to 400-500 sq.m., which requires store relocation and remodelling. Together with 7 new stores added to the network in 2016, [company name]'s selling space increased by 42%. Management plans to continue the fast rollout, store relocation and remodelling program this year. The budget envisages 15 new openings and 9 relocations. We think this target is achievable based on the current pipeline."
Sell fixed assets	"Anti-crisis plan is launched. It stipulates closing of loss-making stores and general cost cutting. 4 worse performing POSs in Moscow and Moscow region were closed in summer 2014."
Divest non-core business units	"The 100-day plan was also successfully completed, with key achievements that include the disposal of the loss-making French subsidiary, a full carve-out from the former parent and the recruitment of a new CFO."
Reduce costs	"SG&A declined by almost 14% thanks to the reduction of warehouse rent, postponed marketing campaigns and staff lay-offs."
Improve IT systems	"The team will need to move very quickly and implement a number of ambitious initiatives in 2008, including: … 5) implement ERP and a proper reporting system;…"
Improve distribution	"Because of their superior credit profile as compared to pharmacies, the distribution model shifted so that more than 90% of sales are now through distributors."
Improve corporate structure	"The 100-day plan was successfully completed and over the next few month the company will focus on improving… introducing organisational change of profit centres and…."
Cash management	
Improve payment terms	"The VP [Vice President] Purchasing who joined in March from [company name] is systematically improving the assortment and negotiating better terms with suppliers."
Improve inventory management	"Notwithstanding the good quality of [company name]'s retail operations, with help from our [the fund's] industry advisors we [the fund manager] identified upside potential in the product mix and inventory management that should support further sales per square meter and like-for-like growth as well as margin improvement and cash generation going forward."

Table 2 (continued)

Revenue growth	
Target market share	"Further market share gains; organic and inorganic growth of market share."
Pursue acquisitions	"In April 2017 [company name] acquired a Slovenian company with IT talent and revenues of ca. USD 3.7 million. Management has also identified a German company with unique business expertise in the automotive sector and c. EUR 10.0 million in revenues, and is in advanced discussions regarding its acquisition. The two acquisitions fit well with [company name]'s strategy."
Change mix of products or services	"New products: Develop non-water beverages to build more comprehensive product mix." "[Company name's] own juice product declined by 25% as part of a controlled phase out of the product to allow the Company focus on its core water business"
Pursue international expansion	"In early December, [company name] will open its first two stores in the Czech market, the first to be established outside of its home market. This opens up further growth potential, as significant rollout is planned in the Czech Republic over the next years."
Change pricing strategy	"In 2008 management was able to increase the gross margin by a spectacular 4.3 percentage points from 41.0% to 45.3% mainly due to the strengthening of the zloty, but also through product mix changes and price increases."
Improve marketing	"Management sees considerable growth potential on that market. In Poland, where management recently reorganized the sales network and ran a marketing campaign, the plan now is to grow sales by repositioning [company name] as a comprehensive provider of single-family houses in both prefabricated and brick-and-mortar technologies."
Improve product quality	"New quality management processes are in place. Cost of non-quality decreased from 3.3% of sales in 2013 to 2.2% in 2014 and 1.6% in 2015."
Governance engineering	
Change CEO	"It has been agreed that [the CEO] would have to leave in the near future. [He] has disappointed with his lack of leadership … and overall lack of discipline and political skill."
Change CFO	"Owing to the poor performance of the CFO we [the fund] decided to replace him as from April 1 with [name] (52), until recently the CFO of our former portfolio company [name]."
Change other senior management	"Overall, we are satisfied with both the management team and the work of the non-executive board members. We are searching for a senior professional to strengthen the commercial side of [company name]'s delivery department."
Improve corporate governance	"[Fund] reorganized corporate governance at the shareholder and supervisory board levels. Prior to the MBO, the Company functioned and reported as a division of an industrial group."
Change board structure	"[Fund] brought in a new chairman of the board."

There are two main dimensions along which I code the plan items based on the text I read from fund documents. First, I pinpoint exactly when a certain VCP was put forward or suggested as a potential return driver. Pre-investment documentation details intended areas of action prior to first disbursement, while quarterly reports are available from the first quarter after the investment. I use this time dimension to differentiate between "initial VCPs" and "any-time VCPs". Second, I track whether each of these plans, regardless of when they are first suggested, is eventually achieved or not. Table 3 illustrates the coding scheme.

Table 3: Example of plan item coding scheme

The table shows an example of the coding scheme. For each deal, year, and indicator, I code "planned" equal to 1 if the PE firm plans to carry out an action that relates to the specific indicator, and 0 otherwise. I code "achieved" equal to 1 if the PE firm achieved its plan with respect to the specific indicator, and 0 otherwise. I track each company from the investment year (or entry year) until the earlier of exit year and year-end 2017 when our sample ends, and use all soft information in that period. I code initial VCPs in the entry year and any-time VCPs in the subsequent years.

					Plan item 1		Plan item 2		
Fund	Company	Entry year	Exit year	Year	Planned	Achieved	Planned	Achieved	…
Fund A	PC 1	2008	2010	2013	1	.	1	.	
Fund A	PC 1	2008	2010	2014	.	.	.	1	
Fund A	PC 1	2008	2010	2015	.	.	.	.	
Fund A	PC 2	2014	2017	2014	1	.	.	.	
Fund A	PC 2	2014	2017	2015	.	1	1	.	
Fund A	PC 2	2014	2017	2016	1	1	1	.	
Fund A	PC 2	2014	2017	2017	.	.	1	1	
Fund B	…								…
…									…

In the example above, Fund A has two portfolio companies, PC 1 and PC 2. At PC 1, Fund A plans to carry out plan item 1 and plan item 2 (both of which are initial VCPs). However, it achieves only plan item 2; it does not achieve plan item 1. Fund A neither carries out a plan nor achieves a plan in 2015. At PC 2, Fund A eventually achieves plan item 1 and plan item 2. The difference with respect to plan item 2 and PC 1 and PC 2 is, that in case of PC 1 the implantation of one plan took one year, say to acquire a competitor, whereas in case

of PC 2, Fund A initiated three attempts to carry out a plan, say the acquisition of competitors 1, competitor 2, and competitor 3. It eventually acquires competitor 3.

Data cleaning

I exclude all deals for which I do not observe any textual data in the fund reports. I also exclude all deals for which I do not observe an initial VCP. I restrict the sample to 20 countries and exclude deals in countries not covered in Orbis.[8] In Section 5 I use Orbis data to investigate how PE firms affect the real outcomes of their portfolio companies, and relate real outcomes to VCPs and investor returns at the deal-level. The final sample size is 1,136 deals.

3.1.5. Fund-level data

As of 31 December 2020, the EBRD has committed EUR 4,624 million to 216 PE funds.[9] Of this amount, EUR 3,489 million has been drawn down, leaving undrawn commitments of EUR 1,135 million. The EBRD currently maintains an active portfolio of EUR 2,334 million and relationships with over 80 general partners (GPs).

Table 4 provides summary statistics of fund characteristics. Of the 216 funds, I have detailed data on 178 of them. I exclude 38 funds, which have been raised after December 2017 when the sample ends. Sample funds range in size from USD 4.8 million to USD 1,633 million, with an average (median) of USD 162.9 million (USD 89.9 million)—comparable to VC funds in the U.S. (see, e.g., Hochberg et al., 2007). Variation in fund size is considerably high, as the largest fund is 18 times as large as the median fund. The average (median) fund invested in 9 (8) portfolio companies, with a maximum of 35. The average (median) deal size is USD 12.2 million (USD 5.0 million) which indicates that most of the portfolio companies are small and medium-sized enterprises. The average portfolio company spends 5.9 years in a

[8] I exclude Albania, Armenia, Azerbaijan, Belarus, Cyprus, Egypt, Georgia, Jordan, Kosovo, the Kyrgyz Republic, Moldova, Mongolia, Tunisia, and Turkmenistan, accounting for 105 deals over our sample period.
[9] See https://www.ebrd.com/what-we-do/sectors-and-topics/equity-funds/data.html.

fund's portfolio before being exited or written off. The 25th, 50th, and 75th percentiles are 3, 6, and 8 years, respectively. Sample funds typically make minority investments. The average (median) equity stake is 38.0% (30.3%), and 1,199 of the 1,680 deals (71.4%) are minority investments.

The EBRD invests in 7 funds per year on average. The vintage year distribution of the sample funds can be found in Table 4. Fund vintages (i.e., the year of the first closing) are evenly spread over the sample period with the exception of the 2002-2006 vintage year cluster with fewer first closes.

Table 4: Fund and portfolio company summary statistics

The table provides fund and portfolio company summary statistics.

	Number of obs.	Mean	p25	Median	p75	S.D.
Panel A: Fund characteristics						
Fund size (USD millions)	179	162.91	39.17	89.85	172.82	229.93
Fund age (years)	179	10.12	6.44	10.25	13.00	5.18
Number of investments	179	9.46	6.00	8.00	11.50	5.74
Number of full exits	179	6.28	1.00	5.00	10.00	6.34
Net IRR	179	2.52	-4.73	4.02	11.34	18.18
Net multiple	179	1.30	0.79	1.14	1.58	0.88
Panel B: Fund size (USD millions) by fund stage focus						
Seed / Start-up	14	72.42	25.60	60.95	95.34	59.51
Growth / expansion	138	122.55	33.24	72.19	157.87	165.88
Buyout	16	525.45	301.30	414.06	663.30	417.84
Other	11	257.04	118.52	142.13	397.39	208.86
Panel C: Fund size (USD millions) by fund manager experience						
First-time fund	103	102.60	33.00	62.16	108.19	123.54
Follow-on fund	76	244.64	78.77	153.38	245.20	304.89
Panel D: Portfolio company characteristics						
Investment size (USD millions)	1,680	12.21	1.69	5.00	12.51	21.31
Holding period (years)	1,680	5.85	3.00	6.00	8.00	3.14
Ownership stake	1,680	38.01	12.12	30.32	54.85	31.08
Gross IRR	1,680	13.14	-18.73	4.21	21.85	265.51
Gross multiple	1,680	1.83	0.39	1.10	1.92	8.16

Table 5: Fund sample overview

The sample consists of 178 PE funds investing in Central and Eastern Europe and the Central Asian republics of the former Soviet Union as well as North Africa. The PE funds were raised and closed between 1992 and 2017 and made investments between 1992 and 2017. I track each fund through the earlier of the final outcome or December 2017. Tracking each fund over time results in an unbalanced panel.

	Fund vintage year					Total
	1992 1996	1997-2001	2002-2006	2007-2011	2012-2017	
Number of funds	**37**	**37**	**26**	**39**	**40**	**179**
Panel A: Fund investing status						
Investing	0	0	1	29	40	70
Harvesting	1	0	11	7	0	19
Near liquidation	4	6	6	1	0	17
Liquidated	32	31	8	2	0	73
Panel B: Fund geographic focus						
Central Eastern Europe	17	25	14	16	14	86
South Eastern Europe	3	7	5	4	4	23
Russia/CIS	17	5	7	15	9	53
Turkey	0	0	0	4	6	10
Middle East and North Africa	0	0	0	0	7	7
Panel C: Fund sector focus						
Generalist	36	32	26	33	33	160
Specialist	1	5	0	6	7	19
Panel D: Fund stage focus						
Venture capital	3	3	0	2	6	14
Growth/expansion	34	32	19	27	26	138
Buyout	0	1	5	3	7	16
Other	0	1	2	7	1	11
Panel E: Fund size (committed capital, USD million)						
Less than 50	24	18	4	3	3	52
50 to 150	10	14	9	18	17	68
150 to 300	3	4	2	10	13	32
Larger than 300	0	1	11	8	7	27
Panel F: Fund manager experience						
First-time fund	32	23	7	22	19	103
Follow-on fund	5	14	19	17	21	76

PE funds typically have a defined contractual fund life of ten years, during which they invest in, work with, and then sell their stakes in portfolio companies. The fund life can be, and often is, extended based on investors' consent should the fund have remaining assets that have not yet been sold by the end of the 10-year period. Based on a fund's age and its status I group sample funds into four categories: (i) investing (with 70 funds), (ii) harvesting (19), (iii) near liquidation (17), and (iv) liquidated (73). Funds in the first category are within their investment period, during which the fund manager can draw down committed capital from its investors and invest in portfolio companies. The average (median) investment period of the sample funds is 5.2 (5) years. Funds in the second category are in the post-investment period and are typically 6 years or older. Once the fund's investment period is over, the fund can no longer draw down any unused committed capital, and the remaining fund life is focused on realizing returns. The average (median) post-investment period of the sample funds is 7.9 (7.1) years. Funds in the third category have exceeded 10 years. Funds in the last category are fully liquidated and do no longer exist. Taken together, the fund sample comprises 106 active and 73 liquidated funds.

Funds diversify their portfolios of companies across different years, countries, sectors and stages. In terms of geographic diversification, funds primarily invest across different countries, unless the country of choice is a larger, more advanced economy such as Russia, Poland, or Turkey. Indeed, Russia, Poland, and Turkey-focused funds account for 80% of the 34 country-focused funds in the sample. Based on the geographic region in which most of a fund's portfolio companies are located, I the sample into: (i) Central Eastern Europe (with 86 funds), (ii) Russia and Commonwealth of Independent States (CIS)[10] countries (53), (iii) South Eastern Europe (23), (iv) Turkey (10), and (v) the Middle East and North Africa (7).

[10] CIS countries comprise Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan.

PE funds rarely invest in one single industry too. Most of the sample funds follow a "generalist" strategy (i.e., they do invest across different industries). Only a small number of the sample funds invest in a single industry sector such as agribusiness or technology. The sample includes 19 of such "specialist funds". Sector-focused funds are often managed by experienced investment teams with the relevant industry expertise.

As far as the fund stage focus is concerned, I use, in accordance with Invest Europe, a PE trade community across Europe, the following classification and definitions: (i) venture capital funds, (ii) growth capital fund, (iii) buyout fund, (iv) mezzanine funds, and (v) rescue/turnaround fund. A venture capital focused fund focuses on making investments in companies in the early stages of their lives. A growth capital focused fund makes investments (often minority investments) in relatively mature companies that are looking to expand and improve their operations or enter new markets to accelerate the growth of their business. A buyout focused fund acquires controlling stakes in companies and financing the transaction through a mix of equity and debt. A mezzanine fund uses a mix of debt and equity financing, comprising equity-based options (such as warrants) and lower-priority (subordinated) debt. Lastly, a rescue/turnaround funds invest in companies that are in financial distress with the view to restoring the company to profitability.

About 77% of the sample are growth funds, 8% are buyout funds, 7% are venture capital funds, and the remaining 6% represent a mix of mezzanine and rescue/turnaround focused funds. As Table 5 shows, the size of the funds differs depending on their stage focus. As one might expect, venture funds are the smallest, followed by growth and buyout funds. Venture funds are on average 1.7 times smaller than growth funds and buyout funds are on average 4.3 times larger than growth funds.

First-time funds account for 58% of the sample. Compared to mature PE firms, first-time funds lack an investment and performance track record, and require alternative signals

to establish initial trust with investors to secure their commitment. Therefore, first-time funds by newly established teams are much smaller on average than follow-on funds from established fund managers. The average (median) fund size of first-time funds and follow-on funds in the sample is USD 102.6 (62.2) million and USD 244.6 (153.4) million, respectively. The EBRD classifies first-time funds in a top-down approach based on the following criteria: (i) the fund sequence number is equal to one. (ii) Joint ventures between established PE firms, spin-offs of key investment personnel from other firms, which often transfer with existing assets and investor base, and sponsored entities are excluded to ensure full independence from a (previous) parent organization. (iii) The management company under which the fund operates has to be recently founded, i.e., not more than three years prior to the vintage year. Using this definition sample comprises 103 first-time funds and 77 follow-on funds.

3.1.6. Portfolio company-level data

The 178 funds in the sample invested in turn in 1,680 portfolio companies. Table 6 provides a portfolio company sample overview. I follow each portfolio company from the time of investment to the earlier of exit, write-off, or 31 December 2017 when the sample ends. As of the end of 2017, 1,112 deals have been exited (including 240 write-offs), while 568 deals remain in the funds' portfolios.

Table 6: Portfolio company overview

The sample consists of 1,680 investments by 178 PE funds investing in Central and Eastern Europe and the Central Asian republics of the former Soviet Union as well as North Africa. I track each investment through the earlier of the final outcome or 31 December 2017.

	Year of investment					Total
	1992-1996	1997-2001	2002-2006	2007-2011	2012-2017	
Number of deals	**165**	**517**	**245**	**293**	**460**	**1,680**
Panel A: Investment status						
Fully realised	165	514	226	159	48	1,112
Unrealised	0	3	19	134	412	568
Panel B: Country						
Albania	0	5	6	3	1	15
Armenia	0	0	0	0	4	4
Azerbaijan	0	2	0	1	0	3
Belarus	0	0	1	1	6	8
Bosnia and Herzegovina	0	4	5	1	2	12
Bulgaria	1	13	20	26	7	67
Croatia	0	11	6	4	6	27
Czech Republic	16	39	19	26	13	113
Egypt	0	0	0	0	9	9
Estonia	2	24	17	6	15	64
Georgia	1	0	1	0	5	7
Greece	0	0	2	3	12	17
Hungary	12	39	14	11	5	81
Jordan	0	0	0	0	11	11
Kazakhstan	0	12	2	5	16	35
Kosovo	0	4	2	1	1	8
Kyrgyz Republic	0	0	0	1	0	1
Latvia	0	6	11	4	6	27
Lithuania	1	21	5	5	3	35
Moldova	0	1	2	0	0	3
Mongolia	0	0	0	0	4	4
Morocco	0	0	0	0	17	17
North Macedonia	0	12	3	0	4	19
Poland	54	113	40	57	56	320
Regional	0	0	0	2	9	11
Romania	6	40	16	27	22	111
Russian Federation	38	121	52	74	95	380
Serbia	0	0	3	4	12	19
Slovak Republic	0	20	5	3	5	33
Slovenia	7	15	1	2	4	29
Tunisia	0	0	0	0	12	12
Turkey	0	0	3	12	76	91
Turkmenistan	1	4	0	0	0	5
Ukraine	26	11	9	14	22	82

Table 6 (continued)

	Year of investment					Total
	1992-1996	1997-2001	2002-2006	2007-2011	2012-2017	
Number of deals	**165**	**517**	**245**	**293**	**460**	**1,680**
Panel C: Industry sector						
Agriculture & Forestry	1	20	4	6	9	40
Construction	15	24	15	15	14	83
Consumer	27	98	28	24	39	216
ICT	20	139	63	65	158	445
Manufacturing	34	70	17	14	12	147
Pharma & Medical	8	30	7	32	32	109
Primary & Energy	6	17	5	26	13	67
Services	36	75	75	83	125	394
Wholesale & Retail	18	44	31	28	58	179
Panel D: Investment stage						
Seed	1	5	2	0	20	28
Start Up	30	71	17	11	23	152
Other Early Stage	35	46	12	13	38	144
Growth capital	72	341	136	160	290	999
Buyout	5	15	53	89	60	222
Rescue / turnaround	3	6	1	0	1	11
Replacement capital	17	27	23	11	12	90
Refinancing bank debt	2	6	1	8	4	21
Unclassified	0	0	0	0	13	13
Panel E: Deal size (USD millions)						
<5	124	391	115	56	147	833
5-10	32	70	44	59	102	307
10-25	8	40	48	92	128	316
25-50	0	8	21	45	44	118
>50	0	0	10	38	36	84
Panel F: Ownership stake (%)						
<25	79	238	70	93	207	687
25-50	62	185	73	65	127	512
>50	24	94	102	135	126	481

Table 6 (continued)

	Year of investment					
	1992-1996	1997-2001	2002-2006	2007-2011	2012-2017	Total
Number of exits	**165**	**514**	**226**	**159**	**48**	**1,112**
Exit year:						
1992-1996	9	0	0	0	0	9
1997-2001	82	69	0	0	0	151
2002-2006	73	354	60	0	0	487
2007-2011	0	77	100	25	0	202
2012-2017	1	14	66	134	48	263
Exit route:						
Sale to management	13	81	27	10	2	133
Public offering	26	49	22	12	1	110
Repayment of loans	2	16	16	10	7	51
Sale to another PE firm	2	20	20	16	4	62
Sale to financial institution	1	6	3	1	2	13
Trade sale	74	216	102	59	22	473
Write-off	47	114	27	43	9	240
Unclassified	0	12	9	8	1	30

The earliest portfolio company investment dates from 1992. Investment activity has varied over time, with the busiest periods in 1997-2001 (with 517 investments) and 2012-2017 (460) (although the latter period includes one more year). The five most active countries are Russia (with 380 investments), Poland (320), the Czech Republic (113), Romania (111) and Turkey (91). These countries together account for 60% the sample. Sample investments come from a wide range of industry sectors. The EBRD classifies portfolio companies into 9 industry sectors: (i) Agriculture (with 40 investments), (ii) construction (83), (iii) consumer (216), (iv) information and communications technology (445), (v) manufacturing (147), (vi) pharma and medical (109), (vii) primary and energy (67), (viii) services (394), and (ix) wholesale and retail (179).

An investment can be classified according to a company's progression of business (or stage) at the time of PE entry. I use Invest Europe's classification and definitions: (i) seed, (ii) start-up, (iii) later stage, (iv) growth, (v) buyout, (vi) rescue/turnaround, (vii) replacement

capital, and (viii) refinancing, According to Invest Europe, seed financing is provided to companies to complete research, product design, market tests, and creating prototypes. Companies classified as “start-ups” may be in the process of being set up or may have been in business for a short period of time, but have not sold their products commercially yet. Funding at this stage is used to start mass production and distribution, and to cover capital expenditures and working capital. Later-stage companies may or may not be profitable at the time of investment. Growth capital is provided to companies that are seeking capital to expand and improve their operations or enter new markets to accelerate the growth of their business. Buyout financing is provided to acquire a company typically by purchasing majority or controlling stakes. In a buyout a significant amount of debt may be used to meet the cost of acquisition. Rescue or turnaround financing is made available to an existing business, which has experienced financial distress, with a view to re-establishing prosperity. Replacement capital is defined as minority stake purchase from another PE firm or from another shareholder. Using these definitions, the sample comprises 324 venture (including 28 seed, 152 start-up, and 144 early stage), 997 growth, 222 buyout, 11 rescue/turnaround, 90 replacement capital, 21 refinancing, and 12 other, non-classified deals.

The average (median) deal size is USD 12.2 million (USD 5.0 million). The relatively small deal size suggests that most of the portfolio companies are small and medium-sized enterprises. Deal size increases over time. While the earlier years are characterized by smaller deal sizes, the latter years show much larger deals on average. Deals larger than USD 50 million are completely absent in the 1990s and early-2000s in the sample. Starting from mid-2000s I observe an increase of larger deals.

The average (median) equity stake of sample portfolio companies is 38.0% (30.3%), and 1,199 of the 1,680 deals (71.4%) are minority investments. Funds hold less than 25% of the portfolio company’s equity in 687 cases, between 25% and 50% in further 512 cases, and

a controlling stake (i.e., at least 50% plus one share) in the remaining 481 deals. This is not surprising as venture deals are typically associated with a smaller ownership stake and larger buyout deals are associated with controlling stakes. Funds occasionally form a consortium with other PE funds in order to underwrite a larger deal and take full control of the company. In a consortium each fund may only own a minority stake, but together often represent a controlling stake. The sample includes 69 such cases and I typically see this with larger companies and larger deal sizes.

The busiest period for exits was between 2002 and 2006 with 487 exits. The majority of these exits relate to the 517 investments which were made between 1997 and 2001. The sample includes 211 investments which were bought and sold in the same 5-year investment year cluster. The sample also includes 57 "quick flips" with a relatively short holding period of 1-2 years. Sample funds exited their investments primarily through a trade sale (with 473 exits), followed by a sale to management or shareholders (133). An IPO or a sale of quoted equity post-IPO, is only the third most used exit route (110). Sale to another PE firm (62), sale to a financial institution (13), and repayment of preference shares, loans and mezzanine (51) account for the remaining exits. Further 240 investments are write-off.

In accordance with Invest Europe, I define a trade sale as the sale of a company's shares to industrial investors. In an IPO a private company’s shares are sold to the public for the first time by listing the company’s shares on a stock exchange. In case of a sale of quoted equity post flotation, the fund retains (part of) the shares linked to its initial investment after the company’s IPO and sells those shares to the market at a later stage (e.g., after the lock-up period). If the PE fund bought preference shares in the portfolio company or provided loans at the time of investment, then the repayment of preference shares or loans according to the amortization schedule represents a decrease of the fund’s financial claim into the company, and hence a divestment. In an exit to a financial institution the fund’s stake is sold to an entity

that provides financial services for its clients, such as banks or insurance companies. A write-off constitutes a scenario in which all the value of the investment is eliminated and the return to investors is zero or negative.

3.1.7. Limitations

To the best of my knowledge, the EBRD dataset is the largest and probably the most comprehensive on emerging markets and PE in general to date. However, the sample covers only a tiny fraction of the global PE universe. Using data from the Emerging Markets PE Association, I estimate that the EBRD region has only attracted around 1% of global PE investment since 2009.[11] This is a relative small share for a region, which accounts for 7% of world output[12] ad 10% of foreign direct investment.[13] Because of the emerging markets setting and the fact that most of the portfolio company investments are minority investments, the results of this dissertation might be challenged by the well-established literature on buyouts in developed markets.

The sample used in this dissertation might not include all PE deals from all the countries in the EBRD regions. There are two reasons. The first reason is selection. The EBRD may choose not to invest in a fund if it is not of "institutional quality" and does not meet minimum diligence requirements. However, this rarely is the case. The second reason relates to an institutional setting. Once an EBRD country of operations reaches an advanced state of transition it may opt to "graduate" and stop receive EBRD funding—directly and indirectly through PE funds. So far, the Czech Republic has been the only such country. It graduated in 2008. Consequently, the sample misses any PE activity in the Czech Republic from 2009 to 2017.

[11] See https://www.empea.org/research/cee-and-cis-data-insight-ye-2018/.
[12] See https://data.worldbank.org/indicator/ny.gdp.mktp.cd.
[13] See https://data.worldbank.org/indicator/BX.KLT.DINV.CD.WD.

Similarly, there could have been PE activity in a country before it became a recipient of EBRD funding. For example, Turkey—the fifth largest countries in the sample in terms of total number of investments—became an EBRD country of operations only in 2012. As such, any PE activity before 2012 and potential participation through EBRD sponsored PE funds is missing in the sample. In addition, in 2014 the EBRD announced that it suspended new investment projects in Russia (including PE funds), following an earlier declaration by the European Council in the context of the pro-Russian unrest in the Ukraine and international sanctions on Russia. As such, new PE activity from mid-2014 to 2017 is missing in the sample as well. In any such case, the EBRD has the right to opt out and does not participate in the portfolio company investment. These "opt outs" are missing in the sample as well. The latter case is less of a concern as these investments would have dropped out from the empirical analysis in anyway.

The sample used in this dissertation also misses investments from global PE investors, which from time to time invest in the EBRD region. For instance, in 2014, investment firm KKR took over United Group (SBB/Telemach), which operates cable networks and pay-tv services in South Eastern Europe. The EBRD is not an investor in the KKR fund and consequently I miss this transaction. Overall, I estimate that the 178 PE funds in the sample account for around two-thirds of all PE funds that focused on transition economies over the sample period, reducing sample selection concerns.

In a very limited number of cases, I do not observe any documents for some of the portfolio company investments from the early 1990s. This is because adequate IT systems were not in place at the time of the EBRD's establishment and data have been lost. To the extent possible, I code the soft information for the missing year from subsequent reports.

Data quality, by means of breadth and depth of textual information, has improved over time. I observe much more detailed fund reports in the more recent years compared to

the early 1990s. As transparency gained more importance, institutional investors required PE firms to follow international best practice reporting guidelines. PE firms might also choose not to report on certain plans or achievement of plans because they are not required to do so or because they deem a plan or an achievement as unimportant relative to other actions.

However, based on conversations with EBRD executives, I am confident that the pre-investment documents and quarterly reports are unbiased. It is unlikely that a fund manager would deliberately withhold or distort information. Doing so would be a contractual breach of the fund's reporting obligation to the EBRD—if detected, such behaviour would significantly decrease the chances of the fund manager ever receiving new funding from the EBRD and as a result would weaken his ability to market future funds to other investors. Fund documents also follow more or less a standardized format so that each portfolio firm is described to the same level of detail regardless of its circumstances. It is thus not the case that quarterly reports gather systematically more information in certain situations, for example, around boardroom disputes or after legal changes in board power.

Although the 23 plan items capture a broad range of value creation strategies, including those most mentioned in the literature, the data do not capture the entire universe of plans. For instance, funds sometimes report that they plan to improve working capital. Improving working capital is an ambiguous term and a fund's report may not include specific information on what the fund exactly had planned to do (or had achieved).

With the binary coding scheme I am unable to track more than one action and their achievement with respect to the same indicator and year. For instance, there are three possible outcomes for a PE firm's plans to acquire two companies. First, the PE firm achieves both acquisitions. Second, it achieves one, but does not achieve the other one. Third, it does not achieve both acquisitions. In the first and second case, I record a plan as being achieved,

although I would miss the order of magnitude. In the third case, I record that a plan as not being achieved.

In a limited number of cases, I do not observe a PE firm's VCPs. For instance, I typically do not observe detailed confidential information following the IPO of a portfolio company. Once a company is listed on a stock exchange, the flow of "insider" information typically stops and fund documents must reflect public information that is available on all market participants. However, this is not a major concern as I primarily rely on initial VCPs. I may also not observe plans or their achievement in a shareholder dispute or court case, when founders or majority shareholders generally refrain from sharing any information.

3.2. Bureau van Dijk

3.2.1. Firm-level data

The firm-level data come from Orbis, a commercial database provided by Bureau van Dijk (BvD). It contains information on financial statements and ownership, among others, for over 300 million companies worldwide. BvD sources the information from over 160 different information providers and, to the extent possible, arranges them in a standard "global" format to facilitate company comparisons across countries, industries and years.

I have access to Orbis Financials, a sub-database that includes detailed information about numerous balance sheet items, profit and loss account items, and financial ratios over time and also static descriptive variables. The descriptive information includes, among other items, an official national identification number, address (country, region, city, street), legal form, year of incorporation, status of the company (active, liquidation, merger-acquisition), number of employees, quoted/unquoted indicator, industry codes as the 4-digit level, and, when available, the description of the nature of business in the local language and English. The access to historic financial information is available by downloading the data from a one-

time web access or from a single disk by selecting several historical years though there are several issues with such a methodology:

I also have access to Orbis Ownership, which contains information on each company's current and historic equity ownership structure: the names of owners, their respective ownership shares, the level of ownership (direct or ultimate cross-ownership), their countries of origin, and owner type.

Using BvD has several advantages: First, Orbis provides a portfolio company's entire history of financial statements including the years before and during PE ownership and, more importantly, the years after PE ownership. From funds' monitoring documentation I do not observe financial statements for the post-exit period as funds stop reporting on their portfolio companies after exiting the investment.

Second, Orbis Financials tracks numerous balance sheet items, profit and loss account items (more than 20 for each), and financial ratios (more than 30) over time. Orbis also tracks static descriptive variables. I use the wealth of information in Orbis Financials to bridge gaps in the fund reporting documents. In general, funds provide only a minimum of balance sheet and income statement items (typically the main lines such as revenues, earnings before interest, taxes, depreciation and amortization, or net income) as they are not obliged to provide more detailed financial data. For example, I would not be able to estimate productivity from labour, capital, and materials inputs as these items are generally not included in the fund reporting.

Third, I use the Orbis Ownership database to create a comparable control group to be used in the econometric analysis and to make sure that control companies are not under PE ownership during the time they serve as control.

Downloading and combining datasets

I access Orbis data online through BvD's website and through historic BvD disks. BvD provides up to 10 years of history online, with a longer period available only in offline formats such as CDs, DVDs, or hard disks. I have access to such hard disks including data for the time period from 1992 to 2007 and all EBRD countries of operations. I access and combine online and offline datasets as follows:

First, using Orbis online, I set the "consolidation code" indicator to unconsolidated financial statements. Most of the large companies report either consolidated accounts (the parent company's statement integrates those of its controlled subsidiaries) or unconsolidated accounts (the parent company's statement does not integrate those of its controlled entities). Some companies report both kinds of accounts. Ultimately, the type of account reported is related to country filing requirements for particular size or the legal type of companies. I use unconsolidated accounts because most of the sample portfolio companies are single entities (i.e. do not have subsidiaries) and consolidated financial statements will involve double counting when both consolidated account of the parent (with all its subsidiaries) and the unconsolidated account of the parent (without subsidiaries) are reported.

Second, I require that all financials are expressed in USD thousands. Orbis offers the option to convert financial accounts from local currency into any hard currency based on the historic exchange rate at each closing date of the financial statement.

Third, I download all the data from BvD's website using the "relative years" option, where the most recent year of non-missing financials (as available to BvD) is referenced as the "Latest Year" and earlier years are referenced as the "Latest Year-1", "Latest Year-2", and so on. Alternatively, I could have used the "absolute years" option, where the year of the financials explicitly refers to calendar years, 2006, 2007, and so on. The distinction in the dating option is important, especially for companies that report irregularly and thus have gaps in their time series. For such companies, five relative years might cover a longer period than

five years requested explicitly. For example, consider a company reporting data for years 2012 and 2014 to 2017. Downloading the information for the last five absolute years (i.e., 2013-2017) would result in only four observations (i.e., 2014-2017), whereas downloading the information for the last five relative years would retain 2012 (2012 is referenced as "Latest Year-4" in this case).

Fourth, using the Orbis disks, I replace old BvD IDs for companies which had their ID changed over time with the most recent ones.[14] This step is necessary as some IDs have changed over time and thus would affect the success of the merge. According to BvD, ID changes relate to changes of address or legal form, or M&A activity. BvD may also initiate a change of the ID when an entity is available on more than one product, or data are provided by more than one information provider and BvD harmonizes the IDs across its databases.

A problem emerges for companies in former Yugoslavia. The same company first belongs to Yugoslavia in the early-2000s, then to Serbia-Montenegro in the mid-2000s, then to, separately, Serbia, Montenegro, or Kosovo. Fortunately, in the IDs of these companies only first two letters, which represent the country code, changed over time—the remaining numeric part did not. Where it is possible, I assign Yugoslavia and Serbia-Montenegro to either Serbia or Montenegro using the numeric part of IDs; where I cannot be certain, I assume they are in Serbia.

Fifth, I check the consistency of units for all variables as data on the hard disk are reported in various units for different companies and even for the same company over time. If a value is not expressed in USD thousands, I follow BvD's approach and convert it using the historic exchange rate from the International Monetary Fund as at the closing date of the statement.

In the last step I combine the two dataset and create an unbalanced data Panel.

[14] BvD ID changes can be obtained via the dedicated BvD ID Change Lookup tool at idchanges.bvdinfo.com.

Cleaning the combined dataset

After I combine the online and offline data, I perform some further data cleaning and correct obvious mistakes: First, I drop all company-years with missing information on total assets, employment, and sales (simultaneously). Second, I drop the entire company if any of total assets, employment, or sales, is negative in any year. Third, I drop the entire company if tangible fixed assets (such as buildings, machinery, etc.) is negative in any year. Fourth, to correct for potential outliers, I winsorize each variable at the top and bottom 1%.

Matching EBRD and Orbis datasets

I manually match each portfolio company from the EBRD sample to a company in Orbis. In order to do so I first identify the beneficiary of receiving PE funding. The EBRD sample sometimes includes the name of a holding company or special purpose vehicle (SPV) rather than the actual name of the portfolio company.[15] Second, for each beneficiary I obtain the legal name, address (country, city, and street), industry sector, and year of incorporation from the PE funds' annual and quarterly reports. Third, using these data I screen Orbis and record the BvD ID of the company that matches the characteristics of the portfolio company. Of the 1,680 deals in the full sample, I am able to link 1,417 deals to Orbis. For 117 of these matches, Orbis lacks any financial data. The final sample includes 1,300 deals.

3.2.2. Limitations

One needs to overcome several challenges before making Orbis usable for research. First, the database is not designed for large downloads. Extracting large amounts of data from any BvD platform is in general slow. In addition, BvD puts a cap of 200,000 data points on the amount of information researchers can download both from the Orbis online and disks.

[15] An SPV is a legal entity created by a firm by transferring assets to the SPV, to carry out some specific purpose or circumscribed activity, or a series of such transactions. SPVs have no purpose other than the transaction(s) for which they were created. See Gorton and Souleles (2005).

Most of the time this cap does not turn into a termination of the download job but rather the downloaded files will have missing information.

Second, researchers have experienced that, once they have access to Orbis online or via purchases of historic disks, they see a large number of unique IDs but many financial or real variables are missing, especially going back in time.

Another concern is that the data may be skewed towards larger companies since these companies are more likely to provide information to the Chambers of Commerce, from whom BvD collects the data. Coverage of small companies and the number of financial statements variables varies from country to country and depends on the filing requirements by business registers in each country. Although most countries require limited liability companies to register once they are formed, requirements in terms of who reports (above certain company size) and what to report from the financial statements vary across countries. For example, some countries in the sample like Greece, Kazakhstan, Latvia, Lithuania, Russia, Turkey, and Ukraine, provide better coverage for total cost of goods sold than for materials and staff costs separately.

Third, Orbis suffers from a survivorship bias because companies are erased from the database if there is no reporting done for some time, even if the company continues operating (but not reporting).

In addition to these considerations there are certain issues with the quality and the harmonization of the data by BvD and hence, a certain cleaning and checking procedure has to be implemented.

4. Private equity value creation plans

Abstract

I systematically document what private equity (PE) value creation plans (VCPs) look like. To this end, I hand-collect confidential information on VCPs and their execution from proprietary pre-investment documents and quarterly post-investment reports that PE firms provide to their investors. I show that PE firms follow a rich variety of value creation strategies, and mostly achieve them. VCPs appear to be tailored to each portfolio company's needs and circumstances, have become more hands-on, and vary with industry sector, deal type, fund ownership, management strategy, growth strategy, and fund characteristics. PE firms also actively monitor their investments and introduce new plans to create additional value or turn around deals that are not performing up to scratch.

JEL classification: G24, G32, G34

Keywords: Private equity, value creation

4.1. Introduction

The PE industry has been growing rapidly in recent years, and so has the academic research on the effects of PE on portfolio companies. What has been less explored are the specific plans and actions that PE firms take to create value. In their survey paper, Kaplan and Strömberg (2009) note that PE firms use their industry and operating knowledge to identify attractive investments, to develop VCPs for those investments, and to implement the VCPs. Such plans might include elements of cost-cutting opportunities and productivity improvements, strategic changes or repositioning, acquisition opportunities, or management changes and upgrades. Although many studies refer to such value creation strategies, there is no evidence on what they actually are.

In this paper, I quantify confidential textual information on PE firms' VCPs in more than 1,000 deals. As an approximation, I know what fund managers know. I have unrestricted access to rich set of textual information in the form of proprietary pre-deal investment memos and investment committee presentations and confidential quarterly post-investment reports provided to fund investors. I also know what actions PE firms take in response to the information they collect. Specifically, the quarterly reports include detailed comments on how fund managers change their strategies when the intended VCP is not realized on time or at all.

For each deal in the sample, I hand-collect textual information on operational practices of PE firms from proprietary investment documents and quarterly reports. These reports provide information on the operational changes at each portfolio company and how instrumental PE firms have been in enacting them. Reading through all of these reports for each portfolio company I manually create a detailed time series dataset. I use this information to document PE firms' plans at the time of investment to create value, track the achievement of these plans, and capture whether new plans are introduced during the course of a deal.

I find that PE firms follow a rich variety of plans to add value to their portfolio companies. A VCP consists of one or more "plan items". In total I track 23 distinct plan items, which I group into five value creation strategies: operational improvements (84% of sample deals), revenue growth (74%), governance engineering (48%), financial engineering (35%), and cash management (14%). A VCP can span across more than one value creation strategy. In the data, the average VCP spans across 2.5 strategies. With five strategies, there are 32 possible strategy combinations. The 10 most popular combinations account for 80% of the sample. Eight of 10 involve either operational improvements or revenue growth or both. Governance engineering features in six of 10. Financial engineering and cash management feature in three and two of 10 combinations, respectively. The top three most popular combinations involve both operational improvements and revenue growth, either with no other strategy (18%) or in combination with governance engineering (15%), or with governance and financial engineering (11%).

The average VCP in the sample includes a total of 4.5 plan items. The top three most popular plan items are buying new or upgrading existing assets (66%), changing the mix of products or services (37%), and pursuing inorganic deals through acquisitions (33%). I find 776 unique combinations of plan items in the sample, with the top-10 most popular combinations accounting for only 11.6% of the sample. This suggests that VCPs are tailored to the needs and circumstances of each individual portfolio company.

Which individual plan items PE firms follow in a deal depends very much on the type of the deal. I document systematic variation in VCPs over time and by industry sector, deal type, ownership, replacing management, inorganic growth strategy, and fund characteristics. All five strategies have become more popular over time, suggesting that PE firms have become more hands-on. For example, three times as many deals pursue governance engineering in 2012-2017 compared to 1992-1997, and twice as many deals pursue growth

strategies. The popularity of individual plan items varies much more over time.

PE firms are more hands-on in buyouts than in earl-stage deals or turnarounds, when they have majority ownership, when they pursue inorganic growth strategies, and when they invest regionally rather than in a single country. For example, buyout deals tend to focus more on optimizing capital structure, pursuing inorganic growth strategies, changing mix of products or services, and replacing senior management. On the other hand, growth capital or early stage deals tend to focus primarily on capital expenditures, and they pursue other VCPs more opportunistically.

I find that PE firms typically manage to implement their VCPs. However, some VCPs are easier to achieve than others as measured by PE firms' propensity to implement them. On the one hand, PE firms in the sample managed to sell existing assets or replace the CFO and other senior management on more than 95% of the deals in which these were part of their initial plans. On the other hand, they could increase market share, improve corporate governance, pursue international expansion or grow inorganically via mergers and acquisitions (M&As) in less than 75% of the deals in which these were part of initial plans.

I use this unique data to track the implementation and achievement (or otherwise) of each plan item over time. I find that PE firms typically manage to implement the majority of their plan items and strategies. However, some plan items and strategies are easier to achieve than others. For example, plans to replace management, buy or sell assets, and reduce costs are nearly always achieved. Plans to increase market share, grow inorganically through acquisitions, and pursuing international expansions are more difficult to achieve.

I document systematic variation in the achievement of VCPs. Plan items belonging to the same strategy are substitutes rather than complements, in the sense that they are less likely to be achieved the more other plan items the plan contains for the same strategy. I find evidence of specialization, in the sense that a plan item is more likely to be successfully

implemented if the fund's other deals pursue related actions. I also see diminishing returns to making VCPs more detailed. Finally, I find systematic variation in achievement rates across funds. Specifically, funds with focused, homogeneous portfolios of predominantly minority positions are systematically better at implementing their VCPs than are other funds.

The findings show that PE firms actively monitor their investments and introduce new plans to create additional value or turn around deals that are not performing up to scratch. For instance, one in every five deals sees a plan to replace the CEO when this plan item is not part of a PE firm's initial VCP. The most popular new plans—introduced a few years into the life of a deal—differ from initial VCPs, and include cost reduction, optimizing capital structure, and changing CEO.

I contribute to the literature on value creation in PE and venture capital based on evidence collected from surveys and qualitative studies. A survey of 79 PE firms by Gompers et al. (2016) finds that PE investors anticipate adding value to portfolio companies, with a greater focus on increasing growth rather than on reducing costs. Most recently, a survey of institutional venture capital investors by Gompers et al. (2020) shows that while deal sourcing, deal selection, and post-investment value added all contribute to value creation, venture capital investors view deal selection as the most important.

The results of this paper differ compared to this strand of the literature. The evidence is based on textual data reflecting the actual plans and actions taken by PE firms. I document exactly what VCPs PE firms set out to achieve (and track their achievement) in each of their deals based on confidential information that PE firms typically report to their investors. This allows to sidestep issues related to survey methodology, in particular the worry that PE firms may want to cast themselves in a positive light or report selectively.

Kaplan and Strömberg (2009) classify three types of value-increasing actions: financial, governance, and operational engineering. These value increasing actions are not

necessarily mutually exclusive. In financial engineering, PE firms provide strong equity incentives to the management teams of their portfolio companies. At the same time, leverage puts pressure on managers not to waste money. In operational engineering, PE firms develop industry and operating expertise. In governance engineering, PE firms control the boards of their portfolio companies and are more actively involved than public companies. However, in the taxonomy in this paper, I follow a more fine-grained approach. Unlike previous literature, I identify two additional value creation strategies—revenue growth and cash management—that are increasingly popular among PE firms but have not featured in academic surveys.

The paper proceeds as follows. Section 4.2 describes the data. Section 4.3 provides an overview of what PE firms' VCPs look like. In Section 4.4, I analyse what determines whether or not a plan is achieved. In Section 4.5, I discuss PE firms making changes to their plans as they see fit. Sections 4.6 and 4.7 further explore value creation by employing cluster and factor analyses. Section 4.8 summarizes the results and concludes.

4.2. Data and sample

The data come from the European Bank for Reconstruction and Development (EBRD), an international financial institution founded in 1991. As part of its mandate, the EBRD has sought to help create a PE market by being a cornerstone investor in funds with focus on transition economies in Eastern Europe, Central Asia, North Africa, and the Middle East. These funds are managed by independent PE firms, have profit-maximizing objectives, and raise their capital from institutional investors. Apart from their focus on transition economies, these funds are no different from those that have been studied in the literature. The EBRD invests in all funds meeting the minimum due-diligence requirements established by Cambridge Associates, an investment consultancy, thus reducing sample selection concerns.

I have detailed data for all 178 funds the EBRD invested in, which in turn invested in 1,580 portfolio companies. Sample funds were raised between 1992 and 2017, and have an average (median) size of USD 163.2 million (USD 88.5 million). After excluding countries with less than 10 deals, the sample contains 1,444 portfolio companies from 20 countries, with an average (median) of 10 (9) per fund.[16]

Table 7 describes the sample. The top three countries are Russia (381), Poland (320), and the Czech Republic (113), which account for approximately half of the sample. Deal activity has varied over time, with the busiest period in 1997-2001 (501). I follow each portfolio company from inception to the earlier of exit (which may take place through a trade sale or an initial public offering on a stock market), write-off, or 31 December 2017, when the sample ends. As of year-end 2017, 1,078 portfolio companies had been exited, while 502 remain in the funds' portfolios. The average (median) deal size is USD 12.4 million (USD 5.0 million), indicating that most portfolio companies are medium-sized enterprises. The majority of the portfolio companies are growth capital investments (935), followed by early stage (302), buyouts (204), and other (139).

[16] The excluded countries are Albania, Armenia, Azerbaijan, Belarus, Cyprus, Egypt, Georgia, Jordan, Kosovo, the Kyrgyz Republic, Moldova, Mongolia, Tunisia, and Turkmenistan, accounting for 105 portfolio companies.

Table 7: Sample overview

The table provides an overview of the sample by country and time period, deal type, and deal size (in USD millions). The sample consists of 1,580 deals made by 178 PE funds investing in Central and Eastern Europe, Central Asia, and North Africa. The PE funds were raised between 1992 and 2017 and made investments during the same time period. I track each investment from the year of investment to the earlier of exit, write-off, or 31 December 2017 when the sample ends. I record whether it has been exited ("FR") or remains in the funds' portfolios as of December 2017 ("UR"). Tracking each deal over time results in an unbalanced panel.

	Year of investment					Case status		All deals
	1992-1996	1997-2001	2002-2006	2007-2011	2012-2017	FR	UR	
Panel A: Number of deals								
Bosnia & Herzegovina	-	4	5	1	2	10	2	12
Bulgaria	1	13	20	25	7	54	12	66
Croatia	-	11	6	4	6	18	9	27
Czech Republic	16	39	19	26	13	96	17	113
Estonia	2	24	17	6	15	47	17	64
Greece	-	-	2	3	12	3	14	17
Hungary	12	39	14	11	5	76	5	81
Kazakhstan	-	12	2	5	16	19	16	35
Latvia	-	6	11	4	6	18	9	27
Lithuania	1	21	5	5	4	30	6	36
North Macedonia	-	12	3	-	4	16	3	19
Morocco	-	-	-	-	18	1	17	18
Poland	54	113	40	57	56	245	75	320
Romania	6	40	16	27	22	80	31	111
Russia	38	121	52	74	96	238	143	381
Serbia	-	-	2	4	12	6	12	18
Slovak Republic	-	20	5	3	5	28	5	33
Slovenia	7	15	1	2	4	23	6	29
Turkey	-	-	3	12	76	15	76	91
Ukraine	26	11	9	14	22	55	27	82
All countries	163	501	232	283	401	1,078	502	1,580
Panel B: Deal type								
Early-stage	69	117	27	22	68	229	74	303
Growth	71	330	129	155	255	623	317	940
Buyout	1	9	52	84	60	122	84	206
Secondary	17	33	22	14	13	78	21	99
Turnaround	5	12	2	8	5	26	6	32
Panel C: Deal size								
Mean	3.4	4.0	13.1	24.3	17.7	8.2	21.3	12.4
Median	2.0	2.3	5.9	13.2	9.6	3.4	10.9	5.0

4.3. What do value creation plans look like?

PE firms typically formulate a VCP before investing in a company. I have detailed textual information about these plans for 1,136 of the 1,580 deals in the sample. I record the features of each VCP and their achievement for 959 of the 1,078 fully realised deals. I also record this information for 177 of the 502 unrealised deals that have spent five years or more in a fund's portfolio. This latter filter ensures that PE firms have had a chance to implement their VCPs. I am unable to find pre-investment documents for 119 fully realised deals and five unrealised deals, even though I am observing the funds' post-investment reports for these deals. I exclude those from the sample.

I carefully select VCP indicators based on a combination of previous literature findings and an initial scan of the pre-investment documents. I first identified variables following the survey of Gompers et al. (2016) of PE firms on their sources of value creation and return drivers. I then randomly selected 100 deals in the sample and read their pre-investment plans to identify additional channels through which a fund plans to add value. Similar Gompers et al. (2016), I design a template to collect these soft information. I focus on the changes, which can be objectively captured in a binary fashion.

In total I record 23 distinct indicators. Table 8 provides an overview. Table A.1 in the Appendix provides the description for each plan item. There are two dimensions along which I code the soft information. First, I pinpoint exactly when a certain VCP was put forward or suggested as a potential return driver. Pre-investment documentation details intended areas of action prior to the first disbursement, while quarterly reports are available typically from the first quarter after which a fund invested in a company. I also use the time dimension to capture the features that were not part of the initial pre-investment VCP and introduced at a later stage. Second, I track the implementation of each plan and record whether it is

eventually achieved or not. This process takes three hours per deal on average or 3,400 man-hours in total.

The following examples, taken from a fund's pre-investment document, illustrate: "Recruit a new CEO (candidate already identified)" and "Acquire [supplier] to improve supply chain management and be less dependable." In the subsequent quarterly reports I observe information on the achievement of these plans: "In April, [name] joined as new CEO from [a well-known company]. [Name] has been working in the industry for more than 20 years" and "We walked away from a potential transaction as we could not agree with the seller on the valuation." The first example is case of a fund planning an action and achieving it. The second example is a case of a fund planning an action and not achieving it.

4.3.1. Items featured in a value creation plan

A VCP consists of one or more "plan items". I track 23 distinct plan items, which in Table 8 are grouped into five strategies: Financial engineering, operational improvements, cash management, revenue growth, and governance engineering. PE firms follow a rich variety of plans to add value to their portfolio companies.

In the sample, the five most popular plans to create value at the time of investment are buying new or upgrading fixed assets (66%), changing the mix of products or services (37%), pursuing acquisitions (33%), improving marketing or promotion (31%), and optimising the capital structure (30%). This set is followed by plan items to change senior management other than the CEO or the CFO (26%) (e.g., Chief Operating Officer or Chief Technology Officer), reduce costs (26%), and pursue international expansion (21%). As such, PE firms seem to plan adding value in multiple areas spanning across financial, operational, revenue growth, and governance dimensions.

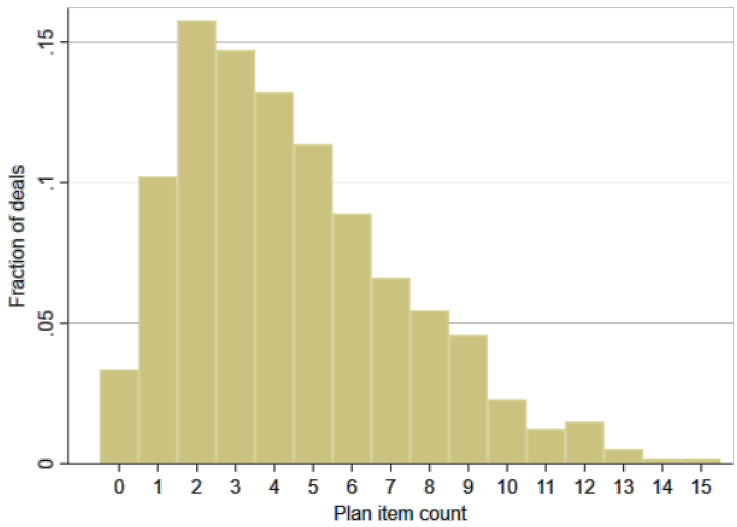
Table 8: Overview of value creation plans

The table provides a breakdown of strategies and plan items used in the VCPs in the sample. I code a plan item equal to 1 if the VCP includes the plan item in question, and 0 otherwise. I code a strategy equal to 1 if at least one plan item belonging to the strategy in question is included in the VCP, and 0 otherwise. Fractions are reported with respect to the total deal count of 1,136. For variable definitions see Table A.1 in the Appendix.

	Fund plans to...	
Strategy / plan item	Deal count	Fraction
Financial engineering	**395**	**0.35**
Optimize capital structure	346	0.30
Improve incentive systems	93	0.08
Operational improvements	**951**	**0.84**
Buy or upgrade fixed assets	749	0.66
Sell fixed assets	78	0.07
Divest non-core business units	70	0.06
Reduce costs	293	0.26
Improve IT systems	188	0.17
Improve distribution	173	0.15
Improve corporate structure	124	0.11
Cash management	**154**	**0.14**
Improve payment terms	126	0.11
Improve inventory management	50	0.04
Revenue growth	**838**	**0.74**
Target market share	159	0.14
Pursue acquisitions	376	0.33
Change mix of products or services	420	0.37
Pursue international expansion	244	0.21
Change pricing strategy	158	0.14
Improve marketing	356	0.31
Improve product quality	114	0.10
Governance engineering	**548**	**0.48**
Change CEO	222	0.20
Change CFO	223	0.20
Change other senior management	298	0.26
Improve corporate governance	52	0.05
Change board structure	157	0.14
Total deal count	**1,136**	**-**

Figure 2 shows the distribution of the total number of plan items per VCP at the deal-level. As the figure shows, PE firms set out to implement 4.5 plan items on average. For a small fraction of the sample deals, PE firms genuinely do not report having a VCP. In 38 deals (3.3%), the PE firm did not formulate a VCP at the outset, though it did so post-investment. In the other extreme case, a PE firm had planned to pursue as many as 15 distinct plan items.

Figure 2: Distribution of plan items
The graph shows the distribution of the total number of plan items per VCP.



With 23 distinct plan items to choose from, there is a very large number of possible combinations of plan items (theoretically $2^{23} \approx 8.4$ million combinations). In practice, I observe 776 unique combinations of plan items. Table 9 provides a breakdown of the top-10 most popular combinations of plan items. The top-10 most popular combinations of plan items account for 17.2% of the sample VCPs. All but two feature buying or upgrade fixed assets either in isolation or in combination with optimizing the capital structure (3.1% of deals), pursuing acquisitions (1.55%), changing the mix of products or services (1%),

pursuing international expansion (0.9%), reducing costs (0.9%), improving distribution (0.7%) and changing the board structure (0.6%).

A closer look at Table 9 also reveals evidence of both commonality in plans and a great amount of heterogeneity across deals: 88.4% of the sample VCPs pursue 766 other combinations of plan items, which suggests that PE firms are quite heterogeneous in their formulating their plans. The presence of such heterogeneity suggests that PE firms tailor each VCP to a portfolio company's specific needs and circumstances.

Table 9: Top-10 most popular combinations of plan items

The table reports the top-10 most popular combinations of plan items in the sample. I code a plan item equal to 1 if the VCP includes the plan item in question, and 0 otherwise. Fractions are reported with respect to the total deal count of 1,136. Combinations are ordered from high on the left-hand side to low on the right-hand side in terms of their frequency.

	Combination									
Strategy / plan item	1	2	3	4	5	6	7	8	9	10
Financial engineering										
Optimize capital structure	-	Yes	-	-	-	-	-	-	-	-
Improve incentive systems	-	-	-	-	-	-	-	-	-	-
Operational improvements										
Buy or upgrade fixed assets	Yes	Yes	Yes	Yes	-	Yes	Yes	Yes	-	Yes
Sell fixed assets	-	-	-	-	-	-	-	-	-	-
Divest non-core business units	-	-	-	-	-	-	-	-	-	-
Reduce costs	-	-	-	-	-	-	Yes	-	-	-
Improve IT systems	-	-	-	-	-	-	-	-	-	-
Improve distribution	-	-	-	-	-	-	-	Yes	-	-
Improve corporate structure	-	-	-	-	-	-	-	-	-	-
Cash management										
Improve payment terms	-	-	-	-	-	-	-	-	-	-
Improve inventory management	-	-	-	-	-	-	-	-	-	-
Revenue growth										
Target market share	-	-	-	-	-	-	-	-	-	-
Pursue acquisitions	-	-	Yes	-	-	-	-	-	-	-
Change mix of products or services	-	-	-	Yes	Yes	-	-	-	-	-
Pursue international expansion	-	-	-	-	-	Yes	-	-	-	-
Change pricing strategy	-	-	-	-	-	-	-	-	-	-
Improve marketing	-	-	-	-	-	-	-	-	-	-
Improve product quality	-	-	-	-	-	-	-	-	-	-
Governance engineering										
Change CEO	-	-	-	-	-	-	-	-	-	-
Change CFO	-	-	-	-	-	-	-	-	-	-
Change other senior management	-	-	-	-	-	-	-	-	-	-
Improve corporate governance	-	-	-	-	-	-	-	-	-	-
Change board structure	-	-	-	-	-	-	-	-	Yes	Yes
Deal count	75	34	17	11	10	10	10	8	7	7
Fraction	6.83	3.10	1.55	1.00	0.91	0.91	0.91	0.73	0.64	0.64

4.3.2. Strategies featured in a value creation plan

Table 8 also provides an overview of the strategies in the sample. I distinguish five distinct value creation strategies: Financial engineering, operational improvements, cash management, revenue growth, and governance engineering. At the time of investment, PE firms plan to add value through operational improvements (84% of the sample deals), revenue growth (74%), governance engineering (48%), financial engineering (35%), and cash management (14%).

It is common for a VCP to span across multiple strategies. In the sample, 929 VCPs (or 82%) span across multiple strategies. The remaining 207 VCPs feature a single strategy. As Figure 3 shows, the vast majority of VCPs span across two or three strategies; with 2.5 strategies on average.

With five different strategies, there are 32 possible combinations to choose from. Table 10 shows the top-10 most popular strategy combinations in the sample, ordered from high on the left-hand side to low on the right-hand side in terms of their frequency. The top-10 most popular combinations account for 80.1% of the sample VCPs. Eight of 10 combinations feature either operational improvements or revenue growth strategies or both. Governance engineering features in six of the top-10. Financial engineering and cash management are in three and two of the top-10 combinations, respectively. The top-three most popular strategy combinations include both operational improvements and revenue growth, either in combination with just governance engineering (15%) or with governance engineering and financial engineering (11%) or with no other strategy (18%).

Figure 3: Distribution of strategies

The graph shows the distribution of the total number of initial strategies per VCP.

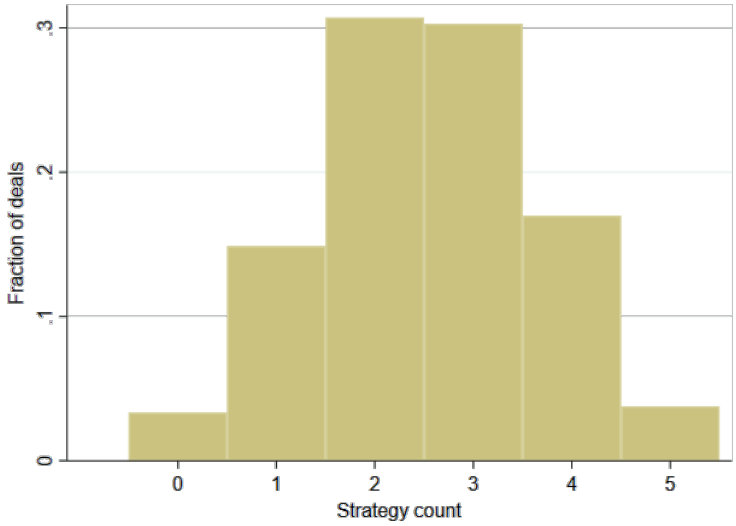


Table 10: Top-10 most popular combinations of strategies

The table reports the top-10 most popular strategy combinations in the sample. I code a strategy equal to 1 if at least one plan item belonging to the strategy in question is included in the VCP, and 0 otherwise. Fractions are reported with respect to the total deal count of 1,136. Strategy combinations are ordered from high on the left-hand side to low on the right-hand side in terms of their frequency.

	Combination									
Strategy	1	2	3	4	5	6	7	8	9	10
Financial engineering	-	-	Yes	-	Yes	-	-	Yes	-	Yes
Operational improvements	Yes	Yes	Yes	Yes	Yes	Yes	-	Yes	-	Yes
Cash management	-	-	-	-	-	Yes	-	Yes	-	-
Revenue growth	Yes	Yes	Yes	-	Yes	Yes	Yes	Yes	Yes	-
Governance engineering	-	Yes	Yes	-	-	Yes	-	Yes	Yes	-
Deal count	201	174	126	104	90	48	44	43	41	39
Fraction	17.69	15.32	11.09	9.15	7.92	4.23	3.87	3.79	3.61	3.43

4.3.3. Strategies and plan items by deal vintages

PE firms have become more hands-on over time in a sense that their VCPs see more plan items over time, pursuing revenue growth, governance engineering, and financial engineering strategies in increasing fashion. Table 11 provides a breakdown of strategies and plan items over time, aggregated into five-year deal vintage periods starting in 1992. Figure 4 illustrates the trends at the strategy level.

Operational improvements is the most popular strategy pursued by the PE funds operating in the EBRD regions, with 80% of all deals having involved one or more plan items aimed at operational improvements. In operational engineering, PE funds engage in buying, upgrading, and selling fixed assets, divesting of non-core business units, cutting costs, improving IT systems, improving distribution and logistics, or improving the organisational structure at portfolio companies.

An equally popular value creation strategy among PE funds is revenue growth, which aims at boosting revenues. Many PE funds report changing the mix of products and services by their portfolio companies towards higher-margin products, investing in marketing and sales teams, improving pricing and quality, and pursuing acquisitions. Alongside this, they develop international expansion strategies to target higher market shares and to become more profitable. The popularity of revenue growth has more than doubled, from 41% of deals in 1992-1996 to 83% in 2012-2017.

Governance engineering has become three times more popular, increasing from 24% to 74% of deals, while financial engineering has nearly quadrupled, from 13% to 51% of deals. The popularity of operational improvements—always high—has increased from 76% to 81% of deals. These two strategies often go hand in hand, typically in the case of buyouts. Increased levels of debt tends to increase financial discipline in portfolio companies whose managers' performance is closely tracked by PE funds and often tied to portfolio companies'

revenue growth or profitability by incentive schemes. Strategies aimed at cash management have never been particularly popular in the sample, though even they have seen an increase, from 7% to 18% of deals. Each of these time trends is statistically significant at the 5% level or better.

Figure 4: Strategies by deal vintages

The figure shows the share of deals pursuing each strategy by deal vintage year, grouped into five-year clusters starting in 1992. The sample size is 1,136 deals. See Table 11 for the full set of statistics.

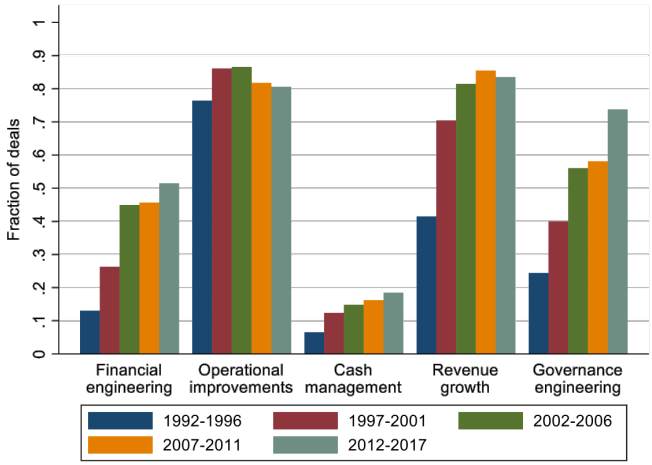


Table 11: Strategies and plan items by deal vintages

The table provides a breakdown of strategies and plan items by deal vintage year, grouped into five-year clusters starting in 1992. I code a plan item equal to 1 if the VCP includes the plan item in question, and 0 otherwise. I code a strategy equal to 1 if at least one plan item belonging to the strategy in question is included in the VCP, and 0 otherwise. Fractions are reported with respect to the total deal count of 1,136. For variable definitions see Table A.1 in the Appendix. The Pearson's Chi2 tests in the last column tests for the equality of fractions across deal vintages.

Strategy / plan item	Deal count	Fractions by deal vintage year					Pearson Chi2 test (*p*-value)
		1992-1996	1997-2001	2002-2006	2007-2011	2012-2017	
Financial engineering	**395**	**0.13**	**0.26**	**0.45**	**0.46**	**0.51**	**0.00**
Optimize capital structure	346	0.12	0.25	0.38	0.37	0.46	0.00
Improve incentive systems	93	0.01	0.02	0.13	0.13	0.20	0.00
Operational improvements	**951**	**0.76**	**0.86**	**0.87**	**0.82**	**0.81**	**0.05**
Buy or upgrade fixed assets	749	0.71	0.74	0.62	0.56	0.58	0.00
Sell fixed assets	78	0.02	0.04	0.10	0.11	0.10	0.00
Divest non-core business units	70	0.01	0.06	0.10	0.05	0.08	0.02
Reduce costs	293	0.11	0.25	0.30	0.31	0.26	0.00
Improve IT systems	188	0.07	0.13	0.24	0.19	0.26	0.00
Improve distribution	173	0.12	0.15	0.17	0.15	0.17	0.80
Improve corporate structure	124	0.03	0.08	0.15	0.14	0.18	0.00
Cash management	**154**	**0.41**	**0.70**	**0.81**	**0.85**	**0.83**	**0.00**
Improve payment terms	126	0.06	0.12	0.16	0.18	0.19	0.00
Improve inventory management	50	0.11	0.23	0.42	0.54	0.37	0.00
Revenue growth	**838**	**0.20**	**0.33**	**0.43**	**0.44**	**0.45**	**0.00**
Target market share	159	0.13	0.17	0.25	0.24	0.39	0.00
Pursue acquisitions	376	0.07	0.12	0.17	0.19	0.13	0.01
Change mix of products or services	420	0.14	0.32	0.32	0.35	0.39	0.00
Pursue international expansion	244	0.09	0.12	0.09	0.08	0.08	0.33
Change pricing strategy	158	0.07	0.12	0.15	0.16	0.18	0.05
Improve marketing	356	0.02	0.10	0.12	0.15	0.16	0.00
Improve product quality	114	0.04	0.04	0.06	0.04	0.07	0.59
Governance engineering	**548**	**0.24**	**0.40**	**0.56**	**0.58**	**0.74**	**0.00**
Change CEO	222	0.07	0.17	0.25	0.22	0.28	0.00
Change CFO	223	0.07	0.12	0.26	0.27	0.39	0.00
Change other senior management	298	0.09	0.17	0.35	0.36	0.47	0.00
Improve corporate governance	52	0.00	0.02	0.05	0.08	0.10	0.00
Change board structure	157	0.07	0.14	0.11	0.16	0.22	0.01
Total deal count	**1,136**	**123**	**453**	**216**	**241**	**103**	**-**

4.3.4. The cross section of strategies and plan items

Which value creation plan PE firms follow depends very much on the deal. VCPs vary systematically with deal type, ownership, management replacement, inorganic growth strategy, and fund characteristics. I find that PE firms formulate plans that are more hands-on in buyouts than in early-stage deals or turnarounds, when they have majority ownership, when they plan to replace existing senior management, and when they pursue inorganic growth strategies. PE firms are more hands-on when they manage larger funds, typically follow-on funds, and when they manage a regional rather than single country-focused fund.

Industry sectors

The Sample deals come from a wide range of industries. The EBRD classifies portfolio companies into nine industries following the classification of Invest Europe, the European private equity and venture capital association: Agriculture and Forestry (32), Construction (62), Consumer (155), Information and Communications Technologies (ICT) (281), Manufacturing (120), Pharma and Medical (77), Primary and Energy (37), Services (250), and Wholesale and Retail (122).

Table 12 shows that at the strategy level, plans to engage in financial engineering does not vary significantly across sectors. All sectors feature a high share of deals that plan to engage in operational improvements except ICT and Services sectors potentially owing to the fact that these are asset light sector. PE firms plan to improve cash management practices primarily in Pharma, Medical, Wholesale, and Retail sectors, and less in Primary and Energy deals. Revenue growth is pursued more in consumer facing sectors such in Services, Wholesale, and Retail sectors. Plans to engage in governance engineering is featured typically in deals in sectors that are highly regulated such as Pharma or Medical Governance engineering is less applicable in Primary and Energy.

Table 12: Strategies and plan items by industry sector

The table provides a breakdown of strategies and plan items by industry sector. The classification follows Invest Europe. Column 1 refers to "Agriculture and Forestry", Column 2 refers to "Construction", Column 3 refers to "Consumer", Column 4 refers to "Information and Communications Technologies", Column 5 refers to "Manufacturing", Column 6 refers to "Pharma and Medical", Column 7 refers to "Primary and Energy", Column 8 refers to "Service", and Column 9 refers to "Wholesale and Retail". I code a plan item equal to 1 if the VCP includes the plan item in question, and 0 otherwise. I code a strategy equal to 1 if at least one plan item belonging to the strategy in question is included in the VCP, and 0 otherwise. Fractions are reported with respect to the total deal count of 1,136. For variable definitions see Table A.1 in the Appendix. The Pearson's Chi2 tests in the last column tests for the equality of fractions across industry sectors.

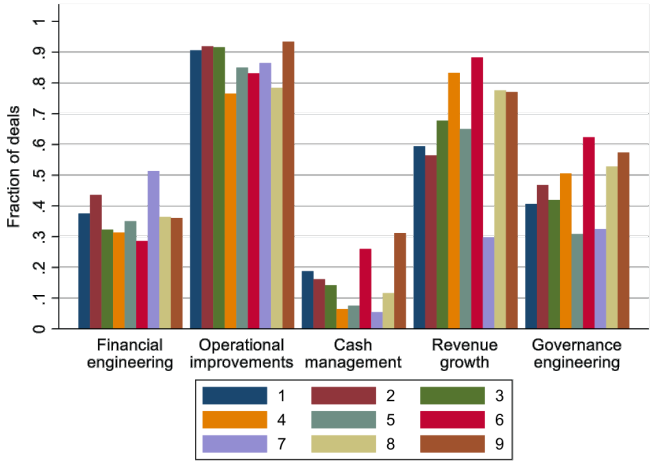
Strategy / plan item	Deal count	Fraction by industry sector									Pearson Chi2 test (*p*-value)
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
Financial engineering	**395**	**0.38**	**0.44**	**0.32**	**0.31**	**0.35**	**0.29**	**0.51**	**0.36**	**0.36**	**0.24**
Optimize capital structure	346	0.38	0.40	0.28	0.28	0.33	0.23	0.51	0.30	0.30	0.07
Improve incentive systems	93	0.03	0.06	0.07	0.06	0.07	0.08	0.03	0.12	0.12	0.19
Operational improvements	**951**	**0.91**	**0.92**	**0.92**	**0.77**	**0.85**	**0.83**	**0.86**	**0.78**	**0.93**	**0.00**
Buy or upgrade fixed assets	749	0.81	0.89	0.80	0.48	0.78	0.73	0.84	0.53	0.79	0.00
Sell fixed assets	78	0.03	0.10	0.06	0.05	0.05	0.10	0.00	0.06	0.15	0.01
Divest non-core business units	70	0.03	0.06	0.06	0.08	0.06	0.05	0.00	0.06	0.05	0.78
Reduce costs	293	0.34	0.24	0.29	0.28	0.26	0.27	0.08	0.26	0.20	0.22
Improve IT systems	188	0.31	0.15	0.09	0.13	0.07	0.34	0.00	0.20	0.27	0.00
Improve distribution	173	0.16	0.15	0.30	0.12	0.09	0.13	0.00	0.10	0.27	0.00
Improve corporate structure	124	0.16	0.08	0.12	0.09	0.08	0.19	0.03	0.13	0.11	0.11
Cash management	**154**	**0.19**	**0.16**	**0.14**	**0.06**	**0.07**	**0.26**	**0.05**	**0.12**	**0.31**	**0.00**
Improve payment terms	126	0.16	0.11	0.10	0.06	0.07	0.22	0.05	0.10	0.24	0.00
Improve inventory management	50	0.03	0.08	0.05	0.00	0.01	0.10	0.00	0.02	0.17	0.00

Table 12 (continued)

Strategy / plan item	Deal count	Fraction by industry sector									Pearson Chi2 test (*p*-value)
		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
Revenue growth	**838**	**0.59**	**0.56**	**0.68**	**0.83**	**0.65**	**0.88**	**0.30**	**0.78**	**0.77**	**0.00**
Target market share	159	0.09	0.06	0.17	0.15	0.11	0.17	0.00	0.16	0.16	0.10
Pursue acquisitions	376	0.28	0.21	0.33	0.37	0.16	0.49	0.14	0.37	0.37	0.00
Change mix of products or services	420	0.38	0.27	0.41	0.54	0.21	0.40	0.00	0.33	0.31	0.00
Pursue international expansion	244	0.13	0.23	0.17	0.20	0.23	0.25	0.14	0.26	0.22	0.27
Change pricing strategy	158	0.16	0.19	0.15	0.15	0.12	0.17	0.03	0.12	0.14	0.44
Improve marketing	356	0.31	0.19	0.34	0.40	0.22	0.38	0.05	0.27	0.37	0.00
Improve product quality	114	0.16	0.11	0.12	0.08	0.18	0.16	0.00	0.08	0.07	0.01
Governance engineering	**548**	**0.41**	**0.47**	**0.42**	**0.51**	**0.31**	**0.62**	**0.32**	**0.53**	**0.57**	**0.00**
Change CEO	222	0.19	0.13	0.13	0.21	0.12	0.30	0.05	0.24	0.25	0.00
Change CFO	223	0.06	0.21	0.15	0.18	0.13	0.27	0.05	0.23	0.32	0.00
Change other senior management	298	0.28	0.19	0.23	0.28	0.13	0.35	0.03	0.30	0.34	0.00
Improve corporate governance	52	0.06	0.05	0.03	0.03	0.04	0.06	0.11	0.05	0.06	0.59
Change board structure	157	0.06	0.21	0.12	0.15	0.10	0.19	0.16	0.14	0.11	0.31
Total deal count	**1,136**	**32**	**62**	**155**	**281**	**120**	**77**	**37**	**250**	**122**	**-**

Figure 5: Strategies by industry sector

The figure shows the share of deals pursuing each strategy by industry sector. The classification follows Invest Europe. "1" refers to Agriculture and Forestry, "2" refers to Construction, "3" refers to Consumer, "4" refers to Information and Communications Technologies, "5" refers to Manufacturing, "6" refers to Pharma and Medical, "7" refers to Primary and Energy, "8" refers to Services, and "9" refers to Wholesale and Retail. The sample size is 1,136 deals. See Table 12 for the full set of statistics.



Deal type

Which individual plans PE firms follow depends very much on the type of the deal. I find that value creation strategies differ systematically across deal types. For instance, operational improvements is a popular strategy in all deal types, while strategies aimed at revenue growth, governance engineering, and financial engineering varies significantly. The popularity of revenue growth increases as the maturity of portfolio companies increases, with 56% of the early-stage, 77% of the growth capital, and 88% of the buyout deals planning to boost revenues. Similarly, the popularity of governance engineering increases as the maturity of portfolio companies increases, with 39% of the early-stage, 47% of the growth capital, and 62% of the buyout deals planning governance engineering.

Buyout deals stand out for their focus on financial engineering (54% of the deals). Secondary buyouts look similar to primary buyouts across most plan items, except with less focus on financial engineering (32% versus 58%). This suggests marginal returns to optimize

the capital structure and incentive systems in secondary buyouts as primary buyout targets are sold on to the next PE owner. Turnaround deals show the greatest focus on financial engineering (59%). At the same time they are the least focused on revenue growth (53%) and plan on governance engineering (41%). Cash management does not vary significantly in popularity across deal types. Figure 6 shows the share of deals pursuing each value creation strategy by deal type and illustrates these patterns graphically.

Which plan items PE firms include in their VCPs depends on the type of deal. Buyouts tend to focus on optimizing the capital structure, pursuing acquisitions, changing the mix of products or services, and replacing management. Early-stage and growth capital deals primarily focus on buying or upgrading fixed assets.

Figure 6: Strategies by deal type

The figure shows the share of deals pursuing each strategy by deal type. The sample size is 1,136 deals. See Table 13 for the full set of statistics.

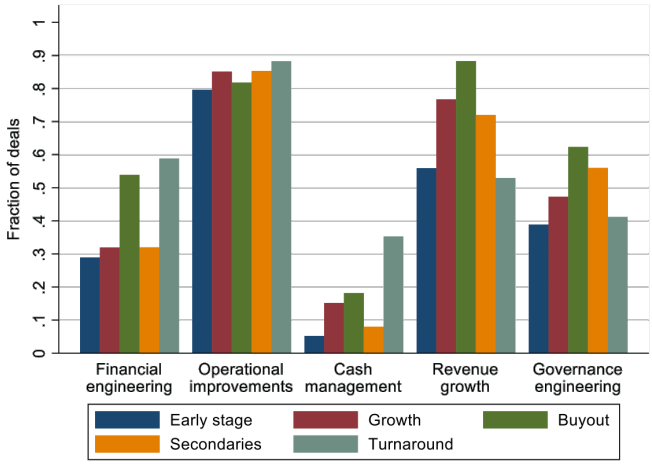


Table 13: Strategies and plan items by deal type

The table provides a breakdown of strategies and plan items by deal type. I code a plan item equal to 1 if the VCP includes the plan item in question, and 0 otherwise. I code a strategy equal to 1 if at least one plan item belonging to the strategy in question is included in the VCP, and 0 otherwise. Fractions are reported with respect to the total deal count of 1,136. For variable definitions see Table A.1 in the Appendix. The Pearson's Chi2 tests in the last column tests for the equality of fractions across deal types.

Strategy / plan item	Deal count	Fractions by deal type					Pearson Chi2 test (*p*-value)
		Early stage	Growth	Buyout	Sec-ondary	Turn-around	
Financial engineering	**395**	**0.29**	**0.32**	**0.54**	**0.32**	**0.59**	**0.00**
Optimize capital structure	346	0.28	0.28	0.44	0.24	0.59	0.00
Improve incentive systems	93	0.02	0.07	0.20	0.12	0.06	0.00
Operational improvements	**951**	**0.80**	**0.85**	**0.82**	**0.85**	**0.88**	**0.26**
Buy or upgrade fixed assets	749	0.69	0.70	0.48	0.59	0.71	0.00
Sell fixed assets	78	0.01	0.07	0.12	0.11	0.12	0.00
Divest non-core business units	70	0.02	0.06	0.11	0.07	0.18	0.00
Reduce costs	293	0.13	0.25	0.40	0.33	0.47	0.00
Improve IT systems	188	0.11	0.18	0.18	0.15	0.18	0.16
Improve distribution	173	0.11	0.16	0.15	0.20	0.12	0.28
Improve corporate structure	124	0.05	0.10	0.18	0.20	0.18	0.00
Cash management	**154**	**0.05**	**0.15**	**0.18**	**0.13**	**0.14**	**0.99**
Improve payment terms	126	0.04	0.12	0.16	0.11	0.12	0.36
Improve inventory management	50	0.02	0.05	0.03	0.03	0.03	0.22
Revenue growth	**838**	**0.56**	**0.77**	**0.88**	**0.72**	**0.53**	**0.00**
Target market share	159	0.05	0.15	0.25	0.12	0.12	0.00
Pursue acquisitions	376	0.14	0.34	0.58	0.35	0.12	0.00
Change mix of products or services	420	0.31	0.34	0.55	0.45	0.18	0.00
Pursue international expansion	244	0.15	0.21	0.34	0.21	0.24	0.00
Change pricing strategy	158	0.08	0.14	0.19	0.17	0.12	0.02
Improve marketing	356	0.32	0.31	0.36	0.28	0.12	0.26
Improve product quality	114	0.05	0.12	0.06	0.09	0.24	0.00
Governance engineering	**548**	**0.39**	**0.47**	**0.62**	**0.56**	**0.41**	**0.00**
Change CEO	222	0.13	0.19	0.29	0.24	0.18	0.00
Change CFO	223	0.09	0.19	0.34	0.25	0.18	0.00
Change other senior management	298	0.19	0.25	0.43	0.24	0.35	0.00
Improve corporate governance	52	0.02	0.05	0.05	0.07	0.00	0.36
Change board structure	157	0.13	0.14	0.12	0.16	0.18	0.90
Total deal count	**1,136**	**211**	**679**	**154**	**75**	**17**	**-**

Fund ownership

The data allow to observe each deal's ownership structure. Table 14 shows that most of the sample deals are minority investments (71%). PE firms in the sample are less hands-on in minority deals. In particular, PE firms in the sample plan to pursue revenue growth, governance engineering, and financial engineering in 72%, 45%, and 31% of their minority deals, compared to 79%, 56%, and 43% of their majority deals. PE firms' strategies aimed at operational improvements and cash management do not vary significantly with ownership. Figure 7 illustrates these differences.

Figure 7: Strategies by fund ownership

The figure shows the share of deals pursuing each strategy by fund ownership. Majority refers deals in which a fund's ownership is equal to or greater than 50%. Minority refers deals in which a fund's ownership is less than 50%. The sample size is 1,136 deals. See Table 14 for the full set of statistics.

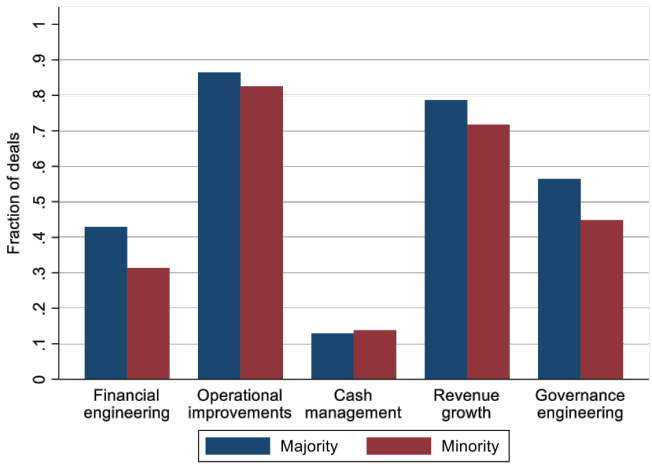


Table 14: Strategies and plan items by fund ownership

The table provides a breakdown of strategies and plan items by fund ownership. Majority refers deals in which a fund's ownership is equal to or greater than 50%. Minority refers deals in which a fund's ownership is less than 50%. I code a plan item equal to 1 if the VCP includes the plan item in question, and 0 otherwise. I code a strategy equal to 1 if at least one plan item belonging to the strategy in question is included in the VCP, and 0 otherwise. Fractions are reported with respect to the total deal count of 1,136. For variable definitions see Table A.1 in the Appendix. The Pearson's Chi2 tests in the last column tests for the equality of fractions across fund ownership.

		Fractions by fund ownership		Pearson Chi2 test
Strategy / plan item	Deal count	Majority	Minority	(*p*-value)
Financial engineering	**395**	**0.43**	**0.31**	**0.00**
Optimize capital structure	346	0.37	0.28	0.00
Improve incentive systems	93	0.15	0.05	0.00
Operational improvements	**951**	**0.86**	**0.83**	**0.10**
Buy or upgrade fixed assets	749	0.68	0.65	0.31
Sell fixed assets	78	0.09	0.06	0.11
Divest non-core business units	70	0.07	0.06	0.50
Reduce costs	293	0.25	0.26	0.67
Improve IT systems	188	0.22	0.14	0.00
Improve distribution	173	0.17	0.14	0.25
Improve corporate structure	124	0.13	0.10	0.16
Cash management	**154**	**0.13**	**0.14**	**0.68**
Improve payment terms	126	0.12	0.11	0.67
Improve inventory management	50	0.03	0.05	0.14
Revenue growth	**838**	**0.79**	**0.72**	**0.02**
Target market share	159	0.13	0.15	0.39
Pursue acquisitions	376	0.40	0.30	0.00
Change mix of products or services	420	0.40	0.36	0.14
Pursue international expansion	244	0.29	0.19	0.00
Change pricing strategy	158	0.16	0.13	0.15
Improve marketing	356	0.36	0.29	0.03
Improve product quality	114	0.10	0.10	0.90
Governance engineering	**548**	**0.56**	**0.45**	**0.00**
Change CEO	222	0.23	0.18	0.03
Change CFO	223	0.27	0.16	0.00
Change other senior management	298	0.36	0.22	0.00
Improve corporate governance	52	0.05	0.04	0.39
Change board structure	157	0.14	0.14	0.85
Total deal count	**1,136**	**333**	**803**	**-**

Growth strategy

Portfolio companies can grow organically by increasing revenues of existing or new products or inorganically by acquiring other companies. In around a third of the deals in the sample, PE firms plan to grow inorganically before entering the deal. Table 15 and Figure 8 provides an overview of how VCPs differ for organic and inorganic deals. This is not surprising as inorganic deals are more complex and thus require related plans to integrate the acquisition target and realise synergies. Compared to organic deals, inorganic deals see higher shares in all plans except for buying or upgrading assets and improving quality. Inorganic deals are also associated with a greater focus on other plan items in the revenue growth bucket, such as targeting market share (24% versus 9%), changing the mix of products and services (43% versus 34%), and pursuing international expansion (30% vs 17%). In addition, inorganic deals also more often plan to achieve strategies aimed at improving corporate governance (59% versus 43%), pursuing financial engineering (42% versus 31%), and improving cash management practices (17% versus 12%).

Figure 8: Value creation plans by growth strategy

The figure shows the share of deals pursuing each strategy by growth strategy. Inorganic refers to deals in which a fund plans to pursue a growth strategy driven by acquisitions. Organic refers to deals in which a fund does not plans to pursue such strategy. The sample size is 1,136 deals. See Table 15 for the full set of statistics.

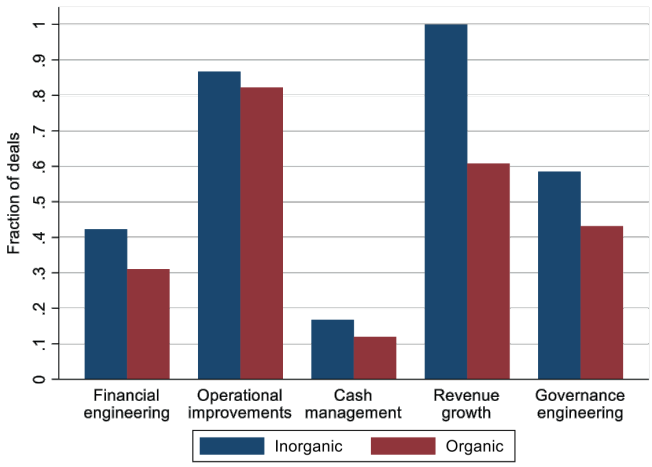


Table 15: Strategies and plan items by growth strategy

The table describes the VCPs in the sample and provides a breakdown by growth strategy. Inorganic refers to deals in which a fund plans to pursue a growth strategy driven by acquisitions. Organic refers to deals in which a fund does not plans to pursue such strategy. I code a plan item equal to 1 if the VCP includes the plan item in question, and 0 otherwise. I code a strategy equal to 1 if at least one plan item belonging to the strategy in question is included in the VCP, and 0 otherwise. Fractions are reported with respect to the total deal count of 1,136. For variable definitions see Table A.1 in the Appendix. The Pearson's Chi2 tests in the last column tests for the equality of fractions across growth strategy.

		Fractions by growth strategy		Pearson Chi2 test
Strategy / plan item	Deal count	Organic	Inorganic	(*p*-value)
Financial engineering	**395**	**0.31**	**0.42**	**0.00**
Optimize capital structure	346	0.28	0.35	0.02
Improve incentive systems	93	0.06	0.12	0.00
Operational improvements	**951**	**0.82**	**0.87**	**0.06**
Buy or upgrade fixed assets	749	0.68	0.61	0.01
Sell fixed assets	78	0.06	0.08	0.30
Divest non-core business units	70	0.04	0.11	0.00
Reduce costs	293	0.23	0.31	0.00
Improve IT systems	188	0.14	0.22	0.00
Improve distribution	173	0.14	0.18	0.09
Improve corporate structure	124	0.09	0.15	0.00
Cash management	**154**	**0.12**	**0.17**	**0.03**
Improve payment terms	126	0.10	0.14	0.06
Improve inventory management	50	0.04	0.05	0.29
Revenue growth	**838**	**0.61**	**1.00**	**0.00**
Target market share	159	0.09	0.24	0.00
Pursue acquisitions	376	0.00	1.00	0.00
Change mix of products or services	420	0.34	0.43	0.00
Pursue international expansion	244	0.17	0.30	0.00
Change pricing strategy	158	0.13	0.16	0.22
Improve marketing	356	0.30	0.35	0.10
Improve product quality	114	0.11	0.09	0.32
Governance engineering	**548**	**0.43**	**0.59**	**0.00**
Change CEO	222	0.17	0.25	0.00
Change CFO	223	0.15	0.29	0.00
Change other senior management	298	0.23	0.32	0.00
Improve corporate governance	52	0.03	0.07	0.00
Change board structure	157	0.13	0.15	0.36
Total deal count	**1,136**	**760**	**376**	**-**

Management strategy

PE firms are more active in all areas of value creation strategies when they plan to replace existing management. Table 16 provides an overview. Replacing management refers to deal in which PE firms report replacing either the CEO or the CFO in their VCP. In roughly one-third of the investments in the sample, the PE fund expects to create value by changing either the CEO or the CFO. Figure 9 shows the share of deals pursuing each value creation theme by whether or not senior management is to be replaced. At the same time, deals replacing senior management also see a high share of VCPs to replace other senior management members (54%), such as the Chief Operating Officer or the Chief Technology Officer.

Figure 9: Value creation plans by management strategy

The figure shows the share of deals pursuing each strategy by management strategy. Retain management refers to deals in which a fund plans to continue working with the incumbent management team. Replace management refers to deals in which a fund plans to either replace the CEO or the CFO. The sample size is 1,136 deals. See Table 15 for the full set of statistics.

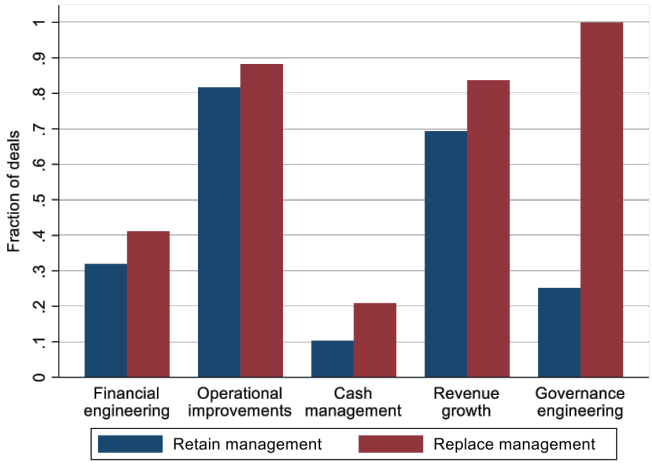


Table 16: Strategies and plan items by management strategy

The table describes the VCPs in the sample and provides a breakdown by management strategy. Retain management refers to deals in which a fund plans to continue working with the incumbent management team. Replace management refers to deals in which a fund plans to either replace the CEO or the CFO. I code a plan item equal to 1 if the VCP includes the plan item in question, and 0 otherwise. I code a strategy equal to 1 if at least one plan item belonging to the strategy in question is included in the VCP, and 0 otherwise. Fractions are reported with respect to the total deal count of 1,136. For variable definitions see Table A.1 in the Appendix. The Pearson's Chi2 tests in the last column tests for the equality of fractions across management strategy.

		Factions by management strategy		Pearson Chi2 test
Strategy / plan item	Deal count	Replace	Retain	(*p*-value)
Financial engineering	**395**	**0.32**	**0.41**	**0.00**
Optimize capital structure	346	0.28	0.35	0.02
Improve incentive systems	93	0.06	0.12	0.00
Operational improvements	**951**	**0.82**	**0.88**	**0.01**
Buy or upgrade fixed assets	749	0.68	0.60	0.01
Sell fixed assets	78	0.05	0.11	0.00
Divest non-core business units	70	0.06	0.07	0.36
Reduce costs	293	0.21	0.37	0.00
Improve IT systems	188	0.11	0.29	0.00
Improve distribution	173	0.14	0.19	0.02
Improve corporate structure	124	0.07	0.19	0.00
Cash management	**154**	**0.10**	**0.21**	**0.00**
Improve payment terms	126	0.08	0.17	0.00
Improve inventory management	50	0.03	0.07	0.02
Revenue growth	**838**	**0.69**	**0.84**	**0.00**
Target market share	159	0.12	0.19	0.00
Pursue acquisitions	376	0.28	0.45	0.00
Change mix of products or services	420	0.33	0.46	0.00
Pursue international expansion	244	0.18	0.29	0.00
Change pricing strategy	158	0.12	0.18	0.01
Improve marketing	356	0.27	0.41	0.00
Improve product quality	114	0.09	0.12	0.14
Governance engineering	**548**	**0.25**	**1.00**	**0.00**
Change CEO	222	0.00	0.63	0.00
Change CFO	223	0.00	0.64	0.00
Change other senior management	298	0.14	0.54	0.00
Improve corporate governance	52	0.02	0.10	0.00
Change board structure	157	0.11	0.20	0.00
Total deal count	**1,136**	**786**	**350**	**-**

Fund characteristics

The final breakdown in Tables 17, 18, and 19 is by fund characteristics. I divide the sample of VCPs into subgroups based on the median of fund size (small and large funds), fund manager experience (first-time and follow-on funds), and by geographic focus (single country focused fund and regional fund).

Smaller funds focus more on buying and upgrading assets (69% vs 61%). At same time, large funds have focus on pursuing acquisitions (41% vs 27%) and changing the CEO (24% vs 16%), the CFO (28% vs 13%), and other senior management (33% vs 20%). Overall, the evidence suggests that larger funds are more hands-on in creating value. Figure 10, Panel A, shows the fraction of deals pursuing each value creation theme by fund size.

Similarly, first-time funds, which typically also have a smaller fund size, focus more on buying and upgrading assets (71% vs 60%). More importantly, follow-on funds in the sample appear to be more hands-on and focus more on increasing revenue growth than first-time funds (83% vs 57%). In particular, they have a much stronger focus on growing revenue inorganically through acquisitions (45% vs 24%). Follow-on funds also plan to engage more in governance engineering than first-time funds (67% vs 41%). Figure 10, Panel B, illustrates.

A little over half of sample deals (54%) are managed by single-country funds; the remainder involve a "regional" fund investing in more than one country. Regional funds pursue revenue growth and governance engineering strategies significantly more often than single-country funds, often because they consolidate companies across countries (say, the Baltic States) and can tap into wider networks of managers and board members. Figure 10, Panel C, shows the share of deals by geographic focus.

Table 17: Strategies and plan items by fund size

The table describes the VCPs in the sample and provides a breakdown by fund size as measured by the median fund size in the sample. I code a plan item equal to 1 if the VCP includes the plan item in question, and 0 otherwise. I code a strategy equal to 1 if at least one plan item belonging to the strategy in question is included in the VCP, and 0 otherwise. Fractions are reported with respect to the total deal count of 1,136. For variable definitions see Table A.1 in the Appendix. The Pearson's Chi2 tests in the last column tests for the equality of fractions across fund size.

		Fractions by fund size		Pearson Chi2 test
Strategy / plan item	Deal count	Small	Large	(*p*-value)
Financial engineering	**395**	**0.32**	**0.38**	**0.03**
Optimize capital structure	346	0.28	0.33	0.06
Improve incentive systems	93	0.08	0.09	0.49
Operational improvements	**951**	**0.84**	**0.83**	**0.65**
Buy or upgrade fixed assets	749	0.69	0.62	0.01
Sell fixed assets	78	0.04	0.10	0.00
Divest non-core business units	70	0.06	0.06	0.85
Reduce costs	293	0.22	0.30	0.00
Improve IT systems	188	0.14	0.19	0.03
Improve distribution	173	0.14	0.16	0.29
Improve corporate structure	124	0.08	0.14	0.00
Cash management	**154**	**0.11**	**0.17**	**0.01**
Improve payment terms	126	0.09	0.14	0.00
Improve inventory management	50	0.03	0.06	0.04
Revenue growth	**838**	**0.71**	**0.77**	**0.01**
Target market share	159	0.11	0.17	0.00
Pursue acquisitions	376	0.27	0.41	0.00
Change mix of products or services	420	0.34	0.41	0.02
Pursue international expansion	244	0.21	0.23	0.41
Change pricing strategy	158	0.12	0.16	0.03
Improve marketing	356	0.32	0.31	0.81
Improve product quality	114	0.11	0.09	0.49
Governance engineering	**548**	**0.42**	**0.55**	**0.00**
Change CEO	222	0.16	0.24	0.00
Change CFO	223	0.13	0.28	0.00
Change other senior management	298	0.20	0.33	0.00
Improve corporate governance	52	0.03	0.07	0.00
Change board structure	157	0.14	0.14	0.96
Total deal count	**1,136**	**613**	**523**	**-**

Table 18: Strategies and plan items by fund manager experience

The table describes the VCPs in the sample and provides a breakdown by fund manager experience. I code a plan item equal to 1 if the VCP includes the plan item in question, and 0 otherwise. I code a strategy equal to 1 if at least one plan item belonging to the strategy in question is included in the VCP, and 0 otherwise. Fractions are reported with respect to the total deal count of 1,136. For variable definitions see Table A.1 in the Appendix. The Pearson's Chi2 tests in the last column tests for the equality of fractions across fund manager experience.

		Fractions by fund manager experience		Pearson Chi2 test
Strategy / plan item	Deal count	First-time	Follow-on	(*p*-value)
Financial engineering	**395**	**0.30**	**0.41**	**0.00**
Optimize capital structure	346	0.27	0.35	0.01
Improve incentive systems	93	0.05	0.12	0.00
Operational improvements	**951**	**0.85**	**0.83**	**0.37**
Buy or upgrade fixed assets	749	0.71	0.60	0.00
Sell fixed assets	78	0.05	0.10	0.00
Divest non-core business units	70	0.05	0.08	0.03
Reduce costs	293	0.23	0.30	0.01
Improve IT systems	188	0.15	0.19	0.10
Improve distribution	173	0.15	0.16	0.75
Improve corporate structure	124	0.08	0.14	0.00
Cash management	**154**	**0.12**	**0.15**	**0.14**
Improve payment terms	126	0.09	0.13	0.04
Improve inventory management	50	0.05	0.04	0.71
Revenue growth	**838**	**0.57**	**0.83**	**0.00**
Target market share	159	0.12	0.16	0.08
Pursue acquisitions	376	0.24	0.45	0.00
Change mix of products or services	420	0.33	0.42	0.00
Pursue international expansion	244	0.18	0.26	0.00
Change pricing strategy	158	0.12	0.16	0.03
Improve marketing	356	0.29	0.35	0.03
Improve product quality	114	0.10	0.09	0.58
Governance engineering	**548**	**0.41**	**0.67**	**0.00**
Change CEO	222	0.16	0.24	0.00
Change CFO	223	0.14	0.26	0.00
Change other senior management	298	0.20	0.34	0.00
Improve corporate governance	52	0.03	0.07	0.00
Change board structure	157	0.14	0.13	0.74
Total deal count	**1,136**	**630**	**506**	**-**

Table 19: Strategies and plan items by fund geographic focus

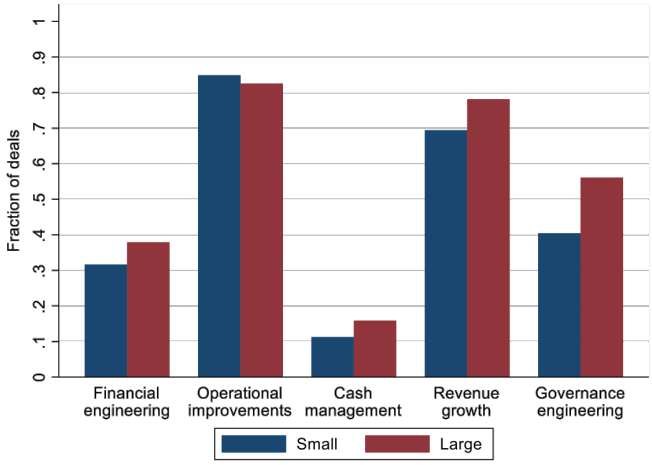
The table describes the VCPs in the sample and provides a breakdown by a fund's geographic focus. A country-focused fund focuses on making investments in a single country, whereas a regional fund makes investments in multiple countries. I code a plan item equal to 1 if the VCP includes the plan item in question, and 0 otherwise. I code a strategy equal to 1 if at least one plan item belonging to the strategy in question is included in the VCP, and 0 otherwise. Fractions are reported with respect to the total deal count of 1,136. For variable definitions see Table A.1 in the Appendix. The Pearson's Chi2 tests in the last column tests for the equality of fractions across geographic focus.

		Fractions by fund geographic focus		Pearson Chi2 test
Strategy / plan item	Deal count	Country	Regional	(*p*-value)
Financial engineering	**395**	**0.35**	**0.34**	**0.76**
Optimize capital structure	346	0.32	0.29	0.35
Improve incentive systems	93	0.06	0.10	0.05
Operational improvements	**951**	**0.84**	**0.83**	**0.63**
Buy or upgrade fixed assets	749	0.72	0.61	0.00
Sell fixed assets	78	0.05	0.09	0.02
Divest non-core business units	70	0.04	0.08	0.02
Reduce costs	293	0.23	0.28	0.10
Improve IT systems	188	0.15	0.18	0.31
Improve distribution	173	0.14	0.16	0.22
Improve corporate structure	124	0.08	0.13	0.00
Cash management	**154**	**0.14**	**0.13**	**0.67**
Improve payment terms	126	0.11	0.11	0.77
Improve inventory management	50	0.05	0.04	0.28
Revenue growth	**838**	**0.67**	**0.80**	**0.00**
Target market share	159	0.08	0.19	0.00
Pursue acquisitions	376	0.26	0.39	0.00
Change mix of products or services	420	0.34	0.39	0.10
Pursue international expansion	244	0.13	0.29	0.00
Change pricing strategy	158	0.14	0.14	0.94
Improve marketing	356	0.30	0.33	0.22
Improve product quality	114	0.10	0.10	1.00
Governance engineering	**548**	**0.43**	**0.53**	**0.00**
Change CEO	222	0.16	0.22	0.02
Change CFO	223	0.15	0.24	0.00
Change other senior management	298	0.23	0.29	0.01
Improve corporate governance	52	0.04	0.05	0.37
Change board structure	157	0.14	0.13	0.60
Total deal count	**1,136**	**528**	**608**	**-**

Figure 10: Strategies by fund characteristics

The figure shows the share of deals pursuing each value creation strategy by fund size (Panel A), fund manager experience (Panel B), and geographic focus (Panel C). The sample size is 1,136 deals. See Tables 17, 18, and 19 for the full set of statistics.

Panel A: Strategies by fund size



Panel B: Strategies by fund manager experience

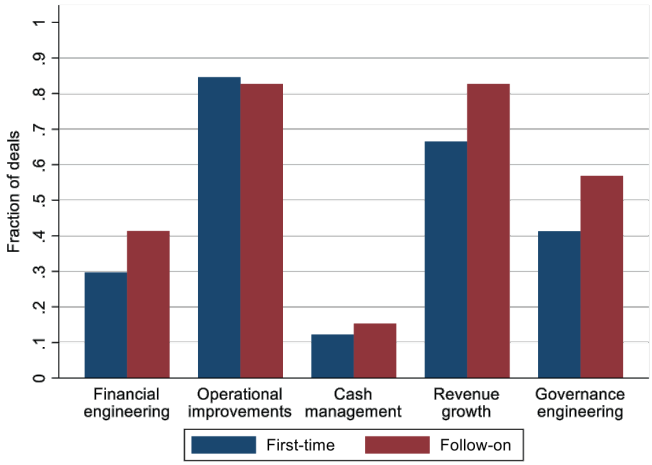
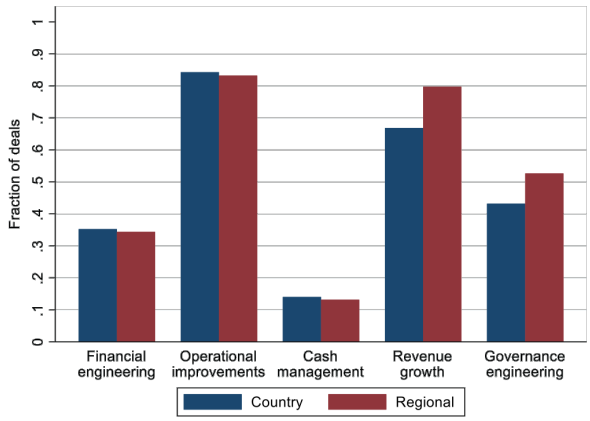


Figure 10 (continued)

Panel C: Strategies by fund geographic focus



4.4. Implementation of value creation plans

The data allow to track the implementation and achievement (or otherwise) of each plan item in each deal's VCP over time.

In most of the sample deals, PE firms manage to implement the majority of their individual plan items and strategies. I illustrate this by plotting the number of planned and achieved VCP items in Figure 11 and strategies in Figure 12 using bubble diagrams. The size of each bubble reflects the number of deals. In the figure, deals on the 45-degree line achieved all their plan items and strategies, whereas deals below the 45-degree line did not achieve all of their initial plan items and strategies. For both plan items and strategies, the vast majority of the deals lies along the 45-degree line, meaning that most of the planned strategies and plan items are achieved. For example, of the 349 deals intending to pursue a combination of two strategies, 287 achieve both, 50 achieve one, and only 12 achieve neither.

Figure 11: Achievement of plan items

The figure shows a scatterplot of how many of the plan items are eventually achieved in a given deal. I code a plan item using information available at the time of investment in a portfolio company and achievement of a plan item using all the subsequent information. The sample size is 1,136 deals. The bubble size represents the number of deals.

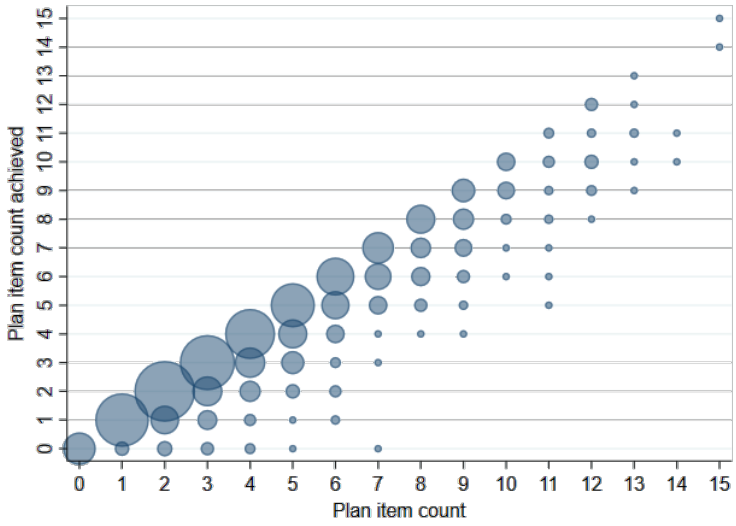
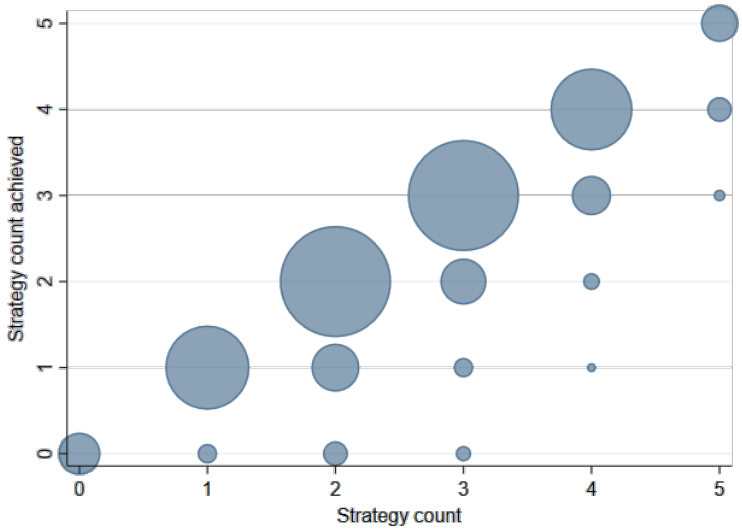


Figure 12: Achievement of strategies

The figure shows a scatterplot of how many of the strategies are eventually achieved in a given deal. I code a strategy equal to 1 if at least one plan item belonging to the strategy in question is included in the VCP, and 0 otherwise. I code a strategy using information available at the time of investment in a portfolio company and achievement of a strategy using all the subsequent information. The sample size is 1,136 deals. The bubble size represents the number of deals.



PE firms in the sample set out to implement 4.5 plan items, on average and report achieving the majority of them. Some PE firms in the sample set out to implement more plans, but the probability of achieving these drops with the number of initial plans. In the most extreme case, a PE firm set out to achieve as many as fifteen different plan items, and managed to achieve all of them.

Table 20 tabulates achievement rates at the individual plan item level. While achievement rates are generally high, some plan items appear to be easier to achieve than others. For example, plans to replace the CEO or the CFO are nearly always implemented (93% and 95% of the deals, respectively). The reading of the pre-investment documentation indicates that suitable candidates are often identified even before a deal is signed. Similarly, plans to buy (93%) or sell assets (96%) and to reduce cost (94%) are practically always executed. On the other hand, plans to increase market share (62%), to grow inorganically (74%), and to pursue international expansion (73%) appear more difficult to implement. Similarly, only 71% of deals planning to improve corporate governance practices manage to do so.

Table 20: Achievement of strategies and plan items

The table reports the number and fraction of deals in which a strategy or a plan item is achieved. The share achieved is the fraction of deals including a particular plan item in its VCP that is successfully implemented. I code a strategy as achieved if at least one plan item belonging to that strategy is achieved, and 0 otherwise. Fractions are reported with respect to the total deal count of 1,136. For variable definitions see Table A.1 in the Appendix.

	Fund plans to…		Fund achieves plan to...			
Strategy / plan item	Deal count	Fraction	Deal count	Fraction	Share achieved	Rank
Financial engineering	**395**	**0.35**	**349**	**0.31**	**0.88**	**5**
Optimize capital structure	346	0.30	303	0.27	0.88	11
Improve incentive systems	93	0.08	84	0.07	0.90	7
Operational improvements	**951**	**0.84**	**904**	**0.80**	**0.95**	**1**
Buy or upgrade fixed assets	749	0.66	698	0.61	0.93	6
Sell fixed assets	78	0.07	75	0.07	0.96	2
Divest non-core business units	70	0.06	56	0.05	0.80	18
Reduce costs	293	0.26	275	0.24	0.94	4
Improve IT systems	188	0.17	154	0.14	0.82	17
Improve distribution	173	0.15	147	0.13	0.85	15
Improve corporate structure	124	0.11	106	0.09	0.85	14
Cash management	**154**	**0.14**	**137**	**0.12**	**0.89**	**4**
Improve payment terms	126	0.11	113	0.10	0.90	8
Improve inventory management	50	0.04	41	0.04	0.82	16
Revenue growth	**838**	**0.74**	**762**	**0.67**	**0.91**	**3**
Target market share	159	0.14	98	0.09	0.62	23
Pursue acquisitions	376	0.33	280	0.25	0.74	20
Change mix of products or services	420	0.37	376	0.33	0.90	9
Pursue international expansion	244	0.21	178	0.16	0.73	21
Change pricing strategy	158	0.14	138	0.12	0.87	12
Improve marketing	356	0.31	310	0.27	0.87	13
Improve product quality	114	0.10	89	0.08	0.78	19
Governance engineering	**548**	**0.48**	**519**	**0.46**	**0.95**	**2**
Change CEO	222	0.20	207	0.18	0.93	5
Change CFO	223	0.20	211	0.19	0.95	3
Change other senior management	298	0.26	287	0.25	0.96	1
Improve corporate governance	52	0.05	37	0.03	0.71	22
Change board structure	157	0.14	139	0.12	0.89	10

4.5. Revision of value creation plans

So far, I have considered the implementation of a PE firm's initial VCP. I now turn to revisions of VCPs during the holding period. Table 21 reports the number and fraction of deals in which a strategy or plan item is added after the first year. As the table shows, PE funds in the sample actively monitor their investments by introducing new plan items in the years following the initial investment. This suggests that PE firms act on the information they collect on portfolio companies and their management teams thanks to their operating partners or representatives on the portfolio company's board of directors. When reading the documents, funds often claim to have identified additional areas of value creation or the need to turnaround an investment that is not performing according to the initial VCP.

I define a revision of a VCP as the introduction of a new plan item after the first year of investment. 77.3% of the sample deals feature a revision. As Figure 13 shows, such revisions tend to be minor though. As can be seen in the left panel of the figure, the most common newly added plan item is cost reduction, which 31% of deals add at some point during the holding period, perhaps to create additional value, perhaps because the deal has underperformed relative to initial expectations or has experienced an external shock (such as a recession). New plans to optimize the capital structure (20%) and change the CEO (19%) are also relatively common, presumably for similar reasons.

At the strategy-level, most of the revisions take place in operational improvements, closely followed by revenue growth. 55% of the deals see an introduction of one or more new plan items in operational improvements, and 49% of the deals see an introduction of one or more new plan items in revenue growth. Governance engineering (39%), financial engineering (23%), and cash management (18%) rank third, fourth, and fifth, respectively.

Figure 14 plots the number of initial plan items against the number of new plan items introduced. Deals on the abscissa did not introduce any new plan items. In 124 cases, I cannot

find pre-deal documentation, even though the EBRD's archive contains post-deal documentation based on which I code plan revisions. These 124 investments do not look observably different from our other sample deals, mitigating selection concerns. These deals are shown on the ordinate.

Deals on the 45-degree line see the same number of new plan items introduced as the original plan had. Deals below the 45-degree line feature small revisions, whereas deals above the 45-degree line feature many revisions. For example, point (x=6, y=3) refers to deals that had six plan items in their initial VCPs and introduced three new plan items. Conversely, point (x=3, y=6) refers to a deal which had three plan items in their initial VCPs and introduced six new plan items post-investment.

Figure 13: Revision of value creation plans

The figure shows the share of deals pursuing individual plan items in the initial VCP and in a revised VCP. I define a revision of a plan item as the introduction of a new plan item after the first year of the holding period. The sample size is 1,136 deals. See Table 21 for the full set of statistics.

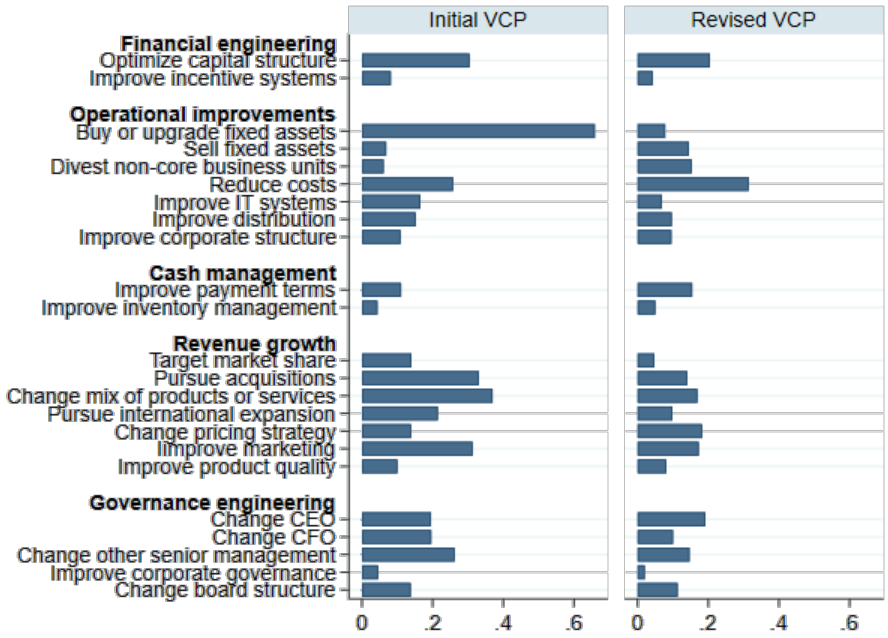


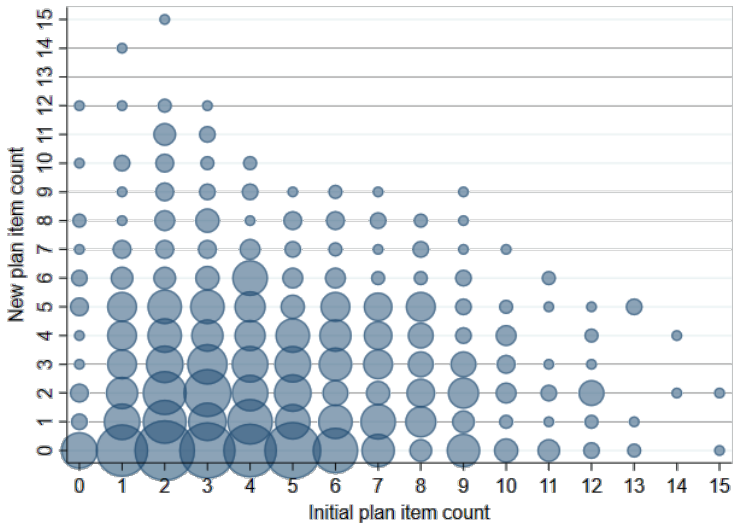
Table 21: Revision of strategies and plan items

The table reports the number and fraction of deals in which an initial strategy or plan item is revised. I code the introduction of new strategies and plan items after the first year as revisions. For variable definitions and details of their construction see Table A.1 in the Appendix.

	Fund plans to...		Fund revises initial plan to...	
Strategy / plan item	Deal count	Fraction	Deal count	Fraction
Financial engineering	**395**	**0.35**	**252**	**0.23**
Optimize capital structure	346	0.30	220	0.20
Improve incentive systems	93	0.08	46	0.04
Operational improvements	**951**	**0.84**	**588**	**0.55**
Buy or upgrade fixed assets	749	0.66	84	0.08
Sell fixed assets	78	0.07	156	0.15
Divest non-core business units	70	0.06	165	0.15
Reduce costs	293	0.26	338	0.31
Improve IT systems	188	0.17	74	0.07
Improve distribution	173	0.15	104	0.10
Improve corporate structure	124	0.11	103	0.10
Cash management	**154**	**0.14**	**191**	**0.18**
Improve payment terms	126	0.11	166	0.15
Improve inventory management	50	0.04	54	0.05
Revenue growth	**838**	**0.74**	**529**	**0.49**
Target market share	159	0.14	51	0.05
Pursue acquisitions	376	0.33	151	0.14
Change mix of products or services	420	0.37	182	0.17
Pursue international expansion	244	0.21	106	0.10
Change pricing strategy	158	0.14	196	0.18
Improve marketing	356	0.31	186	0.17
Improve product quality	114	0.10	87	0.08
Governance engineering	**548**	**0.48**	**420**	**0.39**
Change CEO	222	0.20	206	0.19
Change CFO	223	0.20	108	0.10
Change other senior management	298	0.26	158	0.15
Improve corporate governance	52	0.05	22	0.02
Change board structure	157	0.14	122	0.11

Figure 14: Revision of plan items

The figure shows a scatterplot of the number of initial plan items against the number of new plan items introduced at the deal-level. The sample size is 1,136 deals. The bubble size represents the number of deals.



4.6. Value creation plans throughout the life of a deal

Table 22 combines the information on initial value creation plans and revisions and shows the prevalence of plan items and strategies throughout the life of a deal. The top-5 key focus areas throughout the life of a deal include: Buying or upgrading fixed assets (73%, up from 66% in the initial plan), cutting costs (56%, up from 26% in the initial plan), changing the mix of products or services (53%, up from 37% in the initial plan), optimizing the capital structure (50%, up from 30% in the initial plan), improving marketing or promotion (48%, up from 31% in the initial plan). Notably, pursuing acquisitions (46%, up from 33% in the initial plan) drops from the 3rd rank to 6th.

At the strategy-level, operational improvements retain its top position compared to initial VCPs and features in 92% of the deals. This compares to 84% of the deals featuring plan items related to operational improvements as part of their initial VCP. Revenue growth ranks as the second most popular strategy (86%, up from 74% in the initial plan). Governance engineering (69%), financial engineering (54%), and cash management (29%) rank on the

remaining positions.

Plan items that relate to operational improvements and governance engineering have the highest achievement rates of 97% and 94%, respectively. Within operational improvements, selling fixed assets ranks top with an achievement rate of 98%, followed by cost reductions with an achievement rate of 94%. Within governance engineering, plans to replace other senior management also have achievement rates of over 90%. Targeting market share pursuing acquisitions, and pursuing international expansion have the lowest (but still high) achievement rates ranging between 60-71%.

These results are similar to the achievement of initial VCPs. Improving payment terms, changing other senior management, and changing board member or the shareholder structure become harder to achieve compared to initial VCPs. Each plan item sees a four-percentage point decrease in the rate of achievement. Plan items related to changes in the pricing strategy and improving corporate governance become easier to achieve in relative terms. Both strategies see an increase of three percentage points in their rate of achievement compared to initial VCPs.

Table 22: Value creation plans throughout the life of a deal

The table reports the number and fraction of deals in which a strategy or a plan item is pursued and achieved during the life of a deal including the initial VCP and subsequent actions. The share achieved is the fraction of deals including a particular plan item in its VCP that is successfully implemented. I code a strategy as achieved if at least one plan item belonging to that strategy is achieved, and 0 otherwise. Fractions are reported with respect to the total deal count of 1,136. For variable definitions see Table A.1 in the Appendix.

	Fund plans to…		Fund achieves plan to...			
Strategy / plan item	Deal count	Fraction	Deal count	Fraction	Share achieved	Rank
Financial engineering	**614**	**0.54**	**535**	**0.47**	**0.87**	**5**
Optimize capital structure	566	0.50	484	0.43	0.86	13
Improve incentive systems	139	0.12	126	0.11	0.91	7
Operational improvements	**1,047**	**0.92**	**1,011**	**0.89**	**0.97**	**1**
Buy or upgrade fixed assets	833	0.73	775	0.68	0.93	4
Sell fixed assets	234	0.21	229	0.20	0.98	1
Divest non-core business units	235	0.21	191	0.17	0.81	18
Reduce costs	631	0.56	596	0.52	0.94	2
Improve IT systems	262	0.23	218	0.19	0.83	17
Improve distribution	277	0.24	238	0.21	0.86	12
Improve corporate structure	227	0.20	194	0.17	0.85	14
Cash management	**329**	**0.29**	**291**	**0.26**	**0.88**	**4**
Improve payment terms	292	0.26	251	0.22	0.86	11
Improve inventory management	104	0.09	87	0.08	0.84	16
Revenue growth	**981**	**0.86**	**907**	**0.80**	**0.92**	**3**
Target market share	210	0.18	126	0.11	0.60	23
Pursue acquisitions	527	0.46	376	0.33	0.71	22
Change mix of products or services	602	0.53	541	0.48	0.90	9
Pursue international expansion	350	0.31	250	0.22	0.71	21
Change pricing strategy	354	0.31	319	0.28	0.90	8
Improve marketing	542	0.48	475	0.42	0.88	10
Improve product quality	201	0.18	157	0.14	0.78	19
Governance engineering	**788**	**0.69**	**737**	**0.65**	**0.94**	**2**
Change CEO	428	0.38	388	0.34	0.91	6
Change CFO	331	0.29	302	0.27	0.91	5
Change other senior management	456	0.40	430	0.38	0.94	3
Improve corporate governance	74	0.07	55	0.05	0.74	20
Change board structure	279	0.25	237	0.21	0.85	15

4.7. Discussion of results

This paper relates to evidence collected from two surveys. Gompers et al. (2016) survey 79 PE firms with mean assets under management of just under USD 10 billion in mostly buyout and some growth capital assets. Their sample includes 11 out of the top 25 largest funds worldwide. Gompers et al. (2020) survey 885 institutional venture capitalists in California, the rest of the U.S., and outside the U.S., at 681 firms. The average fund size in their sample is USD 286 million, while the median fund size is USD 120 million. The results derive from 178 PE funds with an average (median) size of USD 163.2 million (USD 88.5 million) and 1,136 portfolio companies in emerging markets. Most of these are growth capital investments. However, the sample also includes early stage, buyouts, and other types of investment.

The evidence derives from quantifying textual data at the deal-level that reflect the actual plans and actions taken by PE firms. I document exactly what PE firms set out to achieve (and track their record of success) in each of their deals based on confidential information that PE firms typically report to their limited partners. In this paper I sidestep issues related to the survey methodology. In particular, the worry that PE firms may want to cast themselves in a positive light or report selectively. Despite different methodologies, I find overlapping results.

The results confirm evidence from Gompers et al. (2016) and Gompers et al. (2020) indicating that PE investors expect to create value from a combination of financial, operational, and governance engineering. Indeed, I find that PE firms follow a rich variety of plans to add value. Which individual plans PE firms follow depends very much on the type of the deal. I show that funds tend to be more hands-on when they hold a majority stake in a portfolio companies. Similarly, they are more active in all areas of value creation strategies

when they also plan to replace existing management. Overall, the results suggest that PE funds are not passive investors and actively add value to their portfolio companies.

Most frequently mentioned source of value creation in Gompers et al. (2016)'s survey is increasing revenue, identified by PE investors as being important in over 70% of their deals, both pre- and post-investment. In the sample, initial VCPs on revenue growth accounts for 74% of the deals; when considering any time VCPs the fraction increases to 86%. Related to revenue growth, Gompers et al. (2020) report that 69% of the venture capitalists say they help their companies connect to customers and 46% report hiring employees.

Operational improvements as in Gompers et al. (2016) ranked as the second most important return driver behind revenue growth and are mentioned by 97% of the PE investors. The authors also state that operational engineering sources of value—by means of cost cutting increasing in importance—appear to be more important post investment than they are identified as or expected to be pre-investment. Gompers et al. (2020) report that 65% of venture capital firms say they provide operational guidance. I find that 84% of deals have plans to improve operations.

Gompers et al. (2016) also identify that follow-on acquisitions are also important in more than 50% of the deals. Gompers et al. (2020) also gave their respondents an opportunity to describe their activities, if they felt the offered list was not sufficient. The more frequently mentioned activities related to helping with mergers and acquisitions. The results show that in a third of all deals PE firms plan pursuing acquisitions (33% in growth capital investments and 59% in buyout investments), with a rate of achievement of 74%.

Reducing costs is also identified as being important in only 36% of their deals, rising to 47% of deals post-investment (Gompers et al., 2016). The results suggest that PE firms plan to focus on cost cutting in 26% of their initial VCPs and 56% of any time VCPs. Taken together with strategies to boost revenue, focus on revenue growth appears to be more

important than reducing costs. Gompers et al. (2016) interpret the focus on revenue growth as a shift in emphasis from the cost cutting and agency cost reduction in the 1980s as emphasized in Jensen (1989).

Related to this, Gompers et al. (2016) find that investors also expect to create value in roughly one third of their investments by redefining or changing the company's strategy or business model. Gompers et al. (2020) report that 87% of the venture capitalists are involved in strategic guidance of their portfolio companies. In this paper I do not separately track the change in a company's strategic direction. However, when using the pursuing acquisitions plan item as proxy—which clearly is of transformative nature—I obtain similar results as Gompers et al. (2016).

Gompers et al. (2016) report that in roughly one third of their sample, PE firms expect to create value by changing the CEO, the CFO, and other members of the senior management team. I find that slightly lower planned management turnover: One in five deals sees a plan to change of the CEO or the CFO, and one in four deals sees a plan change of other senior management. Although, when focusing on buyouts, I find similar results to those of Gompers and co-authors.

Finally, Gompers et al. (2016) report that PE investors also expect to create value by improving incentives (61%) and improving corporate governance (47%). In the sample, I find much lower shares of deals in which PE funds plan to pursue improving incentives and improving corporate governance. Gompers et al. (2016) also report that improving incentives and improving corporate governance remain important sources of value post-investment, increasing by 4% and 5%, respectively, relative to pre-investment expectations. I observe the same effect, although the two strategies continue to lack behind other strategies. Gompers et al. (2020) report that venture capitalists say they also help in hiring board members (58%). I

find that PE firms plan to change board members or the shareholder structure in 14% of the deals pre-investment, increasing to 25% when looking at any time VCPs.

4.8. Cluster analysis

The previous sections of this paper examined PE firms' value creation strategies. The analyses consider each strategy separately. In this section, I examine whether certain value creation strategies are associated with certain portfolio companies. To answer this question, I follow Gompers et al. (2016) and employ cluster analysis to explore heterogeneity in the soft information indictors, and factor analysis to explain how soft information indicators relate to each other. In doing so, I attempt to classify different groups of value creation strategies and map these groups into the notion of financial engineering, operational improvements, cash management, revenue growth, and management and corporate governance.

I first use cluster analysis to divide the sample of deals into groups that contain investments with common characteristics. Specifically, cluster analysis groups the portfolio companies in such a way that the portfolio companies in the same cluster are more similar to each other regarding the plan items than they are to portfolio companies in other clusters. I use Stata's kmeans program for this purpose and implement the Jaccard measure of distance, as the underlying variables are binary. I restrict the sample to portfolio companies for which I observe an initial VCP. I report the results with four clusters.[17] The results are qualitatively similar with five clusters.

Table 23 shows the results of the cluster analysis based on initial VCPs. The first cluster is characterized by a very high of share of deals that engage in the buying or upgrading assets (89%), but with minimal shares for other indicators.

[17] I report plots generated from the within sum of squares (WSS) and its logarithm (log (WSS)) for all cluster solutions, the η^2 coefficient, which is similar to the R^2 coefficient, and the proportional reduction of error coefficient in Figure A.1 in the Appendix.

The second cluster is characterised by a mix of operational improvements, (inorganic) revenue growth, and management and corporate governance. The portfolio companies in this cluster are more likely to improve operations including strategies to buy and upgrade assets (50%) and cut costs (44%), are more likely to pursue acquisitions deal (55%), and are more likely to change the CEO, the CFO, and other senior management (49%, 53%, and 68%, respectively). This cluster also has high shares, but not the highest, for changing the mix of products and services (43%), pursuing international expansion (32%), and improving marketing (46%). I interpret this cluster as inorganic revenue growth and changing management. Acquisitions are more complex and thus require specific management and execution skills.

The third cluster is characterised by plans to optimise the capital structure (97%) and buying and upgrading assets (77%). This suggests portfolio companies take on additional debt to finance capital expenditure. This cluster also has the second highest share of pursuing an acquisition (32%). Again, this suggests that portfolio companies take on additional debt to finance acquisitions.

The fourth cluster is characterised by (organic) revenue growth, as 84% of the deals have an initial plan to change the mix of products or services and 57% of the deals have an initial plan to improve marketing (57%). This cluster also has the highest share of deals planning to improve the pricing strategy. Taken together I the second cluster, I interpret this cluster as organic revenue growth.

Table 23: Cluster analysis

The table reports the results of a cluster analysis using partition clustering that divides the observations into a distinct number of non-overlapping groups of initial plan items (kmeans in Stata). The analysis generates four clusters. The sample size is 1,136 deals.

	Fund plans to…		Mean			
Strategy / plan item	Deal count	Fraction	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Financial engineering	**395**	**0.35**				
Optimize capital structure	346	0.30	0.00	0.25	0.97	0.02
Improve incentive systems	93	0.08	0.03	0.14	0.11	0.04
Operational improvements	**951**	**0.84**				
Buy or upgrade fixed assets	749	0.66	0.89	0.50	0.77	0.40
Sell fixed assets	78	0.07	0.05	0.12	0.07	0.02
Divest non-core business units	70	0.06	0.02	0.10	0.07	0.05
Reduce costs	293	0.26	0.12	0.44	0.25	0.20
Improve IT systems	188	0.17	0.05	0.35	0.10	0.16
Improve distribution	173	0.15	0.07	0.22	0.13	0.22
Improve corporate structure	124	0.11	0.01	0.27	0.08	0.07
Cash management	**154**	**0.14**				
Improve payment terms	126	0.11	0.06	0.22	0.10	0.05
Improve inventory management	50	0.04	0.01	0.09	0.03	0.04
Revenue growth	**838**	**0.74**				
Target market share	159	0.14	0.07	0.22	0.11	0.17
Pursue acquisitions	376	0.33	0.19	0.55	0.32	0.24
Change mix of products or services	420	0.37	0.07	0.43	0.31	0.84
Pursue international expansion	244	0.21	0.11	0.32	0.15	0.32
Change pricing strategy	158	0.14	0.04	0.18	0.12	0.27
Improve marketing	356	0.31	0.10	0.46	0.22	0.57
Improve product quality	114	0.10	0.05	0.10	0.13	0.15
Governance engineering	**548**	**0.48**				
Change CEO	222	0.20	0.05	0.49	0.10	0.10
Change CFO	223	0.20	0.04	0.53	0.10	0.06
Change other senior management	298	0.26	0.04	0.68	0.12	0.16
Improve corporate governance	52	0.05	0.02	0.09	0.05	0.00
Change board structure	157	0.14	0.08	0.20	0.18	0.09
Total deal count	**1,136**		**179**	**270**	**372**	**315**

Table 24 replicates the cluster analysis for VCPs throughout the life of a deal. The first cluster contains by far the largest number of deals (651) and is characterized by optimising capital structure (57%), buying or upgrading assets (74%), cutting costs (80%) pursuing acquisitions (54%), changing the mix of products or services (61%), improving marketing (63%), and changing CEO, CFO and other senior management (53%, 44%, and 60%, respectively). This cluster is comparable to the second cluster in the previous analysis. However, the relative importance of buying and upgrading fixed assets, cutting costs, changing the mix of products and services, and improving marketing increased. Pursuing acquisitions and changing other senior management remained the same. This cluster now also includes deals with the highest share of improving receivable and payable terms and improving pricing strategies.

The second cluster includes 134 deals and features pursuing acquisitions (95%), spinning off business units (43%), pursuing international expansion (49%), and changing the CEO (31%). The third cluster contains 194 deals focused on buying and upgrading assets (95%) and optimising the capital structure (53%), similar to the third cluster based on initial VCPs. The fourth cluster contains 157 deals focused on changing the mix of products and services (94%) and improving marketing (62%).

For the vast majority of the deal in the sample, PE firms expect to create value through a combination of financial engineering, operational improvements, revenue growth, and management strategies. Strategies, as grouped in clusters 2, 3, and 4, appear to be more focused on either inorganic growth or financial engineering combined with capital expenditure or pure organic growth. Buying and upgrading assets appears to an important component of any VCP, with shares larger than 50% in each cluster.

Table 24: Cluster analysis (value creation plans throughout the life of a deal)

The table reports the results of a cluster analysis using partition clustering that divides the observations into a distinct number of non-overlapping groups of plan items throughout the life of a deal (kmeans in Stata). The analysis generates four clusters. The sample size is 1,136 deals.

	Fund plans to…		Mean			
Strategy / plan item	Deal count	Fraction	Cluster 1	Cluster 2	Cluster 3	Cluster 4
Financial engineering	**614**	**0.54**				
Optimize capital structure	566	0.50	0.57	0.39	0.53	0.25
Improve incentive systems	139	0.12	0.18	0.08	0.03	0.03
Operational improvements	**1,047**	**0.92**				
Buy or upgrade fixed assets	833	0.73	0.74	0.52	0.95	0.63
Sell fixed assets	234	0.21	0.29	0.10	0.10	0.06
Divest non-core business units	235	0.21	0.24	0.43	0.03	0.11
Reduce costs	631	0.56	0.80	0.37	0.15	0.18
Improve IT systems	262	0.23	0.35	0.07	0.04	0.13
Improve distribution	277	0.24	0.34	0.06	0.03	0.25
Improve corporate structure	227	0.20	0.30	0.13	0.03	0.06
Cash management	**329**	**0.29**				
Improve payment terms	292	0.26	0.40	0.04	0.08	0.09
Improve inventory management	104	0.09	0.15	0.00	0.02	0.03
Revenue growth	**981**	**0.86**				
Target market share	210	0.18	0.26	0.17	0.02	0.09
Pursue acquisitions	527	0.46	0.54	0.95	0.13	0.15
Change mix of products or services	602	0.53	0.61	0.35	0.05	0.94
Pursue international expansion	350	0.31	0.33	0.49	0.08	0.35
Change pricing strategy	354	0.31	0.46	0.04	0.10	0.20
Improve marketing	542	0.48	0.63	0.13	0.10	0.62
Improve product quality	201	0.18	0.24	0.04	0.06	0.18
Governance engineering	**788**	**0.69**				
Change CEO	428	0.38	0.53	0.31	0.14	0.08
Change CFO	331	0.29	0.44	0.14	0.06	0.07
Change other senior management	456	0.40	0.60	0.24	0.08	0.13
Improve corporate governance	74	0.07	0.09	0.02	0.05	0.01
Change board structure	279	0.25	0.24	0.27	0.28	0.22
Total deal count	**1,136**		**651**	**134**	**194**	**157**

4.9. Factor analysis

As an alternative to cluster analysis, I perform factor analysis to extract the main dimensions of variation in the plan items. Factor analysis seeks to identify correlations among observed variables in terms of underlying unobserved factors of a smaller dimension. Essentially, factor analysis models the observed variables as a function of the unobserved factors.

I first report pairwise tetrachoric correlations of initial VCPs in Table 25, as the plan items are binary. I then use these correlations to perform a principal factor analysis. Many of the plan items are correlated. It is worth highlighting a few correlation. PE firms that plan to engage in buying new assets such as property, plant, or equipment, or improving existing production processes, are also more likely to focus on improving quality (0.3491). In contrast, PE firms that plan to engage in selling portfolio company assets that they deem inefficient or that relate to non-core business activities, are also more likely to focus on cost cutting (0.4606) or organisational changes (0.3773).

Sample PE firms that plan to impose cost discipline, are also more likely to change the company's product pricing strategy (0.3902). This suggests that PE firms plan to pass on cost reductions to their customers in form of lower prices to gain a higher market share. I show in the next essay that this is indeed the case. Cost discipline may be enforced with redundancies and as a consequence changes to the organisational structure (0.4131).

Proper management of receivables, payables and inventory all fall under effective cash management. PE firms in the sample that intent to improve collection and payment terms, are more likely to plan to improve inventory management as well (0.5166). To maintain optimal inventory levels, companies need robust IT systems to accurately track and maintain control of inventory levels (0.4821). PE firms' initial VCPs are also more likely to

include the adoption of a leaner cost structure (0.3928). All these strategies are accompanied by plans to hire a new CFO to create a cash management culture (0.3062).

PE firms that target market share seem to execute this strategy by means of organic and inorganic growth: change of mix of products or services (0.3101) and by pursuing acquisitions (0.3650). Changes to the mix of products or services relate to changes to pricing (0.4262) and to plans to improve marketing (0.4243). Improving marketing is related to other senior management changes (0.3994), which suggests hiring of a new head of sales to execute the new marketing strategy. Related to this, PE firms that plan to change the mix of products or services, or that plan to more effectively market products, are also more likely to focus distribution too.

PE firms that plan to change the CEO, are also more likely to recruit other senior management members—for instance a new CFO (0.4918) or new head of IT (0.5100). Plans to change the CEO are more likely to be accompanied by plans to introduce an incentive system that links the executives' salary to the portfolio company's performance (0.2854). PE firms' initial plans to hire new management seem to be related to more radical changes of the portfolio company's organisational structure too. Change of management except the CEO and the CFO shows the highest correlation (0.4901).

When analysing any time VCPs, most of the correlations remain (unreported). In what follows, I highlight key differences. A general pattern emerges that any time VCPs typically have a cost cutting component. Compared to initial VCPs, cutting costs has much higher positive correlations with any other plans. This suggests that PE firms generally plan to keep an eye on cost. Cost discipline seem to come alongside plans to change the CEO (0.4279). This suggests that incumbent management may have not been good at managing costs and the new CEO will be tasked to implement the new regime.

Table 25: Correlation matrix

The table shows pairwise tetrachoric correlation of initial plan items.

Fund plans to…	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
(1) Optimize capital structure	1.0000										
(2) Improve incentive systems	0.2414	1.0000									
(3) Buy or upgrade fixed assets	0.1591	-0.0364	1.0000								
(4) Sell fixed assets	0.2166	0.1388	0.2964	1.0000							
(5) Divest non-core business units	0.1876	0.0573	-0.2083	0.2903	1.0000						
(6) Reduce costs	0.1864	0.1363	0.0135	0.4606	0.1844	1.0000					
(7) Improve IT systems	0.0375	0.2692	0.0394	0.1021	-0.1899	0.1517	1.0000				
(8) Improve distribution	0.0350	0.1319	0.1143	0.1548	-0.0880	0.1476	0.2924	1.0000			
(9) Improve corporate structure	0.1198	0.3510	-0.0477	0.3773	0.1772	0.4131	0.2683	0.2133	1.0000		
(10) Improve payment terms	0.1601	0.1042	0.2003	0.2868	0.0797	0.3928	0.2178	0.2670	0.3065	1.0000	
(11) Improve inventory management	-0.0062	-0.0059	0.2290	0.2452	-0.0959	0.1394	0.4821	0.1861	0.1540	0.5166	1.0000
(12) Target market share	-0.0162	0.0253	-0.0516	-0.1310	-0.0993	0.2162	0.1972	0.2733	0.0736	0.1755	0.1820
(13) Pursue acquisitions	0.1195	0.2154	-0.1236	0.0751	0.3267	0.1472	0.1766	0.0983	0.1735	0.1159	0.0874
(14) Change mix of products or services	0.0536	0.1874	-0.1501	0.0722	0.0214	0.1950	0.2819	0.3808	0.1827	0.1136	0.0862
(15) Pursue international expansion	-0.0638	0.1652	-0.1278	-0.1166	-0.0522	0.0739	0.1230	0.1202	0.2236	-0.0171	0.0992
(16) Change pricing strategy	0.0873	0.1438	0.1321	0.1867	0.0086	0.3902	0.1462	0.1828	0.1498	0.2433	0.2734
(17) Improve marketing	-0.0102	0.1241	-0.0854	0.0653	-0.0615	0.1731	0.3496	0.3815	0.2145	0.0456	0.2303
(18) Improve product quality	0.1275	0.0527	0.3491	0.0427	-0.1449	0.2085	0.1993	0.3101	0.0890	0.1504	0.2504
(19) Change CEO	0.1101	0.2854	-0.1635	0.2082	0.1061	0.2718	0.1929	0.0936	0.3300	0.1469	0.0409
(20) Change CFO	0.1501	0.1133	-0.0176	0.2440	0.0323	0.2521	0.4739	0.1876	0.3404	0.3076	0.1867
(21) Change other senior management	0.1079	0.3519	-0.0836	0.2322	0.0358	0.2763	0.3911	0.2304	0.4901	0.3062	0.2315
(22) Improve corporate governance	0.1523	0.2972	0.0697	0.2340	0.0560	0.2194	0.3066	0.1416	0.3346	0.2079	-0.0297
(23) Change board structure	0.0801	0.2082	-0.0909	-0.0906	0.0721	0.0899	0.2030	-0.0508	0.1698	0.1634	0.0039

Table 25 (continued)

Fund plans to…	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)
(12) Target market share	1.0000											
(13) Pursue acquisitions	0.3650	1.0000										
(14) Change mix of products or services	0.3101	0.1522	1.0000									
(15) Pursue international expansion	0.2322	0.2405	0.2450	1.0000								
(16) Change pricing strategy	0.2609	0.0723	0.4262	-0.0549	1.0000							
(17) Improve marketing	0.2233	0.0826	0.4243	0.1530	0.3057	1.0000						
(18) Improve product quality	0.1251	-0.0666	0.2268	0.0422	0.2846	0.1523	1.0000					
(19) Change CEO	0.1467	0.1663	0.0828	0.0985	0.0848	0.2019	-0.0235	1.0000				
(20) Change CFO	0.2179	0.2835	0.2634	0.2234	0.1726	0.1988	0.0633	0.4918	1.0000			
(21) Change other senior management	0.1534	0.1697	0.2880	0.2432	0.2002	0.3994	0.1046	0.5100	0.6271	1.0000		
(22) Improve corporate governance	0.2288	0.2311	0.1129	0.1122	0.0309	0.0682	0.0850	0.3212	0.2964	0.2360	1.0000	
(23) Change board structure	0.0005	0.0547	0.0311	0.0440	0.0381	-0.1187	0.0277	0.0878	0.2122	0.0928	0.3149	1.0000

Next, I employ factor analysis using tetrachoric correlations. Table 26 reports factor loadings (rotated) for the first four factors, which explain 81.43% of the variance in PE firms' initial VCPs and have natural interpretations. I retain four factors. I base the decision on the number of factors on three criteria: Eigenvalue larger than 1 (Kaiser-Guttman criterion), scree plot (factor and Eigenvalue), and comprehensibility. I report Eigenvalues in Table 26 and the scree plot in Figure A.2 in the Appendix.

The first factor represents the management and corporate governance theme. It loads positively on changing the CEO (0.5726), changing the CFO (0.6857), changing other senior management (0.6107), improving corporate governance (0.5426), and changing the board or shareholder structure (0.4410). The factor also loads on improving incentive systems (0.4358). With management changes at present, PE firms seem to plan improving the organizational structure too (0.4654).

The second factor has high loadings on targeting market share (0.5280), changing the mix of products or services (0.7222), changing the pricing strategy (0.5266), and improving marketing (0.6090), and thus represents the revenue growth strategy. The factor also loads on improving distribution (0.4663).

The third factor loads on buying or upgrading assets (0.6157), improving collection and payment terms (0.4450), and improving inventory management (0.6560). The factor also loads positively on improving quality (0.4237). The forth factor has high positive loadings on selling existing assets (0.6789), spinning off non-core parts of the business (0.5219), and cutting costs (0.5614). The third and the fourth factor are representative of operational engineering.

Table 26: Factor analysis

The table reports the results of a factor analysis of initial plan items. Likelihood-ratio test: independent vs. saturated: Chi2(153) = 376.57; *p*-value = 0.0000.

Panel A: Principal factors

Factor	Eigenvalue	Difference	Proportion	Cumulative
Factor 1	4.4658	2.8174	0.4242	0.4242
Factor 2	1.6484	0.1513	0.1566	0.5808
Factor 3	1.4971	0.5359	0.1422	0.7230
Factor 4	0.9612	0.2239	0.0913	0.8143

Panel B: Factor loadings

Strategy / plan item	Factor 1	Factor 2	Factor 3	Factor 4
Financial engineering				
Optimize capital structure	0.1215	-0.0830	0.0447	0.3227
Improve incentive systems	0.4358	0.0282	-0.0977	0.1311
Operational improvements				
Buy or upgrade fixed assets	-0.1877	-0.1892	0.6157	0.1261
Sell fixed assets	0.0902	-0.1204	0.2302	0.6789
Divest non-core business units	0.0547	-0.0458	-0.3661	0.5219
Reduce costs	0.0755	0.2430	0.0620	0.5614
Improve IT systems	0.5245	0.1290	0.3775	-0.2603
Improve distribution	-0.0160	0.4663	0.2192	0.0081
Improve corporate structure	0.4654	0.0600	-0.0080	0.3224
Cash management				
Improve payment terms	0.2161	-0.0200	0.4450	0.2944
Improve inventory management	0.0813	0.1096	0.6560	-0.0450
Revenue growth				
Target market share	0.0511	0.5280	-0.0200	-0.1043
Pursue acquisitions	0.2892	0.2058	-0.2510	0.1403
Change mix of products or services	-0.0455	0.7222	-0.0772	0.0327
Pursue international expansion	0.2711	0.2723	-0.1604	-0.1916
Change pricing strategy	-0.2167	0.5266	0.1942	0.2734
Improve marketing	0.0137	0.6090	0.0367	-0.0574
Improve product quality	-0.1593	0.2766	0.4237	0.0293
Governance engineering				
Change CEO	0.5726	-0.0016	-0.1539	0.1561
Change CFO	0.6857	0.0461	0.0734	0.0248
Change other senior management	0.6107	0.1803	0.0268	0.0733
Improve corporate governance	0.5426	-0.1041	0.0061	0.1321
Change board structure	0.4410	-0.2221	-0.0050	-0.0300

Employing factor analysis on any time VCPs produces similar results (unreported). Again, I opt for four factors based on factors with Eigenvalue larger than one, scree plot, and the amount of the variance explained. The first factor has the highest loadings on changes in management (on all levels). The second factor has high positive loadings on variables that relate to operational engineering: buying or upgrading fixed assets (0.5017), selling fixed assets (0.7076), improving payment terms (0.6984), and improving inventory management (0.7080).

The third factor has the highest loadings on changing the mix of products or services (0.5713), changing the pricing strategy (0.5273), improving marketing (0.5776), and improving quality (0.5769), whereas the fourth factor has the highest loadings on variables that relate to inorganic growth (0.5677) and targeting an increase in market share (0.4774). The fourth factor negatively loads on buying and upgrading assets (-0.4984), which suggests a trade-off between organic and inorganic growth strategies.

4.10. Conclusion

Summary of results

In this paper, I quantify textual information on PE firms' VCPs. For each deal in the sample, I hand-collect textual information on operational practices of PE firms from proprietary investment documents, board presentations, and quarterly reports they provide to limited partners. I use this information to document PE firms' plans at the time of investment to create value, track the achievement of these plans, and capture whether new plans are introduced during the course of a deal.

Overall, the results suggest that PE funds are not passive investors and actively add value to their portfolio companies. Post investment PE investors continue to claim they create value from a combination of financial engineering, operational improvements, cash management, revenue growth, and management and corporate governance. Overall, the post

investment sources of value creation are somewhat greater than the sources of value identified pre-deal.

I find that PE firms follow a rich variety of plans to add value to their portfolio companies and typically use a combination of five value creation strategies. In the sample, the three most popular plans to create value at the time of investment are buying new or upgrading fixed assets; changing the mix of products or services; and pursuing acquisitions. PE firms in the sample have become more hands-on over time, pursuing in particular financial engineering, revenue growth, and management and governance strategies in increasing fashion.

Which individual plans PE firms follow depends very much on the type of the deal. On the one hand, buyouts tend to focus on optimizing capital structure, pursuing inorganic growth, changing mix of products or services, and replacing other senior management. On the other hand, growth capital or early stage deals tend to focus primarily on capital expenditures, and they pursue other VCPs more opportunistically. Funds tend to be more hands-on when they hold a majority stake in a portfolio company. Funds focus more actively on financial engineering, revenue growth and management strategies in an inorganic deal. Similarly, they are more active in all areas of value creation strategies when they plan to replace existing management.

PE firms report achieving most of their plans. Some plans are easier to achieve than others. On the one hand, PE firms managed to sell existing assets or replace the CFO and other senior management on more than 95% of the deals in which these were part of their initial plans. On the other hand, they could increase market share, improve corporate governance, pursue international expansion or grow inorganically by pursuing acquisitions in less than 75% of the deals in which these were part of initial plans.

PE firms actively monitor their investments and introduce new plans to create

additional value or turn around deals that are not performing up to scratch. For instance, one in every five deals sees a plan to replace the CEO when this plan item is not part of a PE firm's initial VCP. The most popular new plans—introduced a few years into the life of a deal—differ from initial plans, and include cost reduction, optimizing capital structure, and changing CEO.

I also use cluster analysis to divide the sample of deals into groups that contain deals with common characteristics. As an alternative to cluster analysis, I use factor analysis to extract the main dimensions of variation in the characteristics of the sample firms. Both the cluster analysis and the factor analysis appear to divide portfolio companies into those that have a focus on operational improvements versus financial engineering and those that have a focus on investing in new management versus the incumbent. These results provide one expected and one unexpected result. I do not find it surprising that PE firms pursue strategies that are largely based on financial engineering and others pursue strategies based on operational engineering.

Contribution

I contribute to the literature on value creation in PE based on evidence from surveys and qualitative studies. The analysis carried out in this paper derives from quantifying textual data that reflect the actual plans and actions taken by PE firms. I document exactly what PE firms set out to achieve (and track their record of success). This allows me to sidestep issues related to survey methodology, in particular the worry that PE firms portrait themselves in a positive light or report selectively. Unlike previous studies, I identify two additional value creation strategies that have been increasingly adopted by PE firms but have not featured in academic surveys: Cash management and revenue growth.

Implications

Whether PE firms actually create value—and if so, how exactly they do it—has been

elusive so far. Three main implications emerge from this analysis. First, PE funds can contribute to more diverse financial infrastructure and provide companies with both long-term risk capital and industry expertise. The results show that PE funds may be able to create financial and economic value by improving the debt capacity of the firms they invest in, their operations, cash management, revenue, and governance. Second, value is created when industry expertise, managerial skill, and access to additional financing are combined within a framework that is intended to generate positive economic outcomes. Hence, providing risk capital without clear planning and leadership is often insufficient. Third, in the EBRD regions, the main value creation channels are operational improvement and revenue growth. This suggests that companies are at a greater advantage when they are funded by PE firms who are better at identifying high growth firms and who are more "hands-on" during the time that they manage these firms.

Future research

Following this descriptive analysis, an empirical analysis could examine the potential determinants of achieving a VCP and if VCPs are tailored to a portfolio company's specific needs and circumstances. A related question is, what determines the introduction of new plan items and strategies a few years after the investment.

5. Value creation outcomes and persistence

Abstract

I study how private equity (PE) firms generate returns for their investors, by estimating the effects of PE funding on portfolio companies' operational efficiency and market power. I confirm prior findings that PE funding leads to operational efficiency: both labour productivity and total factor productivity improve as PE-backed companies ramp up investment, employment, and sales. I find no evidence that PE-backed companies increase their market power. In fact, the PE-backed companies in the sample reduce their price markups by 6%, which allows them to gain substantial market shares. I find that the majority of the operational improvements instigated by PE firms persist even after they fully exit their investments. These findings are consistent with PE firms' ability to create long-lasting value as opposed to maximizing short-term returns at the expense of portfolio companies.

JEL Classification: D24, G24, G32, G34, L11, L25

Keywords: Private equity, value creation, persistence

5.1. Introduction

Do PE funds increase operational efficiency at portfolio companies or do they exploit the market power of target companies they invest in? If PE funds do deliver efficiency improvements to their portfolio companies, do these improvements survive beyond the tenure of PE ownership? The answers to these questions can both shed light on the sources of value creation for investors in PE and have profound implications for assessing the overall impact PE has on economic welfare.

Against this background, I investigate how PE firms affect the real outcomes of their portfolio companies. I draw on recent advances in the production-function literature to estimate changes in total factor productivity and company-level price markups. I also examine changes in investment in capital stock and inventory management as well as changes in financial performance.

Identifying the impact of PE (PE) involvement on efficiency and market power is challenging. A key empirical challenge arises because PE firms endogenously select which companies to invest in. It is plausible that selection reflects, in part, a PE fund's expectations of the scope for changes in productivity and market power. For instance, PE firms may target industries undergoing consolidation or deregulatory changes—changes that may provide a boost to the efficiency or pricing power of companies operating in these industries regardless of the involvement of PE firms.

I combine a traditional difference in differences strategy with matching methods to address this selection challenge. To reduce selection bias, I form a set of control companies matched on country, industry, size, and the year of the PE transaction. These controls are similar in spirit to those used by Bharath et al. (2014) and Davis et al. (2014) in their studies of PE, jobs, and productivity in the U.S.

A second empirical challenge relates to the measurement of productivity and market power. Disentangling productivity improvements from changes in market power is challenging when micro-level data on the prices companies charge for their products are unavailable. Absent micro-level price data, researchers need to rely on a set of assumptions about how companies compete in the product market to estimate market power, which is typically measured by price markups over production costs. I follow recent advances in the industrial organization literature on production function estimation suggested by De Loecker and Warzynski (2012) and De Loecker and Eeckhout (2017), who impose minimal assumptions on market competition. By using this approach, I estimate time-varying company-level markups consistently so that I can track how a company's productivity and market power change while under PE ownership.

The results provide evidence of a significant and positive impact of PE ownership on revenue growth, employment, investment, and operational efficiency at portfolio companies. Over the time companies spend in a PE firm's portfolio (an average of five years in the sample), their revenues increase by an average of 59%, employment by 31%, the capital stock per employee by 31%, labour productivity by 17%, and total factor productivity by 4%, over and above the corresponding changes at matched control companies. At the same time, I find that markups charged by portfolio companies fall by an average of 6%. This suggests that cost reductions achieved through operational improvements are passed on to consumers via lower prices.

The results indicate that the majority of the effects documented survive beyond PE firms' tenure in portfolio companies. Notably, these companies continue to enjoy revenue growth and maintain higher levels of efficiency even after PE firms fully realize their investments. As part of the analysis, I also identify inorganic deals in which PE firms grow a

portfolio company via mergers and acquisitions (M&A) and show that the results are not driven by this subset of deals.

The analyses are based on unique data for a 25-year Panel of 1,444 deals in 20 transition economies in primarily Central and Eastern Europe, which were financed by 178 PE funds. I manually match each deal to a company in Orbis, a global database provided by BvD. Orbis provides harmonized balance sheet information on a rich set of public and private companies and therefore allows me to calculate measures of efficiency and market power in a consistent manner across countries, and also to create comparable control groups for the econometric analysis.

I contribute to the literature in two ways. First, I add to the growing evidence on the real operational implications of PE by providing direct estimates of key outcomes such as TFP and market power. Existing literature shows that leveraged buyouts contribute to raising aggregate productivity by increasing capital expenditures (Boucly et al. 2011) and reallocating resources to more productive plants amid net job destruction (Davis et al. 2014, Bharath et al. 2014). Unlike previous studies, I emphasize the role of lowering price markups in driving value creation through organic growth. The only other study of market power and pricing that I am aware of is Fracassi et al. (2017), who draw on product-level price data to show that U.S. consumer-goods companies acquired by PE firms raise prices only marginally on their existing products and that PE ownership benefits consumer-goods customers through new product introductions and increased variety. Unlike Fracassi et al., the data used in this paper encompass all industries PE firms have targeted (not just consumer goods). The drawback of the more comprehensive sample is that I do not observe product-level prices (though production-function estimation helps mitigate this drawback).

The finding that PE-backed companies do not increase their markups generalizes Fracassi et al.'s (2017) conclusion that PE deals are not harmful to U.S. consumers to a wider

range of industries and countries. More importantly, I add nuance to this conclusion by showing that consumers benefit as the gains of productivity improvements are passed on to consumers in the form of lower prices. I am able to pinpoint the exact operational changes that PE firms carry out in their portfolio companies to enable them to pass on cost savings to consumers.

Second, I provide the first evidence on whether operational improvements persist beyond PE ownership and how PE firms time their exits. Previous literature has documented that PE firms improve sales and operational efficiency at portfolio companies. But is this a temporary effect, deriving from relatively short-lived change in ownership that imposes high-powered incentives on senior management to improve efficiency? Or is it a more permanent effect, deriving from long-lasting changes in a company's corporate governance, managerial capital, or business strategy? The findings are consistent with PE firms implementing structural changes, the effects of which persist beyond their investment horizon. In addition, I find evidence that PE exits coincide with industry-wide downturns in demand, which suggests that PE firms time their exits.

5.2. Data and sample

The data come from the European Bank for Reconstruction and Development (EBRD). The EBRD is among the largest investors in PE funds that operate in emerging markets. Since it started operations in 1991, the EBRD has committed USD 5,165 million to PE funds (as of December 2017).[18] As part of its mandate, the EBRD seeks to contribute to the development of the PE industry in its region, which spans Central, Eastern, and Southern Europe, the Baltics, the Commonwealth of Independent States (CIS), and the Middle East and North Africa. Given the coverage and the obligatory reporting demanded by the EBRD, the data do not suffer a survivor bias resulting from only the best or only the largest fund

[18] See http://www.ebrd.com/equity-funds.html for details.

managers contributing data.

The dataset extends the sample used in Cornelli et al. (2013). The 178 sample funds were raised between 1992 and 2017 with an average (median) size of USD 163.2 million (USD 88.5 million). After excluding a small number of deals in countries not covered in Orbis, the sample contains 1,444 deals from 20 countries, with an average (median) of 9.9 (9) deals per fund.[19]

Table 27 provides a sample overview by country and time period. The top three countries are Russia, Poland, and the Czech Republic, which together account for just under half the sample. Deal activity has varied over time, with the busiest periods in 1997-2001 (433 deals) and 2012-2017 (393 deals). I follow each deal from inception to the earlier of exit (which may take place through a trade sale or an initial public offering on a stock market), write-off, or December 2017. As of the end of 2017, 944 deals have been exited (including 131 write-offs), while 500 deals remain in the funds' portfolios. The average (median) deal size is USD 13.9 million (USD 5.4 million), indicating that most portfolio companies are medium-sized enterprises.

[19] The excluded countries are Albania, Armenia, Azerbaijan, Belarus, Cyprus, Egypt, Georgia, Jordan, Kosovo, the Kyrgyz Republic, Moldova, Mongolia, Tunisia, and Turkmenistan, accounting for 105 deals over our sample period.

Table 27: Sample overview

The sample consists of 1,444 investments by 178 PE funds investing in Central and Eastern Europe and the Central Asian republics of the former Soviet Union as well as North Africa. The PE funds were raised and closed between 1992 and 2017 and made investments between 1992 and 2017. I track each investment from the year of investment to the earlier of exit, write-off, or 31 December 2017 when the sample ends. I record whether it has been exited ("FR") or remains in the funds' portfolios as of December 2017 ("UR"). Tracking each deal over time results in an unbalanced panel.

	Year of investment					Case status		All deals
Country	1992-1996	1997-2001	2002-2006	2007-2011	2012-2017	FR	UR	
Panel A: Number of deals								
Bosnia & Herzegovina	-	4	5	1	2	10	2	12
Bulgaria	-	13	13	23	7	43	13	56
Croatia	-	9	5	4	6	15	9	24
Czech Republic	12	33	16	28	13	82	20	102
Estonia	2	23	16	7	19	44	23	67
Greece	-	-	2	3	12	2	15	17
Hungary	10	40	14	10	4	73	5	78
Kazakhstan	-	12	2	5	13	18	14	32
Latvia	-	6	13	3	7	17	12	29
Lithuania	1	22	5	5	4	31	6	37
Morocco	-	-	-	-	22	3	19	22
North Macedonia	-	12	3	-	4	16	3	19
Poland	49	90	30	55	53	201	76	277
Romania	4	31	16	26	23	68	32	100
Russia	36	97	49	58	84	202	122	324
Serbia	-	-	2	2	14	4	14	18
Slovak Republic	-	15	3	3	5	21	5	26
Slovenia	7	15	1	4	4	23	8	31
Turkey	-	-	3	12	75	15	75	90
Ukraine	27	11	9	14	22	56	27	83
All countries	148	433	207	263	393	944	500	1,444
Panel B: Deal size (USD millions)								
Mean	3.95	4.53	14.34	25.30	19.27	9.04	22.28	13.90
Median	2.01	2.18	5.58	13.85	9.44	3.18	10.86	5.40

For each portfolio company in the sample, I estimate measures of value creation (including productivity and price-cost markups), as described in the remainder of this section. Summary statistics are provided in Section 2.3.3.

The company-level measures are based on BvD's Orbis database. Orbis provides consolidated accounting data taken from income statements and balance sheets as well as data on employment and industry for both stock market listed and privately held companies, covering the vast majority of companies operating in the EBRD's investment region. To the extent possible, Orbis reports data in a manner that is consistent and comparable across countries and years.

I manually link sample companies to Orbis by name (including historical ones where names have changed). Of the 1,444 companies in the full sample, I am able to link 1,228 to Orbis. For 331 of these matches, Orbis lacks data around the time of PE investment (i.e., the period starting five years before and ending five years after PE ownership), which I exclude. The result is a sample of 897 portfolio companies (I will refer to this sample as the Orbis sample). The number of observations used in the empirical specifications will vary depending on data availability.

Using Orbis, I construct a number of measures related to four sources of value creation. The first is "financial engineering", which includes a portfolio company's leverage, net debt to EBITDA, and the (implicit) interest rate it pays on its outstanding debt. The second is "operational improvements", which includes capital intensity, labour productivity, and TFP.[20] The third is "cash management", which includes working capital and creditor and collection periods in days. The fourth is "revenue growth", which includes sales, price-cost

[20] TFP captures the efficiency with which all inputs into production (labour, materials, and capital) are used. There is a long-established literature on TFP estimation, which carefully deals with the challenge that companies' input choices are correlated with the error term, given that companies likely choose their inputs based on their current and expected future productivity (which is observed to the company but not to the econometrician). I follow the production-function approach to TFP estimation pioneered by Olley and Pakes (1996), Levinsohn and Petrin (2003), and Ackerberg et al. (2006).

markups, and market shares. I describe how I measure markups in the next subsection. I also construct measures of each company's profitability using data on cash flows, operating margins, and return on assets. Table A.2 in the Appendix provides detailed definitions of all variables I use.

I filter the raw data as follows. First, I remove investments that are based outside EBRD's region or investments in equities listed on a foreign exchange. The raw dataset of portfolio companies contains entries from outside the EBRD's region in some rare cases. For instance, a PE fund with a focus on Eastern Europe might have invested in a small start-up located in the U.S., which has back office functions in the region. Funds could also have invested in equities publicly listed on foreign exchanges. Such investments are removed from the analysis. Second, I eliminate all investments where I cannot identify a match in the Orbis database or the date of first PE funding received.

5.2.1. Estimating production functions

Assume production is given by $Y = L^{\beta_l} K^{\beta_k} M^{\beta_m} * \Omega$, where Ω is an unobserved technology parameter and *L*, *K*, and *M* are labour, capital, and materials, respectively. TFP is typically calculated as the residual in a Cobb-Douglas production function in logs:

$$y_{it} = \beta_l l_{it} + \beta_k k_{it} + \beta_m m_{it} + \omega_{it} \quad (1)$$

where y_{it} denotes output, l_{it} denotes labor inputs, k_{it} denotes the capital stock, m_{it} denotes material inputs, and ω_{it} denotes unobserved productivity for company *i* at time *t*. The residual from a regression of output on the three inputs should therefore result in TFP. However, it is well known since Marschak and Andrews (1944) that such a regression suffers from endogeneity: input choices are correlated with the error term since companies are likely to choose their inputs based on their productivity, which is observed to the company but not to the econometrician. OLS estimates of the coefficients in Equation 1 and the error term are then biased.

To address this endogeneity, researchers either follow the dynamic Panel literature (as in Bharath et al. 2014) or use the more structural methods pioneered by Olley and Pakes (1994) and Levinsohn and Petrin (2003).[21] The latter use observed input decisions to control for unobserved productivity shocks. The two methods essentially differ in their assumptions about how unobserved productivity evolves to identify the coefficients in Equation 1. In structural models, unobserved productivity follows an arbitrary first-order Markov process,

$$\omega_{i,t+1} = g(\omega_{it}) + \xi_{i,t+1}, \tag{2}$$

where $g(.)$ is any non-parametric function and $\xi_{i,t+1}$ is a shock to productivity. In contrast, dynamic Panel models have to make the more restrictive assumption that the Markov process is parametric and linear.

Given their ability to accommodate arbitrary productivity processes, I estimate TFP using structural methods. I implement the methodology with a Cobb-Douglas production function as in Equation 1, subject to the productivity process in Equation 2. As companies may differ across countries or industries in the intensity with which they use each input, I estimate the production function separately for each country and industry pair.[22] This allows for differences in technology across industry-country pairs. I measure capital stock as the reported book value of fixed assets and labour inputs as total staffing costs.[23] I deflate all values by the appropriate country and industry level deflator, which transforms them into real values, stripped of the effect of price changes.[24]

[21] See Ackerberg et al. (2006) for a detailed discussion of problems encountered in the identification of production functions and how structural methods differ from the use of dynamic Panel estimators.
[22] I use Rev. 2 of NACE as our industry grouping.
[23] I prefer using total staffing costs instead of number of employees. Staffing costs better capture the skill composition of a company's workforce assuming that more skilled employees get higher wages. Our TFP estimates are then less affected by the skill composition of a company's labour force.
[24] Deflators for capital goods and output are separately available for most of the countries in our sample at the 2-digit NACE Rev. 2 industry level either through Eurostat or the OECD. At its most detailed level, this corresponds to 64 industries, although deflators for capital goods are typically provided at a more aggregate level. Where Eurostat or the OECD does not provide deflators for sample countries, I rely on local sources such

I closely follow Ackerberg et al. (2006) and De Loecker and Warzynski (2012) in obtaining estimates of the production function. Estimation proceeds in two stages. In a first stage, I obtain predicted output by estimating Equation 1 via OLS and using the universe of companies available in the Orbis database. In a second stage, I compute the company's unobserved productivity ω_{it} using predicted output and regress it on a third-order polynomial approximation of past productivity (i.e., I approximate function $g(.)$ in Equation 2 non-parametrically) to recover the productivity shocks $\xi_{i,t+1}$. The production-function coefficients are then identified by using standard GMM techniques on the following moment conditions:

$$E\left[\xi_{it} | l_{i,t-1}, k_{it}, m_{i,t-1}\right] = 0. \tag{3}$$

Once I obtain a consistent set of production-function coefficients, I calculate a company's time-varying (log) TFP as follows:

$$\widehat{\omega}_{it} = y_{it} - \hat{\beta}_l l_{it} - \hat{\beta}_k k_{it} - \hat{\beta}_m m_{it}. \tag{4}$$

I note that company-level expenditures on materials and staff costs are not always available in Orbis. In particular, some countries (Greece, Kazakhstan, Latvia, Lithuania, Russia, Turkey, and Ukraine) provide better coverage for total cost of goods sold than for materials and staff costs separately. In these cases, I follow De Loecker and Eeckhout (2017) and estimate a production function with two (rather than three) inputs. Specifically, for this subset of countries, I estimate the following production function by industry for this subset of countries:

$$y_{it} = \beta_k k_{it} + \beta_v v_{it} + \omega_{it} \tag{5}$$

where v_{it} denotes total cost of goods sold, subject to the productivity process in Equation 2. The two-step estimation procedure that uses the moment conditions in Equation 3 and

as national central banks and statistical institutes or the World Bank's World Development Indicators to obtain this information.

described above then yields consistent estimates of the coefficients on cost of goods sold alongside capital. I then calculate (log) TFP as:

$$\widehat{\omega}_{it} = y_{it} - \hat{\beta}_k k_{it} - \hat{\beta}_v v_{it}. \tag{6}$$

I first deflate all variables in Orbis using appropriate country-by-industry deflators in order to estimate the production function. I work with these deflated values in the rest of the analysis. I estimate a production function for each industry and country pair in which PE funds in the sample have acquired at least one portfolio company. Because data observability affects number of companies included in the estimation for each industry-country pair, I pool together a few industries to ensure that estimation is done on at least 1,000 company-year observations.

5.2.2. Estimating price-cost markups

There is a long tradition in the industrial organization and international trade literatures to estimate markups from production data and test the assumption of perfect competition.[25] I follow De Loecker and Warzynski (2012) in deriving company-level markups from a production-function framework. Earlier methodologies require the availability of detailed price and quantity information and assumptions about market structure. This has often led researchers to focus on narrowly defined consumer markets. A key contribution of De Loecker and Warzynski is that their approach provides markup estimates without the need for data on prices and quantities and without specifying how companies compete in the product market.

De Loecker and Warzynski (2012) assume cost-minimizing firms with access to a variable input of production (e.g., materials or labour). Their approach relies on the insight that the output elasticity of this input equals its expenditure share in total revenue when price equals marginal cost, i.e., when markup = price/marginal cost = 1. With imperfect

[25] See Hall et al. (1986), Hall (1988), and Hall (1989) for earlier contributions. Klette (1999) provides a more recent example using dynamic Panel estimation techniques.

competition, firms can charge a price above their marginal cost, thereby introducing a wedge between the input's revenue share and its output elasticity. Given consistent estimates of any input's output elasticity, the ratio of this elasticity to the input's revenue share provides a consistent estimate of a company's markup.

Table 28 reports summary statistics of company-level markups for the *universe* of companies with data available in Orbis, broken down by country. Average markups typically range from 1.20 to 1.80, implying that the average company charges a price that is 20% to 80% percent higher than its marginal cost. Average markups are higher than medians, indicating that a number of companies are able to charge prices that significantly exceed their marginal cost.

Table 28: Summary statistics on markup estimation

The table reports summary statistics on company-level markups from the estimation of a Cobb-Douglas production function by industry and country in the sample. Observations indicate the number of company-year entries for which markups are calculated. Number of industries shows for each country how many industries the production function is separately estimated.

Country	Mean	Median	Std. Dev	Observations	Number of industries
Bosnia & Herzegovina	1.73	1.22	1.82	11,380	4
Bulgaria	5.96	4.01	5.63	470,124	14
Croatia	1.24	1.11	0.50	417,322	10
Czech Republic	1.75	1.13	2.00	658,647	33
Estonia	1.61	1.19	1.51	247,204	20
Greece	1.40	1.23	0.75	44,759	8
Hungary	2.66	1.26	3.35	114,072	15
Kazakhstan	1.17	1.12	0.87	5,222	3
Latvia	1.18	1.14	0.23	136,481	10
Lithuania	1.22	1.18	0.34	61,018	6
Morocco	1.68	1.12	1.75	72,053	7
North Macedonia	7.93	5.07	8.64	59,441	8
Poland	2.70	1.25	3.95	720,829	40
Romania	1.73	1.07	1.79	2,635,395	34
Russia	1.16	1.11	0.23	4,103,615	48
Serbia	1.40	1.07	1.04	236,603	8
Slovak Republic	2.15	1.32	2.25	294,958	13
Slovenia	2.08	1.21	2.21	146,356	13
Turkey	1.14	1.13	0.13	108,054	17
Ukraine	1.30	1.25	0.33	1,773,220	27

I follow De Loecker and Warzynski (2012) in deriving company-level markups from a production-function framework. De Loecker and Warzynski's approach assumes cost-minimizing producers who have access to a variable input of production (e.g., materials or labour) and relies on the insight that the output elasticity of this variable input equals its expenditure share in total revenue when price equals marginal production cost (i.e., when markup = price/marginal cost = 1). Under imperfect competition, companies can charge a price above marginal cost, thereby introducing a wedge between the input's revenue share and its output elasticity. The ratio of any input's output elasticity to the input's revenue share then provides a consistent estimate of a company's markup.

I obtain estimates of output elasticities for variable inputs from the production-function estimation. I choose materials as the variable input of production to calculate markups, since materials are more likely to respond to productivity shocks than labour, which is subject to potentially large hiring and firing costs. Using materials, I recover markups from:

$$\mu_{it} = \hat{\beta}_m / \alpha_{it}^M \tag{7}$$

where $\hat{\beta}_m$ is the estimated output elasticity of materials from Equation 1 and α_{it}^M is the share of expenditures on materials in total company revenue. Following De Loecker and Warzynski (2012), I correct markup estimates for the presence of measurement error in revenues. That is, I calculate α_{it}^M as the ratio of reported expenditures on materials to predicted company revenues from Equation 1.

As mentioned before, countries vary in terms of their reporting of materials and staffing costs in the Orbis database. The methodology by De Loecker and Warzynski (2012) allows one to estimate markups consistently using the cost of goods sold alongside capital when a more detailed breakdown of variable input use—i.e., labour costs and material costs—is not available. I therefore follow De Loecker and Eeckhout (2017) in calculating

markups based on estimates from a production function with two inputs. In particular, the price-cost markup in these countries is given by:

$$\mu_{it} = \hat{\beta}_v / \alpha_{it}^V \tag{8}$$

where $\hat{\beta}_v$ is the estimated output elasticity of cost of goods sold from Equation 5 and α_{it}^V is the share of cost of goods sold in total company revenues. I again correct markup estimates for the presence of measurement error as in De Loecker and Eeckhout (2017).

Ideally, I would like to observe quantity data on output and inputs so that price differences across companies (e.g., due to variation in quality or transfer pricing) do not distort estimation. De Loecker and Warzynski (2012) show that when relying on company revenue data, only the level of the markup is potentially affected by lack of data on physical output, but not the estimate of the correlation between markups and company-level characteristics or how markups change within a company over time. While I do not observe measures of physical output, the focus is on understanding how a portfolio company's markups change over time and how this change correlates with other company-level characteristics.

5.3. Empirical strategy

5.3.1. Econometric specification

I document the effects of PE ownership on sources of value creation and profitability using a difference in differences strategy. Specifically, I estimate regressions of the following form:

$$y_{it} = \beta_0 + \beta_1 PE_i * postPE_{it} + \beta_2 postPE_{it} + \beta_3 PE_i * postPE_{it} * Exit_{it} + \beta_4 postPE_{it} * Exit_{it} + \gamma_i + \delta_t + \varepsilon_{it} \tag{9}$$

where y_{it} is an outcome for company *i* in year *t*, and PE_i is a treatment indicator equal to 1 for companies acquired by a PE firm and 0 for companies in the control group. For portfolio companies, $postPE_{it}$ equals 1 for years following the first PE funding round and 0 before.

For control companies, $postPE_{it}$ equals 1 for years after their matched targets first received PE funding and 0 before. The main coefficient of interest is β_1, which is identified from the interaction of the PE treatment indicator PE_i and $postPE_{it}$.

I track portfolio companies that are fully realized deals (meaning that the PE firms have exited completely) for up to five years post-exit.[26] Thereby, I isolate operational improvements that manifest themselves during the PE ownership and test whether these improvements persist or abate post-exit. To this end, Equation 9 includes the interaction term $PE_i * postPE_{it} * Exit_{it}$, where $Exit_{it}$ equals 1 post-exit and 0 otherwise.[27] Given this specification, the β_3 coefficient on this additional interaction term captures any incremental post-exit effects, over and above the average impact of PE ownership captured by the β_1 coefficient (and relative to control companies). Using β_3 I test whether any effect realized under PE ownership persists post-exit: if the sign of β_3 disagrees with the sign of β_1, the effect does not persist and reverts toward the pre-investment level. To estimate the long-term effect of PE ownership relative to control companies, which compares the sum of the ownership effect and the post-exit effect to the pre-investment level of the outcome variable in question, I report the linear combination $\beta_1 + \beta_3$.

Naturally, Equation 9 also includes the interaction term $postPE_{it} * Exit_{it}$, which captures the performance of target and control companies in the years following PE firms' exits relative to the earlier years.[28] I use β_4 to test whether PE firms time the market when

[26] In order to retain the same number of observations before and after PE treatment, I start tracking each portfolio company five years prior to its first round of PE funding and drop observations from earlier years. In unreported results, I replicate our empirical analysis and focus on a window of three, instead of five, years before and after a portfolio company is under PE management. Our results are qualitatively unchanged and estimates quantitatively similar.

[27] Our database identifies the buyers when deals are exited. I code as exits only strategic sales, IPOs, or full write-off. In cases of secondary buyouts involving PE buyers, I define our $postPE_{it}$ variable such that it continues to equal 1; it equals 0 only after the last PE fund has exited the company.

[28] $Exit_{it}$ for control companies is defined such that it equals 1 for years after their matched targets are fully realized.

exiting portfolio companies. Specifically, a negative sign on β_4 suggests an industry-wide downturn while a positive sign suggests an industry-wide expansion.

I estimate the model with a full set of company (γ_i) and year (δ_t) fixed effects and cluster standard errors at the company-level, as disturbances to a company's operating performance are potentially correlated over time. To guard against the influence of outliers, I remove company-year observations with values at the bottom and top 5th percentiles of the sample distribution.

5.3.2. Forming a counterfactual group

Simple matching

To ensure comparability between the treatment and control groups, I form a matched control group based on observables in the first PE transaction year. In particular, I select up to five matched control companies for each PE portfolio company using the following procedure. First, I divide all companies in Orbis into country-by-4-digit industry groups. Second, I sort by total assets within each country-industry pair and select the five nearest companies to the portfolio company as per the first year of PE funding. I require that control companies have received no PE investment in the past and during the period they serve as a control.

Estimating Equation 9 on a matched sample constructed in this way results in the effect of receiving PE funding on portfolio companies relative to an average matched control company with similar characteristics at the time of investment. By construction, I am able to strip out the effects of PE firms targeting certain countries, industries, or companies of a certain size within those country-industry pairs. The industry classification (which follows NACE Rev. 2) contains 615 groups at the 4-digit level, which provides a highly detailed breakdown of industries. Control companies come from narrowly defined cells in which they are likely to experience the same industry shocks or expectations about future profitability as

the portfolio companies in the sample. Constructing such tight control groups based on observables is similar to the strategy followed by Davis et al. (2014) and Bharath et al. (2014) to tackle concerns of selection and unobservable company attributes that may correlate with these control groups.

Propensity score matching

Using matched peers instead of all sector companies as a benchmark is crucial for the valuation of PE activity, given the non-random PE target selection. The selection issue is visible in most summary tables in the literature and also present in the dataset. The acquired companies are, on average, not equal to the industry. The non-random selection becomes manifest in the lengthy deal generation and due diligence. PE firms only acquire companies that promise an upside potential but still show a sufficient profitability to service the debt. It is essential to control for "what would have happened if PE had not acquired the company". Fortunately, an adequate benchmark can be identified using propensity score matching.

First, I use the estimated coefficients from Equation 9 and predict an acquisition probability (propensity score) for each company (in the same country, industry sector and year). Second, I calculate the absolute distance in propensity scores between each deal and company. Third, I mark the 10 (5) companies that are closest to the deals in the propensity score as peers.

5.3.3. Summary statistics

Portfolio companies and baseline control companies

Table 29 reports summary statistics for the key variables included in the empirical analysis. Panel A reports the characteristics of the portfolio companies targeted by PE firms, averaged over the three years prior to their first year under PE ownership, while Panel B reports the same characteristics for control companies using simple matching.

By construction, the two groups in Panel A and Panel B share the same country and industry distributions and are similar in terms of asset size (unreported). They differ somewhat in sales, employment, market share, profitability, and leverage. Specifically, the average (median) portfolio company had USD 21 million (USD 10 million) in annual sales averaged over the three years preceding a PE deal, employed on average 197 (100) employees, commanded a market share of 5% (2%), earned USD 1.9 million (USD 0.7 million) in EBITDA, and had total debt equal to 19% (14%) of its assets. In comparison, the average (median) control company had USD 18 million (USD 6 million) in annual sales averaged over the three years preceding its corresponding PE deal, employed on average 164 (70) employees, commanded a market share of 4% (1%), earned USD 1.3 million (USD 0.3 million) in EBITDA, and had total debt equal to 13% (3%) of its assets.

These results suggest that companies targeted by PE firms tend to command market-leading positions and already have better profitability and access to external funding prior to PE treatment. The econometric strategy will capture the effects that PE treatment has on portfolio companies relative to their pre-PE levels as compared with the relative performance of control companies.

Table 29: Pre-transaction characteristics of portfolio and control companies

The table reports summary statistics on company-level variables used in the baseline analysis. Panel A reports statistics for portfolio companies of PE firms, while Panel B reports statistics for the baseline matched control companies. For each company in the sample, each variable is averaged over the three years preceding the first year of PE funding. All dollar amounts are reported in thousands.

Panel A: Portfolio companies

	Mean	p25	Median	p75	S.D.
Financial engineering					
Leverage	0.19	0.01	0.14	0.32	0.19
Net debt to EBITDA	1.15	-0.45	0.43	2.49	3.10
Implicit interest rate	0.12	0.05	0.09	0.14	0.12
Taxes paid	224.34	1.01	66.26	274.93	377.97
Tax rate	0.14	0.00	0.14	0.22	0.13
Operational improvements					
Employment	197	33	100	273	241
Average wages	13.39	6.21	10.23	19.93	9.87
Labour productivity	130.16	38.75	80.65	171.33	135.35
Net investment	0.04	-0.01	0.01	0.07	0.10
Capital intensity	56.48	6.67	21.05	64.30	90.75
TFP	1.59	0.95	1.49	2.21	0.79
Cash management					
Working capital	0.33	0.07	0.29	0.55	0.30
Credit period	49.71	15.18	39.33	67.77	49.77
Collection period	61.15	22.60	46.53	80.36	58.31
Stock turnover	57.94	6.73	14.86	57.68	102.27
Revenue growth					
Sales	20,968	3,021	10,129	24,434	30,019
Markup	1.91	0.93	1.14	1.62	2.08
Market share	0.05	0.00	0.02	0.08	0.07
Profitability					
EBITDA	1,863	65	738	2,531	2,863
EBITDA margin	0.10	0.03	0.08	0.15	0.11
Return on assets	0.05	0.00	0.04	0.10	0.09

Table 29 (continued)

Panel B: Baseline control companies

	Mean	p25	Median	p75	S.D.
Financial engineering					
Leverage	0.13	0.00	0.03	0.20	0.18
Net debt to EBITDA	0.49	-0.80	-0.01	1.33	3.45
Implicit interest rate	0.13	0.05	0.09	0.16	0.14
Taxes paid	161.19	0.39	24.90	155.47	320.96
Tax rate	0.14	0.00	0.13	0.23	0.14
Operational improvements					
Employment	164	18	70	197	239
Average wages	12.75	5.10	10.24	17.75	9.73
Labour productivity	131.28	34.32	78.58	171.75	142.07
Net investment	0.03	-0.02	0.00	0.06	0.08
Capital intensity	63.35	7.86	23.69	66.79	102.18
Total factor productivity	1.52	0.91	1.47	2.02	0.75
Cash management					
Working capital	0.37	0.08	0.31	0.63	0.33
Credit period	48.04	8.21	32.22	63.30	55.69
Collection period	63.59	20.13	45.37	83.63	63.47
Stock turnover	43.45	5.88	12.06	35.22	83.95
Revenue growth					
Sales	17,784	1,301	6,171	19,634	29,427
Markup	1.82	0.93	1.14	1.64	1.91
Market share	0.04	0.00	0.01	0.04	0.06
Profitability					
EBITDA	1,265	17	306	1,422	2,335
EBITDA margin	0.08	0.02	0.07	0.14	0.11
Return on assets	0.05	0.00	0.03	0.09	0.09

Portfolio and propensity score matched control companies

Table 30 reports summary statistics for company-level outcome variables grouped by value creation strategy, separately for portfolio companies and matched control companies. The table provides evidence that the propensity score matching eliminates, on average, all pre-acquisition differences in the operational measures. I find no significant differences between deals and matched controls pre-acquisition.

Panel A reports pre-treatment levels of portfolio companies and control companies, averaged over the three years preceding the first year of PE funding. Panel B reports pre-treatment trends. For pre-treatment trends, I calculate the change from the previous year to the first year of PE funding. I also report the difference in means between portfolio companies and control companies. The difference in means reports the results of regressing each variable on a dummy equal to 1 for portfolio companies and 0 for control companies.

By construction, the two groups share the same country and industry sector characteristics and are similar in terms of asset size (unreported). The average portfolio company (control company) had USD 42.4 million (USD 40.3 million) in annual sales averaged over the three years preceding a PE deal, employed on average 335 (298) employees, commanded a market share of 14% (9%), earned USD 4.0 million (USD 3.6 million) in EBITDA, and had total debt equal to 23% (17%) of its assets. In comparison, based on pre-treatment tends, the average portfolio company (control company) had USD 3.6 million (USD 0.5 million) in absolute sales growth from the previous year to the first year of PE funding, employed on average 21 (10) more employees than before, had a constant EBITDA, and saw no change in its debt positions relative to its assets.

These results suggest that companies targeted by PE firms tend to command market-leading positions and already have better profitability and access to external funding prior to PE treatment.

Table 30: Pre-treatment characteristics of portfolio companies and control companies

The table reports summary statistics (means) on portfolio company-level variables used in the difference in differences regressions, separately for portfolio companies of PE firms and matched control companies. For pre-treatment levels, for each variable I calculate the average over the three years preceding the first year of PE investment. For pre-treatment trends, for each variable I calculate the change from the previous year to the first year of PE investment. All dollar amounts are reported in thousands. Differences in means report the results of regressing each variable on a dummy equal to 1 for portfolio companies and 0 for control companies with heteroskedasticity consistent standard errors.

Panel A: Pre-investment levels

			Difference in means		
	Portfolio company	Control company	Diff.	*t*-stat	*p*-value
Financial engineering					
Leverage	0.23	0.17	0.05	4.53	0.00
Net debt to EBITDA	0.60	0.44	0.15	0.34	0.74
Implicit interest rate	0.11	0.10	0.01	1.02	0.31
Taxes paid	517.96	617.97	-100.01	-1.19	0.24
Implicit tax rate	0.16	0.16	0.00	-0.15	0.88
Operational improvements					
Employment	335	298	37	1.19	0.23
Average wages	15.01	13.77	1.24	1.39	0.16
Labour productivity	175.72	175.01	0.71	0.04	0.97
Net investment	0.11	0.07	0.04	3.02	0.00
Capital intensity	127.55	165.40	-37.86	-1.65	0.10
Total factor productivity	1.70	1.60	0.10	1.84	0.07
Cash management					
Working capital	0.33	0.35	-0.02	-0.85	0.39
Credit period	50.81	55.99	-5.18	-1.59	0.11
Collection period	62.25	75.39	-13.14	-3.53	0.00
Stock turnover	55.78	46.88	8.90	1.38	0.17
Revenue growth					
Sales	42,372	40,251	2,121	0.35	0.73
Markup	2.42	2.46	-0.04	-0.18	0.85
Market share	0.14	0.09	0.05	4.00	0.00
Profitability					
EBITDA	3,922	3,589	333	0.54	0.59
EBITDA margin	0.09	0.09	0.00	0.02	0.99
Return on assets	0.04	0.04	0.00	-0.13	0.90

Table 30 (continued)

Panel A: Pre-investment trends

	Portfolio company	Control company	Difference in means		
			Diff.	*t*-stat	*p*-value
Financial engineering					
Leverage	0.00	0.00	0.00	-0.39	0.69
Net debt to EBITDA	-1.04	0.05	-1.09	-1.46	0.15
Implicit interest rate	-0.00	0.00	-0.00	-0.43	0.67
Taxes paid	36.39	1.10	35.29	0.48	0.63
Implicit tax rate	-0.02	0.00	-0.02	-2.04	0.04
Operational improvements					
Employment	21	7	14.24	0.99	0.32
Average wages	1.09	-0.04	1.13	1.76	0.08
Labour productivity	-1.24	0.95	-2.19	-0.15	0.88
Net investment	0.00	-0.02	0.03	1.21	0.23
Capital intensity	9.97	1.83	8.14	0.57	0.57
Total factor productivity	-0.05	-0.01	-0.04	-1.57	0.12
Cash management					
Working capital	-0.02	0.00	-0.02	-0.88	0.38
Credit period	-3.82	1.02	-4.83	-1.12	0.26
Collection period	2.96	4.45	-1.49	-0.40	0.69
Stock turnover	-6.27	1.35	-7.62	-1.54	0.12
Revenue growth					
Sales	3,606	462	3,144	1.42	0.16
Markup	-0.06	0.10	-0.16	-1.49	0.14
Market share	0.00	0.00	0.00	0.28	0.78
Profitability					
EBITDA	-284	82	-366	-0.86	0.39
EBITDA margin	-0.03	-0.01	-0.02	-2.96	0.00
Return on assets	-0.02	0.00	-0.02	-2.75	0.01

5.4. Results

In the remainder of this section, I study four value creation channels that PE firms pursue and discuss which of these channels persist even after PE firms exit their investments. I also discuss how profitability is affected during and after PE ownership.

5.4.1. Value creation channels

Financial engineering

I find evidence that portfolio companies engage in financial engineering during PE ownership. Table 31 shows that portfolio companies increase their leverage by 3.2 percentage points relative to their matched controls ($p<0.001$) and that the additional tax shields the increased borrowing gives rise to reduce their effective tax rates by 1.3 percentage points on average ($p=0.003$). These are economically large effects relative to the sample means of 19% leverage and a 14% tax rate. Portfolio companies manage to increase leverage without paying significantly higher interest rates,[29] perhaps because their net debt to EBITDA ratio remains stable (implying that EBITDA increases, as I will shortly confirm). While tax rates fall, total taxes paid rise by around 15% relative to control companies,[30] again implying that EBITDA increases, although this rise is not statistically significant.

[29] Since I can calculate interest only for companies that borrow, the sample used in this regression is smaller.
[30] Computed as exp(0.136) - 1 = 0.15.

Table 31: Value creation channels: Financial engineering

The table reports difference in differences regression results of the effect of receiving PE funding on company-level outcomes. The sample includes both realized and unrealized deals and each deal's matched control group of companies. For variable definitions and details of their construction see Table A.2 in the Appendix. All regressions include company and year fixed effects. Standard errors are clustered at the company-level. Heteroskedasticity consistent standard errors clustered at the company-level are shown in italics underneath the coefficient estimates. I use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively.

	Leverage	Net debt to EBITDA	Implicit interest rate	Taxes paid	Tax rate
	(1)	(2)	(3)	(4)	(5)
β_1: *PE* x *postPE*	0.032***	0.176	0.007	0.136	-0.013**
	0.009	*0.185*	*0.008*	*0.132*	*0.006*
β_2: *postPE*	0.012***	0.192*	0.003	-0.036	0.003
	0.004	*0.099*	*0.005*	*0.060*	*0.003*
β_3: *PE* x *postPE* x *exit*	-0.009	-0.163	0.027**	0.269	0.013
	0.014	*0.267*	*0.012*	*0.191*	*0.008*
β_4: *postPE* x *exit*	-0.019***	-0.236*	0.006	-0.333***	-0.006
	0.006	*0.132*	*0.006*	*0.080*	*0.004*
$\beta_1 + \beta_3$	0.024	0.013	0.034**	0.405*	-0.000
	0.016	*0.294*	*0.014*	*0.210*	*0.010*
R-squared	0.011	0.003	0.023	0.024	0.015
Number of obs.	25,215	22,943	11,223	21,358	32,324

Operational improvements

I find strong evidence that portfolio companies engage in a variety of operational changes during PE ownership. Table 32 shows that portfolio companies increase employment by 31% more than their control companies on average (p<0.001), wages by 11% (p=0.007), and labour productivity by 17% (p<0.001). These operational changes are economically large and likely related to each other. They imply, for example, that the average portfolio company increases its headcount from 197 before PE ownership to 258 after.[31] The attendant increase in average wages could either reflect a positive change in skill composition or the need to offer higher wages to attract labour (possibly from direct competitors). Assuming a textbook model of labour demand, which argues that workers are paid the marginal revenue product of their labour, the estimates suggest that workers at portfolio companies may not fully share in the gains from the rise in scale (i.e., average wage growth of 11% smaller than average labour productivity growth of 17%).

Does the improvement in labour productivity simply result from an increase in scale, which allows portfolio companies to move down their average cost curves? In the remainder of Table 32, I test potential changes in capital investment and TFP, both of which can impact efficiency over and above increasing scale. An important difference, however, is that while capital investment represents a source of efficiency improvement that is technology-driven (i.e., an increase in capital intensity mechanically raises the marginal product of labour), changes in TFP are isolated from both increases in scale and changes to the production technology.

I find no statistical difference between the rate of net investment at portfolio and control companies, while capital intensity increases strongly (by 31%) at portfolio companies

[31] Computed as the sum of the suitably exponentiated coefficients on PE x $postPE_{it}$ and $postPE_{it}$ times the pre-investment mean of 197.

under PE ownership. Note that net investment is calculated as a rate (the annual change in net assets scaled by beginning-of-year total assets), while capital intensity is measured as the book value of fixed assets to employment. This suggests that PE funds oversee a one-time injection of capital investment rather than continuous increases in capital expenditures. In light of the earlier finding that portfolio companies increase their leverage during the same period, this increase in capital intensity is likely funded by external debt. The last column of Table 32 shows that TFP increases by 3.7% (p=0.058). This point estimate is considerably smaller than the increase in labour productivity, which suggests that part of the efficiency improvement is facilitated by capital investment.

Table 32: Value creation channels: Operational improvements

The table reports difference in differences regression results of the effect of receiving PE funding on company-level outcomes. The sample includes both realized and unrealized deals and each deal's matched control group of companies. For variable definitions and details of their construction see Table A.2 in the Appendix. All regressions include company and year fixed effects. Standard errors are clustered at the company-level. Heteroskedasticity consistent standard errors clustered at the company-level are shown in italics underneath the coefficient estimates. I use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively.

	Employ-ment	Average wage	Labour productivity	Net investment	Capital intensity	TFP
	(1)	(2)	(3)	(4)	(5)	(6)
β_1: *PE* x *postPE*	0.273***	0.102***	0.158***	-0.006	0.269***	0.036*
	0.051	*0.038*	*0.039*	*0.006*	*0.059*	*0.019*
β_2: *postPE*	0.083***	0.015	-0.046**	-0.010***	-0.054**	-0.025***
	0.022	*0.018*	*0.020*	*0.003*	*0.028*	*0.009*
β_3: *PE* x *postPE* x *exit*	0.052	0.116***	0.093**	0.009	-0.128	0.029
	0.076	*0.044*	*0.047*	*0.007*	*0.079*	*0.024*
β_4: *postPE* x *exit*	-0.159***	-0.080***	-0.092***	0.006*	-0.110***	-0.021*
	0.031	*0.022*	*0.025*	*0.003*	*0.039*	*0.012*
$\beta_1 + \beta_3$	0.324***	0.218***	0.251***	0.004	0.141	0.066**
	0.091	*0.058*	*0.061*	*0.008*	*0.097*	*0.029*
R-squared	0.045	0.344	0.144	0.110	0.132	0.013
Number of obs.	24,090	14,344	22,611	15,266	21,940	23,984

Cash management

It is often argued that PE firms create value and generate free cash flow by renegotiating contracts with suppliers and customers, introducing lean-manufacturing techniques, and reducing working capital needs (Braguinsky et al., 2015). Table 33 provides evidence of such value creation strategies in the sample. Compared with control companies, portfolio companies reduce their working capital as a share of total assets by 3.9 percentage points on average ($p<0.001$). This corresponds to around a 12% improvement in working capital management relative to an average portfolio company before PE ownership.

To understand where the working capital improvement comes from, I examine the number of days portfolio companies take to pay their suppliers, the number of days they wait to collect payments from customers, and stock turnover. While portfolio companies do not pay their suppliers any more slowly, they do collect payment from their customers 4.6 days sooner under PE ownership ($p=0.042$), which is an 8% improvement over the pre-PE average of 61 days. Stock turnover rates, on the other hand, do not change significantly. These findings suggest that the improvement in working capital management is most likely driven by contract renegotiations with customers rather than better inventory management.[32]

[32] In ongoing work, I draw on textual information from funds' quarterly reports to pinpoint whether the documented effects are indeed driven by portfolio companies in which PE funds have identified and acted to improve working capital management.

Table 33: Value creation channels: Cash management

The table reports difference in differences regression results of the effect of receiving PE funding on company-level outcomes. The sample includes both realized and unrealized deals and each deal's matched control group of companies. For variable definitions and details of their construction see Table A.2 in the Appendix. All regressions include company and year fixed effects. Standard errors are clustered at the company-level. Heteroskedasticity consistent standard errors clustered at the company-level are shown in italics underneath the coefficient estimates. I use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively.

	Working capital	Credit period	Collection period	Stock turnover
	(1)	(2)	(3)	(4)
β_1: *PE* x *postPE*	-0.039***	-0.523	-4.641**	-0.383
	0.011	*2.119*	*2.277*	*3.299*
β_2: *postPE*	0.003	0.202	1.236	1.002
	0.006	*1.123*	*1.241*	*1.615*
β_3: *PE* x *postPE* x *exit*	0.031*	0.261	2.525	1.298
	0.016	*3.222*	*3.257*	*4.250*
β_4: *postPE* x *exit*	-0.005	1.752	-0.926	2.141
	0.009	*1.625*	*1.701*	*2.310*
$\beta_1 + \beta_3$	-0.008	-0.262	-2.116	0.915
	0.020	*3.741*	*3.787*	*4.874*
R-squared	0.005	0.015	0.017	0.004
Number of obs.	26,057	27,931	29,146	24,482

Revenue growth

Portfolio companies experience strong growth in revenues while under PE ownership. Table 34 shows that their revenue grows by around 59% on average compared to their matched controls (Column 1). Given average (median) sales of USD 21 (10) million, the point estimate implies that by the time a PE fund exits its investment, annual sales will have risen to nearly USD 34 (16) million for the average (median) company.

Perhaps most interestingly, Column 2 shows that company-level markups are on average 6.7% lower while under PE ownership ($p<0.001$). Taken together with the finding that portfolio companies improve their operational efficiency, lower markups imply that reductions in marginal costs (as captured by the increase in TFP) are at least partially passed on to customers in the form of lower relative prices. It also suggests that PE firms do not resort to increasing prices to service the higher indebtedness of their portfolio companies. Instead, they seem to follow a high-growth strategy by pricing their products and services competitively.

Reducing markups is expected to lead to market share gains. Column 3 confirms this conjecture: portfolio companies do indeed increase their market share, by 1 percentage point on average, a 20% increase from the 5% sample mean.

Table 34: Value creation channels: Revenue growth

The table reports difference in differences regression results of the effect of receiving PE funding on company-level outcomes. The sample includes both realized and unrealized deals and each deal's matched control group of companies. For variable definitions and details of their construction see Table A.2 in the Appendix. All regressions include company and year fixed effects. Standard errors are clustered at the company-level. Heteroskedasticity consistent standard errors clustered at the company-level are shown in italics underneath the coefficient estimates. I use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively.

	Sales	Markup	Market share
	(1)	(2)	(3)
β_1: *PE* x *postPE*	0.467***	-0.065***	0.010***
	0.055	*0.019*	*0.002*
β_2: *postPE*	0.068**	0.007	0.000
	0.027	*0.010*	*0.001*
β_3: *PE* x *postPE* x *exit*	0.138	-0.017	0.001
	0.090	*0.030*	*0.004*
β_4: *postPE* x *exit*	-0.256***	0.012	-0.001
	0.038	*0.015*	*0.001*
$\beta_1 + \beta_3$	0.605***	-0.082**	0.011**
	0.110	*0.036*	*0.004*
R-squared	0.122	0.020	0.070
Number of obs.	29,777	24,050	29,886

Organic versus inorganic growth

Does the remarkable growth in the scale of portfolio companies reflect organic growth or buy-and-build strategies said to be popular among PE firms? I draw on two sources to classify sample deals into organic vs. inorganic. The first is BvD's Zephyr database, which tracks M&A transactions.[33] I code a company as following an inorganic-growth strategy if Zephyr lists it at least once as an acquirer while under PE ownership. The second is the EBRD archive of quarterly PE fund reports, which I use to verify and update the Zephyr classification. I classify 116 of the 898 portfolio companies (or 13%) as being engaged in M&A deals.

Tables 35 to 38 exclude these inorganic deals and their matched controls. This makes little difference to the magnitudes of the estimated effects of PE ownership on sales, markups, and market share as shown in Table 38. Portfolio companies that grow organically experience revenue growth of 57%, while lowering markups by 6.1%, and increasing their market share by 0.07 percentage point on average. None of these point estimates is significantly different from its counterpart in the full sample. In sum, I find no evidence that the effects I document are driven by the small number of portfolio companies that grow inorganically. Removing inorganic deals similarly makes little difference to the findings regarding financial engineering, operational improvements, and cash management. Tables 35 to 37 illustrate.

[33] Zephyr screens news reports and company websites to track M&A activity. It provides information on acquirers, target companies, announcement dates, and transaction status, which can be either of "completed", "pending", "rumour", or "withdrawn".

Table 35: Financial engineering—organic deals only

The table reports difference in differences regression results of the effect of receiving PE funding on company-level outcomes. The sample includes both realized and unrealized deals and each deal's matched control group of companies. For variable definitions and details of their construction see Table A.2 in the Appendix. All regressions include company and year fixed effects. Standard errors are clustered at the company-level. Heteroskedasticity consistent standard errors clustered at the company-level are shown in italics underneath the coefficient estimates. I use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively.

	Leverage	Net debt to EBITDA	Implicit interest rate	Taxes paid	Tax rate
	(1)	(2)	(3)	(4)	(5)
β_1: *PE* x *postPE*	0.033***	0.178	0.013	0.143	-0.018**
	0.010	*0.202*	*0.008*	*0.144*	*0.007*
β_2: *postPE*	0.013***	0.231**	-0.000	-0.049	0.003
	0.005	*0.108*	*0.005*	*0.065*	*0.003*
β_3: *PE* x *postPE* x *exit*	-0.016	-0.378	0.026*	0.323	0.014
	0.016	*0.280*	*0.014*	*0.206*	*0.009*
β_4: *postPE* x *exit*	-0.019***	-0.154	0.009	-0.368***	-0.005
	0.007	*0.141*	*0.006*	*0.086*	*0.005*
$\beta_1 + \beta_3$	0.017	-0.200	0.038**	0.466**	-0.003
	0.017	*0.314*	*0.015*	*0.231*	*0.011*
R-squared	0.011	0.004	0.023	0.025	0.015
Number of obs.	20,853	18,990	9,400	18,086	26,820

Table 36: Operational improvements—organic deals only

The table reports difference in differences regression results of the effect of receiving PE funding on company-level outcomes. The sample includes both realized and unrealized deals and each deal's matched control group of companies. For variable definitions and details of their construction see Table A.2 in the Appendix. All regressions include company and year fixed effects. Standard errors are clustered at the company-level. Heteroskedasticity consistent standard errors clustered at the company-level are shown in italics underneath the coefficient estimates. I use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively.

	Employ-ment	Average wage	Labour productivity	Net investment	Capital intensity	TFP
	(1)	(2)	(3)	(4)	(5)	(6)
β_1: *PE* x *postPE*	0.254***	0.098**	0.137***	-0.002	0.228***	0.036*
	0.054	*0.044*	*0.044*	*0.007*	*0.066*	*0.020*
β_2: *postPE*	0.094***	0.028	-0.045**	-0.011***	-0.045	-0.032***
	0.024	*0.020*	*0.022*	*0.003*	*0.030*	*0.010*
β_3: *PE* x *postPE* x *exit*	0.060	0.111**	0.068	0.012	-0.186**	0.041
	0.078	*0.051*	*0.051*	*0.008*	*0.090*	*0.026*
β_4: *postPE* x *exit*	-0.157***	-0.059**	-0.079***	0.006	-0.078*	-0.027**
	0.033	*0.024*	*0.027*	*0.004*	*0.043*	*0.013*
$\beta_1 + \beta_3$	0.314***	0.209***	0.205***	0.009	0.041	0.077***
	0.095	*0.067*	*0.067*	*0.009*	*0.108*	*0.029*
R-squared	0.042	0.337	0.145	0.105	0.129	0.016
Number of obs.	20,034	11,924	18,713	12,557	18,200	19,789

Table 37: Cash management—organic deals only

The table reports difference in differences regression results of the effect of receiving PE funding on company-level outcomes. The sample includes both realized and unrealized deals and each deal's matched control group of companies. For variable definitions and details of their construction see Table A.2 in the Appendix. All regressions include company and year fixed effects. Standard errors are clustered at the company-level. Heteroskedasticity consistent standard errors clustered at the company-level are shown in italics underneath the coefficient estimates. I use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively.

	Working capital	Credit period	Collection period	Stock turnover
	(1)	(2)	(3)	(4)
β_1: *PE* x *postPE*	-0.040***	-0.482	-6.937***	-0.474
	0.013	*2.453*	*2.473*	*3.332*
β_2: *postPE*	0.006	0.178	1.371	-0.141
	0.007	*1.228*	*1.392*	*1.657*
β_3: *PE* x *postPE* x *exit*	0.037**	-0.836	2.972	-0.255
	0.018	*3.603*	*3.602*	*4.394*
β_4: *postPE* x *exit*	-0.005	2.753	-0.139	2.135
	0.010	*1.808*	*1.856*	*2.302*
$\beta_1 + \beta_3$	-0.003	-1.318	-3.965	-0.729
	0.022	*4.182*	*4.093*	*4.816*
R-squared	0.005	0.017	0.019	0.003
Number of obs.	21,570	23,061	24,154	20,431

Table 38: Revenue growth—organic deals only

The table reports difference in differences regression results of the effect of receiving PE funding on company-level outcomes. The sample includes both realized and unrealized deals and each deal's matched control group of companies. For variable definitions and details of their construction see Table A.2 in the Appendix. All regressions include company and year fixed effects. Standard errors are clustered at the company-level. Heteroskedasticity consistent standard errors clustered at the company-level are shown in italics underneath the coefficient estimates. I use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively.

	Sales	Markup	Market share
	(1)	(2)	(3)
β_1: *PE* x *postPE*	0.467***	-0.065***	0.010***
	0.055	*0.019*	*0.002*
β_2: *postPE*	0.068**	0.007	0.000
	0.027	*0.010*	*0.001*
β_3: *PE* x *postPE* x *exit*	0.138	-0.017	0.001
	0.090	*0.030*	*0.004*
β_4: *postPE* x *exit*	-0.256***	0.012	-0.001
	0.038	*0.015*	*0.001*
$\beta_1 + \beta_3$	0.605***	-0.082**	0.011**
	0.110	*0.036*	*0.004*
R-squared	0.122	0.020	0.070
Number of obs.	29,777	24,050	29,886

5.4.2. Persistence of real effects

The empirical setting allows to test the persistence of effects that companies experience under PE ownership. In particular, the coefficient on $PE_i * postPE_{it} * Exit_{it}$ captures whether gains in operational performance created under PE ownership survive beyond PE firms' tenure. A coefficient of the same sign as that on $PE_i * postPE_{it}$ suggests that the outcome in question continues to amplify in magnitude, while a coefficient of a different sign suggests reversion towards the pre-PE level (in each case relative to the control companies).

One particular way in which companies may be negatively affected following PE exit is a potential loss of access to external financing. Boucly et al. (2011) show that LBOs foster firm growth by alleviating credit constraints, presumably because lenders experience positive externalities from the monitoring PE firms engage in at their portfolio companies. When PE firms exit, lenders' willingness to lend may decline. The post-exit coefficients in Table 31 provide some support for this conjecture: after PE firms exit, interest rates increase by 2.7 percentage points more than at matched control companies (p=0.024). Debt falls, though not significantly, while effective tax rates rise by 1.3 percentage points (p=0.104) (consistent with a reduction in tax shields), reversing the tax rate reduction experienced under PE ownership. Total taxes paid continue to rise (by 31%, p=0.159) and eventually reach a level that is nearly 50% greater than the pre-PE level of taxes paid when compared with control companies.

With regards to operational improvements (Table 32), cash management (Table 33), and revenue growth (Table 34), I find little evidence that portfolio companies experience reversals post-exit. For instance, Column 1 in Table 32 suggests that the reduction achieved in the ratio of working capital to total assets employed in production is reversed by 3.1 percentage points. In a couple of cases, the improvements even continue post-exit: wages and

labour productivity continue to rise (by 12% and 10%, respectively, relative to matched controls). Portfolio companies also continue to grow their sales by a further 15% on average (p=0.125).

The long-term impact of PE ownership is captured by the linear combination $\beta_1 + \beta_3$ in Equation 9. Looking across Tables 31 through 34, I find that PE ownership results in long-lasting changes. Over the period of PE ownership and the years that follow, portfolio companies employ significantly more people (by 38%), pay higher average wages (by 24%), enjoy greater labour productivity (by 29%) and higher TFP (by 6.8%), grow their sales (by 83%) and market shares (by 1.1 percentage points), and reduce their price markups (by 8.5%), compared to before they were targeted by a PE firm (and relative to matched controls). I also find that they end up paying a higher interest rate (by 3.4 percentage points) on their debt, while their cash management practices appear unchanged in the long run (again compared to the pre-PE period and relative to matched controls).

5.4.3. Exit timing

The empirical design allows to test whether PE firms time the market when exiting portfolio companies. Specifically, coefficient β_4 captures what happens to the portfolio company's industry (as represented by its control companies) in the years following exit, relative to the earlier years. Looking across Tables 31 through 34, I find that PE exits precede periods in which firms deleverage (by 1.9 percentage points), total taxes paid drop (by 40%), and employment (by 17%), average wages (by 8.3%), labour productivity (by 9.6%), capital intensity (by 12%), TFP (by 2.1%), and sales (by 29%) all fall significantly. This suggests that PE firms exit their portfolio companies just before similar companies begin to experience significant stress, consistent either with industry-wide falls in demand or the possibility that control companies lost the battle with their PE-backed competitors.

The interpretation of the coefficient β_4 as capturing industry-wide trends in the post-

exit period relies on the assumption that control companies are not affected by the PE treatment received by portfolio companies they are matched with. In econometric terminology, I require that the stable unit treatment value assumption (SUTVA) is not violated. A violation can occur in strategic settings. For instance, some control companies may be in direct product market competition with portfolio companies and lose market share if they are unable to match the price reductions that portfolio companies undertake thanks to PE funding. Then a negative sign on β_4 would not necessarily imply an industry-wide fall in demand.

The SUTVA requirement is less likely to be violated in more competitive industries as one company's strategy and actions (such as engaging in aggressive price-cutting and lowering markups) are less likely to affect other companies' actions. I therefore calculate a measure of market concentration, the Herfindahl-Hirschman index (HHI), in each of the country-industry pairs I have in the panel dataset. HHI is given by the sum of squares of company-level market shares in each year. The median HHI in the annual country-industry sample is 0.2; a lower HHI means a more competitive industry in which companies are more likely to be price-takers.

I replicate the estimates for Tables 32 and 34 using the sample of less concentrated (more competitive) industries as defined by an HHI of smaller than 0.2. Results are reported in Tables 39 and 40, respectively. The estimates remain nearly unchanged. In the sample of more competitive industries, PE exits precede periods in which employment (by 20%), wages (by 4.7%), labour productivity (by 6.5%), capital intensity (by 10%), TFP (by 2.9%), and sales (by 26%) all suffer significant drops. This suggests that PE firms may indeed be timing their exits of portfolio companies that precedes industry-wide falls in activity.

Table 39: Operational improvements—sample of less concentrated industries

The table reports difference in differences regression results of the effect of receiving PE funding on company-level outcomes. The sample includes both realized and unrealized deals and each deal's matched control group of companies in industries that are classified as less concentrated. For variable definitions and details of their construction see Table A.2 in the Appendix. All regressions include company and year fixed effects. Standard errors are clustered at the company-level. Heteroskedasticity consistent standard errors clustered at the company-level are shown in italics underneath the coefficient estimates. I use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively.

	Employ-ment	Average wage	Labour productivity	Net investment	Capital intensity	TFP
	(1)	(2)	(3)	(4)	(5)	(6)
β_1: *PE* x *postPE*	0.273***	0.103**	0.151***	-0.000	0.257***	0.037
	0.060	*0.048*	*0.045*	*0.007*	*0.071*	*0.024*
β_2: *postPE*	0.063**	0.027	-0.020	-0.011***	-0.034	-0.025**
	0.025	*0.021*	*0.022*	*0.004*	*0.033*	*0.010*
β_3: *PE* x *postPE* x *exit*	0.120	0.129**	0.089*	0.012	-0.094	0.008
	0.078	*0.051*	*0.053*	*0.009*	*0.099*	*0.028*
β_4: *postPE* x *exit*	-0.185***	-0.046*	-0.063**	0.006	-0.094**	-0.029**
	0.035	*0.024*	*0.029*	*0.004*	*0.045*	*0.014*
$\beta_1 + \beta_3$	0.393***	0.231***	0.239***	0.011	0.164	0.045
	0.096	*0.068*	*0.069*	*0.011*	*0.120*	*0.033*
R-squared	0.052	0.348	0.154	0.098	0.130	0.016
Number of obs.	18,147	10,444	16,959	11,224	16,443	17,997

Table 40: Revenue growth—sample of less concentrated industries

The table reports difference in differences regression results of the effect of receiving PE funding on company-level outcomes. The sample includes both realized and unrealized deals and each deal's matched control group of companies in industries that are classified as less concentrated. For variable definitions and details of their construction see Table A.2 in the Appendix. All regressions include company and year fixed effects. Standard errors are clustered at the company-level. Heteroskedasticity consistent standard errors clustered at the company-level are shown in italics underneath the coefficient estimates. I use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively.

	Sales	Markup	Market share
	(1)	(2)	(3)
β_1: *PE* x *postPE*	0.480***	-0.068***	0.009***
	0.063	*0.023*	*0.002*
β_2: *postPE*	0.081***	0.005	0.001
	0.030	*0.011*	*0.001*
β_3: *PE* x *postPE* x *exit*	0.125	0.005	0.001
	0.107	*0.033*	*0.003*
β_4: *postPE* x *exit*	-0.234***	0.010	-0.002
	0.043	*0.016*	*0.001*
$\beta_1 + \beta_3$	0.606***	-0.064	0.010**
	0.128	*0.039*	*0.004*
R-squared	0.119	0.023	0.067
Number of obs.	22,460	18,099	23,325

5.4.5. Profitability

In addition to strong sales growth, there are two ways that the strategies that emerge from the previous sub-section can generate attractive returns to investors. First is EBITDA growth: to the extent that PE firms keep the growth of operating costs below that of revenues, higher variable profits will translate into greater company value. Second, previously documented strategies may allow PE firms to exit portfolio companies at higher multiples (multiple expansion). While both are likely at play in generating returns, something that speaks for the multiple expansion channel is the fact that PE firms seem to exit just before industry-wide downturns. In this section, I examine changes in profitability measures: EBITDA as well as relative measures such as EBITDA margins and return on assets (ROA).

Column 1 of Table 41 reports estimates of Equation 9 with EBITDA as the outcome variable. In line with previous literature, I find that profitability rises strongly under PE ownership. The point estimate indicates an increase of 62% relative to control companies on average (p=0.010). Portfolio companies continue to experience fast EBITDA growth even after PE funds exit—in fact, at almost twice the rate as during PE ownership. Notably, margins (Column 2) and ROA (Column 3) are on average lower while under PE ownership but then increase strongly following post-exit. I return to this pattern below, after I discuss the role of inorganic growth.

Table 42 repeats the profitability analysis in the sample of organic deals. As before, EBITDA increases under PE ownership at around the same rate, while both margins and ROA are around 1 percentage point lower. This suggests that strong EBITDA growth or the variation in the other profitability measures is not driven by synergies from acquisitions.

Table 41: Profitability

The table reports difference in differences regression results of the effect of receiving PE funding on company-level outcomes. The sample includes both realized and unrealized deals and each deal's matched control group of companies. For variable definitions and details of their construction see Table A.2 in the Appendix. All regressions include company and year fixed effects. Standard errors are clustered at the company-level. Heteroskedasticity consistent standard errors clustered at the company-level are shown in italics underneath the coefficient estimates. I use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively.

	EBITDA	EBITDA margin	Return on assets
	(1)	(2)	(3)
β_1: *PE* x *postPE*	0.483**	-0.008	-0.009**
	0.188	*0.005*	*0.004*
β_2: *postPE*	0.075	-0.004	-0.004*
	0.094	*0.003*	*0.002*
β_3: *PE* x *postPE* x *exit*	0.722**	0.011*	0.021***
	0.283	*0.007*	*0.006*
β_4: *postPE* x *exit*	-0.510***	-0.007**	-0.005
	0.130	*0.004*	*0.003*
$\beta_1 + \beta_3$	1.205***	0.003	0.012*
	0.320	*0.008*	*0.007*
R-squared	0.018	0.020	0.019
Number of obs.	28,211	28,003	29,966

Table 42: Profitability—organic deals only

The table reports difference in differences regression results of the effect of receiving PE funding on company-level outcomes. The sample includes both realized and unrealized deals and each deal's matched control group of companies. For variable definitions and details of their construction see Table A.2 in the Appendix. All regressions include company and year fixed effects. Standard errors are clustered at the company-level. Heteroskedasticity consistent standard errors clustered at the company-level are shown in italics underneath the coefficient estimates. I use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively.

	EBITDA	EBITDA margin	Return on assets
	(1)	(2)	(3)
β_1: *PE* x *postPE*	0.452**	-0.010*	-0.009*
	0.199	*0.005*	*0.005*
β_2: *postPE*	0.032	-0.004	-0.004
	0.102	*0.003*	*0.002*
β_3: *PE* x *postPE* x *exit*	0.739**	0.013*	0.024***
	0.306	*0.007*	*0.007*
β_4: *postPE* x *exit*	-0.513***	-0.006	-0.005
	0.141	*0.004*	*0.003*
$\beta_1 + \beta_3$	1.191***	0.003	0.015*
	0.340	*0.008*	*0.008*
R-squared	0.017	0.019	0.020
Number of obs.	23,918	23,236	24,618

Earlier results in this paper show that portfolio companies reduce markups while increasing sales, employment and capital intensity at a considerably high pace under PE ownership. While EBITDA grows at a similar rate to sales under PE ownership on average, the initial drops I observe in margins and ROA indicate that the growth in company scale potentially comes at the expense of short-term profits. I therefore check how EBITDA and margins evolve in each year following the first year of PE funding. In particular, I estimate the following dynamic regression,

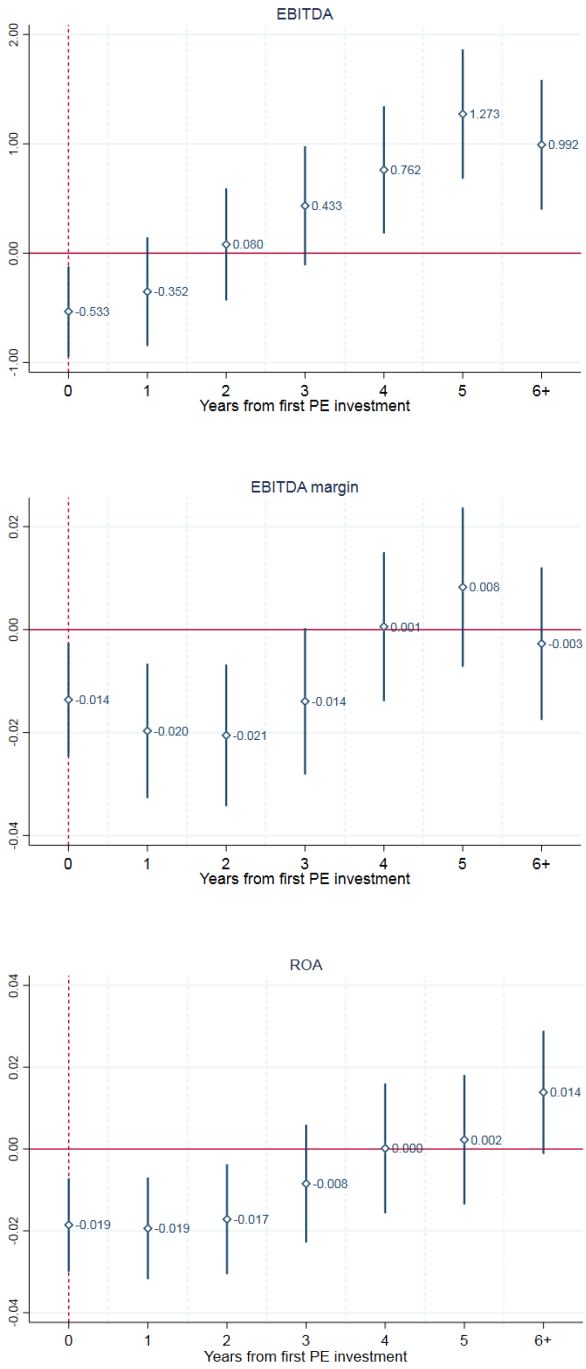
$$y_{it} = \beta_0 + \sum_{s=0}^{6+} \beta_s PE_i * postPE_{it}^s + \sum_{s=0}^{6+} \theta_s \, postPE_{it}^s + \gamma_i + \delta_t + \varepsilon_{it} \qquad (10)$$

where $postPE_{it}^s$ equals 1 for year s after the first round of funding, with s=0, 1, 2, 3, 4, 5, and 6+. This specification allows to decompose the main $PE_i * postPE_{it}$ effect documented earlier into year-by-year effects.

Figure 16 shows the results, with EBITDA in the top Panel, EBITDA margin in the middle Panel and ROA in the bottom Panel. Cash flow and profitability take a considerable hit in the early years of PE ownership. EBITDA is actually down by more than 50% in the first year under PE management and only recovers to become positive (and statistically significant) only from the fourth year onward, when compared with its pre-PE level and relative to control companies. A similar trajectory is also observed for margins. As the sample mostly includes companies that can be classified as requiring expansion capital, this suggests that PE firms are willing to forgo profitability early on to focus on lowering prices relative to competitors and building market share.

Figure 15: Dynamic estimates of profitability under PE management

The figure reports regression estimates and 95% confidence intervals from Equation 10. All regressions include company and year fixed effects. Standard errors are clustered at the company-level.



The long-term effect of PE ownership on profitability, as measured by $\beta_1 + \beta_3$ in Equation 9, is significantly positive for both EBITDA and ROA, though not for margins. Finally, in line with the earlier observation that PE firms may be timing their exits, I find strong and significant downturns in profitability as measured by EBITDA at control companies in the period following PE firm exits.

Table 43: Profitability—sample of less concentrated industries

The table reports difference in differences regression results of the effect of receiving PE funding on company-level outcomes. The sample includes both realized and unrealized deals and each deal's matched control group of companies in industries that are classified as less concentrated. For variable definitions and details of their construction see Table A.2 in the Appendix. All regressions include company and year fixed effects. Standard errors are clustered at the company-level. Heteroskedasticity consistent standard errors clustered at the company-level are shown in italics underneath the coefficient estimates. I use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively.

	EBITDA	EBITDA margin	Return on assets
	(1)	(2)	(3)
β_1: *PE* x *postPE*	0.640***	-0.009	-0.010**
	0.226	*0.006*	*0.005*
β_2: *postPE*	-0.007	-0.003	-0.004*
	0.109	*0.003*	*0.002*
β_3: *PE* x *postPE* x *exit*	0.427	0.005	0.008
	0.359	*0.008*	*0.007*
β_4: *postPE* x *exit*	-0.482***	-0.004	-0.004
	0.145	*0.004*	*0.003*
$\beta_1 + \beta_3$	1.067***	-0.004	-0.002
	0.404	*0.009*	*0.008*
R-squared	0.019	0.019	0.020
Number of obs.	21,287	21,165	22,360

5.4.7. Robustness checks

I check for the robustness of the earlier findings by using an alternative group of control companies. To recap, I selected control companies from those with total assets similar to those of portfolio companies. I now allow for a more flexible selection procedure and carry out a propensity score matching exercise. Specifically, I estimate the propensity score of receiving PE funding by estimating a probit regression model on log total assets in the year of the investment, log revenue in the year before the investment and the year of the investment, log employment in the year of the investment, and a full set of fixed effects for two-digit NACE Rev. 2 industry sectors and investment years. I then select up to five corresponding control companies from the same country-industry sector-investment year cell as the portfolio company that have the closest propensity score to be acquired by a PE firm. I then replicate Tables 31 through 34 and Table 41 using this alternative set of control companies.

Results are reported in Tables 44 through 48. The main findings are unchanged. The point estimates (and their level of statistical significance) are also very similar to the baseline estimates, with two exceptions. First, I find that the increase in TFP at portfolio companies relative to their matched controls is no longer statistically significant while under PE ownership. However, but it remains significant in the long run (with a similar 6.4% rise, p=0.033). Second, the reduction in the payment collection period in Table 37 is no longer significant. These results suggest that PE firms' selection of target companies, at least based on observable characteristics, are not enough to explain away the results I documented earlier.

Table 44: Financial engineering—propensity score matched sample

The table reports difference in differences regression results of the effect of receiving PE funding on company-level outcomes. The sample includes both realized and unrealized deals and each deal's matched control group of companies, based on propensity score matching. For variable definitions and details of their construction see Table A.2 in the Appendix. All regressions include company and year fixed effects. Standard errors are clustered at the company-level. Heteroskedasticity consistent standard errors clustered at the company-level are shown in italics underneath the coefficient estimates. I use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively.

	Leverage	Net debt to EBITDA	Implicit interest rate	Taxes paid	Tax rate
	(1)	(2)	(3)	(4)	(5)
β_1: *PE* x *postPE*	0.031***	0.280	0.003	0.135	-0.015**
	0.010	*0.190*	*0.009*	*0.140*	*0.007*
β_2: *postPE*	0.011**	-0.044	0.003	-0.034	0.003
	0.005	*0.110*	*0.006*	*0.073*	*0.004*
β_3: *PE* x *postPE* x *exit*	-0.007	-0.189	0.029**	0.385*	0.014
	0.015	*0.280*	*0.013*	*0.202*	*0.009*
β_4: *postPE* x *exit*	-0.020***	-0.297**	-0.001	-0.344***	-0.008*
	0.007	*0.137*	*0.007*	*0.094*	*0.005*
$\beta_1 + \beta_3$	0.025	0.091	0.033**	0.520**	-0.002
	0.017	*0.311*	*0.014*	*0.222*	*0.010*
R-squared	0.011	0.003	0.021	0.027	0.015
Number of obs.	23,148	20,537	8,800	16,146	24,608

Table 45: Operational improvements—propensity score matched sample

The table reports difference in differences regression results of the effect of receiving PE funding on company-level outcomes. The sample includes both realized and unrealized deals and each deal's matched control group of companies, based on propensity score matching. For variable definitions and details of their construction see Table A.2 in the Appendix. All regressions include company and year fixed effects. Standard errors are clustered at the company-level. Heteroskedasticity consistent standard errors clustered at the company-level are shown in italics underneath the coefficient estimates. I use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively.

	Employ-ment	Average wage	Labour productivity	Net investment	Capital intensity	TFP
	(1)	(2)	(3)	(4)	(5)	(6)
β_1: *PE* x *postPE*	0.274***	0.098**	0.145***	-0.006	0.270***	0.029
	0.054	*0.039*	*0.039*	*0.006*	*0.060*	*0.019*
β_2: *postPE*	0.090***	0.009	-0.034*	-0.006	-0.056*	-0.011
	0.024	*0.019*	*0.020*	*0.004*	*0.031*	*0.010*
β_3: *PE* x *postPE* x *exit*	0.037	0.102**	0.111**	0.014*	-0.046	0.033
	0.079	*0.047*	*0.049*	*0.007*	*0.081*	*0.025*
β_4: *postPE* x *exit*	-0.156***	-0.085***	-0.095***	0.006	-0.182***	-0.012
	0.034	*0.024*	*0.027*	*0.004*	*0.042*	*0.013*
$\beta_1 + \beta_3$	0.311***	0.201***	0.255***	0.008	0.224**	0.062**
	0.098	*0.062*	*0.063*	*0.009*	*0.099*	*0.029*
R-squared	0.045	0.341	0.139	0.116	0.128	0.008
Number of obs.	22,442	12,776	20,057	12,128	19,501	21,276

Table 46: Cash management—propensity score matched sample

The table reports difference in differences regression results of the effect of receiving PE funding on company-level outcomes. The sample includes both realized and unrealized deals and each deal's matched control group of companies, based on propensity score matching. For variable definitions and details of their construction see Table A.2 in the Appendix. All regressions include company and year fixed effects. Standard errors are clustered at the company-level. Heteroskedasticity consistent standard errors clustered at the company-level are shown in italics underneath the coefficient estimates. I use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively.

	Working capital	Credit period	Collection period	Stock turnover
	(1)	(2)	(3)	(4)
β_1: *PE* x *postPE*	-0.042***	0.851	-0.938	-0.220
	0.011	*2.044*	*2.174*	*3.461*
β_2: *postPE*	-0.001	0.592	0.601	0.264
	0.007	*1.204*	*1.294*	*1.865*
β_3: *PE* x *postPE* x *exit*	0.017	-0.232	-0.187	0.066
	0.016	*3.145*	*3.087*	*4.419*
β_4: *postPE* x *exit*	0.000	3.553**	0.911	-0.344
	0.009	*1.670*	*1.814*	*2.981*
$\beta_1 + \beta_3$	-0.025	0.619	-1.125	-0.154
	0.020	*3.582*	*3.623*	*4.921*
R-squared	0.006	0.018	0.015	0.004
Number of obs.	23,791	21,434	22,395	18,821

Table 47: Revenue growth—propensity score matched sample

The table reports difference in differences regression results of the effect of receiving PE funding on company-level outcomes. The sample includes both realized and unrealized deals and each deal's matched control group of companies, based on propensity score matching. For variable definitions and details of their construction see Table A.2 in the Appendix. All regressions include company and year fixed effects. Standard errors are clustered at the company-level. Heteroskedasticity consistent standard errors clustered at the company-level are shown in italics underneath the coefficient estimates. I use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively.

	Sales	Markup	Market share
	(1)	(2)	(3)
β_1: *PE* x *postPE*	0.635***	-0.073***	0.010***
	0.082	*0.019*	*0.002*
β_2: *postPE*	0.226***	0.015	-0.001
	0.041	*0.010*	*0.001*
β_3: *PE* x *postPE* x *exit*	0.157	0.006	0.001
	0.113	*0.030*	*0.004*
β_4: *postPE* x *exit*	-0.305***	-0.015	-0.001
	0.055	*0.016*	*0.001*
$\beta_1 + \beta_3$	0.792***	-0.067*	0.011***
	(0.140)	*(0.036)*	*(0.004)*
R-squared	0.067	0.020	0.075
Number of obs.	29,161	21,354	29,338

Table 48: Profitability—propensity score matched sample

The table reports difference in differences regression results of the effect of receiving PE funding on company-level outcomes. The sample includes both realized and unrealized deals and each deal's matched control group of companies, based on propensity score matching. For variable definitions and details of their construction see Table A.2 in the Appendix. All regressions include company and year fixed effects. Standard errors are clustered at the company-level. Heteroskedasticity consistent standard errors clustered at the company-level are shown in italics underneath the coefficient estimates. I use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively.

	EBITDA	EBITDA margin	Return on assets
	(1)	(2)	(3)
β_1: *PE* x *postPE*	0.405**	-0.008	-0.007
	0.188	*0.006*	*0.004*
β_2: *postPE*	0.243***	-0.002	-0.004*
	0.093	*0.003*	*0.002*
β_3: *PE* x *postPE* x *exit*	0.690**	0.020***	0.018***
	0.275	*0.007*	*0.006*
β_4: *postPE* x *exit*	-0.431***	-0.014***	-0.004
	0.127	*0.004*	*0.003*
$\beta_1 + \beta_3$	1.094***	0.012	0.011
	0.312	*0.009*	*0.007*
R-squared	0.020	0.019	0.017
Number of obs.	26,279	25,069	27,558

5.6. Conclusion

I study the effects of receiving private equity funding on portfolio companies focusing on a wide range of economic outcomes spanning the four value creation strategies: financial engineering, operational improvements, cash management, and revenue growth. Regarding the first strategy, I find that PE firms help portfolio companies increase their borrowing during their ownership. However, increased borrowing ability is not associated with investor returns. I confirm prior findings that PE ownership leads to operational efficiency and revenue growth: both labour productivity and TFP improve as PE-backed companies ramp up investment, employment, and sales. PE ownership also helps portfolio companies renegotiate faster payments from customers. Using detailed confidential information obtained from inside PE firms, I show that the PE firms in the sample push for operational improvements. I find no evidence that PE-backed companies increase their market power. In fact, the PE-backed companies in the sample reduce their price markups by 6% on average.

I provide a first answer to the question, how persistent are the benefits of PE investment for portfolio companies? The answer matters greatly for both investors and target companies. If portfolio companies retain any competitive advantage they gain while under PE ownership, the value creation is more permanent in nature. The results indicate that the majority of operational improvements that are instigated by PE firms remain beyond their investment period at a portfolio company. Finally, I find strong evidence that PE firms time their exits from portfolio companies to coincide with periods of industry downturns.

Future research

The focus in this paper is on value creation conditional on a PE fund having selected a company for investment. The surveys papers of Gompers et al. (2016) and Gompers et al. (2020) highlight the importance of deal selection. How PE firms select their investments is a promising avenue for future research.

6. Value creation plans, economic outcomes, and investor returns

Abstract

I study how private equity (PE) firms generate returns for their investors by linking data on detailed confidential value creation plans (VCPs) and their achievement obtained from inside PE firms, related company-level economic outcomes, and investor returns. No single value creation strategy emerges on its own as the best predictor of investor returns. Instead, investor returns depend on how value creation strategies are combined. Successful execution of VCPs is a key driver of investor returns, especially in growth, buyout, and secondary deals. Company operations improve in ways consistent with successful execution of VCPs. I confirm prior findings in the literature by showing that investors earn higher returns the more a portfolio company increases its sales, EBITDA, employment, and capital intensity during the holding period.

JEL Classification: G24, G32, G34

Keywords: Private equity, value creation, investor returns

6.1. Introduction

Academic research on PE has grown mainly in two strands. The first strand of literature has focused on operational changes at PE-backed companies (e.g., profitability, employment, and productivity).[34] The second strand has studied the return drivers and has documented that investors have done well out of investing in PE, earning returns in excess of those available in public equity markets.[35] Although both strands have developed independently, they imply that PE "creates value" for its investors and portfolio companies. The aim of this paper is to explore the links between PE firms' VCPs, company-level changes in economic outcomes, and investor returns using unique data.

Kaplan and Strömberg (2009) note that "private equity firms use their industry and operating knowledge to identify attractive investments, to develop value creation plans for those investments, and to implement the value creation plans. A [value creation] plan might include elements of cost-cutting opportunities and productivity improvements, strategic changes or repositioning, acquisition opportunities, as well as management changes and upgrades." Although many studies refer to such VCPs, there is no systematic evidence in the literature on whether such plans help improve portfolio companies or investor returns or both.

Against this background, I ask: Do investor returns reflect the PE firms' VCPs and their (successful) execution? How are investor returns affected if these plans are not realised? Are certain strategies better than others for generating returns? Which value creation strategies are the main drivers of the relationship between changes in economic outcomes and investor returns? An answers to these questions can shed light on the actual underlying

[34] For instance, see Boucly, Sraer, and Thesmar (2011), Davis et al. (2014), Bharat, Dittmar, and Sivadasan (2014), Fracassi et al. (2017).
[35] For instance, see Ljungqvist and Richardson (2003), Kaplan and Schoar (2005), Kaplan and Strömberg (2009), Robinson and Sensoy (2016), Higson and Stucke (2013), Phalippou (2014), and Harris, Jenkinson, and Kaplan (2014).

sources of value creation for investors in PE and have profound implications for assessing the overall impact PE has on economic welfare.

To answer these question, I link three unique individual datasets on PE firms' value creation plans, changes in company-level economic outcomes during the holding period, and investor returns. Each dataset spans 1,580 deals by 178 PE funds in 20 transition economies in Central and Eastern Europe over a 25-year period.

As an approximation, I know what PE firms know. I have unrestricted access to confidential pre-deal investment documents and quarterly summaries of information PE firms have about their portfolio companies and the conclusions they draw from them. This data allows me to capture each fund's intended strategy to create value at the time of investment and how they achieve it over time. I also know what actions PE firms take in response to the information they collect. Specifically, the quarterly reports include comments on eventual success or failure of implementing a VCP and how PE firms change strategies when intended plans do not materialise on time or at all.

For each PE-backed portfolio company in the sample, I complement the textual information on VCPs with hard information from annual balance sheets and income statements. In doing so, I manually match each portfolio company to Orbis. Orbis provides harmonized information on financial statements on a rich set of public and private companies. I use Orbis data to capture company-level changes in economic outcomes and to construct a control group of companies for the empirical analysis.

I also have access to precisely dated cash flows between funds and their portfolio companies, which I use to compute a set of financial return measures. In contrast, investor returns on PE-backed portfolio company are impossible to compute with any certainty from commercial databases, because the exact contractual structure of the investments is not

recorded. Commercial databases also often only have quarterly information which further skews these measures.

I take seriously the possibility that PE firms may strategically skew their reporting to their investors in ways that falsely attribute success to superior execution and failure to external circumstances beyond their control. To this end, I check on funds' self-reported achievements by relating PE firms' VCPs to changes in company-level outcomes. Such analysis requires a reasonable benchmark against which to compare whether the observed company-level changes can be plausibly attributed to the PE investment or would have happened regardless of the PE firm's participation. I follow prior literature and compare the portfolio companies in the sample to a set of narrowly constructed control companies matched by country, industry, year, and company financials following Bharat et al. (2014) and Davis et al. (2014).

Using this matched sample, I show that during the holding period, portfolio companies experience the kinds of changes in financial metrics, operational metrics, cash management, and revenue growth reflect the successful implementation of PE firms' VCPs. Specifically, portfolio companies increase leverage, significantly improve their operations, and boost their revenues. Funds planning to introduce a value creation strategy and not achieving it see a lower or decreasing effect in company-level outcomes compared to funds planning to introduce and achieve a related value creation strategy. The results offer corroborating evidence as a check on funds' self-reported plan achievements.

To investigate whether some value creation strategies are associated with higher investor returns, I link VCPs and their execution to investor returns. I use LASSO to identify which planned and achieved strategy combinations best predict investor returns out of sample. This analysis reveals a novel finding: No single value creation strategy emerges on its own as the best predictor of investor returns. Instead, it appears that investor returns

depend on how certain strategies are combined. The highest investor returns are predicted and realized for strategy combinations that are not popular in the sample.

I complement the LASSO analysis with a traditional in-sample analysis. This analysis reinforces the conclusions from the LASSO analysis. I find that the share of achieved plan items is a key driver of investor returns, especially in growth, buyout, and secondary deals. In addition, neither the number of planned plan items nor the number and the share of newly plan items introduced after the investment correlate significantly with investor returns.

As further evidence against strategic reporting, I examine whether changes in company-level outcomes during the holding period help explain investor returns. PE firms increasingly turn to generating returns through revenue growth and carrying out efficiency improvements (Gompers et al., 2016). In line with this, I show that investors earn higher returns the more a portfolio company increases its sales, EBITDA, employment, and capital intensity during the holding period.

6.2. Data and sample

The data come from the European Bank for Reconstruction and Development (EBRD), an international financial institution founded in 1991. As part of its mandate, the EBRD has sought to help create a PE market by being a cornerstone investor in private equity funds with focus on transition economies in Central and Eastern Europe, Central Asia, North Africa, and the Middle East. Apart from their geographic focus, these funds are not different compared to those that have been studied extensively in the PE literature. They are managed by independent PE firms, have profit-maximizing objectives, and raise their capital from institutional investors. In fact, roughly half of the funds are run by Western fund managers. The EBRD invests in all PE funds that meet the minimum due-diligence requirements established by Cambridge Associates, an investment consultancy, thus reducing sample selection concerns.

The sample used in this paper extends the sample used in Cornelli et al. (2013) and combines three unique datasets: data on PE firms' pre-investment value creation plans, data on company-level economic outcomes, and data on investor returns. Each of these datasets spans information on 178 PE funds in which the EBRD invested in, which in turn invested in 1,580 "portfolio companies". Sample funds were raised and closed between 1992 and 2017, and have an average (median) size of USD 163.2 million (USD 88.5 million). After excluding countries with less than 10 deals, the sample contains 1,444 portfolio companies from 20 countries, with an average (median) of 10 (9) per fund.[36]

Table 49 describes the full sample. The top-three countries in terms of number of deals are Russia (381), Poland (320), and the Czech Republic (113), which together account for approximately half of the full sample. Deal activity has varied over time, with the busiest period in 1997-2001 (501). I follow each portfolio company from the year of investment to the earlier of exit (which may take place through a trade sale or an initial public offering on a stock market), write-off, or 31 December 2017 when the sample ends. As of year-end 2017, 1,078 (68%) portfolio companies had been exited, while 502 (32%) remain in the funds' portfolios. The average portfolio company spends 5.8 years in a sample fund's portfolio before being exited or written off.

The vast majority of the sample comprises growth capital investments (940), followed by early-stage deals (303), buyouts (206), secondary transactions (99), and turnaround deals (32). Growth capital investments typically involve acquiring a minority stake in a company which has fast growing sales and profits. Early-stage deals feature start-ups and companies that do not generate significant income yet. Buyouts typically involve taking majority control of mature companies with relatively stable cash flows. In a secondary transaction, an existing

[36] The excluded countries are Albania, Armenia, Azerbaijan, Belarus, Cyprus, Egypt, Georgia, Jordan, Kosovo, the Kyrgyz Republic, Moldova, Mongolia, Tunisia, and Turkmenistan, accounting for 105 portfolio companies.

PE-backed portfolio company is sold to another PE firm. Turnarounds deals focus on underperforming companies.

The average (median) deal size is USD 12.4 million (USD 5.0 million), indicating that most portfolio companies are small to medium-sized enterprises.

Table 49: Sample overview

The sample consists of 1,580 deals by 178 PE funds investing in Central and Eastern Europe, Central Asia, North Africa, and the Middle East. The PE funds were raised and closed between 1992 and 2017 and made investments between 1992 and 2017. I track each investment from the year of investment to the earlier of exit, write-off, or 31 December 2017 when the sample ends. I record whether it has been exited ("FR") or remains in the funds' portfolios as of December 2017 ("UR"). Tracking each deal over time results in an unbalanced panel.

	Year of investment					Case status		All deals
	1992-1996	1997-2001	2002-2006	2007-2011	2012-2017	FR	UR	
Panel A: Number of deals								
Bosnia & Herzegovina	-	4	5	1	2	10	2	12
Bulgaria	1	13	20	25	7	54	12	66
Croatia	-	11	6	4	6	18	9	27
Czech Republic	16	39	19	26	13	96	17	113
Estonia	2	24	17	6	15	47	17	64
Greece	-	-	2	3	12	3	14	17
Hungary	12	39	14	11	5	76	5	81
Kazakhstan	-	12	2	5	16	19	16	35
Latvia	-	6	11	4	6	18	9	27
Lithuania	1	21	5	5	4	30	6	36
Morocco	-	-	-	-	18	1	17	18
North Macedonia	-	12	3	-	4	16	3	19
Poland	54	113	40	57	56	245	75	320
Romania	6	40	16	27	22	80	31	111
Russia	38	121	52	74	96	238	143	381
Serbia	-	-	2	4	12	6	12	18
Slovak Republic	-	20	5	3	5	28	5	33
Slovenia	7	15	1	2	4	23	6	29
Turkey	-	-	3	12	76	15	76	91
Ukraine	26	11	9	14	22	55	27	82
All countries	163	501	232	283	401	1,078	502	1,580
Panel B: Deal type								
Early-stage	69	117	27	22	68	229	74	303
Growth	71	330	129	155	255	623	317	940
Buyout	1	9	52	84	60	122	84	206
Secondary	17	33	22	14	13	78	21	99
Turnaround	5	12	2	8	5	26	6	32
Panel C: Deal size								
Mean	3.4	4.0	13.1	24.3	17.7	8.2	21.3	12.4
Median	2.0	2.3	5.9	13.2	9.6	3.4	10.9	5.0

6.2.1. Value creation plans

Using proprietary pre-investment documents and quarterly reports provided by PE firms to their investors, I identify the channels through which funds realize operational improvements and growth in company value. To this end, I quantify soft information about value creation plans as reported by funds themselves and document how different strategies affect operational changes and investor returns at the company-level. The underlying information comes from the fund managers' pre-investment documents, quarterly reports, and audited financial statements. Of particular interest are funds' confidential comments regarding their VCPs and their ability to implement these plans. Unlike accounting data, these comments are potentially difficult to verify (say, in the annual shareholders' meeting) and thus constitute soft information.

Based on a literature review and an initial scan of pre-investment documents, I select a total of 23 indicators, grouped into five strategies. I first identified variables following Gompers et al. (2016)'s survey of PE firms on their sources of value creation and return drivers. I then randomly selected 100 deals in the sample and read their pre-investment plans to identify additional common sources of value creation. Similar to Gompers et al. (2016), I design a template to collect the soft information from the VCPs. I focus on changes at the portfolio company-level during the PE holding period, which can be objectively captured in a binary fashion and that two independent readers could agree on.

There are two main dimensions along which I code up the soft information. First, I pinpoint exactly when a certain "plan item" was put forward or suggested as a potential returns driver. Pre-investment documents detail the intended areas of action prior to the first disbursement, while quarterly reports are available typically from the first quarter after which a fund invested in a portfolio company. Second, I track whether each of these plans is

eventually achieved or not. In summary I am able to quantify textual information on PE firms' VCPs for 1,136 deals (hereinafter referred to as "VCP sample").

I distinguish five strategies: Financial engineering, operational improvements, cash management, revenue growth, and governance engineering. In their surveys, Kaplan and Strömberg (2009) and Gompers et al. (2016) focus on three of these five strategies: financial engineering, operational improvements, and governance engineering. I add cash management and revenue growth strategies based on the literature review and initial reading of the pre-investment documents.

6.2.2. Value creation outcomes

I use Orbis data to calculate changes in company-level outcomes. Orbis provides consolidated accounting information taken from annual balance sheets and income statements as well as data on employment and industry sector classification for both publicly listed and privately held companies. Orbis reports these data in a manner that is consistent and comparable across countries and years. Orbis covers the vast majority of the companies operating in the EBRD regions.

I manually link each company in the full sample to Orbis (including historical ones where names have changed). Of the 1,580 companies in the full sample, I am able to link 1,373 to Orbis. I exclude 331 of these matches because Orbis lacks sufficient information around the time of the PE investment. The result is a sample of 1,042 portfolio companies (hereafter referred to as the "Orbis sample"). Although the number of observations used in the empirical specifications will vary depending on the data availability in Orbis.

Using Orbis, I construct a number of measures that relate the strategies in the VCP sample: The first is "financial engineering", which includes a portfolio company's leverage (total debt to total assets), net debt to earnings before interest, taxes, depreciation, and amortisation (EBITDA), implicit interest rate it pays on its outstanding debt, effective tax

rate, and taxes paid. The second is "operational improvements", which includes employment, average wages, capital intensity, labour productivity, and total factor productivity (TFP).[37] The third is "cash management", which includes working capital, creditor and collection periods in days, and stock turnover. The fourth is "revenue growth", which includes sales, price-cost markups, and market shares. I also calculate three profitability measures: EBITDA, EBITDA margin, and return on assets. Table A.2 in the Appendix provides the definitions of all variables used in the analysis.

6.2.3. Private equity performance measures

To estimate investor returns, I use precisely dated cash flows between a fund and a portfolio company. These cash flows comprise the initial investment and any follow-on investment, dividend income, and exit proceeds, if any. For partially realized and unrealized portfolio companies, I also observe the fund's fair value estimate as of year-end 2017, which acts as a proxy for future cash proceeds. Cash flows are gross of the fund's management fees, expenses, and carried interest and are a flection of the portfolio company's underlying performance.

Using this data, I estimate standard performance measures: the public market equivalent (PMEs), the multiple on invested capital (MOIC), and the internal rate of return (IRR). I construct PME in the spirit of Kaplan and Schoar (2005), using the MSCI Emerging Markets index as a benchmark.

[37] TFP captures the efficiency with which all inputs into production (labour, materials, and capital) are used. There is a long-established literature on TFP estimation, which carefully deals with the challenge that companies' input choices are correlated with the error term, given that companies likely choose their inputs based on their current and expected future productivity (which is observed to the company but not to the econometrician). I follow the production-function approach to TFP estimation pioneered by Olley and Pakes (1996), Levinsohn and Petrin (2003), and Ackerberg et al. (2006).

6.3. Empirical strategy

6.3.1. Value creation plans and outcomes

To check on funds' self-reported plan achievements, I investigate the relationship between the change in company-level outcomes and PE firms' VCPs and their achievement. I document the effects of receiving PE funding on company-level economic outcomes during the holding period by estimating difference in differences regressions of the following form:

$$y_{it} = \beta_0 + \beta_1 PE_i * postPE_{it} + \beta_2 postPE_{it} + \gamma_i + \delta_t + \varepsilon_{it} \quad (11)$$

where y_{it} is an outcome variable for company *i* in year *t*, and PE_i is a treatment indicator equal to 1 for companies acquired by a PE firm and 0 for companies in the control group. For portfolio companies, $postPE_{it}$ equals 1 for years following the first PE funding round and 0 before. For control companies, $postPE_{it}$ equals 1 for years after their matched targets first received PE funding and 0 before. I estimate the model including a full set of company (γ_i) and year (δ_t) fixed effects and cluster standard errors at the company-level. To guard against the influence of outliers, I remove company-year observations with values at the bottom and top 1th percentiles of the sample distribution.

I follow prior literature and compare portfolio companies in the Orbis sample to a set of control companies matched based on country, industry, year of investment, and observable financials. Specifically, I estimate the propensity score of receiving PE funding by estimating a probit regression model on log total assets in the year of the investment, log revenue in the year before the investment and the year of the investment, log employment in the year of the investment, and a full set of fixed effects for two-digit NACE Rev. 2 industry sectors and investment years. I then select up to five corresponding control companies from the same country-industry sector-investment year cell as the portfolio company that have the closest propensity score to be acquired by a PE firm.

The control companies come from narrowly defined cells country-industry cells in which they are likely to experience the same macro and industry shocks or expectations about future profitability as our portfolio companies. Constructing such narrow groups of control companies is similar to the matching strategies of Bharat et al. (2014) and Davis et al. (2014) and helps address concerns of selection and unobservable company attributes that may correlate with these control groups. Using Orbis' ownership database, I also make sure that control companies have not received PE funding before.

6.3.2. Value creation plans and investor returns

Least absolute shrinkage and selection operator (LASSO)

To identify which types of VCPs best predict investor returns, I start with a LASSO analysis. LASSO is a popular machine-learning prediction model and was introduced by Frank and Friedman (1993) and Tibshirani (1996).[38] LASSO identifies a set of variables the best predict investor returns out-of-sample. This contrasts with a traditional OLS analysis, which seeks to provide the best in-sample fit by minimizing the sum of squared differences between observed outcomes and predicted outcomes.[39]

I use LASSO to identify the combinations of VCP strategies that best predict PMEs, MOICs, and IRRs, while controlling for log deal size, log deal duration, and entry and exit year fixed effects. Specifically, I estimate the following LASSO function:

[38] Tibshirani (1996) motivates LASSO with two major advantages over OLS. First, due to the nature of the "L1"-penalty, the LASSO sets some of the coefficient estimates exactly to zero and, in doing so, removes some predictors from the model. Thus, LASSO serves as a model selection technique and facilitates model interpretation. Second, LASSO can outperform least squares in terms of prediction accuracy due to the bias-variance trade-off.

[39] OLS coefficients optimize in-sample fit. OLS coefficients are unbiased, but OLS tends to produce high residual mean squared errors leading to poor out-of-sample accuracy. In contrast, LASSO coefficients optimize out-of-sample prediction. LASSO coefficients are biased towards 0, but LASSO produces low variance leading to good out-of-sample accuracy. While OLS includes all variables, LASSO tends to choose a subset of variables (i.e., it sets some coefficients to zero). LASSO does so to avoid "overfitting," as including too many variables tends to hurt out-of-sample predictions.

$$\hat{\beta}_{lasso}(\lambda) = \arg\min \frac{1}{n}\sum_{i=1}^{n}(y_i - x'_i\beta)^2 + \frac{\lambda}{n}\sum_{j=1}^{p}\psi_j|\beta_j| \quad (12)$$

subject to $\lambda \geq 0$

where λ is a penalising parameter, y_i is the deal-level PME, MOIC, or IRR, and x'_i is a vector of dummies representing the five value creation strategies financial engineering, operational improvements, cash management, revenue growth, and governance engineering. I code a strategy equal to 1 if at least one plan item within a strategy is pursued, and 0 otherwise. I code pre-investment plan items using information available at the time of investment, and use all subsequent information to track achievement. All regressions include log deal size, log deal duration, and entry and exit year fixed effects. I separately model planned and achieved strategy combinations to predict investor returns.

I run LASSO on all 2^5=32 possible combinations of the five value creation strategies in the VCP sample to predict returns. LASSO is a shrinkage method. The penalization parameter lambda controls the shrinkage. A higher lambda reduces the complexity of the model and shrinks its coefficients towards zero. This lowers the variance but increases the bias. I set lambda to optimize the out-of-sample prediction, using a 10-fold cross-validation whereby the data are repeatedly divided into training data and validation data. LASSO outputs one or more specifications which most accurately predict investor returns.

Ordinary least squares (OLS) regression

In a second step, I relate PE performance metrics to VCPs and their achievement, and changes to initial VCPs. Specifically, I run OLS regressions of the deal-level PME, MOIC, or IRR on the number of plan items, the share of plan items achieved, and the number of new plan items introduced and achieved. I also control for log deal size, log deal duration, and entry and exit year fixed effects. The share of plan items achieved is defined as the number of initial plan items achieved over the total number of plan items. The share of new plan items

introduced is defined as the number of new plan items introduced after the investment over the sum of one plus the number of initial plan items at the time of the investment. The share of new plan items achieved is defined as the number of new plan items achieved which were introduced after the investment over the total number of new plan items which were introduced after the investment.

6.3.3. Value creation outcomes and returns

I now turn to assess whether returns generated by PE funds go hand-in-hand with the value creation strategies studied in the previous section. I draw on proprietary deal-level cash flows to relate the variation in returns to operational changes at the deal-level. I use PME and MOIC as proxies for returns. I estimate cross-sectional company-level regressions of the form:

$$y_i = \beta_0 + \beta_1[x_{i,exit} - x_{i,entry}] + \beta_2 X_i + \delta_{i,entry} + \delta_{i,exit} + \varepsilon_i \quad (13)$$

where y_i is the deal-level PME, MOIC, or IRR. $\Delta x_i = [x_{i,exit} - x_{i,entry}]$ is a vector of company-level changes measured over the holding period (hereafter referred to as "absolute change"). X_i is a vector of controls including log deal size and log deal duration. $\delta_{i,entry}$ and $\delta_{i,exit}$ capture entry and exit year effects.

In order to guard against fluctuations in company-level outcomes driven by entry and exit years, I average entry and exit values over a three-year period. That is, x_i at the time of the investment is measured as the average of the outcome variable in the year before, the year of, and the year after the investment. In the same way I calculate x_i at the time of the exit. The results do not change if I focus on the exact entry and exit years but it reduces the sample size due to gaps in the Orbis dataset.

It is possible that PE firms in the sample hold on to their investments during a period of macroeconomic growth that coincides with ample liquidity or greater demand for private assets. This can introduce a positive correlation between both changes in company-level

outcomes and investor returns. I therefore include time dummy variables for both entry and exit years ($\delta_{i,entry}$ and $\delta_{i,exit}$, respectively) to capture the impact of market timing on investor returns.

In the same way I calculate the absolute change, I calculate the median change in outcome variables in matched control companies $\Delta x_s = [x_{s,exit} - x_{s,entry}]$. I construct the matched control sample as described in Section 6.3.1. In a second step, following Acharya et al. (2013), I add to the regressions the difference between deal-level changes in outcomes and contemporaneous changes at corresponding control companies $\Delta x_i - \Delta x_s$ (hereafter referred to as "relative change").

I estimate Equation 13 on the sample of fully realized investments and "mature" unrealized investments which have spent five years or more in a PE fund's portfolio. Excluding this latter subset of deals does not change the results qualitatively, but reduces the sample size. As the company-level changes are highly correlated with each other—for instance, a high-growth firm sees its employment, revenues, productivity, and capital intensity all grow at the same time—I relate the change in each outcome variable to investor returns one at a time.

6.4. Results

6.4.1. Summary statistics

Value creation plans

Table 50 summarises the prevalence of value creation strategies and plan items in the VCP sample. The left panel of the table reports the deal count and the fraction of deals pursuing a VCP. As this panel shows, sample PE firms follow a rich variety of VCPs. The middle panel of the table provides an overview of the achievement rates for each strategy and plan item. Funds typically report having achieved their initial VCP although some plan items

appear easier to achieve than others. The right panel of the table reports the deal count and fraction of deals that see a revision of the initial VCP after the investment.

In the VCP sample, the five most popular plans to create value at the time of investment are buying new or upgrading fixed assets (66%), changing the mix of products or services (37%), pursuing acquisitions (33%), improving marketing or promotion (31%), and optimising the capital structure (30%). This set of plan items is followed by plans to change other senior management (26%), reduce costs (26%), and pursue international expansion (21%).

PE firms set out to implement 4.5 of these plans on average and report achieving the majority. Some plans are easier to achieve than others. On the one hand, PE firms manage to implement plans aimed at buying or upgrading fixed assets or replace the CEO in more than 90% of the deals in which these plan items were part of the initial VCP. On the other hand, they report achieving an increase market share, improve corporate governance practices, pursue international expansion, or grow inorganically through acquisitions in less than 75% of the deals.

PE firms also actively monitor their investments and introduce new plans in order to turn around deals that are not performing as expected. For instance, one in every five deals sees a plan to replace the CEO when this plan item is not part of the initial VCP. The five most popular new plan items—introduced a few years into the life of a deal—differ from the initial VCP and include cost reductions (31%), optimizing the capital structure (20%), changing the CEO (19%), changing the pricing strategy (18%), and improving the mix of products and services (17%).

Table 50: Value creation plans

The table reports the share of deals pursuing individual VCPs, grouped into five themes, by time periods in which funds introduce plans. I code a theme equal to 1 if at least one plan within a theme is pursued, and 0 otherwise. The first two columns report deal-level VCPs at the time of investment (years 0 and 1). The final four columns report achievement of initial VCPs.

	Fund plans to…		Fund achieves plan to...			Fund introduces new plan to...	
Strategy / plan item	Deal count	Fraction	Deal count	Fraction	Share achieved	Deal count	Fraction
Financial engineering	**395**	**0.35**	**349**	**0.31**	**0.88**	**252**	**0.23**
Optimize capital structure	346	0.30	303	0.27	0.88	220	0.20
Improve incentive systems	93	0.08	84	0.07	0.90	46	0.04
Operational improvements	**951**	**0.84**	**904**	**0.80**	**0.95**	**588**	**0.55**
Buy or upgrade fixed assets	749	0.66	698	0.61	0.93	84	0.08
Sell fixed assets	78	0.07	75	0.07	0.96	156	0.15
Divest non-core business units	70	0.06	56	0.05	0.80	165	0.15
Reduce costs	293	0.26	275	0.24	0.94	338	0.31
Improve IT systems	188	0.17	154	0.14	0.82	74	0.07
Improve distribution	173	0.15	147	0.13	0.85	104	0.10
Improve corporate structure	124	0.11	106	0.09	0.85	103	0.10
Cash management	**154**	**0.14**	**137**	**0.12**	**0.89**	**191**	**0.18**
Improve payment terms	126	0.11	113	0.10	0.90	166	0.15
Improve inventory management	50	0.04	41	0.04	0.82	54	0.05
Revenue growth	**838**	**0.74**	**762**	**0.67**	**0.91**	**529**	**0.49**
Target market share	159	0.14	98	0.09	0.62	51	0.05
Pursue acquisitions	376	0.33	280	0.25	0.74	151	0.14
Change mix of products or services	420	0.37	376	0.33	0.90	182	0.17
Pursue international expansion	244	0.21	178	0.16	0.73	106	0.10
Change pricing strategy	158	0.14	138	0.12	0.87	196	0.18
Improve marketing	356	0.31	310	0.27	0.87	186	0.17
Improve product quality	114	0.10	89	0.08	0.78	87	0.08
Governance engineering	**548**	**0.48**	**519**	**0.46**	**0.95**	**420**	**0.39**
Change CEO	222	0.20	207	0.18	0.93	206	0.19
Change CFO	223	0.20	211	0.19	0.95	108	0.10
Change other senior management	298	0.26	287	0.25	0.96	158	0.15
Improve corporate governance	52	0.05	37	0.03	0.71	22	0.02
Change board structure	157	0.14	139	0.12	0.89	122	0.11

Value creation outcomes

Table 51 reports summary statistics for company-level outcome variables, separately for portfolio companies and matched control companies. Panel A reports pre-treatment levels of portfolio companies and control companies, averaged over the three years preceding the year of the PE investment. Panel B reports pre-treatment trends. For pre-treatment trends, I calculate the change from the previous year to the year of the PE investment. I also report the difference in means between portfolio companies and control companies. The difference in means results from regressing each outcome variable on a dummy equal to 1 for portfolio companies and 0 for control companies.

By construction, portfolio and control companies share the same country and industry sector distributions and are similar in asset size (unreported). The average portfolio company (control company) had USD 42.4 million (USD 40.3 million) in annual sales averaged over the three years preceding a PE deal, employed on average 335 (298) employees, commanded a market share of 14% (9%), earned USD 4.0 million (USD 3.6 million) in EBITDA, and had total debt equal to 23% (17%) of its assets. In comparison, based on pre-treatment tends, the average portfolio company (control company) had USD 3.6 million (USD 0.5 million) in absolute sales growth from the previous year to the first year of PE funding, employed on average 21 (10) more employees than before, had a constant EBITDA, and saw no change in its debt positions relative to its assets.

These results suggest that companies targeted by PE firms tend to command market-leading positions and already have better profitability and access to external funding prior to PE treatment.

Table 51: Pre-treatment characteristics of portfolio companies and control companies

The table reports summary statistics (means) on portfolio company-level variables used in the difference in differences regressions, separately for portfolio companies of PE firms and matched control companies. For pre-treatment levels, for each variable I calculate the average over the three years preceding the first year of PE investment. For pre-treatment trends, for each variable I calculate the change from the previous year to the first year of PE investment. All dollar amounts are reported in thousands. Differences in means report the results of regressing each variable on a dummy equal to 1 for portfolio companies and 0 for control companies with heteroskedasticity consistent standard errors.

Panel A: Pre-investment levels

			Difference in means		
Strategy / outcome variable	Portfolio company	Control company	Diff.	*t*-stat	*p*-value
Financial engineering					
Leverage	0.23	0.17	0.05	4.53	0.00
Net debt to EBITDA	0.60	0.44	0.15	0.34	0.74
Implicit interest rate	0.11	0.10	0.01	1.02	0.31
Taxes paid	517.96	617.97	-100.01	-1.19	0.24
Implicit tax rate	0.16	0.16	0.00	-0.15	0.88
Operational improvements					
Employment	335	298	37	1.19	0.23
Average wages	15.01	13.77	1.24	1.39	0.16
Labour productivity	175.72	175.01	0.71	0.04	0.97
Net investment	0.11	0.07	0.04	3.02	0.00
Capital intensity	127.55	165.40	-37.86	-1.65	0.10
Total factor productivity	1.70	1.60	0.10	1.84	0.07
Cash management					
Working capital	0.33	0.35	-0.02	-0.85	0.39
Credit period	50.81	55.99	-5.18	-1.59	0.11
Collection period	62.25	75.39	-13.14	-3.53	0.00
Stock turnover	55.78	46.88	8.90	1.38	0.17
Revenue growth					
Sales	42,372	40,251	2,121	0.35	0.73
Markup	2.42	2.46	-0.04	-0.18	0.85
Market share	0.14	0.09	0.05	4.00	0.00
Profitability					
EBITDA	3,922	3,589	333	0.54	0.59
EBITDA margin	0.09	0.09	0.00	0.02	0.99
Return on assets	0.04	0.04	0.00	-0.13	0.90

Table 51 (continued)

Panel A: Pre-investment trends

Strategy / outcome variable	Portfolio company	Control company	Difference in means		
			Diff.	*t*-stat	*p*-value
Financial engineering					
Leverage	0.00	0.00	0.00	-0.39	0.69
Net debt to EBITDA	-1.04	0.05	-1.09	-1.46	0.15
Implicit interest rate	-0.00	0.00	-0.00	-0.43	0.67
Taxes paid	36.39	1.10	35.29	0.48	0.63
Implicit tax rate	-0.02	0.00	-0.02	-2.04	0.04
Operational improvements					
Employment	21	7	14.24	0.99	0.32
Average wages	1.09	-0.04	1.13	1.76	0.08
Labour productivity	-1.24	0.95	-2.19	-0.15	0.88
Net investment	0.00	-0.02	0.03	1.21	0.23
Capital intensity	9.97	1.83	8.14	0.57	0.57
Total factor productivity	-0.05	-0.01	-0.04	-1.57	0.12
Cash management					
Working capital	-0.02	0.00	-0.02	-0.88	0.38
Credit period	-3.82	1.02	-4.83	-1.12	0.26
Collection period	2.96	4.45	-1.49	-0.40	0.69
Stock turnover	-6.27	1.35	-7.62	-1.54	0.12
Revenue growth					
Sales	3,606	462	3,144	1.42	0.16
Markup	-0.06	0.10	-0.16	-1.49	0.14
Market share	0.00	0.00	0.00	0.28	0.78
Profitability					
EBITDA	-284	82	-366	-0.86	0.39
EBITDA margin	-0.03	-0.01	-0.02	-2.96	0.00
Return on assets	-0.02	0.00	-0.02	-2.75	0.01

Table 52, Panel A, reports means—both simple and weighted by investment cost—for PME, MOIC, and IRR for the full sample. The table shows that portfolio companies in the sample deliver returns for their investors. The average portfolio company has a MOIC of 1.81 and an IRR of 9.3%, and outperforms the benchmark emerging markets index with a PME of 1.44. When weighted by investment cost, the average portfolio company has a MOIC of 1.51, an IRR of 3.6%, and a PME of 1.10. The full sample includes 485 deals (unreported), which returned less money than invested and includes 162 full write-offs (unreported).

In the sample, fully realized perform better in terms of PME and MOIC but not in terms of IRR. Fully realised deals have an average (weighted average) PME of 1.63 (1.31), MOIC of 2.03 (1.87), and an IRR of 9.1% (5.5%). Unrealised portfolio companies have an average (weighted average) PME of 1.04 (0.93), MOIC of 1.34 (1.21), and an IRR of 9.7% (2.1%). Funds tend to hold unrealized deals close to their original investment costs, especially in the first few years of a deal, which gives rise to lower performance measures on average. For instance, when weighted by investment cost, the average portfolio company outperforms the benchmark index with a PME of 1.40. Panels B and C shows summary statistics for the VCP and Orbis subsamples.

Table 53 reports two-sample *t*-tests of equality of means for the full sample less the VCP sample (see Panel A) and the full sample and the Orbis sample (see Panel B). *P*-values indicate that both the VCP sample and the Orbis sample are representative of the full sample, so that data gaps in these two sub samples are random at least in this sense. As Panel A shows, there is difference in weighted IRRs of unrealised deals between the full sample and the VCP sample.

Table 52: Investor returns by sample

The table reports summary statistics on deal-level investor returns for the full sample, the VCP sample, and the Orbis sample. PME stands for public market equivalent, MOIC stands for money on invested capital, and IRR stands for internal rate of return. Weighted means report returns weighted by investment cost. I lack cash flow data for 19 of the 1,580 sample deals in Panel A and for 16 of 1,136 sample deals in Panel B.

		PME		MOIC		IRR	
	N	Mean	Weighted mean	Mean	Weighted mean	Mean	Weighted mean
Panel A: Full sample							
Fully realized deals	1,062	1.63	1.31	2.03	1.87	9.11	5.47
Unrealized deals	499	1.04	0.93	1.34	1.21	9.74	2.09
All deals	1,561	1.44	1.10	1.81	1.51	9.31	3.61
Panel B: VCP sample							
Fully realized deals	946	1.72	1.33	2.15	1.91	8.85	3.23
Unrealized deals	174	0.91	0.70	1.19	0.92	-6.46	-14.93
All deals	1,120	1.59	1.11	2.00	1.56	6.47	-3.21
Panel C: Orbis sample							
Fully realized deals	922	1.75	1.33	2.20	1.93	14.99	6.84
Unrealized deals	436	1.04	0.95	1.35	1.23	7.87	1.40
All deals	1,358	1.52	1.12	1.93	1.55	12.71	3.86

Table 53: Equality of means across the samples used in the analysis

The table reports two-sample *t*-tests of equality of means for the full sample less the VCP sample (Panel A) and the full sample less the Orbis sample (Panel B). PME stands for public market equivalent, MOIC stands for money on invested capital, and IRR stands for internal rate of return.

	PME		MOIC		IRR	
	t-stat	*p*-value	*t*-stat	*p*-value	*t*-stat	*p*-value
Panel A: Full sample vs VCP sample						
Fully realized deals	-0.14	0.89	-0.26	0.80	0.02	0.98
Unrealized deals	1.41	0.16	1.25	0.21	3.93	0.00
All deals	-0.31	0.76	-0.54	0.59	0.32	0.75
Panel B: Full sample vs Orbis sample						
Fully realized deals	-0.18	0.85	-0.36	0.72	-0.47	0.64
Unrealized deals	0.00	1.00	-0.11	0.92	0.58	0.56
All deals	-0.18	0.85	-0.37	0.71	-0.40	0.69

6.4.2. Value creation plans and outcomes

Table 54 shows the results of estimating Equation 11 for each of the 23 outcome variables. To conserve space, the table reports one regression per row. Column 1 shows on the coefficient of interest β_1, which captures the average change in each outcome variable during the PE holding period.

I focus on changes in company-level outcomes that relate to four strategies in PE firms' VCPs: financial engineering, operational improvements, cash management, and revenue growth. I lack company-level data that relates to PE firms' plans and achievement of governance engineering. The estimation sample in each regression includes realized deals as well as unrealized deal that are held in a fund's portfolio for five years or more and matched controls. The number of observations in each regression varies depending on the availability of individual data items in Orbis. To guard against outliers in company-level changes, I winsorize each variable at the 1% level.

For each outcome variable, I split the sample into deals in which funds plan to pursue a value creation strategy that relates to the outcome variable in question, and deals in which they do not plan such strategy. For instance, for each outcome variable in revenue growth (i.e., sales, markups, and market share), I split the sample into deals in which the funds' VCPs feature a financial engineering strategy (i.e., targeting market share, pursuing acquisitions, changing the mix of products or services, pursuing international expansion, changing the pricing strategy, improving marketing or promotion, and improving product quality) and deals that do not feature such plans.

In total I consider four subsamples: Panel A reports the effects of receiving PE funding for a subsample of deals in which funds plan to purse a value creation strategy that relates to the outcome variable in question. Panel B reports on deals in which funds that do not feature such plans. Panel C reports on deals in which funds plan to pursue a strategy and

report achieving it. Finally, Panel D reports on a subsample of deals in which funds plan to pursue a value creation strategy and not achieving it. I then test whether the outcomes change among these groups.

Panel A shows that eight out of the 23 outcome variables change significantly over and above contemporaneous changes at control companies and when PE firms plan to pursue a related value creation strategy. In terms of financial engineering, portfolio companies significantly increase leverage by 4% on average compared to control companies. In terms of operational improvements, portfolio companies significantly increase employment by 31%, increase average wages by 13%, increase labour productivity by 13%, and increase capital intensity by 43%.[40] In terms of revenue growth, they significantly increase sales by 32%,[41] reduce markups by 5.4%, and increase their market share by 1.3%. The remaining outcomes are statistically insignificant.

In Panel B, I examine the effects of receiving PE funding for a subset of deals which do not feature a value creation strategy that relates to the outcome variable in question. Compared to Panel A, the coefficients on employment, average wages, labour productivity, and capital intensity are no longer statistically significant. Interestingly, the estimated effect on revenue and market share are larger compared to those reported in in Panel A.

Panel C models the changes in company-level outcomes and achievement of related value creation strategies. The results suggest that portfolio company operations improve in ways consistent with successful execution of PE firms' VCPs. Compared to Panel A, the effects increase slightly and have the same or stronger statistical power. Most notable is the increase in the effect of PE funding on sales from 32% as reported in Panel A to 63% as reported in Panel C.

[40] Computed as exp(0.274)-1=0.32, exp(0.119)-1=0.13, exp(0.132)-1=0.14, exp(0.36)-1=0.43, respectively.
[41] Computed as exp(0.486)-1=63%.

As Panel D shows, funds planning to introduce a value creation strategy and not achieving it see a lower or decreasing effect in company-level outcomes compared to funds planning to introduce and achieve a related value creation strategy. For instance, while employment in Panel D increases by 29% during the PE holding period, the change is smaller compared to funds planning and achieving a strategy aimed at operational improvements. Similarly, revenue increases by "only" 38% compared to 63% when funds plan and achieve a strategy aimed at boosting revenue growth.

Table 54: Difference in differences estimates

The table reports difference in differences estimates of the effect of PE funding on company-level outcomes. The sample includes both realized and unrealized deals and each deal's matched control group of companies. For variable definitions and details of their construction see Table A.2 in the Appendix. All regressions include company and year fixed effects. Heteroskedasticity-consistent standard errors clustered at the company-level are shown in italics next to the coefficient estimates. I use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively.

Panel A: Fund plans strategy

	β_1: *PE x postPE*			
	coef.	s.e.	*R*-sq.	N
Strategy / outcome variable	(1)	(2)	(3)	(4)
Financial engineering				
Leverage	0.039**	*0.017*	0.022	6,419
Net debt to EBITDA	-0.142	*0.359*	0.004	5,868
Implicit interest rate	-0.003	*0.009*	0.031	2,384
Taxes paid	0.242	*0.195*	0.038	4,430
Tax rate	0.003	*0.014*	0.017	5,388
Operational improvements				
Employment	0.271***	*0.063*	0.049	14,143
Average wage	0.120***	*0.042*	0.369	8,983
Labour productivity	0.125***	*0.043*	0.170	13,702
Net investment	-0.005	*0.006*	0.144	13,711
Capital intensity	0.357***	*0.065*	0.136	13,336
TFP	0.000	*0.024*	0.011	12,966
Cash management				
Working capital	-0.029	*0.034*	0.017	3,398
Credit period	-4.891	*5.213*	0.043	2,932
Collection period	2.372	*4.310*	0.036	3,167
Stock turnover	3.781	*3.248*	0.033	2,736
Revenue growth				
Sales	0.441***	*0.075*	0.131	14,956
Markup	-0.054**	*0.025*	0.033	12,626
Market share	0.013***	*0.005*	0.070	15,039

Table 54 (continued)

Panel B: Fund does not plan strategy

	β_1: *PE x postPE*			
	coef.	s.e.	*R*-sq.	N
Strategy / outcome variable	(5)	(6)	(7)	(8)
Financial engineering				
Leverage	0.021	*0.015*	0.011	9,144
Net debt to EBITDA	0.093	*0.294*	0.006	8,426
Implicit interest rate	-0.012*	*0.007*	0.036	2,982
Taxes paid	-0.115	*0.244*	0.044	6,268
Tax rate	-0.017*	*0.010*	0.043	8,454
Operational improvements				
Employment	0.259	*0.166*	0.062	2,197
Average wage	-0.198	*0.137*	0.328	1,207
Labour productivity	0.099	*0.115*	0.167	2,020
Net investment	0.024**	*0.010*	0.169	2,166
Capital intensity	0.122	*0.166*	0.189	1,953
TFP	0.079	*0.067*	0.026	1,859
Cash management				
Working capital	-0.061***	*0.015*	0.010	12,609
Credit period	2.868	*2.784*	0.020	11,019
Collection period	-4.500	*2.769*	0.021	11,447
Stock turnover	-3.406	*2.284*	0.007	9,651
Revenue growth				
Sales	0.521***	*0.152*	0.089	2,711
Markup	-0.190**	*0.075*	0.052	2,099
Market share	0.022**	*0.011*	0.255	2,691

Table 54 (continued)

Panel C: Fund achieves strategy

	β_1: *PE x postPE*			
	coef.	s.e.	*R*-sq.	N
Strategy / outcome variable	(9)	(10)	(11)	(12)
Financial engineering				
Leverage	0.039**	*0.017*	0.022	5,978
Net debt to EBITDA	-0.029	*0.372*	0.004	5,465
Implicit interest rate	-0.003	*0.009*	0.027	2,216
Taxes paid	0.221	*0.205*	0.037	4,166
Tax rate	0.006	*0.014*	0.021	5,031
Operational improvements				
Employment	0.274***	*0.064*	0.050	13,759
Average wage	0.119***	*0.043*	0.376	8,711
Labour productivity	0.132***	*0.043*	0.169	13,352
Net investment	-0.004	*0.006*	0.143	13,358
Capital intensity	0.360***	*0.066*	0.139	13,004
TFP	0.005	*0.025*	0.011	12,621
Cash management				
Working capital	-0.018	*0.035*	0.021	3,148
Credit period	-5.023	*5.219*	0.048	2,681
Collection period	2.750	*4.190*	0.033	2,887
Stock turnover	3.416	*3.356*	0.037	2,493
Revenue growth				
Sales	0.486***	*0.078*	0.138	13,658
Markup	-0.061**	*0.026*	0.032	11,637
Market share	0.013***	*0.005*	0.062	13,814

Table 54 (continued)

Panel D: Fund does not achieve strategy

	β_1: *PE x postPE*			
	coef.	s.e.	*R*-sq.	N
Strategy / outcome variable	(13)	(14)	(15)	(16)
Financial engineering				
Leverage	0.022	*0.015*	0.012	9,585
Net debt to EBITDA	0.005	*0.287*	0.006	8,829
Implicit interest rate	-0.012*	*0.007*	0.037	3,150
Taxes paid	-0.084	*0.235*	0.043	6,532
Tax rate	-0.020**	*0.010*	0.036	8,811
Operational improvements				
Employment	0.252*	*0.151*	0.048	2,581
Average wage	-0.138	*0.132*	0.330	1,479
Labour productivity	0.071	*0.107*	0.174	2,370
Net investment	0.013	*0.010*	0.164	2,519
Capital intensity	0.133	*0.152*	0.169	2,285
TFP	0.042	*0.066*	0.025	2,204
Cash management				
Working capital	-0.063***	*0.015*	0.010	12,859
Credit period	2.756	*2.779*	0.020	11,270
Collection period	-4.441	*2.762*	0.022	11,727
Stock turnover	-3.205	*2.257*	0.007	9,894
Revenue growth				
Sales	0.324**	*0.133*	0.081	4,009
Markup	-0.126**	*0.063*	0.055	3,088
Market share	0.016*	*0.008*	0.233	3,916

6.4.3. Value creation plans and investor returns

In this section I investigate to what extent PE firms' VCPs are associated with higher returns. I begin by plotting average returns and risk (as measured by 95% confidence intervals) for each of the top-10 most popular planned strategy combinations and for each of the 23 plan items for all realised deals in the sample (N=946). I obtain return averages and return dispersion from a univariate regressions without a constant of PME, MOIC, or IRR on a dummy set equal to 1 if the value creation strategy or plan item in question is included in the VCP, and 0 otherwise.

Table 55 shows the top-10 most popular value creation strategy combinations in the sample ordered from high to low frequency. Figure 17 plots average returns and return dispersion of PME, MOIC, and IRR for each strategy combination. As Figure 17 shows, there is a substantial variation in terms of average returns and return dispersion across the top-10 combinations. Seven of the top-10 strategy combinations have a PME of greater than 1 on average. All 10 strategy combinations generate a MOIC of greater than 1 on average. Average IRRs are distorted though. Figure 17 also shows that average MOICs and IRRs do not increase monotonically in their frequency, which suggests that there is no single strategy that maximizes returns for investors.

Table 55: Top-10 combinations of strategies

The table reports the most popular strategy combinations in the sample. Fractions in the last column are reported with respect to total deal count. Combinations are ordered from high to low in terms of frequency.

	Combination									
Strategy	1	2	3	4	5	6	7	8	9	10
Financial engineering	-	-	Yes	-	Yes	-	-	Yes	-	Yes
Operational improvements	Yes	Yes	Yes	Yes	Yes	Yes	-	Yes	-	Yes
Cash management	-	-	-	-	-	Yes	-	Yes	-	-
Revenue growth	Yes	Yes	Yes	-	Yes	Yes	Yes	Yes	Yes	-
Governance engineering	-	Yes	Yes	-	-	Yes	-	Yes	Yes	-
Deal count	**201**	**174**	**126**	**104**	**90**	**48**	**44**	**43**	**41**	**39**
Share of deals	17.69	15.32	11.09	9.15	7.92	4.23	3.87	3.79	3.61	3.43

Figure 16: Strategies and distribution of investor returns

The figure shows average returns and dispersion of returns by value creation strategy. Averages and dispersion are obtained from a univariate regression, without a constant, of PME, MOIC or IRR on a dummy indicating the specified VCP at the time of investment. Only fully realised deals are included in the sample for regressions (N=946).

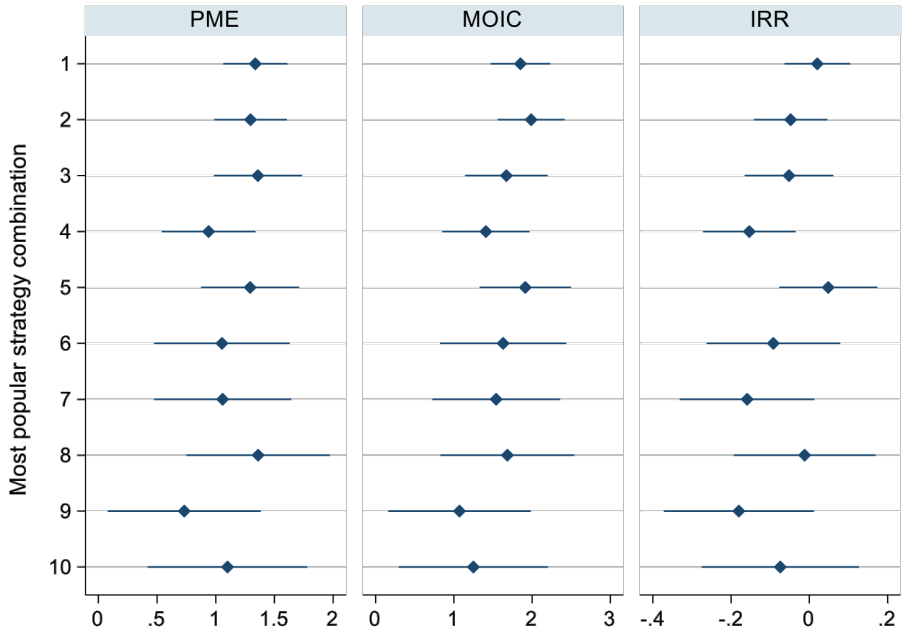
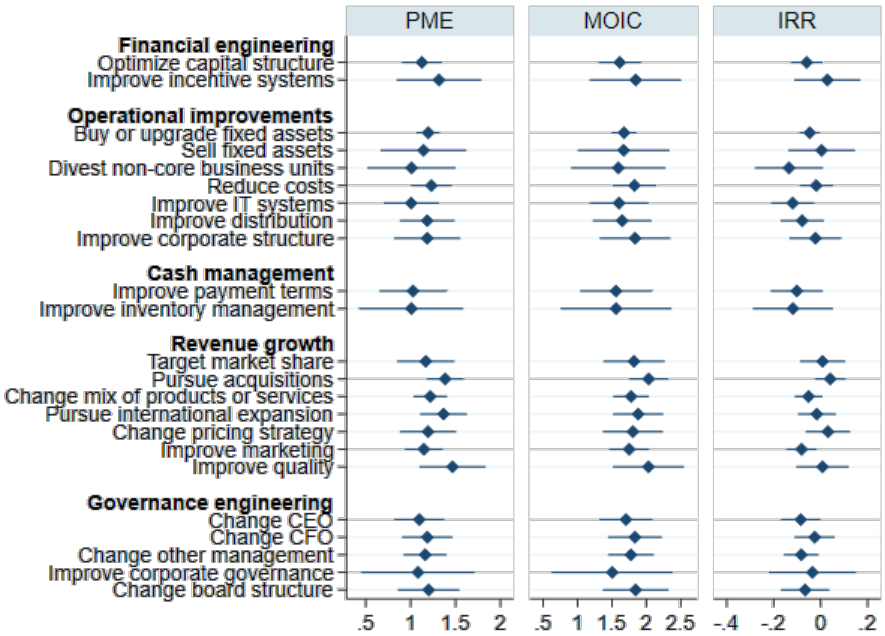


Figure 18 shows that at the plan item level some planned actions appear riskier than others. Mean PMEs range between 0.95 and 1.3 and mean MOICs range between 1.5 and 1.8. The plan item buying or upgrading assets by far has the lowest variance, followed by plans to grow inorganically through acquisitions and cutting costs. Plan items aimed at boosting revenue are generally associated with higher average returns and lower risk. Deals, which plan to improve corporate governance have the highest return dispersion among all plan items. This plan item has the lowest achievement rate (0.71). However, the number of VCPs featuring a corporate governance plan item is relatively low (n=22).

Figure 17: Plan items and distribution of investor returns

The figure shows average returns and dispersion of returns by plan item. Averages and dispersion are obtained from a univariate regression, without a constant, of PME, MOIC, or IRR on a dummy indicating the specified VCP at the time of investment. Only fully realised deals are included in the sample for regressions (N=946).



LASSO regressions

I use LASSO to identify which value creation strategy combinations best predict investor returns. Table 56 reports the LASSO specifications on the sample of fully realised deals (N=946). I lack cash flow data for 13 of the 959 fully realised deals. Panels A-C show LASSO specifications for planned strategy combinations for PMEs, MOICs, and IRRs, respectively, while Panels D-F show achieved strategy combinations for PMEs, MOICs, and IRRs, respectively.

The initial specification includes all 2^5=32 possible strategy combinations. The initial specification also includes log deal size, log deal duration, and entry year and exit year fixed effects. Column 6 shows the LASSO coefficient. Column 7 shows the post-estimation OLS coefficient. Column 8 shows the deal count and column 9 shows the share of deals featuring the strategy combination in question. Deal count and fraction in columns 8 and 9 are with respect to planned strategy combinations (Panels A-C) and achieved strategy combinations (Panels D-F). LASSO retains the strategy combinations as reported in Table 56 as well as log deal size (in all panels), log deal duration (in Panels B, C, E, and F), and a subset of entry year and exit year fixed effects (not reported) for a total of 19, 37, and 44 variables in Panels A-C and 18, 40, and 48 variables in Panels D-F. In total, I observe 28 strategy combinations in the sample. Four of the 32 possible combinations are not present in the sample.

Panel A shows that out of all possible combinations LASSO selected four planned strategy combinations have explanatory power to predict PMEs. Two of them predict higher PMEs and two predict lower PMEs than average as indicated by the sign of the LASSO coefficient in Column 6. Planning to combine revenue growth and governance engineering strategies predicts the highest PME, while planning to combine operational improvements and governance engineering strategies predicts the lowest PME.

As Column 8 and 9 indicate, none of these planned combinations are popular strategy combinations in the sample. For instance, planning to combine revenue growth and governance engineering only ranks 12th (used in 2.92% of the deals) and planning to combine operational improvements and governance engineering strategies ranks 9th (used in 3.65% of the deals). The other two planned strategy combinations that LASSO selects rank 18th (used in 0.83% of the deals) and 4th (used in 9.49% of the deals), respectively. The 18th most popular planned strategy combination predicts a higher PME and the 4th most popular planned strategy combination predicts a lower PME.

Panel B shows that LASSO selects 11 planned strategy combinations that have predictive power to explain the variation in MOICs. Four strategy combinations that predict higher MOICs and seven strategy combinations that predict lower MOICs. The 4th most popular planned strategy combination remains to predict lower MOICs. Panel C shows that LASSO selects 14 planned strategy combinations that have predictive power to explain the variation in IRRs out of which seven strategy combinations predict higher IRRs.

As Panels D-F show, predicting investor returns based on achieved strategy combinations rather than planned strategy combinations results in a somewhat different picture. Perhaps the most interesting change is that the most popular strategy combination (operational improvements combined with revenue growth), if achieved, predicts higher PMEs, MOICs, and IRRs. However, the most popular achieved strategy combination is not predicted to generate the highest returns. The highest returns are associated with the 12th (revenue growth combined with governance engineering) and 18th most popular achieved strategy combinations (financial engineering combined with revenue growth and governance engineering).

Table 56 also shows no single strategy stands out as being “good” or “bad” for returns. Each of the five value creation channels features both in strategy combinations that

predict higher and lower returns. This suggest that returns depend on how value creation strategies are combined and customised according to the specific needs and circumstances of each portfolio company.

Table 56 also hinds that the number of value creation strategies that are combined into a VCP does not predict investor returns. Both very broad strategy combinations and very focused strategy combinations predict higher and lower returns. It is also worth noting which strategy combinations LASSO did not select (with the exception of Panels C and F which use the IRR as dependent variable): Deals that focused on all five value creation strategies do not appear to be particularly better or worse than average.

Table 56: Predicting investor returns with value creation plans

The table reports LASSO model-selection estimation results. Panels A-C focus on planned strategies combinations. Panels D-F focus on achieved strategies combinations. The dependent variable is PME, MOIC, or IRR. The sample includes only fully realized deals (N=946). Combinations are ordered from high to low in terms of LASSO coefficient. Deal count and fraction in columns 8 and 9 are with respect to planned strategy combinations (Panels A-C) and achieved strategy combinations (Panels D-F).

Strategy combination								
Financial engineering	Operational improvements	Cash management	Revenue growth	Governance engineering	LASSO coef.	Post-estimation OLS coef.	Deal count	Fraction
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel A: Planned strategy combinations with PME as dependent variable								
-	-	-	Yes	Yes	0.132	0.424	28	2.92
Yes	-	-	Yes	Yes	0.023	0.642	8	0.83
Yes	Yes	-	Yes	Yes	-0.107	-0.309	91	9.49
-	Yes	-	-	Yes	-0.223	-0.615	35	3.65
Panel B: Planned strategy combinations with MOIC as dependent variable								
Yes	-	-	Yes	Yes	0.737	1.317	8	0.83
-	-	-	Yes	Yes	0.237	0.484	2	0.21
-	Yes	Yes	Yes	-	0.193	0.509	18	1.88
-	Yes	-	Yes	Yes	0.018	0.078	142	14.81
-	-	Yes	Yes	-	-0.026	-1.022	2	0.21
-	Yes	Yes	Yes	Yes	-0.049	-0.375	43	4.48
-	-	-	-	Yes	-0.161	-0.725	9	0.94
-	-	Yes	-	-	-0.243	-1.284	2	0.21
Yes	Yes	-	Yes	Yes	-0.252	-0.486	91	8.45
Yes	Yes	-	-	-	-0.326	-0.708	31	3.23
-	Yes	-	-	Yes	-0.381	-0.723	35	3.65

Table 56 (continued)

Strategy combination								
Financial engineering	Operational improvements	Cash management	Revenue growth	Governance engineering	LASSO coef.	Post-estimation OLS coef.	Deal count	Fraction
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel C: Planned strategy combinations with IRR as dependent variable								
Yes	-	-	Yes	Yes	0.256	0.354	8	0.83
-	-	-	Yes	Yes	0.112	0.128	28	2.92
-	Yes	-	Yes	-	0.040	0.058	180	18.77
-	-	Yes	Yes	Yes	0.028	0.291	2	0.21
Yes	Yes	-	Yes	-	0.016	0.041	81	8.45
-	Yes	Yes	Yes	-	0.005	0.082	18	1.88
-	-	-	-	Yes	0.005	0.127	9	0.94
Yes	Yes	-	-	-	-0.027	-0.120	31	3.23
-	-	-	Yes	-	-0.047	-0.098	42	4.38
-	Yes	Yes	Yes	Yes	-0.048	-0.117	43	4.48
-	Yes	-	-	Yes	-0.103	-0.178	35	3.65
Yes	Yes	Yes	Yes	Yes	-0.110	-0.161	29	3.02
Yes	Yes	-	Yes	Yes	-0.114	-0.165	91	9.49
-	-	Yes	Yes	-	-0.160	-0.386	2	0.21

Table 56 (continued)

Strategy combination								
Financial engineering	Operational improvements	Cash management	Revenue growth	Governance engineering	LASSO coef.	Post-estimation OLS coef.	Deal count	Fraction
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel D: Achieved strategy combinations with PME as dependent variable								
-	-	-	Yes	Yes	0.595	0.954	26	2.71
Yes	-	-	Yes	Yes	0.166	0.877	9	0.94
-	Yes	-	Yes	-	0.043	0.228	162	16.89
-	Yes	-	-	Yes	-0.019	-0.319	45	4.69
-	-	-	-	Yes	-0.118	-0.538	17	1.77
Panel E: Achieved strategy combinations with MOIC as dependent variable								
Yes	-	-	Yes	Yes	0.899	1.494	9	0.94
-	-	-	Yes	Yes	0.890	1.148	26	2.71
-	Yes	Yes	Yes	-	0.350	0.749	16	1.67
Yes	-	-	Yes	-	0.141	0.900	8	0.83
-	Yes	-	Yes	-	0.109	0.253	162	16.89
Yes	Yes	-	Yes	-	0.057	0.177	72	7.51
-	-	Yes	Yes	-	-0.015	-1.272	2	0.21
Yes	Yes	-	Yes	Yes	-0.044	-0.244	69	7.19
-	Yes	-	-	Yes	-0.081	-0.381	45	4.69
Yes	Yes	-	-	-	-0.161	-0.475	28	2.92
-	Yes	Yes	-	Yes	-0.172	-0.605	6	0.63
-	-	-	-	Yes	-0.476	-0.851	17	1.77

Table 56 (continued)

Strategy combination								
Financial engineering	Operational improvements	Cash management	Revenue growth	Governance engineering	LASSO coef.	Post-estimation OLS coef.	Deal count	Fraction
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Panel F: Achieved strategy combinations with IRR as dependent variable								
Yes	-	-	Yes	Yes	0.321	0.440	9	0.94
-	-	-	Yes	Yes	0.209	0.288	26	2.71
Yes	Yes	Yes	-	-	0.143	0.484	2	0.21
Yes	Yes	-	Yes	-	0.117	0.168	72	7.51
Yes	-	-	Yes	-	0.107	0.268	8	0.83
-	Yes	-	Yes	-	0.074	0.119	162	16.89
Yes	Yes	-	-	Yes	0.071	0.155	30	3.13
Yes	-	Yes	-	-	0.056	0.509	1	0.1
Yes	Yes	Yes	Yes	-	0.040	0.167	11	1.15
-	Yes	Yes	-	-	0.036	0.172	8	0.83
-	Yes	Yes	Yes	-	0.027	0.134	16	1.67
Yes	Yes	Yes	Yes	Yes	-0.008	-0.025	19	1.98
-	Yes	-	-	Yes	-0.017	-0.059	45	4.69
-	Yes	Yes	-	Yes	-0.027	-0.151	6	0.63
-	-	-	Yes	-	-0.032	-0.063	53	5.53
Yes	Yes	-	Yes	Yes	-0.062	-0.096	69	7.19
-	-	Yes	Yes	-	-0.146	-0.321	2	0.21
-	-	Yes	-	Yes	-0.487	-0.753	1	0.1

OLS regressions

Table 57 shows the results of regression returns on the number of plan items, the share of plan items achieved, and the share of new plan items introduced. All regressions include log deal size, log deal duration, and entry and exit year fixed effects (not shown to conserve space). The estimation sample includes only fully realized deals (N=946).

The number of plan items does not explain the variation in returns investors eventually receive. As Column 2 and 6 show, achieving a greater share of planned plan items while holding constant the number of planned plan items is strongly associated with higher returns. The results suggest that successful execution of VCPs appears to be key driver of returns.

The specifications in Columns 3 and 7 show that execution of VCPs varies across deal types. Successful execution is associated with significantly higher returns only in growth capital, buyout, and secondary deals. In early-stage deals, the achievement of planned plan items does not correlate significantly with returns. This suggests that risk factors relating to early-stage deals are more idiosyncratic and thus more difficult for PE investors to influence. Turnaround deals often involve lengthy negotiations with lenders over impaired collaterals, covenants, and refinancing. These activities may be central to boosting returns but they are not explicitly mentioned in the VCPs.

Columns 4 and 8 show that the introduction of new plan items is negatively correlated with returns, possibly because funds are more likely to introduce new plans to turn around bad performing deals.

Table 57: Explaining investor returns with value creation plans

The table reports regression results of returns on VCPs. The unit of observation is a deal. The dependent variable (PME, MOIC, or IRR) is winsorized at the top 1%. All regressions include log deal size, log deal duration, and entry and exit year fixed effects. For variable definitions and details of their construction see Table A.1 in the Appendix. The estimation sample includes only fully realized deals (N=946). Heteroskedasticity-consistent standard errors clustered at the fund level are shown in italics underneath the coefficient estimates. I use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively.

	PME				
	(1)	(2)	(3)	(4)	(5)
Number of plan items	-0.007	-0.012	-0.023	-0.011	-0.018
	0.020	*0.021*	*0.021*	*0.020*	*0.025*
Share of plan items achieved		0.425***			
		0.161			
x early-stage deal			0.958***		
			0.224		
x growth deal			-0.263		
			0.179		
x buyout deal			0.580***		
			0.176		
x secondary deal			0.947***		
			0.283		
x turnaround deal			0.250		
			0.407		
Number of new plan items introduced				-0.041*	-0.023
				0.022	*0.029*
Share of new plan items achieved					-0.057
					0.059
Log deal size and log duration	Yes	Yes	Yes	Yes	Yes
Entry and exit year FE	Yes	Yes	Yes	Yes	Yes
R-squared	0.087	0.093	0.132	0.090	0.091
Number of obs.	946	946	946	946	946

Table 57 (continued)

	MOIC				
	(6)	(7)	(8)	(9)	(10)
Number of plan items	-0.011	-0.020	-0.033	-0.015	-0.021
	0.030	*0.030*	*0.031*	*0.030*	*0.035*
Share of plan items achieved		0.625***			
		0.230			
x early-stage deal			1.352***		
			0.319		
x growth deal			-0.210		
			0.260		
x buyout deal			0.813***		
			0.241		
x secondary deal			1.130***		
			0.306		
x turnaround deal			0.430		
			0.569		
Number of new plan items introduced				-0.037	-0.022
				0.037	*0.046*
Share of new plan items achieved					-0.050
					0.069
Log deal size and log duration	Yes	Yes	Yes	Yes	Yes
Entry and exit year FE	Yes	Yes	Yes	Yes	Yes
R-squared	0.132	0.139	0.169	0.134	0.134
Number of obs.	946	946	946	946	946

Table 57 (continued)

	IRR				
	(11)	(12)	(13)	(14)	(15)
Number of plan items	-0.009	-0.012	-0.016**	-0.010	-0.010
	0.007	*0.007*	*0.007*	*0.008*	*0.009*
Share of plan items achieved		0.215**			
		0.084			
x early-stage deal			0.460***		
			0.098		
x growth deal			-0.045		
			0.093		
x buyout deal			0.267***		
			0.082		
x secondary deal			0.424***		
			0.109		
x turnaround deal			0.232		
			0.229		
Number of new plan items introduced				-0.008	-0.006
				0.007	*0.010*
Share of new plan items achieved					-0.007
					0.023
Log deal size and log duration	Yes	Yes	Yes	Yes	Yes
Entry and exit year FE	Yes	Yes	Yes	Yes	Yes
R-squared	0.230	0.240	0.282	0.231	0.231
Number of obs.	946	946	946	946	946

6.4.4. Value creation outcomes and returns

Absolute change

Table 58 reports results separately for PMEs, MOICs, and IRRs, considering each outcome variable one at a time. The variable of interest in each regression is the company-level change in each of the 23 outcome variables measured over the PE holding period and winsorized at the 1% level. Log deal size, log deal duration, and entry and exit year fixed effects are included in each regression but not shown to conserve space. The estimation sample includes exited deals and "mature" unrealised deals with a holding period of five years or more. The number of observations included in each regression varies depending on the data availability in Orbis.

Regardless of PMEs, MOICs, and IRRs being the dependent variable, I find that a strong and positive correlation between five of the 23 outcome variable and investor returns, while holding constant wider industry trends using entry and exit year dummies: the more a portfolio company manages to "improve" in terms operational improvements, revenue growth, and profitability during the holding period, the higher investors' returns on the deal on average. In addition, and only in terms of IRR, I find that the more a portfolio company decreases its leverage, the higher investor returns. A change in outcome variables related to cash management does not correlate with investor returns.

Across the five specifications in the "operational improvement" strategy, I find strong evidence that deals which experience higher growth in terms of employment and capital intensity also deliver higher returns for their investors. For instance, the point estimates from Columns 1, 5, and 9 suggest that a log percentage point increase in employment is associated with 0.121 points higher PME ($p<0.001$), 0.248 points higher MOIC ($p<0.001$), and 0.058 points higher IRR ($p<0.001$). Average wage, labour productivity, and TFP are not associated with higher returns though.

As shown under “revenue growth”, the more a portfolio company manages to increase its sales during the holding period, the higher investors’ returns on the deal. Column 1 suggests that each log point increase in sales is associated with a 0.094 points rise in PME ($p<0.001$), a 0.151 points increase in MOIC ($p<0.001$), and a 0.033 points increase in IRR ($p<0.001$). A change in in price-cost markup and market share does not correlate significantly with investor returns.

In the last group of outcomes, I relate changes in EBITDA, EBITDA margin, and return on assets during the holding period to investor returns. The more a portfolio company increases its EBITDA or return on assets, the higher investor returns in the cross-section. The results suggest that each log point increase in EBITDA is associated with a 0.032 points rise in PME ($p<0.001$), a 0.046 points increase in MOIC ($p<0.001$), and a 0.014 points increase in IRR ($p<0.001$). An increase in the EBITDA margin during the holding period does not correlate significantly with investor returns.

Figure 19 visualizes the effect of company-level changes in each of the 23 outcome variables considered in Table 58 measured over the PE holding period on investor returns as measured by PME, MOIC, or IRR. The figure uses standardized coefficients that can easily be compared in terms of their power to explain investor returns. Both outcomes and returns are standardized to have mean 0 and standard deviation 1. As Figure 19 shows, increases in employment, capital intensity, sales, and EBITDA result in the strongest and largest effects. Changes in outcomes associated with financial engineering and cash management do not correlate significantly with investor returns in the cross-section.

Table 58: Absolute change in outcomes and investor returns

The table reports regression results of Equation 13 estimated on the cross-section of portfolio companies. The dependent variable in each regression is either PME or MOIC, trimmed at the top 1th percentile of the distribution. The sample in each regression includes fully realized deals and unrealized deals that are held in a fund's portfolio for at least four years. For variable definitions and details of their construction see Table A.2 in the Appendix. All regressions include log deal size, log deal duration, and entry and exit year fixed effects. Heteroskedasticity-consistent standard errors are shown in italics next to the coefficient estimates. I use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively.

	PME			
	coef.	s.e.	*R*-sq.	N
Strategy / outcome variable	(1)	(2)	(3)	(4)
Financial engineering				
Leverage	-0.484	*0.318*	0.123	522
Net debt to EBITDA	0.001	*0.001*	0.118	515
Implicit interest rate	-0.882	*1.289*	0.215	229
Taxes paid	0.036	*0.028*	0.193	227
Tax rate	0.267	*0.469*	0.168	312
Operational improvements				
Employment	0.121***	*0.038*	0.144	523
Average wage	0.097	*0.162*	0.210	270
Labour productivity	0.026	*0.036*	0.135	473
Net investment	0.001	*0.002*	0.114	545
Capital intensity	0.072**	*0.036*	0.142	468
Total factor productivity	0.051	*0.073*	0.113	483
Cash management				
Working capital	-0.102	*0.150*	0.128	552
Credit period	-0.001	*0.001*	0.163	298
Collection period	0.000	*0.001*	0.162	309
Stock turnover	-0.000	*0.000*	0.164	281
Revenue growth				
Sales	0.094***	*0.025*	0.132	603
Markup	-0.086	*0.103*	0.113	483
Market share	0.101	*0.160*	0.116	599
Profitability				
EBITDA	0.032***	*0.008*	0.130	595
EBITDA margin	0.157	*0.286*	0.116	553
Return on assets	0.553**	*0.274*	0.123	594

Table 58 (continued)

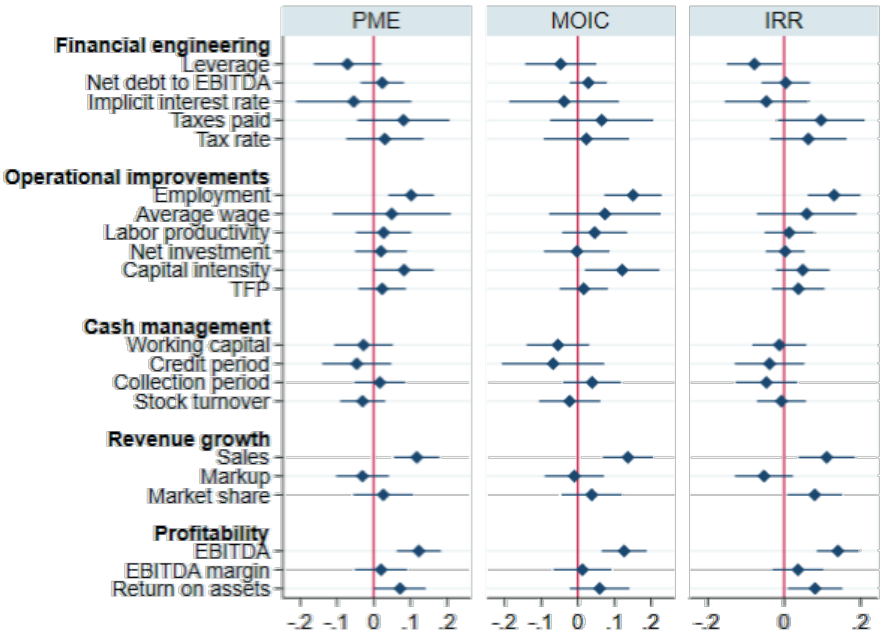
	MOIC			
	coef.	s.e.	*R*-sq.	N
Strategy / outcome variable	(5)	(6)	(7)	(8)
Financial engineering				
Leverage	-0.437	*0.462*	0.171	522
Net debt to EBITDA	0.001	*0.001*	0.169	515
Implicit interest rate	-0.836	*1.699*	0.312	229
Taxes paid	0.040	*0.043*	0.262	227
Tax rate	0.284	*0.715*	0.192	312
Operational improvements				
Employment	0.248***	*0.065*	0.184	523
Average wage	0.203	*0.211*	0.199	270
Labour productivity	0.061	*0.059*	0.172	473
Net investment	-0.000	*0.004*	0.157	545
Capital intensity	0.147**	*0.063*	0.191	468
Total factor productivity	0.050	*0.103*	0.160	483
Cash management				
Working capital	-0.277	*0.222*	0.164	552
Credit period	-0.001	*0.001*	0.187	298
Collection period	0.001	*0.001*	0.199	309
Stock turnover	-0.000	*0.000*	0.197	281
Revenue growth				
Sales	0.151***	*0.039*	0.173	603
Markup	-0.036	*0.161*	0.159	483
Market share	0.202	*0.222*	0.154	599
Profitability				
EBITDA	0.046***	*0.011*	0.168	595
EBITDA margin	0.138	*0.435*	0.152	553
Return on assets	0.634	*0.440*	0.160	594

Table 58 (continued)

	IRR			
	coef.	s.e.	*R*-sq.	N
Strategy / outcome variable	(9)	(10)	(11)	(12)
Financial engineering				
Leverage	-0.196**	*0.093*	0.183	522
Net debt to EBITDA	0.000	*0.000*	0.176	515
Implicit interest rate	-0.280	*0.331*	0.316	229
Taxes paid	0.016*	*0.009*	0.322	227
Tax rate	0.206	*0.166*	0.273	312
Operational improvements				
Employment	0.058***	*0.016*	0.227	523
Average wage	0.044	*0.049*	0.312	270
Labour productivity	0.005	*0.012*	0.198	473
Net investment	0.000	*0.001*	0.205	545
Capital intensity	0.016	*0.012*	0.208	468
Total factor productivity	0.031	*0.029*	0.173	483
Cash management				
Working capital	-0.017	*0.049*	0.164	552
Credit period	-0.000	*0.000*	0.253	298
Collection period	-0.000	*0.000*	0.258	309
Stock turnover	-0.000	*0.000*	0.241	281
Revenue growth				
Sales	0.033***	*0.011*	0.191	603
Markup	-0.055	*0.041*	0.175	483
Market share	0.114**	*0.052*	0.181	599
Profitability				
EBITDA	0.014***	*0.003*	0.198	595
EBITDA margin	0.106	*0.100*	0.183	553
Return on assets	0.231**	*0.105*	0.178	594

Figure 18: Value creation outcomes and investor returns

The figure shows the effect of company-level changes in each of the 23 outcome variables measured over the PE holding period on investor returns as measured by PME, MOIC or IRR. For variable definitions and details of their construction see Table A.2 in the Appendix. Both outcomes and returns are standardized to have mean 0 and standard deviation 1. Error bands indicate 95% confidence intervals.



Relative change

Table A.3 in the Appendix shows the regression results when relating investor returns to company-level changes *relative* to the contemporaneous changes experienced by the matched control companies. The results confirm the strong and positive relation between growth in productivity and profitability, and returns. Interestingly, the point estimates are in general smaller for the impact of relative operational changes than absolute changes. This suggests that part of the variation in investor returns generated by PE firms is due to their ability to identify companies that are set to experience productivity and profitability growth.

6.5. Conclusion

Summary of findings

In this paper, I study how PE firms generate returns for their investors. I present three sets of results. First, I find evidence for some of the real outcomes, that having an initial VCP and achieving it leads to stronger changes at the portfolio companies level than not having a plan or having one but not achieving it. The results suggest that portfolio companies experience the kinds of changes that would reflect the successful implementation of PE firms' VCPs. These results offer corroborating evidence as a check on funds' self-reported plan achievements.

Second, a LASSO analysis reveals that no single value creation strategy emerges on its own as the best predictor of eventual success. Deals in which a fund pursues financial engineering, revenue growth, and governance engineering are associated with higher returns. Similarly, deals in which a fund pursues operational improvements, cash management, and revenue growth also do well. Overall, deals in which revenue growth is not pursued seems to do worse than others.

It is important for PE firms to achieve their VCPs in order to generate high returns to their investors. Some VCPs are naturally riskier than others. The number of plan items in a VCP does not explain the variation in investor returns. But the share of plan items achieved in a VCP is a strong and positive predictor of returns, especially in growth, buyout, and secondary transactions. A revision of a plan does not correlate significantly with investor returns.

Third, I investigate whether the changes portfolio companies experience during the PE-holding period can help explain investor returns. This analysis reveals that investors earn higher returns the more a portfolio company increases its employment, capital intensity, sales, and EBITDA during the holding period. Sales growth has the highest explanatory

power amongst all outcomes variable to explain the variation in investor returns. This can help explain why revenue growth has become the most prominent value creation strategy in the sample. However, when benchmarked to observably similar matched control companies, this latter effect vanishes. An increase in EBITDA above contemporaneous changes at the control companies remains a strong driver of investor returns.

Contribution

I contribute to the literature in two ways. First, I provide empirical evidence on whether initial value creation strategies and PE firms' success (or failure) in achieving them help predict eventual returns. Thereby I shed light on the conditions under which PE can create value for investors and the level of risk such value creation strategies entail.

Second, I link operational changes to investor returns at the deal-level, as done previously by Achleitner et al. (2012) and Acharya et al. (2013). However, in this paper I study a much greater set of operational and financial outcomes and also quantify the most important return drivers.

Implication

Taken together, in the EBRD regions, the main driver of returns in PE continues to be revenue growth and operational improvements. This suggests that companies are at a greater advantage when they are backed by PE firm who are better at identifying high growth firms and who are more "hands-on" during the time they manage these firms.

Future research

Future research could explore if PE firms generate higher returns when they craft a VCP that fits the portfolio company's specific needs and circumstances and execute it well. Future research could also investigate what causes deals to fail by establishing a closer link between execution of VCPs and investor returns.

7. Concluding remarks

This dissertation provides new evidence on the black box of value creation in PE. I show that PE firms follow a rich variety of plans to add value to companies. VCPs appear highly differentiated, suggesting that they are tailored to each individual portfolio company's needs and circumstances of. PE firms have become more hands-on over time, pursuing financial engineering, revenue growth, and governance engineering strategies in an increasing fashion. Which individual plans a PE firm follows depends on the type of the deal. PE firms tend to be more hands-on when they hold a majority stake, when they plan to engage in acquisitions, and when they plan to replace management. PE firms manage to implement the majority of their strategies and plan items. Some plans appear to be easier to achieve than others. 77% of sample deals see revisions, which tend to be minor.

During the holding period PE-backed companies experience improvements across all five value creation channels. PE funding leads to operational efficiency: both labour productivity and total factor productivity improve as PE-backed companies ramp up investment, employment, and sales. PE-backed companies in the sample reduce their price markups by 6%, which allows them to gain substantial market shares. PE funding has a significant impact on profitability too. A novel finding is that most of these changes instigated by PE firms persist even after they fully exit their investments. These findings are consistent with PE firms' ability to create long-lasting value as opposed to maximizing short-term returns at the expense of portfolio companies.

I show that these kinds of changes portfolio companies experience during the holding period reflect the successful implementation of a PE firm's VCPs. No single value creation strategy is associated with significantly higher or lower investor returns. Instead what matters more is how certain strategies are combined. Successful implementation of VCPs is an important predictor of investor returns, especially the case in growth capital, buyout, and

secondary transactions. Investors earn higher returns the more a portfolio company increases its employment, capital intensity, sales, and EBITDA during the holding period.

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Appendix

Table A.1: Definition of individual VCP items

Strategy / plan item	Definition
Financial engineering	
Optimize capital structure	Borrowing additional debt to finance projects or refinancing or restructuring existing debts.
Improve incentive systems	Introduction of performance-based incentive systems for management (e.g., through equity ownership).
Operational improvements	
Buy or upgrade fixed assets	Buying or upgrading fixed assets such as property, plant, and equipment.
Sell fixed assets	Selling fixed assets such as property, plant, and equipment.
Divest non-core business units	Selling a portion of a company, such as a subsidiary, a division, or a line of business, to another party.
Reduce costs	Reduction of cost of goods sold (e.g., direct labour, materials, and overhead) and/or operational expenses (e.g., selling, general, and administrative).
Improve IT systems	Improving information technology (IT) systems (e.g., management information system).
Improve distribution	Improving the movement of raw materials into an organization, and the movement of finished goods out of the organization and towards the end consumer.
Improve corporate structure	Right-sizing of business functions and units.
Cash management	
Improve payment terms	Reduction of payment terms to customers and/or the extension of payment terms to suppliers.
Improve inventory management	Improving the process of ordering, storing, and using a company's inventory.
Revenue growth	
Target market share	Increasing market share or reaching a certain scale as a key objective of business plan.
Pursue acquisitions	Merging with or acquiring shares of another company.
Change mix of products or services	Introducing, upgrading, or eliminating products and services.
Pursue international expansion	Entering new geographies or leaving existing markets.
Change pricing strategy	Increasing prices or decreasing prices.
Improve marketing	Improving marketing communications, and communication strategy.
Improve product quality	Improving the quality of products and services.

Table A.1 (continued)

Strategy / plan item	Definition
Governance engineering	
Change CEO	Changing the chief executive officer (CEO).
Change CFO	Changing the chief financial officer (CFO).
Change other senior management	Changing members of the senior management team other than CEO and CFO (e.g., chief operating officer) as well as middle management (e.g., heads of departments).
Improve corporate governance	Improving the system of rules, practices, and processes by which a company is directed and controlled (e.g., internal controls, disclosure, and transparency).
Change board structure	Changing the size and composition of the board of directors or shareholders as well as resolving shareholder conflicts.

Figure A.1: Cluster solutions

The figure reports within sum of squares (WSS), log WSS, η^2 coefficient, and proportional reduction of error (PRE) for all cluster solutions *k (k=1,…,20)*.

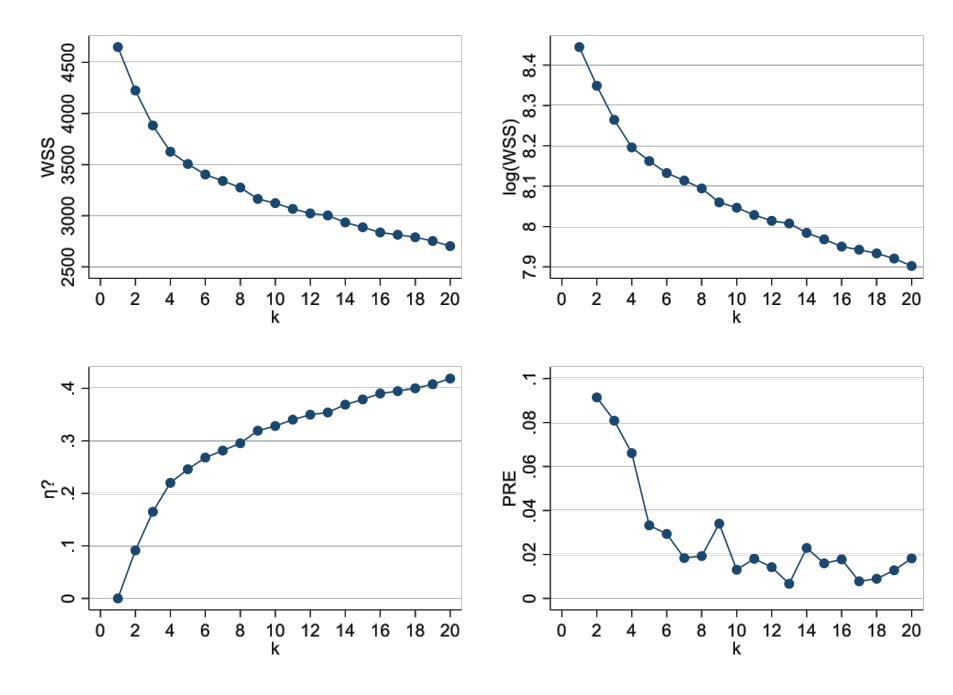

Figure A.2: Scree plot—initial value creation plans

The figure reports the scree plot of eigenvalues after the factor analysis.

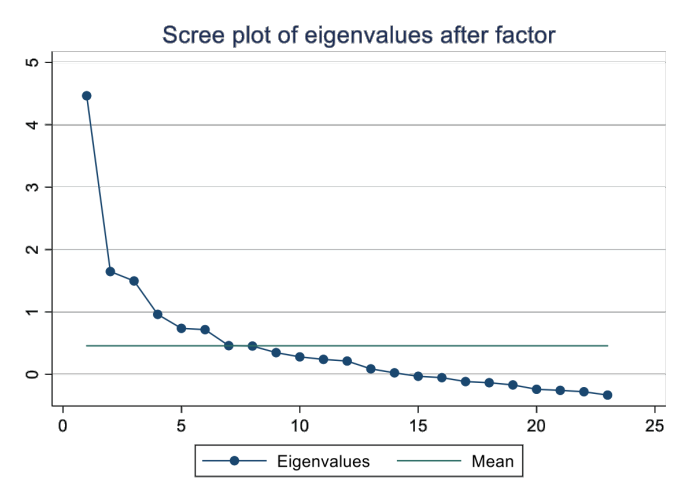

Table A.2: Variables and definitions—company-level outcomes

Strategy / outcome variable	Definition
Financial engineering	
Leverage	Ratio of total debt to total assets.
Net debt to EBITDA	Ratio of total debt minus cash to EBITDA.
Implicit interest rate	Imputed as the ratio of interest expense to total debt.
Taxes paid	Natural log of total taxes paid by the company.
Tax rate	Imputed from 1 – earnings after tax / earnings before tax and winsorized at the bottom and top 5%.
Operational improvements	
Employment	Natural log of the total number of full-time employees.
	Natural log of the ratio of total staffing costs to employment.
Labour productivity	Natural log of the value of company revenues per employee.
Net investment	Annual change in fixed assets net of depreciation and scaled by beginning-of-year nominal total assets.
Capital intensity	Natural log of the ratio of fixed assets to employment.
Total factor productivity (TFP)	Captures the efficiency with which all inputs into production (labour, materials, and capital) are used.
Cash management	
Working capital	Ratio of working capital to the sum of working capital and fixed assets.
Credit period	Ratio of creditors to operating revenue, multiplied by 360.
Collection period	Ratio of debtors to operating revenue, multiplied by 360.
Stock turnover	Ratio of operating revenue to inventories.
Revenue growth	
Sales	Natural log of annual operating revenue measured in USD.
Markup	Natural log of the estimated ratio of price to marginal cost.
Market share	Ratio of annual company sales to the total of annual sales by all companies in the same 4-digit NACE industry and country.
Profitability	
Earnings before interest, taxes, depreciation, and amortization (EBITDA)	Natural log of EBITDA if EBITDA is positive, and minus the natural log of minus EBITDA if EBITDA is negative. Note that I replace EBITDA with earnings before interest, and taxes (EBIT) whenever EBITDA is missing.
EBITDA margin	Ratio of EBITDA to sales.
Return on assets (ROA)	Ratio of net income to total assets.

Table A.3: Relative change in outcomes and investor returns

The table reports regression results of Equation 13 estimated on the cross-section of portfolio companies. The dependent variable in each regression is either PME or MOIC, trimmed at the top 1th percentile of the distribution. The sample in each regression includes fully realized deals and unrealized deals that are held in a fund's portfolio for at least four years. For variable definitions and details of their construction see Table A.2 in the Appendix. All regressions include log deal size, log deal duration, and entry and exit year fixed effects. Heteroskedasticity-consistent standard errors are shown in italics next to the coefficient estimates. I use ***, **, and * to denote significance at the 1%, 5%, and 10% level (two-sided), respectively.

	PME			
	coef.	s.e.	*R*-sq.	N
Strategy / outcome variable	(1)	(2)	(3)	(4)
Financial engineering				
Leverage	-0.272	0.331	0.214	290
Net debt to EBITDA	0.000	0.001	0.218	279
Implicit interest rate	-15.059	10.333	0.866	31
Taxes paid	-0.018	0.078	0.559	53
Tax rate	0.736	0.895	0.353	95
Operational improvements				
Employment	0.107**	0.048	0.196	295
Average wage	-0.199	0.231	0.373	91
Labour productivity	0.004	0.046	0.195	264
Net investment	0.003	0.003	0.168	340
Capital intensity	-0.014	0.044	0.209	245
Total factor productivity	0.125	0.098	0.193	262
Cash management				
Working capital	-0.006	0.110	0.191	328
Credit period	-0.001	0.001	0.400	87
Collection period	0.001	0.001	0.350	96
Stock turnover	0.000	0.000	0.419	77
Revenue growth				
Sales	0.035	0.030	0.174	391
Markup	0.153	0.123	0.194	262
Market share	0.006	0.226	0.171	389
Profitability				
EBITDA	0.020**	0.009	0.174	370
EBITDA margin	0.123	0.266	0.173	323
Return on assets	0.662*	0.367	0.185	364

Table A.3 (continued)

	MOIC			
	coef.	s.e.	*R*-sq.	N
Strategy / outcome variable	(5)	(6)	(7)	(8)
Financial engineering				
Leverage	-0.272	0.331	0.214	290
Net debt to EBITDA	0.000	0.001	0.218	279
Implicit interest rate	-15.059	10.333	0.866	31
Taxes paid	-0.018	0.078	0.559	53
Tax rate	0.736	0.895	0.353	95
Operational improvements				
Employment	0.107**	0.048	0.196	295
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Market share	0.006	0.226	0.171	389
Profitability				
EBITDA	0.020**	0.009	0.174	370
EBITDA margin	0.123	0.266	0.173	323
Return on assets	0.662*	0.367	0.185	364

Table A.3 (continued)

	IRR			
	coef.	s.e.	*R*-sq.	N
Strategy / outcome variable	(9)	(10)	(11)	(12)
Financial engineering				
Leverage	-0.272	0.331	0.214	290
Net debt to EBITDA	0.000	0.001	0.218	279
Implicit interest rate	-15.059	10.333	0.866	31
Taxes paid	-0.018	0.078	0.559	53
Tax rate	0.736	0.895	0.353	95
Operational improvements				
Employment	0.107**	0.048	0.196	295
Average wage	-0.199	0.231	0.373	91
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Declaration of honour

Ich erkläre hiermit ehrenwörtlich, dass ich die vorliegende Arbeit selbstständig angefertigt habe. Sämtliche aus fremden Quellen direkt und indirekt übernommene Gedanken sind als solche kenntlich gemacht. Die Dissertation wurde bisher keiner anderen Prüfungsbehörde vorgelegt und noch nicht veröffentlicht.

I declare upon my word of honour that the thesis submitted herewith is my own work. All sources and aids used have been listed. All references or quotations in any form and their use have been clearly identified. The dissertation has not been submitted for examination purposes to any institution before.

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Markus Biesinger

Mainz, 31 March 2021