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Globalization of Alternative Investments Working Papers Volume 2
The Global Economic Impact of Private Equity Report 2009

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Globalization of Alternative Investments

Working Papers Volume 2

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The Global Economic Impact of Private Equity Report 2009

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Preface

KEVIN STEINBERG
Chief Operating Officer and Head of the Centre for Global Industries (New York), World Economic Forum USA

MAX VON BISMARCK
Director and Head of Investors Industries, World Economic Forum USA

The World Economic Forum is proud to release this second volume of Working Papers from our Globalization of Alternative Investments project. Building on the first volume published in January of 2008, we hope that these Working Papers will provide further insight into the global economic impact of private equity.

Over recent months we have witnessed fundamental changes to the global financial system. The world is experiencing an unwinding of global imbalances and dramatic deleveraging. After more than two decades of exceptional growth, financial institutions are adapting to a new environment of tighter credit, lower economic growth, increased government intervention and a threat to the previous pace of globalization. The crisis is challenging many assumptions and has triggered a fundamental review of the global financial system in terms of regulation, the role and responsibilities of financial institutions and of governments.

This second volume of Working Papers on the Globalization of Alternative Investments is being launched in conjunction with our Annual Meeting 2009 in Davos-Klosters, where a key track of the meeting will focus on promoting stability in the financial system and reviving global economic growth. In this context, the Forum will also release another report – entitled *The Future of the Global Financial System – A Near-Term Outlook and Long-Term Scenarios*. These two efforts provide complementary perspectives on aspects of the current crisis. The latter gives a broad overview of the current market dynamics and possible long-term implications across a wide variety of players and financial institutions. This volume, along with Volume 1 of the Working Papers, goes into particular detail about alternative investments, notably private equity, and the role they play in the global economy.

In the first volume of Working Papers in this series, we noted that through recent years, alternative investment asset classes such as private equity have become increasingly important pools of capital in the global financial system. The total value of firms (both equity and debt) acquired in leveraged buyouts is estimated to be US$3.6 trillion from 1970 through 2007, of which US$2.7 trillion-worth of transactions occurred between 2001 and 2007. Private equity has also grown tremendously in global reach, such that a majority of transactions now take place outside the United States. The first volume of Working Papers focused on the evolution of the private equity industry since the 1980s, covering the demography of private equity investments, their impact on innovation, employment and corporate governance. The work was complemented by six case studies.

Since the onset of the current crisis private equity activity has slowed dramatically. Credit markets have collapsed and the industry is adjusting to a deleveraging world where access to financing is hard to find. Many, therefore, ask “How will private equity, as an ownership model, be able to play a constructive role in the current situation?” Perspectives on this question largely depend on views about the ability of the asset class to create sustainable and fundamental value beyond ‘financial engineering’.

The research undertaken in this second volume of Working Papers could not be more timely and relevant to this core question. This volume of Working Papers complements the first one by examining the quality of management practices adopted by private equity firms at portfolio companies, and analyses the impact of private equity on labour productivity. Moreover, the Working Papers further broaden the geographic focus of Volume 1 (which relied heavily on US and UK data) by investigating the economic impact of private equity investments in France and the demography of private equity in emerging markets.

As was the case for the first volume, this report is the culmination of a year-long partnership between leading international scholars, industry practitioners, other distinguished experts and stakeholders, and our organization. The core research team, led by Josh Lerner, Jacob H. Schiff Professor of Investment Banking at Harvard Business School, also included:

- Nick Bloom, Stanford University
- Quentin Boucly, HEC School of Management
- Steven J. Davis, University of Chicago Booth School of Business
- John Haltiwanger, University of Maryland
- Ron Jarmin, United States Census Bureau
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- David Sraer, University of California at Berkeley

- Per Strömberg, Institute of Financial Research and Stockholm School of Economics
- David Thesmar, HEC School of Management
- John Van Reenen, London School of Economics

In a matter of only 10 months, this group oversaw the four large-scale analytic studies.

On behalf of the World Economic Forum the project was ably led by Anuradha Gurung, who served as both the project manager as well as the co-editor of this volume together with Josh Lerner. Her efforts have been a key driver of the project's success.

Intellectual stewardship and guidance was provided by an actively involved Advisory Board, chaired by Joe Rice, Chairman of Clayton & Rice Dubilier, Inc. An illustrious group of experts completed the Advisory Board, including:

- Piero Barucci, Autorità Garante della Concorrenza e del Mercato
- Wim Borgdorff, AlpInvest Partners
- Ulrich Cartellieri, former board member at Deutsche Bank
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- Kevin Steinberg, World Economic Forum USA
- David Swensen, Yale University
- Mark Wiseman, CPP Investment Board

While not necessarily endorsing any of the specific conclusions reflected in the analyses or case studies, the Board provided detailed feedback, and helped ensure the integrity of the work by acting as a sounding board for the independent academics. The opinions herewith are solely the views of the authors and do not reflect the opinions of the Advisory Board or the World Economic Forum.

The research was undertaken as part of the Globalization of Alternative Investments project, which was mandated by the World Economic Forum's Investors Industry Partnership. The Investors Industry Partners are leading global companies that are actively involved in the World Economic Forum's mission and include top companies from private equity, hedge funds, venture capital, institutional investors and sovereign wealth funds. Their contributions and intellectual input to the research as well as to related discussions throughout the past year has been much appreciated.

On behalf of the World Economic Forum, we thank all involved in creating this second volume of Working Papers. We appreciate their tremendous contributions to this valuable work, and relay our earnest hope they will continue their involvement in our future efforts. We also hope that this research will not only advance the academic understanding of the economic impact of alternative investments, but serve as a catalyst for further public discourse.

Letter on behalf of the Advisory Board

JOSEPH L. RICE, III
Chairman, Clayton, Dubilier & Rice, Inc.
Chair of the Advisory Board for the World Economic Forum
Globalization of Alternative Investments Project

Is private equity solely an exercise of financial engineering or is it an ownership model capable of producing sustainable improvement in business? This is an important question as policy-makers address the question of a new financial architecture for a world in distress.

Against this backdrop, the extensive research undertaken by a group of prominent researchers and presented in this volume of Working Papers is timely and relevant. It provides a context in which to assess private equity's impact on corporate performance. The picture which emerges is one of improved management and increased productivity.

As with the first volume of the Forum's Working Papers, the members of the Advisory Board, which include distinguished international experts representing labour, industry, finance and pensioners, do not necessarily endorse all of the conclusions reflected in the write-ups. Indeed, certain of the conclusions do not accord with the practical experience of certain members of the Advisory Board. Nevertheless, the breadth of the subject matter and sheer scale of the data analysed make this research effort among the most comprehensive ever undertaken on private equity. The research team, once again led by Josh Lerner of Harvard Business School, was diligent and open-minded in soliciting the counsel of the Advisory Board about avenues for additional research and analysis, but the final work product appropriately represents the independent findings and conclusions of the research team. Our hope is that these Working Papers will serve as a factual basis and catalyst for constructive ongoing discussion about the merits of private equity ownership.

On behalf of the Advisory Board, I would like to thank the research team for their important contributions.

Executive Summary

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Introduction

The past year has seen unprecedented turmoil in the markets, resulting in a fundamental restructuring of the financial landscape. As the magnitude of the turmoil and its consequences has become clear, there has been a natural desire on the part of political leaders to closely examine the role of financial intermediaries. These have not only included traditional financial institutions such as banks and insurance companies, but also alternative investment asset classes such as private equity, which in many nations have remained largely outside the pale of regulators.

Thus, in an era when financial regulation is rapidly evolving, understanding the role and consequences of private equity has never been more important. Yet the systematic knowledge we can draw upon about these institutions is surprisingly limited. In the last few decades, private equity has emerged as an important class of investment within the financial system and has evolved beyond the US and UK. Today, private equity transactions span different geographies and influence employment, productivity, corporate governance, management practices and the broader economy. But our understanding of the impact of the modern private equity industry remains at a relatively early level.

Research project overview

The World Economic Forum's research project on the global economic impact of private equity commenced in 2007 and brought together a team of international scholars to conduct in-depth analysis of the impact of the private equity industry and its transactions. The results were published in *Globalization of Alternative Investments, Working Papers Volume 1: The Global Economic Impact of Private Equity Report 2008*. For purposes of the research project, private equity is defined as investments by professionally managed partnerships that involve leveraged buyouts or other equity investments with a substantial amount of associated indebtedness (as opposed, for instance, to venture capital investments in start-ups) unless otherwise indicated in the respective papers. Prior to the launch of the research effort, existing literature on private equity had primarily focused on a relatively small number of transactions in the US and the UK conducted in the 1980s.

The first volume of the Working Papers published in January of 2008 addressed the evolution of the private equity industry since the 1980s by including large-sample studies that covered the following broad topics: a) the demography of private equity investments, b) the willingness of private equity-backed firms to make long-term investments, c) the impact of private equity activity on employment and d) the post-acquisition governance practices utilized by private equity firms. The research team complemented these studies with a variety of case studies, which examined these issues and others across a variety of geographies, with a particular emphasis on Germany, the UK and emerging private equity markets such as China and India.

The current volume of Working Papers complements the first by examining:

a) management practices adopted by private equity firms at portfolio companies

b) the impact of private equity activity on labour productivity

c) the impact of private equity investment in France

d) the demography of private equity in emerging markets

A key choice made at the outset of the project, given the tight one-year time frame for the research, was to draw on already existing databases about the private equity industry (such as SDC Platinum, Capital IQ, Dealogic and VentureXpert), as well as information from complementary databases compiling information on such activities as productivity and firm performance, rather than developing new material from the original records of the groups.

1.A: Key findings: Management practices study

One of the essential questions – largely unanswered in Volume 1 of this series – is whether and how private equity investors affect the management of the firms in which they invest. The first two papers look at this question in different ways. In the first paper in this volume, we employ a survey to understand management practices. In the second, we focus on measures of labour productivity from census data.

The first study examines management practices across 4,000 private equity-owned and other firms in a sample of medium-sized manufacturing firms in Asia, Europe and the US using a unique double-blind management survey conducted in 2006 to score monitoring, targets and incentive practices.

The main goal of the study is to determine whether private equity ownership is a way to achieve improved management practices within firms through the introduction of new managers and better management practices.

Among the key findings are the following:

- Private equity-owned firms are on average the best-managed ownership group. Private equity-owned firms are significantly better managed across a wide range of

management practices than government-, family- and privately owned firms. This is true even after controlling for a range of other firm characteristics such as country, industry, size and employee skills. Often private equity-owned firms are particularly strong at operational management practices, such as the adoption of modern 'lean manufacturing' practices, using continuous improvements and a comprehensive performance documentation process. While the results for private equity vs dispersed shareholding firms are not statistically significant, they indicate that private equity-owned firms have slightly higher management practices scores than those owned by dispersed shareholders.

- Most private equity-owned firms are well managed. The high average levels of management practices in private equity firms are due to the lack of any 'tail' of very badly managed firms under their ownership (that is, very few private equity firms are really badly managed). While government- and family-owned firms, as well as firms owned by private individuals, have substantial 'tails' of badly managed firms, those owned by private equity appear to be consistently well managed.
- Private equity-owned firms have strong operational management practices. Private equity-owned firms have strong people management practices in that they adopt merit-based hiring, firing, pay and promotions practices. Relative to other firms, they are even better at target management practices, in that private equity-owned firms tend to have tough evaluation metrics, which are integrated across the short and long run, are well understood by the employees and linked to firm performance. Private equity-owned firms are better still at operational management practices. Operational management practices include the adoption of modern lean manufacturing practices, using continuous improvements and a comprehensive performance documentation process. This suggests private equity ownership is associated with broad-based improvements across a wide range of management practices.

1.B: Key findings: Productivity study

This study builds on the initial paper on private equity and employment in Volume 1 of the Working Papers by looking beyond employment and focusing on whether and how labour productivity changes at firms that were targets of private equity transactions in the US from 1980 to 2005. As in the earlier study, the authors analysed detailed data on private equity transactions that they have integrated with longitudinal micro datasets at the US Census Bureau.

The key finding in the earlier study was that the net impact of private equity investments on employment was quite modest. While private equity-backed firms shed jobs at a considerably higher pace at existing establishments (for example, factories or offices of the acquired entity) in the three years after the transaction, they also added jobs more rapidly at existing establishments. Our interpretation of these patterns needed to be cautious, because we did not examine productivity changes at these establishments.

This new study provides evidence about the joint behaviour of productivity, jobs and worker earnings at manufacturing firms purchased by private equity investors compared with other firms. Key findings include:

- As in the earlier study, target manufacturing firms experience an intensification of creative destruction. Job creation and job destruction activity, establishment entry and exit, and establishment acquisition and divestiture (all relative to controls) are intensified in the wake of private equity transactions. The same patterns hold for private equity targets in the private sector as a whole.
- Firms acquired by private equity groups experience productivity growth in the two-year period after the transaction that is on average two percentage points more than at controls. About 72% of this out-performance differential reflects more effective management of existing facilities, including gains from accelerated reallocation of activity among the continuing establishments of target firms. About 36% of the differential reflects the productivity contribution of more entry and exit at target firms. It was also found that firms acquired by private equity had higher productivity than their peers at the time of the original acquisition by the private equity group.
- The probability of establishment shut-down is less likely for more productive facilities for both private equity targets and comparable firms, but the relationship is much stronger for private equity-backed firms. In other words, private equity investors are much more likely to close underperforming establishments at the firms they back, as measured by labour productivity.
- The roughly 1,400 private equity transactions involving US manufacturing firms from 1980 to 2005 raised output by somewhere between US$ 4 billion and US$ 15 billion per year as of 2007 (expressed in inflation-adjusted 2007 dollars), depending on whether and how rapidly the productivity gains dissipate after the buyout.
- Both targets and controls tend to share productivity gains with workers in the form of higher wages, but the relationship between productivity gains and wage increases is slightly stronger at targets. Establishments with higher than average productivity growth have higher than average earnings per worker growth.
- The positive productivity growth differential at target firms (relative to controls) is larger in periods with an unusually high interest rate spread between AAA-rated and BB-rated corporate bonds. The higher productivity growth at target firms during periods of financial stress reflects greater reallocation of activity to more productive establishments and a higher rate of closure at less productive ones.

1.C: Key findings: French study

This paper examines how leveraged buyout (LBO) transactions impact corporate growth in France, and it expands on existing literature that focused primarily on LBO transactions in the US and UK throughout the 1980s by investigating LBO transactions in France over the more recent time frame of 1994-2004.

The study utilizes Capital IQ and SDC Platinum datasets coupled with accounting data from the French Statistical Office to analyse 830 transactions that involve (1) a 100% change in ownership where at least one of the new owners is a private equity fund, and (2) the use of leverage to finance the deal.

The study finds that in France, private equity funds act as an engine of growth for small and medium-sized enterprises. Post-LBO growth in jobs, productivity, sales and assets of targets is higher in industries that have insufficient internal capital. In addition, the findings suggest that the transitional capital provided by private equity funds fills a critical gap at times when the capital markets are weak.

1.D: Key findings: Emerging markets study

The final study examines the rapid increase of private equity investment in emerging markets. From 2004 to 2007, the dollars raised by funds investing in the emerging economies of Asia, Russia and the former Soviet Union, Latin America, the Middle East and Africa has increased between eight- and thirty-fold.

In this study, the authors construct what they believe is the most comprehensive sample of private equity investments across nations. This study aims to understand the private and social returns of private equity investments in emerging economies by looking at the nature and outcomes of these private equity deals across nations that differ in the development of their financial sectors, governance, regulatory systems and operational infrastructures.

The key findings are as follows:

- Emerging markets account for a very modest share (under 4% on a US dollar-weighted basis) of private equity activity over the years 1990 through 2008. This share has grown in recent years, particularly in the growth equity category. Private equity represents a greater share of the gross domestic product (GDP) in nations that are wealthier and whose per capita GDP is growing more quickly.
- Only equity market development matters for the development of private equity, not the provision of debt, and the effects are particularly strong for venture capitalists. One interpretation is that exiting through public offerings is particularly important for these firms.
- The measures of operational engineering appear to be particularly important for buyout activity. In particular, the presence of barriers to free trade, greater complexity in establishing new entities, and greater corruption are associated with fewer LBOs.
- Minority transactions are associated with faster-growing countries. The presence of syndicated investments is associated with larger deals and with less favourable fundraising environments, which may be attributable to liquidity constraints.
- Deals in wealthier countries worldwide, especially venture capital transactions, are less likely to be successfully executed. Because the authors do not observe returns to transactions, they cannot say whether the benefits from their potentially greater successes compensate for their greater risk. Deals undertaken in 'hotter' private equity markets – for example, following relatively large private equity fundraising markets – are more likely to fail and less likely to experience a successful exit.

Putting it all together

Each of the four large-sample studies provides key insights into the evolution and impact of private equity across different geographies over the course of several decades. The findings illustrate that:

- Private equity-owned firms are associated with high scores on a wide range of management practices, especially operational management practices.
- In the first two years after private equity transactions, productivity grows on average by about two percentage points more at target firms than at controls and productivity gains at both targets and controls are shared with workers in the form of higher wages.
- In France, private equity funds act as an engine of jobs, productivity and asset growth for small and medium-sized firms.
- Although emerging markets only account for a small share of private equity activity, the share is increasing. While financial and governance engineering matter for private equity activity, operational engineering seems to matter the most as private equity activity is more apparent in countries that have less corruption and better financial markets infrastructures.

The Working Papers presented in this volume, together with last year's research, are intended to build a better understanding of private equity, which can serve as a foundation for the implementation of sound public policy measures with respect to this asset class.

Part 1

Do Private Equity-owned Firms have Better Management Practices?

Do Private Equity-owned Firms have Better Management Practices?*

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I. INTRODUCTION

Private equity (PE) ownership has become commonplace within the US and UK[1]. It is also increasing rapidly within Continental Europe and Asia. PE also appears to generate increases in profitability, as documented in several studies[2]. One view of this evolution is that PE ownership is associated with improved profitability through more effective use of debt and other financial instruments without any associated change in 'real' performance, such as greater productivity for ongoing business units. A second view of PE ownership is that it does enable improved firm-level productivity, but only through more efficient reallocations of labour and capital across plants from more targeted lay-offs and capital spin-outs. A third view is that PE ownership is a way to achieve improved management practices within firms through the introduction of new managers and better management practices[3]. In this paper, we focus on the last claim by looking at management practices across 4,000 PE-owned and other firms in a sample of medium-sized manufacturing firms in Asia, Europe and the US[4].

To implement this we first have to develop a technique to measure management practices across firms and countries. To do this we use a double-blind management survey developed in Bloom and Van Reenen [2007] to score on monitoring, targets and incentive management practices.

One part of the double-blind methodology is that our interviewers are not told anything about the financial performance of the firms they interview. The interviewers are simply given the firms' names and telephone numbers, making them 'performance blind' as they generally have not heard of the medium-sized companies we survey. The second part of the double-blind technique is that the managers we interview are not informed that they are being scored. To achieve this, we score management using a predefined practice grid provided by a leading international consultancy company and open-ended questions. The fact interviewers are 'performance blind' and managers are 'scoring blind' appears to provide informative management survey data.

To validate the accuracy of the scoring we carry out two pieces of analysis. First, we re-interview 222 firms using both a different interviewer and a different plant manager at the same firm. Comparing these independently run interviews with the first interviews, we confirm that our management practice survey is consistently measuring practices within firms. Second, we match our management practice data to firm-level performance indicators from independently collected company accounts, such as productivity, profitability, sales growth and Tobin's Q. We find that better management practices are strongly correlated with these independently collected firm performance measures. This is true for firms we interviewed from every region – the Anglo-Saxon countries (US and UK), Continental Europe (France, Germany, Sweden, Italy, Poland, Greece and Portugal) and Asia (China, India and Japan). This suggests our survey measures of management practices are robustly informative about firm performance.

Using this new management practice data (collected in 2006) on over 4,000 firms in Asia, Europe and the US we turn to the analysis of the management practices in PE-owned firms. We find three broad sets of results. First, PE firms are on average the best-managed ownership group in the sample[5]. PE-owned firms are significantly better managed than

* Acknowledgements: We would like to thank members of the World Economic Forum Globalization of Alternative Investments Advisory Board and Research Team, particularly Wim Borgdorff, Nick Ferguson, Anuradha Gurung, John Haltiwanger, Josh Lerner, Joe Rice and David Swensen for helpful comments on an earlier draft. We would like to thank the Anglo-German Foundation, the Advanced Institute of Management, the Economic and Social Research Council, the Kauffman Foundation and the World Economic Forum for their substantial financial support. We received no funding from the global management consultancy firm we worked with in developing the survey tool. Our partnership with Pedro Castro, Stephen Dorgan and John Dowdy has been particularly important in the development of the project. We are very grateful for the endorsement letters from the Banque de France, Bank of Greece, Bank of Japan, Bank of Portugal, Bundesbank, Confederation of Indian Industry, European Central Bank, European Union, Federation of Greek Industries, IUI Sweden, Ministero delle Finanze, National Bank of Poland, Peking University, People's Bank of China, Polish Treasury, Reserve Bank of India, Shenzhen Development Bank, Sveriges Riksbank, UK Treasury and the Warsaw Stock Exchange.

[1] See Davis et al [2008]. They also point out that in inflation-adjusted dollars, fundraising by US PE groups was over 100 times greater in 2006 than in 1985. PE ownership is defined as a PE firm representing the largest ownership block.

[2] See Kaplan and Schoar [2005], Muscarella and Vetsuypens [1990] or Phalippou and Gottschalg [2007]. Bebchuk and Fried [2004] and Schleifer and Summers [1998] offer a more skeptical view.

[3] This is the view associated with Jensen [1986, 1989] – leverage, active investors and enhanced alignment of incentives of managers and shareholders drive business improvements. Holstrom and Kaplan [2001] argue that although this may have been true in the past technological change and deregulation meant that by the late 1990s these practices have been more generally adopted.

[4] We focus on medium-sized firms because there is little accounting information on very small firms. Our survey method involves interviewing one or two plant managers, which would not be representative of very large firms that could operate across hundreds of plants.

[5] The other ownership groups we consider are dispersed ownership, family-owned (external CEO), managerially owned, private individuals, family-owned (family CEO), founder-owned and government-owned. We discuss this in detail below.

government-, family- and privately owned firms. This is true even after controlling for a range of other firm characteristics such as country, industry, size and employee skills. While the results for PE vs dispersed shareholding firms are not statistically significant, they indicate that PE-owned firms have slightly higher management practice scores than those owned by dispersed shareholders. This seems consistent with Leslie and Oyer [2008], who found no evidence that PE firms outperformed public firms in their sample of US firms between 1996 and 2004.

Second, the main reason for the high average levels of management practices in PE firms is the lack of any 'tail' of very badly managed firms under their ownership (that is, very few PE firms are really badly managed). While government- and family-owned firms, as well as firms owned by private individuals, have substantial 'tails' of badly managed firms, those owned by private equity appear to be all consistently well managed.

Finally, disaggregating the types of management practice, it seems that PE-owned firms have strong people management practices, in that they adopt merit-based hiring, firing, pay and promotions practices. Relative to other firms, they are even better at target management practices, in that PE-owned firms tend to have tough targets (evaluation metrics), which are integrated across the short and long run, well understood by the employees and linked to firm performance. However, PE-owned firms are better still at operational management practices. Operational management practices include the adoption of modern 'lean manufacturing' practices, using continuous improvements and a comprehensive performance documentation process. As such, this suggests PE ownership is associated with broad-based improvements across a wide range of management practices rather than simply just stronger performance incentives[6].

The layout of the rest of the paper is as follows. Section 2 discusses measuring management practices and the management data, and Section 3 offers an external validation of the survey tool. In Section 4 we discuss the distribution of management practices across ownership types, focusing on PE in particular. Finally, some concluding comments are offered in Section 5.

2. MEASURING MANAGEMENT PRACTICES

To investigate these issues we first have to construct a robust measure of management practices and overcome three hurdles: scoring management practices, collecting accurate responses and obtaining interviews with managers. We discuss these issues in turn.

2.A: Scoring management practices

To measure management requires codifying the concept of 'good' or 'bad' management into a measure applicable to different firms across the manufacturing sector. This is a hard task as good management is tough to define, and is often contingent on a firm's environment. There is no single index of good management, but our initial hypothesis is that while some management practices are too contingent to be evaluated as 'good' or 'bad', others can potentially be defined in these terms, and it is these practices we tried to focus on in the survey. To do this we used a benchmarking tool developed by a leading international management consultancy firm. In order to prevent any perception of bias with our study we chose to receive no financial support from this firm.

The practice evaluation tool defines and scores from 1 (worst practice) to 5 (best practice) across 18 key management practices used by industrial firms. These were chosen by working closely with a leading international management consultancy and are focused on best practices that can be used to increase manufacturing productivity. In Appendix A (Table A1) we detail the practices and the type of questions we asked in the same order as they appeared in the survey. In Table A2 we give four example practices, the associated questions and scoring system, and three anonymized responses per practice. Bloom and Van Reenen [2006] give examples that are more extensive across all 18 practices.

These practices are grouped into four areas:

I) operations (three practices)
i. introduction of lean manufacturing techniques
ii. documentation of improvements in processes
iii. rationale behind introduction of improvements

II) monitoring (five practices)
i. tracking of performance of individuals
ii. review of performance (e.g. through regular appraisals and job plans)
iii. performance dialogue (how meetings are structured, what type of feedback occurs)
iv. consequence management (e.g. making sure that plans are kept and appropriate sanctions and rewards are in place)
v. performance clarification and comparability

III) targets (five practices)
i. type of targets (whether goals are simply financial or operational or more holistic)
ii. realism of the targets (stretching, unrealistic or non-binding)
iii. transparency of targets (simple or complex)
iv. range of targets
v. interconnection of targets (e.g. whether they are given consistently throughout the organization)

IV) incentives (five practices)
i. rewarding high-performers (e.g. pay and bonus where best practice is deemed the approach that gives strong rewards for those with both ability and effort)
ii. removing poor performers (fixing or firing bad performers)
iii. promotion criteria (e.g. purely tenure-based or including an element linked to individual performance)
iv. attracting human capital
v. retaining human capital

A subset of the practices has similarities with those used in studies on human resource management practices.

[6] Leslie and Oyer [2008] show that PE-owned firms adopt much stronger incentives for their top managers (although this does not persist for more than one or two years after they go public).

Since the scaling may vary across practices in the econometric estimation, we convert the scores (from the 1-5 scale) to z-scores by normalizing by practice to mean zero and standard deviation one. In our main econometric specifications, we take the unweighted average across all z-scores as our primary measure of overall managerial practice, but we also experiment with other weighting schemes based on factor analytic approaches.

There is scope for legitimate disagreement over whether all of these measures really constitute 'good practice'. Therefore, an important way to examine the external validity of the measures is to examine whether they are correlated with data on firm performance constructed from completely independent data sources – company accounts and the stock market. We do this in Section 4, where we show that our measures are strongly correlated with measures of (total factor) productivity, profitability, sales growth, market-to-book ratios and firm survival. We also investigate whether the measures may be culturally biased towards an Anglo-Saxon view of the world. Although this is possible, at least two pieces of evidence suggest that the measures are not wholly biased in this manner. First, we show that our management scores are correlated with productivity among every regional group – that is, the relationship between our measures of management and productivity as derived from an entirely separate data source (firm accounts) is as strong (if not stronger) in France and Germany as it is in the US or the UK. Second, although the US scores on average the highest on our management measures, Britain scores relatively poorly – significantly worse than Japan, Germany or Sweden for example. If the measures were fundamentally biased towards English-speaking nations it is unlikely that England would score so poorly.

2.B: Collecting accurate responses

With this evaluation tool, we can provide some quantification of firms' management practices. However, an important issue is the extent to which we can obtain unbiased responses to our questions from firms. In particular, will respondents provide accurate responses? As is well known in the surveying literature (for example, Bertrand and Mullainathan [2001]) a respondent's answer to survey questions is typically biased by the scoring grid, anchored towards those answers that they suspect the interviewer thinks are correct. In addition, interviewers may themselves have preconceptions about the performance of the firms they are interviewing and bias their scores based on their ex ante perceptions. More generally, a range of background characteristics, potentially correlated with good and bad managers, may generate some kinds of systematic bias in the survey data.

To try to address these issues we took a range of steps to obtain accurate data. First, the survey was conducted by telephone without telling the managers that they were being scored[7]. This enabled scoring to be based on the interviewer's evaluation of the firm's actual practices, rather than its aspirations, the manager's perceptions or the interviewer's impressions. To run this 'blind' scoring we used open questions (for example, "Can you tell me how you promote your employees?"), rather than closed questions (for example, "Do you promote your employees on tenure [yes/no]?"). Furthermore, these questions target actual practices and examples, with the discussion continuing until the interviewer can make an accurate assessment of the firm's typical practices based on these examples. For each practice, the first question is broad with detailed follow-up questions to fine-tune the scoring. For example, in dimension (1) *Modern manufacturing introduction* the initial question is "Can you tell me about your manufacturing process?" and is followed up by questions such as "How do you manage your inventory levels?".

Second, the interviewers did not know anything about the firm's financial information or performance in advance of the interview. This was achieved by selecting medium-sized manufacturing firms and by providing only the names of the firms and their contact details to the interviewers, but no financial details. Consequently, the survey tool is 'double blind' – managers do not know that they are being scored and interviewers do not know about the performance of the firm. The interviewers were incentivized on the number of interviews they ran and so had no interest in spending time researching the companies in advance of running the interview. These smaller firms (the median size was 675 employees) would not be known by name and are rarely reported in the business media. The interviewers were specially trained graduate students from top European and US business schools. All interviews were conducted in the manager's native language.

Third, each interviewer ran over 50 interviews on average, allowing us to remove interviewer-fixed effects from all empirical specifications. This helps to address concerns over inconsistent interpretation of categorical responses (see Manski [2004]), standardizing the scoring system.

Fourth, the survey instrument was targeted at plant managers, who are typically senior enough to have an overview of management practices but not so senior as to be detached from day-to-day operations of the enterprise.

Fifth, we collected a detailed set of information on the interview process itself (number and type of prior contacts before obtaining the interviews, duration, local time of day, date and day of the week); on the manager (gender, seniority, nationality, company and job tenure, internal and external employment experience and location); and on the interviewer (individual interviewer-fixed effects, time of day and subjective reliability score). Some of these survey controls are significantly informative about the management score[8] and help reduce residual variation.

[7] This survey tool has been passed by Stanford Univerity's Human Subjects Committee. The deception involved was deemed acceptable because it is: (i) necessary to get unbiased responses; (ii) minimized to the management practice questions and is temporary (we send managers debriefing packs afterwards); and (iii) presents no risk as the data are confidential.

[8] In particular, we found the scores were significantly higher for senior managers, when interviews were conducted later in the week and/or earlier in the day. That is to say, scores were highest, on average, for senior managers on a Friday morning and lowest for junior managers on a Monday afternoon. By including information on these characteristics in our analysis, we explicitly controlled for these types of interview bias.

2.C: Ensuring international comparability

In comparing organizational and management surveys across countries we have to be extremely careful to ensure comparability of responses. To maximize comparability we undertook three steps. First, every interviewer had the same initial three days of interview training, provided jointly by the Centre for Economic Performance and our partnering international consultancy firm. This training included three role-play calibration exercises, where the group would all score a role-played interview and then together discuss the scoring of each question. This was aimed at ensuring every interviewer had a common interpretation of the scoring grid. In addition, every Friday afternoon throughout the survey period the group met for 90 minutes for training and to discuss any problems with interpretation of the survey.

Second, the team operated from one location, the Centre for Economic Performance at the London School of Economics (LSE), using two large survey rooms. The different national survey teams were thus listening in on each other's surveys on a daily basis, were organized and managed in the same way, and ran the surveys using exactly the same telephone, computer and software technology[9].

Third, the individual interviewers interviewed firms in multiple countries. The team language was English, with every interviewer able to complete English language interviews, so that interviewers were able to interview firms from their own country plus the UK and US. As a result, the median number of countries that each interviewer scored was three, enabling us to remove interviewer-fixed effects in the cross-country analysis.

2.D: Obtaining interviews with managers

Each interview took on average 50 minutes and was run in the summer of 2006. Overall, we obtained a relatively high response rate of 45%, which was achieved through four steps. First, the interview was introduced as "a piece of work"[10] without discussion of the firm's financial position or its company accounts, making it relatively uncontroversial for managers to participate. Interviewers did not discuss financial information in the interviews, both to maximize the participation of firms and to ensure our interviewers were truly 'blind' on the firm's financial position. Second, the survey was ordered to lead with the least controversial questions (for example, on shop-floor operations management), leading on to monitoring, incentives and organizational structure. Third, interviewers' performance was monitored, as was the proportion of interviews achieved, so they were persistent in chasing firms. The questions were also about practices within the firm in order that any plant manager could respond, so there were potentially several managers per firm who could be contacted[11]. Fourth, the written endorsement of many official institutions[12] helped demonstrate to managers that this was an important academic exercise with official support. Fifth, the involvement of Cambridge and Stanford universities and the LSE, along with the institutions of the interviewers[13], provided a signal of the research focus of the work.

2.E: Defining private equity ownership

For 80% of the firms in our sample, the ownership definition was collected during the survey interview. During the interview the manager was asked about the ultimate ownership of the firm. Interviewers would then allocate the response to the most appropriate ownership definition from the following options: 1) Dispersed shareholders (defined as no one holding more than 25% of the firm's equity); 2) Cooperative; 3) Family; 4) Founder; 5) Government; 6) Managers; 7) Private equity or venture capital; 8) Private individuals; 9) Other.

In order to cross-check the accuracy of this information[14] and to populate the other 20% of the data we gathered additional data from manual searches. More specifically, we used the global ultimate owner information provided by ORBIS and ZEPHYR, Bureau van Dijk (BVD) datasets specifically designed to study firm-level ownership information. For about 30% of the sample, ownership data were not available from either ORBIS or ZEPHYR so we also looked at companies' websites as many firms report information on ownership in the 'about us' or 'company history' sections of their websites. If nothing could be found on company websites, we then looked for generic news articles on firms using Lexis/Nexis and simple Google searches. This enabled us to collect ownership data for all the firms in the database.

There was a problem in the Swedish sample as a large number of firms said that they were owned by Wallenberg (called Investor AB). We dropped these from the sample in the main results, but also examined what happened if we defined these as PE firms. The results were robust when using this definition.

2.F: Sampling frame and additional data

Since our aim is to compare across countries we decided to focus on the manufacturing sector, where productivity is easier to measure than in the non-manufacturing sector. We also focused on medium-sized firms, selecting a sample of firms with predicted employment of between 100 and 5,000 workers (with a median of 270). Very small firms have little publicly available data. Very large firms are likely to be more heterogeneous across plants, and so it would be more difficult to get a picture of organization in the firm as a whole from interviews with one or two plant managers. We drew a sampling frame from each country to be representative of medium-sized manufacturing firms and then randomly chose the order of which firms to contact (see Appendix B for details). Since we use different databases in Europe (Amadeus), the US (Icarus), China and Japan (Oriana) and India (Firstsource) we had concerns regarding the cross-country comparisons so we

[9] See http://www.youtube.com/watch?v=HgJXt8KwhA8 for video footage of the survey team.
[10] We avoided using the words "research" or "survey" as many firms link these to market research surveys, which they often refuse to be involved with.
[11] We found no significant correlation between the number, type and timescale of contacts before an interview was conducted and the management score. This suggests that while different managers may respond differently to the interview proposition this does not appear to be correlated with their responses or the average management practices of the firm.
[12] The Banque de France, Bank of Greece, Bank of Japan, Bank of Portugal, Bundesbank, Confederation of Indian Industry, European Central Bank, European Commission, Federation of Greek Industries, IUI Sweden, Ministero delle Finanze, National Bank of Poland, Peking University, People's Bank of China, Polish Treasury, Reserve Bank of India, Shenzhen Development Bank, Sveriges Riksbank, UK Treasury and Warsaw Stock Exchange
[13] Interviewers were drawn from the following universities: Berkeley, City of London, Columbia, Harvard, HEC School of Management, IESE Business School, Imperial, INSEAD, Kellogg, London Business School, LSE, Lund, MIT, Nova de Lisbon, Oxford, Stanford and Yale.
[14] The manager's statements were almost always correct.

include country dummies in all of the preferred specifications. Our choice of countries was determined by economic size, data and our ability to hire analysts who were natives of the countries in which interviews were being conducted (in order for the interview to be conducted fluently in the same language as the plant manager being interviewed).

Comparing the responding firms with those in the sampling frame, we found no evidence that the responders were systematically different from the non-responders on any of the performance measures. They were also statistically similar on all the other observables in our dataset. The only exception was on size and multinational status, where our firms were slightly larger on average than those in the sampling frame and slightly more likely to be a multinational subsidiary (see Appendix B for details).

We also collected a large amount of additional data from the survey to use as controls. On the human resource side, we have information on the proportion of the workforce with degrees, average hours worked and the gender and age breakdown of the workforce. In addition, from the sample databases we have information on firm size, whether the firm was listed on the stock exchange and standard accounting information on sales, capital, etc.

3. VALIDATING THE MANAGEMENT PRACTICES MEASURES

Before we investigate the reasons for the spread of management practices across firms it is worth evaluating whether these practices are correlated with firm performance. The purpose of this exercise is not to directly identify a causal relationship between our management practice measures and firm performance. It is rather an external validity test of the survey measurement tool to check that the scores are not just 'cheap talk' but are actually correlated with quantitative measures of firm performance from independent data sources on company accounts, survival rates and market value.

3.A: Internal data validation: Independent manager and interviewer resurveys

The data potentially suffer from several types of measurement error that are likely to bias the association of firm performance with management towards zero. First, we could have measurement error in the management practice scores obtained using our survey tool. To quantify this, we performed repeat interviews on 222 firms, contacting different managers in the firm, typically at different plants and using different interviewers. To the extent that our management measure is truly picking up general company-wide management practices these two scores should be correlated, while to the extent the measure is driven by noise the measures should be independent.

The correlation of the first interview against the second interview was strongly positive (a correlation coefficient of 0.627 with a p-value of 0.000), and is plotted in Figure 1. Furthermore, there is no obvious (or statistically significant) relationship between the difference between the first and second interviews and the absolute score. That is to say, high and low scores appear to be as well measured as average scores, and firms that have high (or low) scores on the first interview tend to have high (or low) scores on the second interview. Thus, firms that score below two or above four appear to be genuinely badly or well managed rather than extreme draws of sampling measurement error.

3.B: External data validation: Management practices and productivity

Consider the basic firm 'production function':

$$(1) \qquad y_{ijc} = a_l l_{ijc} + a_k k_{ijc} + a_m m_{ijc} + \beta\, MNG_{ijc} + \gamma' Z_{ijc} + \eta_j + \theta_c + u_{ijc}$$

where $y = ln$(deflated sales) of firm i in (three-digit) industry j in country c. The conventional factor inputs are l, ln(labour), k, ln(capital) and m, ln(materials); and in some specifications reported we allow country-specific parameters on the inputs. The Zs are a number of other controls that will affect productivity, such as workforce characteristics (the proportion of workers with a college degree and the average hours worked), firm characteristics (firm age and whether the firm is publicly listed on the stock market), a complete set of three-digit industry dummies and country dummies.

The crucial variable for us is management practices denoted MNG. Our basic measure takes z-scores of each of the 18 individual management practices and then averages over the variables to proxy MNG. We experimented with a number of other approaches, including using the primary factor from factor-analysis and using the raw average management scores, and found very similar results.

Table I investigates the association between firm performance and management practices. Column (1) simply reports a level OLS specification including only industry, country and time dummies as additional controls. The management score is strongly positively and significantly associated with higher labour productivity. The second column includes fixed capital, materials and skills, plus our general controls of industry dummies, average hours worked, education, firm age and listing status, and a full set of interview 'noise controls' to mitigate biases across interviewers and types of interviewees. This has little effect on the point estimate on the management term. Overall, the first two columns suggest that the average management score is positively and significantly correlated with higher productivity.

Columns (3), (4) and (5) of Table I examine three other measures of firm performance. In column (3) we use an alternative performance measure, which is return on capital employed (ROCE). The significant and positive coefficient on management in the ROCE equation, which also includes the same set of controls as in column (2), confirms the basic productivity results. In column (4) we look at sales growth and also find a positive and (weakly) significant coefficient. In column (5), we estimate a Tobin's Q specification (the ratio of the market value of the firm to its book value), which again includes the same set of controls as in the production function. We also find a significant and positive coefficient on management. Note that we also find a strong and positive correlation between firm size and management practices, which is often used as another measure of firm performance and is consistent with the Lucas [1978] model. Survival rates are also higher for better-managed firms (see Bloom and Van Reenen [2007]).

We were concerned that the definition of 'good management' may be culturally biased towards an Anglo-Saxon view of the management world. Some may regard such business practices as suitable for Britain and America, but less suitable for Continental Europe. We empirically tested this by regressing our preferred productivity equation from column (2) separately for firms from Anglo-Saxon countries (US and UK, in column (6)), Asian countries (China, India and Japan, in column (7)) and Continental European countries (France, Germany, Greece, Italy, Poland, Portugal and Sweden in column (8)). We found that the management coefficient was positive and significant in all regional blocs, which suggests that our concept of good management is not specific to the English-speaking world but of more general applicability[15].

Finally, in two other pieces of work we have looked at the relationship between management practices and wider 'social performance' measures. In Bloom, Kretschmer and Van Reenen [2006] we examined the relationship between management practices and work-life balance in the firm, both in terms of subjective employee statements on overall work-life balance and objective measures of the ability of employees to work from home, job-share, work part-time and take time off for child care. We found that firms that scored more highly on our indicators for management practices also had significantly higher subjective and objective employee work-life balance. This is consistent with the view that improved management practices do not come at the expense of workers' welfare (at least in the dimension of work-life balance). In Bloom, Genakos, Martin et al. [2008] we looked at the relationship between management practices and firms' energy use, finding that well-managed firms tended to use less energy in the production process. One obvious explanation is that the adoption of modern lean manufacturing techniques enables firms to profitably reduce the energy intensity of their production process.

Overall then, there is substantial evidence that the measures of management we use are positively and significantly associated with better firm performance across a number of dimensions. These results also offer some external validation of the survey tool, implying that we are not simply measuring statistical noise.

4. MANAGEMENT PRACTICES IN PRIVATE EQUITY FIRMS

4.A: Overall management practices

We start by investigating the relationship between private equity ownership and management practices. To do this we have allocated firms into several ownership groups according to the type of their single-largest shareholding block. In Figure 2 we show the average management score by these ownership groups, while in Table I we show these results in statistical form after adding a variety of controls.

Looking first at Figure 2, three main results stand out from the raw data. First, PE firms received the highest management scores on average. Second, dispersed ownership firms (those with no ownership block above 25%, often publicly quoted) are almost as well run as PE-owned firms. Third, government-owned firms, family-owned firms with a family CEO[16], founder-owned firms (the individual who set up the company) and companies owned by private individuals are notably more poorly managed than PE-owned firms.

Table 2 column (1) reports these differences alongside standard errors, produced by regressing management practices on ownership dummies with the PE ownership category as the omitted category. This shows that the difference between PE-owned firms and dispersed ownership firms are small in magnitude and not statistically significant. On the other hand, the difference between PE-owned firms and government-, founder- and family-owned and family-CEO firms is highly significant. In column (2) we add country dummies, because many PE firms are in more developed countries (US, UK and Sweden) while many government-owned and family-owned firms are in developing countries. Controlling for country of location reduces the gaps between the ownership types, but leaves the qualitative results broadly unchanged. In columns (3) and (4) we add in subsequent controls for three-digit industry dummies, firm size, worker skills, hours and a survey noise, and again find the results are broadly robust.

Figure 2 also contains information on management practices based on the current owner (dark shading) and based on the ownership if this has been continuous for the last three years (light shading). We see that among firms with stable ownership over the last three years PE-managed firms appear to have a slightly better average management score. This suggests that PE ownership is associated with relatively better management practices after a longer period of ownership. This is presumably because firms recently acquired by PE firms may be badly managed, if they are selected on their potential for performance improvement. We investigate this selection issue in more detail in sub-section 4.D below by examining the subset of our data where we have longitudinal information on changes in management practices.

4.B: Consistency of management practices across ownership types

Figure 3 plots the management practice histogram across firms by ownership category (in solid shading). Overlaid on this is the kernel density plot[17] for PE firms (dashed line), to facilitate a comparison between the distribution of firms' management practices between PE firms and other ownership categories. This shows that PE-owned firms have better management practices on average than government-owned, founder-owned, family-owned and family-CEO, and privately owned firms because of the lack of a tail of badly managed firms. For example, out of the 137 PE-owned firms in the sample only one has a management score of less than 2 while government-, founder- and family-owned and family-CEO firms all have more than 15% of their management scores less than 2. By contrast, dispersed shareholder firms have a very similar distribution of scores to PE-owned firms.

[15] The coefficients on the factor inputs suggest constant returns to scale in each country, but with different factor intensities. Material inputs are not available for UK and US companies.
[16] Family-owned firms that appoint an external CEO appear to be well managed, suggesting that it is merit-based appointment of senior managers which matters more than family ownership per se.
[17] The kernel is estimated using an Epanechnikov smoother over a bandwidth of 100 firms.

4.C: Types of management practices

We also investigate in Table 3 to what extent the difference between PE management practices and other firms is due to particular types of management practices. This reports the results from regressing the average management scores for the four subgroups of management practices outlined in Section 2.A – operations management, monitoring, targets and incentives – against a PE ownership dummy, with all other firms as the baseline group. Each one of the four management practice subgroups was normalized to have a standard deviation to unity. Therefore, the coefficient on the private equity dummy in each column reports how many standard deviations PE firms are different from all other firms on that management practice.

In column (1) of Table 3 we report the results for operations management (lean manufacturing and continuous improvement) and find PE firms are significantly better-managed on this dimension than other types of firms. In column (2) we add controls for country, industry, firm and noise and find that PE firms are still significantly better than other firms on operations management. Columns (3) to (8) repeat similar estimations of the difference between PE and non-PE firms on monitoring, targets and incentives management with and without other controls. Interestingly, we find that while PE firms are significantly better than non-PE firms on all types of management practices, this is notably so on operations and monitoring practices.

In Table 4 we look at the differential between PE-owned firms and all other firms on all 18 of the individual management practices. What we find is that PE firms are substantially better at the adoption of modern lean manufacturing techniques, and at process documentation, review and tracking. Interestingly, the other area where they are notable better than other firms is in removing poor performers, suggesting that they are more willing to retrain or exit underperforming employees.

4.D: Changes in management practices over time

We followed the 732 firms interviewed in 2004 in Bloom and Van Reenen [2007] through to 2006. We were able to collect information on 561 of these firms and can observe how our management measure evolves over time. Fifty-six of these firms had some change in ownership over these two years so we can examine changes in practices among firms who stayed in the same ownership type and in those who changed. Figure 4 plots out the change in the management index by ownership type. The bottom bar shows that firms which remained in private equity hands for at least three years had the fastest improvement of management practices of all the different ownership types. By contrast, the firms whose management performance was deteriorating were more likely to be taken over by private equity (second from bottom bar).

The obvious interpretation of this graph is that PE disproportionately targets firms whose management is underperforming and are then better at improving them. Although this is consistent with anecdotal evidence, an important caveat is that we do not have a long period after the PE takeover so we cannot be sure of this interpretation. Furthermore, some of the cell sizes are very small – we only have nine firms who remained in PE for three years or more, for example.

With these caveats in mind, Figure 4 reinforces the point in Figure 2 that we may be underestimating the benefits of PE ownership by simply looking at the cross-sectional correlations. The fact that PE seem to target underperforming firms means that there will be a downward bias to the cross-sectional regressions in Tables 2 through 4 (which may be why PE firms appear no better than those with dispersed ownership patterns).

A final reason why we may be underestimating some of the benefits of PE is that we are mixing all types of very heterogeneous PE firms together. It may be that the larger and more prestigious PE firms are much better at improving firm performance. To investigate this we identified the names of the PE firms who owned the firms in our sample and examined whether these 'top tier' PE firms were different[18]. Unfortunately, we were unable to detect significant differences between these types of firms, which was probably related to the small sample size of PE firms (there are only 137 in our sample).

5. CONCLUSIONS

Using a new survey tool we collect management practice and ownership data from over 4,000 medium-sized manufacturing firms across Asia, Europe and the US. We find three broad sets of results.

First, PE firms are on average the best-managed ownership group in the sample. PE firms are significantly better managed than government-owned, family-owned and privately owned firms. This is true even after controlling for a range of other firm characteristics such as country, industry, size and employee skills. However, the difference in management practice scores between PE and dispersed shareholding firms (including publicly quoted firms) is small and insignificant. Second, the reason for the high average levels of management practices in PE firms is the lack of any tail of badly managed firms under their ownership. While government-owned, family-owned and privately owned firms have substantial tails of badly managed firms, those owned by private equity are all consistently well managed. Finally, PE-owned firms are particularly strong at operations management practices, such as the adoption of modern lean manufacturing practices, using continuous improvements and a comprehensive performance documentation process. As such, this suggests PE ownership is associated with broad-based improvements across a wide range of management practices rather than simply just stronger performance incentives.

One limitation of our study is that it is mainly cross-sectional, so we cannot determine the causal effect of PE on management practices and performance as we do not have a sufficiently long panel or an instrumental variable for PE. Nevertheless, we do find evidence suggesting that we may be underestimating the positive effects of PE. Using a small panel of changes in management practices, we find that PE firms have the

[18] We used the 'top 15' PE firms from the website http://www.peimedia.com/pei50. Results are similar when using the top 10 or 5.

fastest improvement in management. This is partly disguised because PE firms also seem to select underperforming firms, which they then subsequently help turn around.

A second limitation is that our measures of management practice are coarse and cannot capture all of the nuances of management style and strategy. Having some quantitative cross-national measures that can be used across a range of industries is, in our view, an important advantage of this study. These practice measures are complementary to (and strongly correlated with) other measures of firm performance such as productivity. The findings reported here are the first for PE and management practices so are an initial step in a longer-term research programme.

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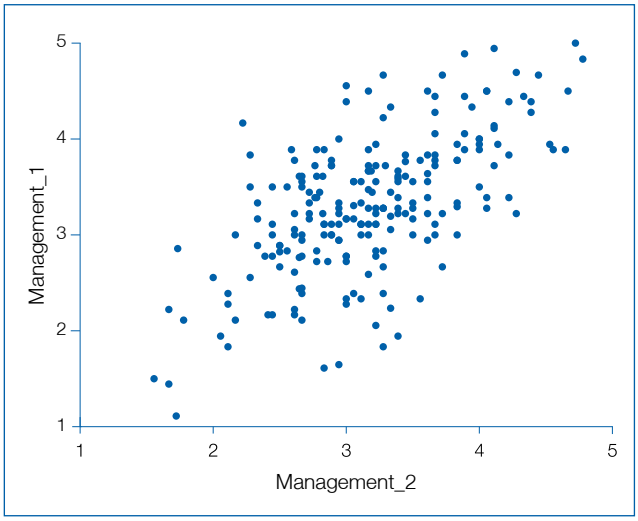
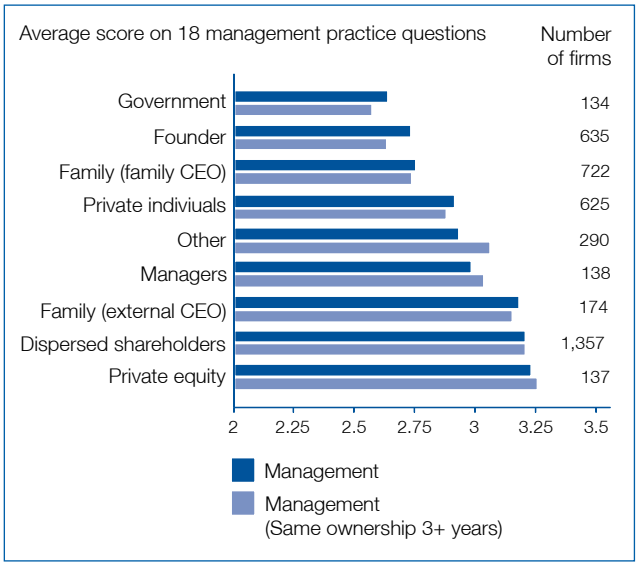
Figure 1: Double interviews of the same firm



Notes: The figure plots the management score from the first interview (management_1) of a firm against the second interview of the firm (management_2). These two interviews are undertaken independently – so both the interviewer (MBA student) and interviewee (typically the plant manager) are different across two interviews. There are 222 interview pairs plotted here.

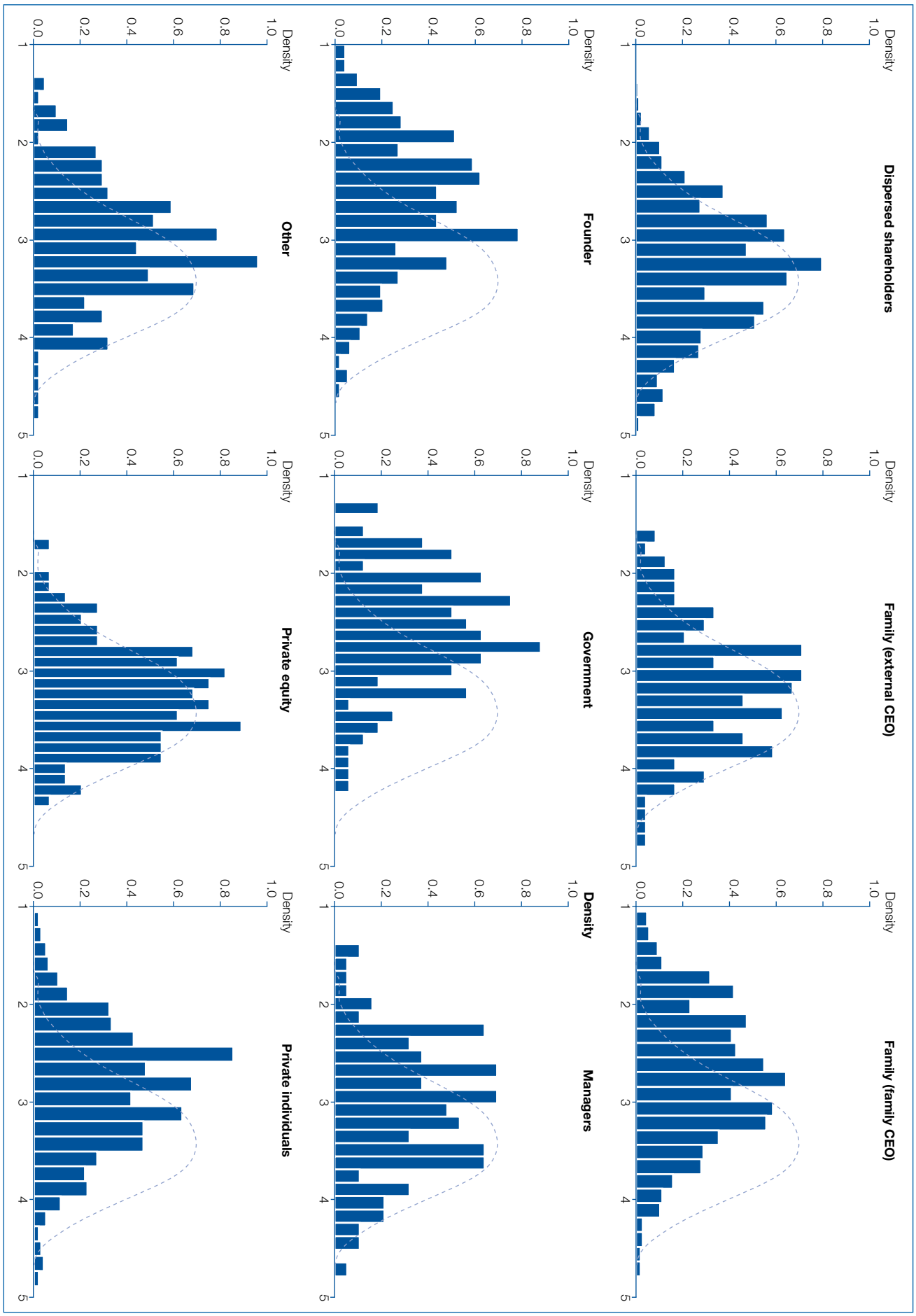
Figure 2: Private equity-owned firms have the best raw management practice scores on average



Note: Sample of 4,221 medium-sized manufacturing firms. The bottom bar chart only covers the 3,696 firms which have been in the same ownership for the last 3 years. The 'Other' category includes venture capital, joint ventures, charitable foundations and unknown ownership.

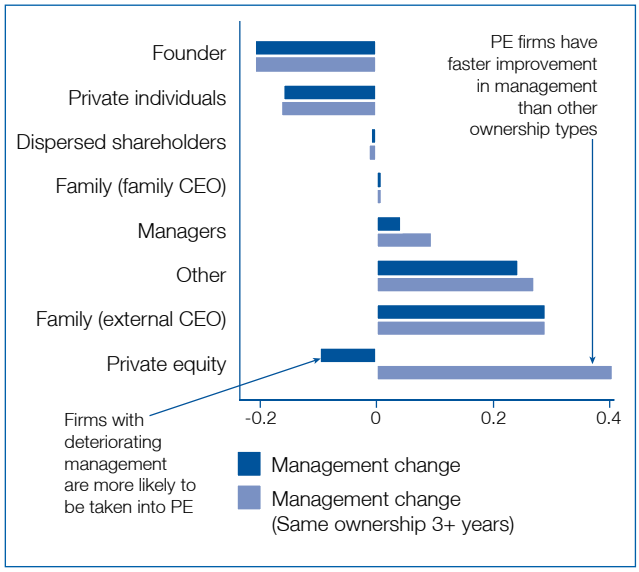
Figure 3: Private equity-owned firms high average scores reflect their smaill tail of badly managed firms

Distribution of firm management scores by ownership. Overlaid line is the PE kernel density.



Note: Sample of 4,221 medium-sized manufacturing firms.

Figure 4: Private equity-owned firms have greater improvements in management practice over time (2004-2006)



Note: Sample of 561 firms. Surveyed in 2004 and 2006

Table 1: Management practices and firm performance

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Firms	**All**	**All**	**All**	**All**	**Quoted**	**US and UK**	**Asian**	**Continental European**
Dependent variable	**Ln (Y) $_{it}$ Sales**	**Ln (Y) $_{it}$ Sales**	**ROCE Profitability**	**Sales growth**	**Ln (Tobin's Av. Q)**	**Ln (Y) $_{it}$ Sales**	**Ln (Y) $_{it}$ Sales**	**Ln (Y) $_{it}$ Sales**
Management	0.616***	0.192***	0.982**	0.007*	0.223***	0.169***	0.474**	0.203***
z-score	(0.038)	(0.021)	(0.438)	(0.004)	(0.079)	(0.033)	(0.187)	(0.027)
Ln (L) $_{it}$		0.626***	1.035***	-0.007	0.097	0.750***	0.239**	0.584***
Labour		(0.029)	(0.327)	(0.004)	(0.075)	(0.033)	(0.093)	(0.044)
Ln (K) $_{it}$		0.255***	-1.126***	0.007**	-0.096	0.201***	0.493***	0.233***
Capital		(0.017)	(0.226)	(0.003)	(0.066)	(0.025)	(0.049)	(0.023)
Ln (N) $_{it}$		0.205***	0.212	0.018***	-0.057		0.240**	0.251***
Materials		(0.015)	(0.243)	(0.003)	(0.053)		(0.113)	(0.019)
ln (H) $_{it}$		0.057***	0.166	0.000	0.103***	0.043***	-0.015	0.055***
% employees with a degree		(0.010)	(0.202)	(0.002)	(0.036)	(0.013)	(0.045)	(0.013)
Country, time and industry dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Noise controls	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firms	3,278	3,278	2,432	2,953	327	1,058	615	1,605
Observations	13,922	13,922	11,656	12,948	1,561	4,691	914	8,317

Notes: ***denotes that a coefficient is significant at the 0.01 level, ** at the 0.05 level and * at the 0.10 level. All columns estimated by OLS. In all columns standard errors are in parentheses under coefficient estimates and allow for arbitrary heteroskedasticity and serial correlation (i.e. clustered by firm). 'Firm controls' comprise firm-level controls for ln(average hours worked), ln(firm age), a dummy for being listed and the share of the workforce with degrees. 'Noise controls' are 48 interviewer dummies; the seniority, gender, tenure and number of countries worked in of the manager who responded; the day of the week the interview was conducted; the time of day the interview was conducted; the duration of the interviews; and an indicator of the reliability of the information as coded by the interviewer. Accounting data span 2001 to 2006. All regressions include a full set of three-digit industry dummies and we add in country dummies to control for differences across the 12 countries. Materials data were not directly available for the UK and US so we could not include this variable in the regressions of column (6). In other columns (1) to (5) we include a dummy variable for when materials data are missing.

Table 2: Ownership types and management practices

	(1)	(2)	(3)	(4)
Estimation method	**OLS**	**OLS**	**OLS**	**OLS**
Dependent variable	**Management raw score**	**Management raw score**	**Management raw score**	**Management raw score**
PE-owned	Baseline	Baseline	Baseline	Baseline
Dispersed shareholders	-0.044	-0.003	-0.011	-0.042
	(0.041)	(0.042)	(0.042)	(0.039)
Family-owned, external CEO	-0.094	-0.071	-0.058	-0.121**
	(0.060)	(0.059)	(0.059)	(0.052)
Managers	-0.179***	-0.143**	-0.126*	-0.099*
	(0.065)	(0.065)	(0.067)	(0.059)
Private individuals	-0.348***	-0.249***	-0.239***	-0.169***
	(0.045)	(0.046)	(0.046)	(0.042)
Family-owned, family CEO	-0.482***	-0.414***	-0.384***	-0.281***
	(0.045)	(0.046)	(0.046)	(0.043)
Founder ownership	-0.573***	-0.403***	-0.381***	-0.267***
	(0.046)	(0.047)	(0.048)	(0.044)
Government ownership	-0.633***	-0.401***	-0.393***	-0.378***
	(0.061)	(0.061)	(0.061)	(0.056)
Other	-0.204***	-0.131***	-0.127**	-0.136***
	(0.050)	(0.051)	(0.051)	(0.046)
Country controls	No	Yes	Yes	Yes
Industry controls	No	No	Yes	Yes
Firm and noise controls	No	No	No	Yes
Firms	4,081	4,081	4,081	4,081

Notes: *** denotes that a coefficient is significant at the 0.01 level, ** at the 0.05 level and * at the 0.10 level. All columns estimated by OLS. In all columns robust standard errors are in parentheses under coefficient estimates. 'Firm controls' are comprised of firm-level controls for ln(average hours worked), ln(firm age), a dummy for being listed and the share of the workforce with degrees. 'Noise controls' are 48 interviewer dummies; the seniority, gender, tenure and number of countries worked in of the manager who responded; the day of the week the interview was conducted; the time of day the interview was conducted; the duration of the interviews; and an indicator of the reliability of the information as coded by the interviewer.

Table 3: Management practice types and private equity ownership

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable:	**Operations**	**Operations**	**Monitoring**	**Monitoring**	**Targets**	**Targets**	**Incentives**	**Incentives**
PE-owned	0.454***	0.163**	0.482***	0.239***	0.398***	0.138**	0.196***	0.108
	(0.074)	(0.078)	(0.067)	(0.067)	(0.074)	(0.069)	(0.074)	(0.069)
Country controls	No	Yes	No	Yes	No	Yes	No	Yes
Industry controls	No	Yes	No	Yes	No	Yes	No	Yes
Firm and noise controls	No	Yes	No	Yes	No	Yes	No	Yes
Firms	No	Yes	No	Yes	No	Yes	No	Yes
Observations	4,081	4,081	4,081	4,081	4,081	4,081	4,081	4,081

Notes: *** denotes that a coefficient is significant at the 0.01 level, ** at the 0.05 level and * at the 0.10 level. All columns estimated by OLS. Columns (1) and (2) dependent variable is operations management (Table A1 questions 1, 2 and 3), columns (3) and (4) dependent variable is monitoring (Table A1 questions 4, 5, 6, 7 and 12), columns (5) and (6) dependent variable is targets (Table A1 questions 8, 9, 10, 11 and 13), while columns (7) and (8) dependent variable is incentives (Table A1 questions 14, 15, 16, 17 and 18). The management dependent variables in each column have been normalized to have a standard deviation of unity. In all columns robust standard errors are in parentheses under coefficient estimates. 'Firm controls' are comprised of firm-level controls for ln(average hours worked), ln(firm age), a dummy for being listed and the share of the workforce with degrees. 'Noise controls' are 48 interviewer dummies; the seniority, gender, tenure and number of countries worked in of the manager who responded; the day of the week the interview was conducted; the time of day the interview was conducted; the duration of the interviews; and an indicator of the reliability of the information as coded by the interviewer.

Table 4: Individual management practices and private equity ownership

Practice name	Practice number	Practice type	Average value for private equity (Point estimate)
Modern manufacturing	1	Operations	0.129
			(0.085)
Modern manufacturing, rationale	2	Operations	0.069
			(0.080)
Process documentation	3	Operations	0.219***
			(0.076)
Performance tracking	4	Monitoring	0.231***
			(0.071)
Performance review	5	Monitoring	0.191***
			(0.072)
Performance dialogue	6	Monitoring	0.261***
			(0.078)
Consequence management	7	Monitoring	0.138*
			(0.072)
Target breadth	8	Targets	0.128*
			(0.074)
Target interconnection	9	Targets	0.105
			(0.076)
Target time horizon	10	Targets	0.141*
			(0.083)
Targets are stretching	11	Targets	0.100
			(0.074)
Performance clarity and comparability	12	Monitoring	0.056
			(0.080)
Managing human capital	13	Targets	0.026
			(0.083)
Rewarding high performance	14	Incentives	0.036
			(0.080)
Removing poor performers	15	Incentives	0.142**
			(0.070)
Promoting high performers	16	Incentives	0.057
			(0.088)
Attracting human capital	17	Incentives	0.020
			(0.073)
Retaining human capital	18	Incentives	0.092
			(0.085)

Notes: Each row shows the point estimate (standard error) from regressing the z-score for that practice against a private equity ownership dummy in the sample of 4,081 firms with complete management practice data. The practice z-score is the score outlined in Appendix A below, normalized to have a mean of zero and a standard deviation of 1. *** denotes that the variable is significant at the 1% level, ** denotes 5% significance and * denotes 10% significance. Estimation by OLS with robust standard errors in parentheses. Controls are the same as in columns (2), (4), (6) and (8) of Table 3, so include country dummies, industry dummies, firm and plant size, and noise controls. Noise controls include the day of the week the interview took place, an interview reliability score, the manager's seniority and tenure, the duration of the interview, and four dummies for missing values in seniority, tenure, duration and reliability.

APPENDIX A: DETAILS OF THE SURVEY QUESTIONNAIRES

Table A1: Full list of management practices with examples of the questions asked

Practice	Practice number	Practice type	Example of questions we asked
Modern manufacturing, introduction	1	Operations	a) Can you describe the production process for me? b) What kinds of lean (modern) manufacturing processes have you introduced? Can you give me specific examples? c) How do you manage inventory levels? What is done to balance the line?
Modern manufacturing, rationale	2	Operations	a) Can you take me through the rationale to introduce these processes? b) What factors led to the adoption of these lean (modern) management practices?
Process documentation	3	Operations	a) How would you go about improving the manufacturing process itself? b) How do problems typically get exposed and fixed? c) Talk me through the process for a recent problem. d) Do the staff ever suggest process improvements?
Performance tracking	4	Monitoring	a) Tell me how you track production performance? b) What kind of key performance indicators (KPIs) would you use for performance tracking? How frequently are these measured? Who gets to see this KPI data? c) If I were to walk through your factory could I tell how you were doing against your KPIs?
Performance review	5	Monitoring	a) How do you review your key performance indicators (KPIs)? b) Tell me about a recent meeting. Who is involved in these meetings? c) Who gets to see the results of this review?
Performance dialogue	6	Monitoring	a) How are these meetings structured? Tell me about your most recent meeting. b) During these meetings, how much useful data do you have? c) How useful do you find problem-solving meetings? d) What type of feedback occurs in these meetings?
Consequence management	7	Monitoring	a) What happens if there is a part of the business (or a manager) who isn't achieving agreed-upon results? Can you give me a recent example? b) What kind of consequences would follow such an action? c) Are there any parts of the business (or managers) that seem to repeatedly fail to carry out agreed actions?
Target breadth	8	Targets	a) What types of targets are set for the company? What are the goals for your plant? b) Tell me about the financial and non-financial goals. c) What do company headquarters (CHQ) or its appropriate manager emphasize to you?
Target interconnection	9	Targets	a) What is the motivation behind your goals? b) How are these goals cascaded down to the individual workers? c) What are the goals of the top management team (do they even know what they are!)? d) How are your targets linked to company performance and its goals?
Target time horizon	10	Targets	a) What kind of timescale are you looking at with your targets? b) How are long-term goals linked to short-term goals? c) Could you meet all your short-term goals but miss your long-term goals?
Targets are stretching	11	Targets	a) How tough are your targets? Do you feel pushed by them? b) On average, how often would you say that you meet your targets? c) Are there any targets which are obviously too easy (will always be met) or too hard (will never be met)? d) Do you feel that on targets that all groups receive the same degree of difficulty? Do some groups get easy targets?
Performance clarity and comparability	12	Monitoring	a) What are your targets (i.e. do they know them exactly)? Tell me about them in full. b) Does everyone know their targets? Does anyone complain that the targets are too complex? c) How do people know about their own performance compared with other people's performance?

Table A1: Full list of management practices with examples of the questions asked (continued)

Managing human capital	13	Targets	a) Do senior managers discuss attracting and developing talented people? b) Do senior managers get any rewards for bringing in and keeping talented people in the company? c) Can you tell me about the talented people you have developed within your team? Did you get any rewards for this?
Rewarding high performance	14	Incentives	a) How does your appraisal system work? Tell me about the most recent round. b) How does the bonus system work? c) Are there any non-financial rewards for top performers?
Removing poor performers	15	Incentives	a) If you had a worker who could not do his job what would you do? Could you give me a recent example? b) How long would underperformance be tolerated? c) Do you find any workers who lead a sort of charmed life? Do some individuals always just manage to avoid being fixed/fired?
Promoting high-performers	16	Incentives	a) Can you rise up the company rapidly if you are really good? Are there any examples you can think of? b) What about poor performers – do they get promoted more slowly? Are there any examples you can think of? c) How would you identify and develop (i.e. train) your star performers? d) If two people both joined the company five years ago and one was much better than the other would he/she be promoted faster?
Attracting human capital	17	Incentives	a) What makes it distinctive to work at your company as opposed to your competitors? b) If you were trying to sell your firm to me how would you do this (get them to try to do this)? c) What don't people like about working in your firm?
Retaining human capital	18	Incentives	a) If you had a star performer who wanted to leave what would the company do? b) Could you give me an example of a star performer being persuaded to stay after wanting to leave? c) Could you give me an example of a star performer who left the company without anyone trying to keep them?

Table A2: Management practice interview guide and example responses for 4 of the 18 practices

Any score from 1 to 5 can be given, but the scoring guide and examples are only provided for scores of 1, 3 and 5. Multiple questions are used for each dimension to improve scoring accuracy.

Practice 3:
Process problem documentation (Operations)

	Score 1	Score 3	Score 5
Scoring grid:	No, process improvements are made when problems occur.	Improvements are made in weekly workshops involving all staff, to improve performance in their area of the plant.	Exposing problems in a structured way is integral to individuals' responsibilities and resolution occurs as a part of normal business processes rather than by extraordinary effort/teams.
Examples	A US firm has no formal or informal mechanism in place for either process documentation or improvement. The manager admitted that production takes place in an environment where nothing has been done to encourage or support process innovation.	A US firm takes suggestions via an anonymous box, they then review these each week in their section meeting and decide any that they would like to proceed with.	The employees of a German firm constantly analyse the production process as part of their normal duty. They film critical production steps to analyse areas more thoroughly. Every problem is registered in a special database that monitors critical processes and each issue must be reviewed and signed off by a manager.

Practice 4:
Performance tracking (Monitoring)

	Score 1	Score 3	Score 5
Scoring grid:	Measures tracked do not indicate directly if overall business objectives are being met. Tracking is an ad-hoc process (certain processes are not tracked at all).	Most key performance indicators are tracked formally. Tracking is overseen by senior management.	Performance is continuously tracked and communicated, both formally and informally, to all staff using a range of visual management tools.
Examples	A manager of a US firm tracks a range of measures when he does not think that output is sufficient. He last requested these reports about eight months ago and had them printed for a week until output increased again. Then he stopped and has not requested anything since.	At a US firm every product is bar-coded and performance indicators are tracked throughout the production process; however, this information is not communicated to workers.	A US firm has screens in view of every line. These screens are used to display progress to daily target and other performance indicators. The manager meets with the shop floor every morning to discuss the day past and the one ahead and uses monthly company meetings to present a larger view of the goals to date and strategic direction of the business to employees. He even stamps napkins with key performance achievements to ensure everyone is aware of a target that has been hit.

Table A2: Management practice interview guide and example responses for 4 of the 18 practices (continued)

Practice 11:
Targets are stretching (Targets)

	Score 1	Score 3	Score 5
Scoring grid:	Goals are either too easy or impossible to achieve; managers provide low estimates to ensure easy goals.	In most areas, top management pushes for aggressive goals based on solid economic rationale. There are a few 'sacred cows' that are not held to the same rigorous standard.	Goals are genuinely demanding for all divisions. They are grounded in solid economic rationale.
Examples:	A French firm uses easy targets to improve staff morale and encourage people. They find it difficult to set harder goals because people just give up and managers refuse to work people harder.	A chemicals firm has two divisions, producing special chemicals for very different markets (military, civil). Easier levels of targets are requested from the founding and more prestigious military division.	A manager of a UK firm insisted that he has to set aggressive and demanding goals for everyone – even security. If they hit all their targets he worries he has not stretched them enough. Each KPI is linked to the overall business plan.

Practice 16:
Promoting high-performers (Incentives)

	Score 1	Score 3	Score 5
Scoring grid:	People are promoted primarily on the basis of tenure.	People are promoted on the basis of performance.	We actively identify, develop and promote our top performers.
Examples:	A UK firm promotes based on an individual's commitment to the company, measured by experience. Hence, almost all employees move up the firm in lock-step. Management was afraid to change this process because it would create bad feeling among the older employees who were resistant to change.	A US firm has no formal training programme. People learn on the job and are promoted based on their performance on the job.	At a UK firm each employee is given a red light (not performing), amber light (doing well and meeting targets), a green light (consistently meeting targets/very high performer) and a blue light (high-performer capable of promotion of up to two levels). Each manager is assessed every quarter based on his succession plans and development plans for individuals.

Note: The full set of scoring and examples can be found in Bloom and Van Reenen [2006]

APPENDIX B: DATA

B.1: Survey data

The survey sampling frame

Our sampling frame was based on the BVD Amadeus dataset for Europe (France, Germany, Greece, Italy, Poland, Portugal and the UK); on BVD Icarus for the US, on Centre for Monitoring Indian Economy (CMIE) Firstsource dataset for India, and on the BVD Oriana dataset for China and Japan. These databases all provide sufficient information on companies to conduct a stratified telephone survey (company name, address and a size indicator). These databases also typically have some accounting information, such as employment, sales of capital assets, etc. However, apart from size, we did not insist on having accounting information to form the sampling population.

Amadeus and Firstsource are constructed from a range of sources, primarily the national registries of companies (such as Companies House in the UK and the Registry of Companies in India). Icarus is constructed from the Dun & Bradstreet database, which is a private database of over five million US trading locations built up from credit records, business telephone directories and direct research. Oriana is constructed from the databases of Huaxia Credit in China and Teikoku Databank in Japan, covering all public and private firms with one of the following: 150 or more employees, US$ 10 million of sales or US$ 20 million of assets.

In every country the sampling frame was all firms with a manufacturing primary industry code and between 100 and 5,000 employees on average over the most recent three years of data (typically 2002 to 2004)[19]. In Japan and China we used all manufacturing firms with 150 to 5,000 employees since Oriana only samples firms with over 150 employees[20]. In Portugal, the population of firms with 100 to 5,000 employees was only 242, so we supplemented this with the 72 firms with 75 to 100 employees. We checked the results by conditioning on common size bands (above 150 in all countries). Interviewers were each given a randomly selected list of firms from the sampling frame, which further analysis in Bloom, Genakos, Martin et al. [2008] confirms.

In addition to randomly surveying from the sampling frame described above we also tried to resurvey the firms we interviewed in the 2004 survey wave used in Bloom and Van Reenen [2007]. This was a sample of 732 firms from France, Germany, the UK and the US, with a manufacturing primary industry code and 50 to 10,000 employees (on average during the period 2000 to 2003). This sample was drawn from the Amadeus dataset for Europe and Standard & Poor's Compustat dataset for the US. Only companies with accounting data were selected. Therefore, for the UK and France this sampling frame was very similar to the 2006 sampling frame. For Germany, it is more heavily skewed towards publicly quoted firms since smaller privately held firms do not report balance sheet information. For the US, it comprised only publicly quoted firms. As a result, when we present results we always include controls for firm size. As a robustness test we drop the firms that were resurveyed from 2004. These resurveyed firms were randomly distributed among the relevant country interviewers.

The survey response rate

Of the firms we contacted 44.9% took part in the survey: a high success rate given the voluntary nature of participation. Of the remaining firms, 16.8% refused to be surveyed and the remaining 38.3% were in the process of being scheduled when the survey ended. The reason for this high share of 'scheduling in progress' firms was the need for interviewers to keep a portfolio of firms that they cycle through when trying to set up interviews. Since interviewers only ran an average of 2.8 interviews a day the majority of their time was spent trying to contact managers to schedule future interviews. For scheduling it was efficient for interviewers to keep a stock of between 100 and 500 firms to cycle through. The optimal level of this stock varied by country – in the US and UK many managers operated voicemail, so large stocks of firms were needed. In Japan, after two weeks the team switched from working Japanese hours (midnight to 08.00) to Japanese afternoons and UK mornings (04.00 till midday), which left large stocks of contacted firms in Japan[21]. In Continental Europe, in contrast, managers typically had personal assistants rather than voicemail, who wanted to see government endorsement materials before connecting interviewers with the managers, and therefore each approach was more time-consuming, requiring a smaller stock of firms.

The ratio of successful interviews to rejections (ignoring 'scheduling in progress') is above 1 in every country. Hence, managers typically agreed to the survey proposition when interviewers were able to connect with them. This agreement ratio is lowest in China and Japan. There were two reasons for this: first, the Chinese and Japanese firms did appear to be genuinely more likely to refuse to be interviewed; and second, time zone differences meant that our interviewers could not call during the Chinese or Japanese morning, which sometimes led to rejections if managers were too busy to talk in the afternoon.

We also find (detailed in Bloom, Genakos, Martin et al. [2008]) that the decision to accept the interview proposition is uncorrelated with revenues per worker, listing status of the firm or firm age. Large firms and multinationals did appear to be more predisposed to accepting the interview proposition, although the size of this effect is not large – multinationals were about seven percentage points more likely to agree to the interview, and firms about four percentage points more likely for each doubling in size. The likelihood of managers accepting the interview proposition did not rise significantly through the survey. Finally, compared with the US only four countries had a significantly higher conditional acceptance rate – France, Greece, Italy and Poland – while none had a significantly lower acceptance rate.

[19] In the US only the most recent year of employment is provided. In India employment is not reported for private firms, so for these companies we used forecast employment, predicted from their total assets (which are reported) using the coefficients from regressing log (employees) on log (assets) for public firms.

[20] Note that the Oriana database does include firms with less than 150 employees if they meet the sales or assets criteria, but we excluded this to avoid using a selected sample.

[21] After two weeks of the Japanese team working midnight to 08.00 it became clear this schedule was not sustainable due to the unsociability of the hours, with one of the Japanese interviewers resigning. The rest of the team then switched to working 04.00 until noon.

B.2: Firm-level data

Our firm accounting data on sales, employment, capital, profits, shareholder equity, long-term debt, market values (for quoted firms) and wages (where available) came from the BVD Amadeus dataset for Europe (France, Germany, Greece, Italy, Poland, Portugal and the UK), the BVD Icarus dataset for the US, the CMIE Firstsource dataset for India, and the BVD Oriana dataset for China and Japan.

B.3: Industries and industry-level data

Our basic industry code is the US Standard Industrial Classification (SIC) 1997 three-digit level – which is our common industry definition in every country. We allocate each firm to its main three-digit sector (based on sales). For the 3,601 firms in the sample we have 134 unique three-digit industries. There are at least 10 sampled firms in each industry for 96.9% of the sample.

The 'Lerner index of competition' constructed, as in Aghion et al. [2005], as the mean of (1 – profit/sales) in the entire database (excluding the surveyed firms themselves) for every country industry pair. Profits are defined as EBIT (earnings before interest and taxation) to include the costs of labour, materials and capital but excluding any financing or tax costs. The five-year period 2000 to 2004 is used in every country to ensure comparability across countries (since earlier data are not available in Oriana). In the US and India private firms do not provide profits data so the index was constructed from the population of all publicly listed firms, obtained from Compustat for the US and the CMIE Prowess dataset for India.

B.4: Data descriptive statistics

A set of descriptive statistics broken down by country is in Table B1. We have 3,902 firms with 4,038 observations, since 136 firms were interviewed twice. There are also a few missing values for some control variables (for example, the percentage of employees with a degree). In these cases we set the value of the control variable equal to zero when it was missing and include an additional dummy variable to indicate this. However, the results are robust to dropping missing values entirely.

Table B1: The survey sample descriptive statistics

	All	CN	FR	GE	GR	IN	IT	JP	PO	PT	SW	UK	US	Missing #
Observations, #	4,038	325	323	348	187	470	204	122	239	177	286	649	694	n/a
Firms, #	3,902	319	313	308	187	467	207	121	239	177	259	609	682	n/a
Firms, excluding 2004 resurvey, #			242	225								560	535	n/a
Firm employees (median)	270	700	240	500	230	250	185	310	250	183	267	250	375	0
Firm employees, excluding 2004 resurvey			200	325								250	300	n/a
Plant employees (median)	150	500	150	225	120	150	150	150	150	125	150	140	150	0
Production sites (median), #	2	1	3	2	1	1	2	2	1	1	2	2	3	94
Age of firm (median, years)	34	12	39	40	32	22	33	57	31	35	62	34	33	101
Listed firm, %	14.5	6.4	4.6	16.4	18.7	26.2	1.4	28.3	2.3	5.6	1.7	6.5	30.1	121
Share of workforce with degrees, %	17.3	8	17.3	14.9	11.9	22.0	16.3	30.9	20.0	9.6	19.8	12.9	20.1	436
Management (mean)	2.99	2.61	2.99	3.18	2.64	2.54	3.00	3.15	2.88	2.73	3.15	3.00	3.31	0
Trust (%)	38	65	17	33	15	39	40	43	31	16	72	36	42	48
1-Lerner index	0.957	0.950	0.965	0.949	0.935	0.923	0.965	0.966	0.967	0.9720	0.980	0.968	0.940	111
% of foreign MNEs	0.25	0.20	0.46	0.31	0.19	0.10	0.25	0.03	0.35	0.18	0.44	0.38	0.14	0
% of domestic MNEs	0.22	0.01	0.34	0.36	0.13	0.02	0.22	0.32	0.04	0.20	0.39	0.25	0.33	0
Interview duration (minutes)	47.9	48.6	46.3	44.7	49.8	59.8	46.6	58.4	47.8	54.5	56.3	43.5	46.8	34

Notes: All=All countries combined, CN=China, FR=France, GE=Germany, GR=Greece, IN=India, IT=Italy, JP=Japan, PO=Poland, PT=Portugal, SW=Sweden, UK=United Kingdom, US=United States.

Part 2

Private Equity, Jobs and Productivity

Private Equity, Jobs and Productivity

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I. INTRODUCTION

The productivity effects of private equity are a matter of considerable controversy. Much of the popular press, and many labour and political leaders, characterize private equity as engaged mainly in financial engineering that delivers few productivity gains or other benefits to the firms they acquire. Some critics go further and claim that private equity harms the firms that they acquire and their workers. Even among sympathetic observers, the mechanisms through which private equity groups improve operations at portfolio firms are seldom well-articulated and well-documented.

In this paper, we develop evidence about whether and how productivity changes at firms that are targets of private equity transactions. We also provide evidence about the joint behaviour of productivity, jobs and worker earnings at private equity targets compared with other firms. We build on our recent study of employment outcomes at firms and establishments that were targets of private equity transactions in the United States from 1980 to 2005 (Davis et al. [2008]). As in our earlier study, we exploit detailed data on private equity transactions that we have integrated with longitudinal micro datasets at the US Census Bureau.

Specifically, we rely on the Longitudinal Business Database (LBD) to follow employment at virtually all private equity-backed companies in the US, before and after the private equity transactions, as well as at matching firms with similar observable characteristics. We follow activity at the level of firms and establishments – that is, specific factories, offices and other distinct physical locations where business takes place. We restrict attention to the manufacturing sector for the productivity part of our analysis, because productivity measures are more widely available and of better quality for the manufacturing sector. To measure productivity, we rely on micro data from the Annual Survey of Manufactures (ASM).

We combine these Census Bureau data sources with data from Capital IQ and other sources to identify and characterize private equity transactions. We identify about 5,000 US firms acquired in private equity transactions from 1980 to 2005 ('target firms') and about 250,000 US establishments operated by these firms at the time of the private equity transaction ('target establishments'). About 1,400 target firms and 14,000 target establishments are in the manufacturing sector. To construct controls, we match each target establishment to other establishments in the transaction year that are comparable in terms of industry, firm size and firm age. We follow a similar approach to controls for target firms.

To clarify the scope of our study, we consider later-stage changes in ownership and control executed that are partly financed by private equity firms. In these transactions, the (lead) private equity firm acquires a controlling stake in the target firm and retains a significant oversight role until it 'exits' by selling its stake. The initial transaction usually involves a shift towards greater leverage in the capital structure of the target firm and, sometimes, a change in its management. We exclude management-led buyouts that do not involve a private equity firm. We also exclude start-up firms backed by venture capitalists.

Our ability to track both establishments and firms over time allows us to examine three competing hypotheses about the effects of private equity on productivity at target firms:

Hypothesis 1: Private equity groups do not systematically improve productivity at target firms, because their main focus is to generate profits through leverage and other tools of financial engineering. In fact, if the financial engineering leads management to focus on debt service and short-term financial goals at the expense of operating performance, or if it deprives management of the resources needed to enhance operations, private equity transactions negatively affect productivity at target firms.

Hypothesis 2: Private equity groups raise productivity at target firms by working with their managers to improve operations and realign incentives and by substituting better executives. Under this hypothesis, most productivity gains at private equity targets (relative to controls) involve

[1] Davis, Haltiwanger and Lerner are research associates with the National Bureau of Economic Research, and Davis is a Visiting Scholar at the American Enterprise Institute. We thank Paul Bailey and Kyle Handley for research assistance with this project and Per Strömberg for data on private equity transaction classifications. Participants in and Advisory Board members of the World Economic Forum's Globalization of Alternative Investments project provided many helpful comments. The World Economic Forum, the Kauffman Foundation, Harvard Business School's Division of Research, the Global Markets Initiative at the University of Chicago Booth School of Business and the US Census Bureau provided generous financial support for this research. This document reports the results of research and analysis undertaken in part by US Census Bureau staff. This work is unofficial and has not undergone the review accorded to official publications of these agencies. All results have been reviewed to ensure that no confidential information is disclosed. The views expressed in the paper are those of the authors and not necessarily those of the US Census Bureau.

improvements within continuing establishments rather than divestitures and closures of underperforming units or, more generally, the reallocation of resources across establishments.

Hypothesis 3: Private equity groups raise productivity at target firms by deciding which facilities to retain, expand, sell off, shrink or close. Under this hypothesis, most productivity gains at private equity targets (relative to controls) arise from the reallocation of factor inputs from less productive to more productive establishments.

Our previous study finds that, compared with controls, target firms exhibit substantially greater rates of gross job destruction and gross job creation in the wake of private equity transactions. We know from other research that a large fraction of industry-level productivity gains reflects factor reallocation from less productive to more productive establishments[2]. These observations suggest that perhaps private equity transactions act as accelerants for this source of productivity gains. One possibility is that private equity investors have a greater ability to identify underperforming units in portfolio firms, a greater willingness to curtail their operations, or both. If so, then cutting back at underperforming units can free up resources to expand activity at better performing units and new facilities. This possibility is consistent with recent suggestions by Jovanovic and Rousseau [2008], who argue that takeovers lead to a shift of firm resources to more efficient uses and to better managers.

The main findings of our study can be summarized as follows:

1. Target manufacturing firms experience an intensification of job creation and job destruction activity, establishment entry and exit, and establishment acquisition and divestiture (all relative to controls) in the wake of private equity transactions. The same patterns hold for private equity targets in the private sector as a whole.
2. At the time of private equity transactions, labour productivity is 3.7 log points (3.8%) higher on average at continuing establishments of target firms than at continuing establishments of comparable firms in the same industry and of similar size and age. Two years later, the productivity gap between such continuing establishments of target firms and comparable firms has widened to 5.1 log points (5.2%). This increased gap is on an employment-weighted basis so it reflects both within-establishment effects and the effects of changing allocation of activity across establishments within firms.
3. The probability of establishment shut-down falls with productivity for both private equity targets and comparable firms, but the relationship is much steeper for targets. In other words, target firms are much more likely to close underperforming establishments, as measured by labour productivity.
4. In the first two years after private equity transactions, productivity grows on average by about two percentage points more at target firms than at controls. About 72% of this differential reflects greater productivity gains at continuing establishments, including gains from accelerated reallocation of activity among the continuing establishments of target firms. About 36% of the differential reflects the productivity contribution of more establishment entry and exit at target firms. A greater pace of acquisitions and divestitures at target firms makes a small negative contribution to the differential in productivity growth.
5. Cumulating the extra value-added implied by the differential in productivity growth, the roughly 1,400 private equity transactions involving US manufacturing firms from 1980 to 2005 raised output by US$ 4 billion to US$ 15 billion per year as of 2007 (expressed in inflation-adjusted 2007 dollars), depending on whether and how rapidly the productivity gains dissipate after the buyout.
6. Continuing establishments at target firms pay a wage premium, with average earnings per worker 1.1% greater than continuing establishments at comparable firms, at the time of private equity transactions. Two years later, average wages at the continuing establishments of target firms are the same as at the continuing establishments of comparable firms. This changing gap is on an employment-weighted basis and thus reflects within-establishment changes as well as changing allocation across continuing establishments[3].
7. Both targets and controls tend to share productivity gains with workers in the form of higher wages, but the relationship between productivity gains and wage increases is slightly stronger at targets[4].

In the current economic climate, a special concern is whether leveraged transactions have different effects in a severe downturn with limited credit availability. For example, even if private equity investments have beneficial productivity effects during our sample period as a whole, debt-heavy capital structures at target firms may lead to unfavourable outcomes in a downturn characterized by a sharp contraction in credit availability. We cannot yet investigate outcomes in the current downturn, but we can investigate outcomes in earlier periods that saw a recession and a contraction in credit availability. In this regard, we find the following:

8. The positive productivity growth differential at target firms (relative to controls) is larger in periods with an unusually high interest rate spread between AAA-rated and BB-rated corporate bonds. The higher productivity growth at target firms during periods of higher credit risk spreads reflects greater reallocation of activity to more productive establishments and a higher rate of closure at less productive ones.

[2] See Foster, Haltiwanger and Krizan [2001, 2006] and the references therein.
[3] Note that we know very little at this point about the impact of private equity transactions on wages for individual workers inside the establishments of target firms. Understanding the wage dynamics of private equity transactions requires the use of linked employer–employee datasets, which is beyond the scope of this paper.
[4] This pattern reflects cross-sectional variation in growth rates across establishments. That is, the establishments with higher than average productivity growth have higher than average earnings per worker growth.

These findings suggest that private equity firms are more prone to take difficult, but productivity-enhancing, decisions to restructure businesses during a credit market 'crunch'.

The paper proceeds as follows: In Section 2 we review previous studies that consider the impact of private equity transactions on productivity outcomes. We then describe the construction of the data in Section 3. Section 4 describes our empirical methodology. We present our main analyses in Section 5. The final section offers concluding remarks and discusses directions for future work.

2. PREVIOUS LITERATURE

Economists have a longstanding interest in how ownership changes affect productivity (for example, Lichtenberg and Siegel [1987], Long and Ravenscraft [1993], McGuckin and Nguyen [2001]). However, few empirical works explicitly consider the impact of private equity on productivity. In this section, we review the existing large-sample studies and then discuss several clinical studies of particular transactions.

2.A: Large-sample studies

Kaplan [1989a] focuses on public-to-private leveraged buyouts (LBOs) during the 1980s. In 48 firms for which he can obtain post-buyout financial information, he finds increases in operating income (before depreciation) and net cash flow, as well as reductions in capital expenditures. When normalized by assets or sales to control for post-buyout asset sales, the increases in income and cash flow are between 20% and 50%. He interprets these findings as consistent with Jensen [1989], who argues that the combination of incentives, control and leverage imposed by private equity significantly enhances operating performance at target firms.

The analysis closest in spirit to our study is Lichtenberg and Siegel [1990], who use Census Bureau data to examine changes in productivity at the manufacturing plants of 131 firms undergoing buyouts between 1981 and 1986. They find more rapid productivity growth at these plants post-buyout than at other plants in the same industries, even though buyout plants were already more efficient before the transaction. Interestingly, they find no significant productivity changes in the 38 LBOs that occurred in 1981 and 1982, a recessionary period, while the post-1982 LBOs had a strong positive impact.

Two other studies examine private equity transactions in Great Britain, historically the second-largest market for buyout activity. Amess [2002] examines 78 buyouts of entire British firms between 1986 and 1997, and Harris, Siegel and Wright [2005] examine 979 buyouts of British firms between 1994 and 1998. The results in both studies suggest that private equity transactions are associated with productivity increases[5].

These earlier studies share certain features. First, there is little effort to distinguish among sources of productivity changes, that is, how much of any gains reflects productivity improvements within continuing establishments and how much reflects divestiture or closures of underperforming establishments or, more generally, reallocation from less to more productive establishments. Some of the studies seek to partly address this issue by eliminating buyouts involving substantial asset sales, but it is unclear how this type of sample restriction affects the results given the extent of 'asset shuffling' by private equity-backed and other firms. Such an approach is also unable to address the broader contribution of factor reallocation to productivity in the wake of private equity transactions.

Second, previous US studies consider a relatively modest number of deals in the 1980s. Since that time, the private equity industry has become much larger. Using inflation-adjusted dollars, fundraising by US private equity groups was 36 times greater in 1998 than in 1985 and more than 100 times greater in 2006[6]. The tremendous growth in private equity activity allows us to examine a much larger sample. It also suggests that earlier relationships might no longer hold because of increased competition for transactions or greater operational orientation of many private equity groups.

Third, many previous studies restrict attention to whole-firm and public-to-private transactions. Divisional buyouts, secondary buyouts and private equity investments in firms that were already private may produce quite different results.

2.B: Clinical studies

Another group of studies provide detailed descriptions and analyses of particular private equity transactions. These studies find productivity effects and other outcomes in particular transactions that may have broader implications. By our reading, these studies deliver four sets of insights.

First, some private equity transactions generate limited or no productivity gains. In several cases, and for various reasons, private equity groups sometimes fail to achieve their goals for target firms. For instance, when Berkshire Partners bought Wisconsin Central, it had an ambitious plan to increase productivity. However, technological problems arose soon after the buyout transaction and prevented the deployment of a computerized control system that was crucial to the plan. Moreover, the original business plan overlooked certain costs and greatly overestimated the target's ability to cut expenditures. As a result, the numbers in the ambitious business plan were never met (Jensen, Burkhardt and Barry [1990]). In other cases, such as the Revco transaction, a crippling debt load, along with management disarray, a weak and inexperienced LBO sponsor and a disastrous midstream shift in strategy led to a failure to achieve performance goals (Wruck [1991]). As these examples illustrate, some private equity transactions fail in the sense of not achieving the goals of the private equity investors. Positive productivity effects are unlikely in such cases.

Second, the Revco case also suggests that the primary source of private value creation in at least some buyouts involves tax savings rather than operational improvements.

[5] These studies of British transactions also include management-led deals (which they term management buyouts). Some of these transactions may not have a financial sponsor playing a key role in governing the firm, and thus may be quite different from traditional private equity transactions.
[6] These statistics are from the VentureXpert database. See http://www.venturexpert.com (accessed 6 October 2008).

Consistent with this view, the large-sample study of Kaplan [1989b] provides evidence that greater leverage and other organizational shifts imposed by private equity investors can yield substantial tax savings that represents "an important source of the wealth gains in leveraged buyouts". If tax savings are the principal motive for private equity transactions, there is no compelling reason to anticipate positive effects on productivity at target firms and, as we suggested in the introduction, some reason to fear negative productivity effects.

Third, many case studies find substantial productivity gains at target firms in the form of improvements to existing operations. For instance, in the Hertz buyout, Clayton, Dubilier and Rice (CD&R) addressed inefficiencies in pre-existing operations to help increase profitability. Specifically, CD&R lowered overhead costs by reducing inefficient labour expenses and cutting non-capital investments to industry standard levels, and more closely aligned managerial incentives with return on capital (Luehrman [2007]). Similarly, the buyout of O.M. Scott & Sons led to substantial operating improvements in the firm's existing operations, partly through powerful incentives offered to management and partly through specific suggestions by the private equity investors (Baker and Wruck [1989]). In examples like these, profitability increases and private value creation are likely to go hand in hand with productivity gains.

Finally, in a number of other cases, private equity targets achieved substantial efficiency improvements not by enhancing existing operations, but rather by divesting units. Beatrice had acquired a large number of unrelated businesses as part of a conglomerate strategy, many of which operated in segments in which it had little expertise. Its private equity investor, Kohlberg, Kravis and Roberts, divested many of these laggard operations, leaving behind a core of well-integrated businesses (Baker [1992]). Similarly, the buyout group that purchased Kaiser Steel shut down its outdated and inefficient steel operations. The group focused its operational attention at Kaiser on the firm's coal mines, which it regarded as the "hidden jewel" in the firm. Little effort, though, was devoted to improving the operations of mining facilities (Luehrman [1992]). Greater profitability and private value creation are also likely to involve productivity gains in these types of examples, though mainly through productivity-enhancing reallocation rather than operational improvements within continuing units.

These case studies illustrate a wide range of motives for and effects of private equity transactions. They can be used to support a variety of hypotheses about the favourable or unfavourable economic impact of private equity. Our study can be seen as an effort to determine which of these stories best characterizes the impact of private equity transactions on average, especially with respect to productivity outcomes.

3. THE SAMPLE

3.A: Identifying private equity transactions

To identify private equity transactions, we begin with the Capital IQ database. Capital IQ has specialized in tracking private equity deals on a worldwide basis since 1999 and, through extensive research, attempts to 'back fill' earlier transactions[7]. We download all recorded transactions in Capital IQ that closed between January 1980 and December 2005.

We impose two sample restrictions. First, we restrict attention to transactions that entail some use of leverage. Many of the Capital IQ transactions that do not involve leverage involve venture capital rather than private equity investments in mature or later-stage firms. To focus on private equity, we delete transactions not classified by Capital IQ as 'going private', 'leveraged buyout', 'management buyout', 'platform', or a similar term. This approach excludes some private equity-backed 'growth buyouts' and 'expansion capital', transactions that involve little or no leverage in the purchase of a minority stake[8]. While such transactions do not fit the classic profile of leveraged buyouts, they share other characteristics of private equity transactions.

Second, the Capital IQ database includes a number of transactions that did not involve a financial sponsor (that is, a private equity firm). We eliminate these deals as well. While transactions in which a management team takes a firm private using its own resources are interesting, they are not the focus of this study. After restricting the sample in these two ways, the resulting database contains about 11,000 transactions worldwide and about 5,000 transactions for target firms in the United States.

We supplement the Capital IQ data with data from Dealogic. In many cases, Dealogic has better information about certain features of private equity transactions, such as the multiple of earnings paid and the capital structure. It also frequently records information on alternative names associated with the firms, add-on acquisitions and exits. We also draw on Securities Data Company (SDC) databases and compilations of news stories to identify the characteristics of the transactions and the nature of exits from the investments.

3.B: Integrating data on private equity transactions with the LBD

The LBD is a longitudinal database of US establishments and firms with paid employees. It is constructed from the US Census Bureau's Business Register and enhanced with survey data collections (see Jarmin and Miranda [2002]). The LBD covers all sectors of the US economy and all geographic areas and currently runs from 1976 to 2005. In recent years, it contains over six million establishment records and almost five million firm records per year.

To merge data on private equity transactions with the LBD, we match the names and addresses of the private equity portfolio firms (that is, the targets) to name and address

[7] Most data services tracking private equity transactions were not established until the late 1990s. The most geographically comprehensive exception, SDC VentureXpert, was primarily focused on capturing venture capital transactions until the mid-1990s.

[8] It also excludes private equity acquisitions of majority stakes without leverage. These deals typically involve very small targets and funds. The funds that carry out these transactions are often US government-subsidized Small Business Investment Corporations, which are limited by regulators in their use of leverage. These no-leverage buyout transactions are much smaller on an aggregated US dollar-weighted basis than leveraged buyouts.

records in the LBD[9]. For each transaction identified in our Capital IQ/Dealogic private equity dataset, we search for a match to the LBD in a three-year window centred on the transaction year. A three-year window helps us deal with timing differences between the private equity data sources and the LBD, which records March values for most variables.

Once we match a target firm to the LBD, we use firm-establishment links in the LBD to identify all establishments owned by the target firm at the time of the private equity transaction. We then follow target firms and their establishments before and after the private equity transaction.

Of the approximately 11,000 target firms in our private equity sample, a little more than half are not headquartered in the United States. After dropping foreign firms, our dataset contains slightly more than 5,000 US target firms acquired in private equity transactions between 1980 and 2005[10]. We currently match about 86% of these targets to the LBD, which yields an analysis sample of about 4,500 target firms. This sample of target firms serves as the basis for our earlier study of firm and establishment employment outcomes at private equity targets and a portion of our analysis below.

Figure 1 shows the number of US private equity targets by year and the number that we currently match to the LBD. It is apparent from Figure 1 that the number of transactions grew rapidly in the late 1990s. Figure 2a shows the amount of employment accounted for by target firms in the transaction year. Firms that became private equity targets in 2005 alone account for about 2% of all employees in the non-farm private sector. Figure 2b shows the amount of employment accounted for by target manufacturing establishments. While the magnitude in terms of number of jobs is much smaller than in Figure 2a, the broad patterns are similar. Moreover, private equity targets account for a larger fraction of manufacturing employment – almost 3%, for example, in 2003 alone. Remarkably, nearly one-tenth of US manufacturing workers were employed in firms that became private equity targets from 2000 to 2005.

Our productivity analysis considers the subset of manufacturing establishments covered by the Annual Survey of Manufacturers (ASM). Basic data items collected about each manufacturing establishment in the ASM include employment, payroll, materials usage, value added, detailed industry codes, employer identification numbers, business name and information about location[11]. Identifiers in the LBD files enable us to compute growth rate measures for establishments and firms, to track entry and exit of establishments and firms, and to identify changes in firm and establishment ownership. The LBD defines firms based on operational control, and all establishments that are majority owned by the parent firm are included as part of the parent's activity measures. Because the ASM over-samples larger manufacturing firms and establishments, we present all analyses in this paper using sample weights that adjust for the propensity of a given firm or establishment to be included in the ASM.

4. METHODOLOGY

4.A: Key choices in the empirical design

The Census data permit analysis at both the establishment and firm level. Our first choice, thus, relates to the unit of analysis. In our empirical analysis, our unit of analysis is typically the establishment, but we use the link to the parent firm to classify the status of establishments. That is, we identify whether establishments are part of target firms or controls. In addition, we identify whether an establishment is a continuing plant within a firm, is being shut down, is a newly opened 'greenfield' plant, has been acquired or is being divested. We also use the link to the parent firm to aggregate our establishment-level results to the firm level to quantify the differences in productivity growth between targets and control firms. Second, we measure productivity by real value added per worker, where value added is the value of output minus the cost of intermediate inputs. Total factor productivity, an alternative measure frequently encountered in the literature and that also accounts for capital services, is more difficult to compute using data available from the ASM and LBD.

A third key choice relates to the use of controls. Suitable controls are important because the distribution of private equity transactions across industries and by firm and establishment characteristics is not random. For example, practitioner accounts often suggest that transactions are concentrated in industries undergoing significant restructuring, whether due to regulatory action, foreign competition or technological changes. In what follows, we control for detailed industry of the establishment interacted with year – the four-digit Standard Industrial Classification (SIC) interacted with year in the 1980-2001 period, and the six-digit North American Industrial Classification (NAICS) interacted with year in the 2002-2005 period. This means we control for more than 400 industry effects per year in the manufacturing sector.

We know from our earlier study that target firms tend to be larger and older than other firms in the same industry. Furthermore, many previous studies report that productivity growth differs systematically with firm size and age. Motivated by these observations, we also control for detailed firm age and firm size categories. For each establishment, we measure the firm age and firm size of its parent firm. We measure firm age by the age of its oldest establishment and firm size by the number of employees of the parent firm. We construct these measures using the full LBD, since it contains data for the entire firm and not just its establishments in the manufacturing sector.

[9] For some of the non-matched cases, we have been successful in matching the name of the seller in the Capital IQ database to the corresponding LBD firm. We plan to use such seller matches to fill out our matches of target firms, but the use of these matches requires us to determine which components of the seller firm are involved in the private equity transaction.

[10] Some foreign firms targeted in private equity transactions likely operate US establishments. We will explore this issue and seek to capture US-based establishments operated by foreign-owned private equity targets in a future draft.

[11] Administrative revenue data can be appended to the LBD from 1994 onwards. However, these data are recorded at the level of employer identification numbers and not necessarily at the establishment level. Establishment-level sales data from the Economic Censuses are available every five years.

Figure 3 shows the employment distribution by firm age, firm size and industry for private equity targets and the universe of manufacturing establishments. For targets, we use all the establishments operating in manufacturing for the target firm. Using the establishment-level data, we classify each establishment into a firm age, firm size and detailed industry category. We then tabulate the share of employment in each of the categories for both targets and the universe of manufacturing establishments. It is apparent that targets are indeed older, much larger and have a different distribution of employment across industries[12]. Our statistical analyses control for these factors so that we compare targets with other firms in the same industry that are also similar in terms of size and age.

Another key choice relates to the time frame of our analysis. Tracking productivity performance for many years after private equity transactions has clear attractions. For instance, a five-year horizon corresponds to the typical holding period of portfolio firms by private equity groups (Strömberg [2008]). In addition, research on productivity dynamics in new plants and firms finds evidence of important learning and selection effects over at least the first five years. At the same time, we must confront some practical issues. First, firms get reorganized over time through mergers, acquisitions and divestitures, as well as whole-firm changes in ownership. Second, establishments exit the ASM sample over time through panel rotation, and the ASM is our source of establishment-level productivity measures[13]. Third, a large share of all private equity transactions occurred in the last few years of the period covered by our data. In light of these practical considerations, we focus our analysis on the first two years after buyout transactions. Our earlier work (Davis et al. [2008]) finds considerable restructuring of target firms in the first two years post-buyout, suggesting that a two-year horizon captures much of the action.

We classify plants operated by the target firm as of the event year into three groups, depending on whether the plant continues operations under the target's ownership, continues operations but is divested, or is shut down. Similarly, we classify plants operated by the target firm two years later into those that have remained in operation under the target's ownership since the event year, those acquired by the target after the event year and plants that are newly opened by the target firm after the event year. We use the same type of classification of establishments in control firms.

4.B: Measuring productivity and decomposing productivity growth differentials

We compute real value-added per worker at establishment e in year t as[14]

$$\omega_{et} = (VA_{et}/TE_{et}) = (Y_{et} - M_{et})/TE_{et},$$

where

VA_{et} = real value-added

Y_{et} = real gross output

M_{et} = real materials (including energy), and

TE_{et} = total employment.

To obtain productivity for firm i, we aggregate over its establishments according to

$$P_{it} = \sum_{e \in i} s_{et}\omega_{et},$$

where s_{et} is the employment share of establishment e, and ω_{et} is (log) value added per worker[15].

One of our chief goals is to quantify the contribution of continuing plants, exits, divestitures, entrants and acquisitions to firm-level productivity growth. Classifying establishments into these five groups, we can obtain the following simple decomposition of firm-level productivity growth from t to $t+k$[16]:

$$\begin{aligned}(1)\quad \Delta P_{it} = P_{it+k} - P_{it} = s^C_{t+k}P^C_{t+k} - s^C_t P^C_t &\quad \text{(contribution of continuers)}\\ + s^N_{t+k}P^N_{t+k} = s^X_t P^X_t &\quad \text{(contribution of entry and exit)}\\ + s^A_{t+k}P^A_{t+k} - s^D_t P^D_t &\quad \text{(contribution of acquisition and divestiture)}\end{aligned}$$

where the superscript C denotes continuers, N entrants, A acquisitions, X exits and D divestitures. For example, P^C_t is the employment-weighted average productivity at time t for establishments operated by the firm in both t and $t+k$, and S^C_t is the employment share of those establishments in t.

Equation (1) tells us how to apportion productivity changes in a single firm among the continuing establishments it operates from t to $t+k$, the entry and exit of its establishments during the time interval, and its acquisitions and divestitures from t to $t+k$. The contribution of the different categories of plants depends on their productivity outcomes and their employment shares in the firm. We apply equation (1) to private equity targets and then aggregate over firms using employment weights. We do the same for controls. By comparing productivity growth between targets and controls, and by using (1) to decompose the sources of any differences, we can evaluate the three hypotheses set forth in the introduction. That is, we can measure the productivity growth differential between targets and controls after private equity transactions and decompose the sources of any growth differential.

As an example, consider how a productivity growth differential might arise in connection with establishment exits. In general, productivity can differ between exiting target firms and exiting control firms for several reasons:

[12] The industry codes in Figure 3 are SIC codes and the patterns for the industry distributions reflect only the years 1980-2001. In our empirical analysis, we control for detailed industry codes interacted with year at the SIC level from 1980-2001 and NAICS codes from 2002-2005.

[13] Although we rely on the ASM for establishment-level productivity measures, we are careful to define all entry, exit, acquisition and divestiture events using the full LBD. We use propensity score weights to account for sample rotation in our statistical analyses. The propensity score model uses an interacted model of variables including detailed industry interacted with year, multi-unit status, size and age effects.

[14] We use CES-NBER industry-level deflators from the NBER Productivity Database (www.nber.org), updated through 2005.

[15] We use employment as the activity weight because the employment-weighted average of labour productivity growth across production units closely approximates standard industry-level measures of labour productivity growth (see Baily, Hulten and Campbell [1992] and Foster, Haltiwanger and Krizan [2001]).

[16] Since P_{it} is the weighted average of log productivity, the change in P_{it} is a log-based index of growth.

- Targets and controls have different levels and distributions of productivity in the event year,
- Targets and controls have different probabilities of exiting, conditional on initial productivity, and
- Interactions between the initial productivity distributions and the conditional exit probabilities.

Figure 4 illustrates the simple case with identical productivity distributions for targets and controls in the event year but different exit thresholds. In this example, the conditional exit probability is one for all plants below the indicated threshold, and zero otherwise. The figure shows the case where private equity targets apply a higher productivity threshold for plant closure[17]. By chopping off more of the lower tail, exits are a bigger source of productivity gains at targets than controls in this case. This type of outcome could arise because private equity groups are better at identifying underperforming establishments in their portfolio firms; because they are more willing and able to shut them down; or some combination of both.

Another simple case, not illustrated in the figure, is that target and control firms have identical exit thresholds, but the private equity targets have a larger share of employment at low-productivity establishments in the event year. In this situation as well, exits contribute to a positive productivity growth differential for private equity targets relative to controls but for a different reason.

4.C: Measuring real earnings per worker

We measure earnings per worker as the ratio of payroll to employment, deflated by an index for the price of the firm's output. In particular, we compute the real wage as the nominal wage divided by an industry-level index for the output price. This type of real wage measure is readily compared with our measure of real value added per worker, because both measures involve the same price deflator for nominal output.

5. ANALYS IS

5.A: The pace of entry, exit, acquisitions and divestitures at target firms

Table 1 summarizes a key finding in our earlier study (Davis et al. [2008]): Private equity targets have a higher pace of employment-weighted entry, exit, acquisition and divestiture than controls in the first two years after buyout transactions. Table 1 covers private equity transactions in the US private sector from 1980 to 2005. Table 2 presents analogous results for the manufacturing sector, the focus of the current study[18]. The patterns are similar qualitatively to those in Table 1, but the magnitudes are somewhat muted. Manufacturing is a sector with larger and more stable establishments than other sectors, and with lower but still substantial entry and exit rates.

5.B: Results from two-year horizon analysis

We estimate descriptive regressions for establishment-level outcomes on productivity and real earnings per worker in the event year and two years later. For any pair of years, the sample contains ASM establishments owned by firms in the event year and two years later. Each establishment is linked to its parent firm and classified as part of a private equity target firm or part of a control firm[19]. Classification as part of a private equity target means that the establishment was owned by the target firm in the event year and two years later. We use the five-way classification of establishments into continuers, entrants, exits, acquisitions and divestitures described above, and we control for industry-year effects, firm age and firm size for the establishment. We weight by employment in all regressions[20]. The event year regressions (Table 3) pool all years from 1980 to 2003. The two years after the event regressions (Table 4) pool all years from 1982 to 2005.

Table 3 reports results for the event year regressions on productivity. Continuing plants for private equity firms have productivity that is 3.7 log points higher than continuers operated by control firms – the reference group in our regressions. Private equity exits have productivity that is 19.8 log points lower than the continuing plants of the control firms, while control exits have productivity that is 15.2 log points lower than continuing control plants. Productivity at private equity divestitures (that is, establishments sold by private equity-backed firms) is similar to continuing plants in control firms, but it is 10.6 log points lower at control firm divestitures. All of the differences we have noted are statistically significant at the 5% level.

To investigate whether target firms are more likely to close low productivity establishments, we fit a logit specification for the probability of a plant exit as a function of its decile in its industry productivity distribution in the event year. Figure 5 plots the fitted relationship separately for targets and controls. It shows that private equity targets have higher exit probabilities in the lower deciles of the productivity distribution; much higher in the bottom decile[21]. In other words, target firms are more likely than controls to shut down poorly performing establishments as measured by labour productivity.

The results for two years after the event are presented in Table 4. We find that private equity continuing establishments have productivity that is 5.1 log points higher than continuing control establishments. Private equity entering establishments have a slightly lower productivity for entering establishments

[17] Theoretical models that deliver a productivity threshold rule for exit include Hopenhayn [1992], Hopenhayn and Rogerson [1992] and Melitz, Gianmarco and Ottaviano [2005]. Productivity is the only source of idiosyncratic profit variation in these models, and establishments face a fixed cost of operating and potentially a cost of exit. Productivity shocks follow a first-order Markov process: profit-maximizing firms base their exit decisions on the present discounted value of net profits. Such an environment yields an exit rule like the one illustrated in Figure 4.

[18] In constructing Table 2, we include the non-manufacturing activity of firms that engage primarily in manufacturing activity. The results are very similar (with slightly smaller magnitudes but similar differences between targets and controls) when we exclude non-manufacturing activity.

[19] Once a firm has been in the sample as a private equity target for the period between the transaction year and two years later the establishments of this firm are not included in any other years of the analysis.

[20] We also use propensity score weights to ensure that our weighted sample is representative of two-year continuing firms for each pair of years considered in our regressions. The propensity score weights control for the fact that certain types of establishments are more likely to be in the ASM sample than others.

[21] Differences are statistically significant at the 5% level for the bottom four deciles.

relative to continuing control establishments, although the difference is not statistically significant. In contrast, entering establishments of controls have much lower (and statistically significant) productivity than continuing establishments for controls, with a gap of 17.7 log points. The acquisitions for private equity firms have 10.4 log point lower productivity than control continuing establishments, while acquisitions for control firms have 7.7 log point lower productivity relative to control continuing establishments.

In comparing the results of Tables 3 and 4, several interesting patterns stand out. First, the comparison of the productivity advantage of continuing establishments of targets in year t+2 and t is of interest. This advantage increases from 3.7 log points to 5.1 log points, indicating that continuing establishments of private equity targets have a substantial gain in productivity relative to controls. Second, the gap between the productivity of exiting establishments and entering establishments for private equity targets is very large in absolute magnitude (15.6 log points) and substantially larger than the analogous gap for controls (-2.5 log points). Third, the gap between the productivity of acquired and divested establishments for private equity targets is actually negative (-8.3 log points) and lower than the gap for controls (2.9 log points). As we show below, the gains from continuing establishments and net entry for targets are sufficiently large that they more than offset the drag on productivity from net acquisitions so that the net effect on productivity growth for targets is positive.

Appropriate caution is required on interpreting the role of entry and acquisition since the analysis is only over a two-year horizon. The literature on tracking the productivity dynamics of entering establishments (see Foster, Haltiwanger and Krizan [2001, 2006]) highlights the important learning and selection effects that are critical for interpreting the productivity dynamics of young establishments. The standard pattern for each entering cohort of entrants is that their productivity grows more rapidly than incumbents in the first 10 years of existence, both because of selection effects (the low-productivity entrants have a high rate of exit) and learning-by-doing effects (surviving young establishments have rapid productivity gains). Our analysis is not able to capture those learning and selection effects directly, but we include some analysis below that discusses the longer-run implications of the productivity gains already evident in Tables 3 and 4.

Turning to the earnings per worker results for Tables 3 and 4, many of the same qualitative patterns hold as with productivity. This makes sense, as earnings per worker at an establishment are closely related to real value added per worker. For example, private equity exits have productivity that is 19.8 log points and earnings per worker that is 10.7% lower than continuing control establishments. Control exits have productivity that is 15.2 log points and earnings per worker that is 7.8 log points lower than continuing establishments.

While the qualitative patterns are similar, comparing and contrasting the productivity and earnings per worker findings yields some interesting results. For example, private equity continuing plants in the event year have a productivity and earnings per worker positive difference relative to control establishments. Two years later the productivity advantage has increased but the earnings per worker difference has disappeared. The results for exits indicate that private equity firms are shutting down low-productivity, low-earnings-per-worker plants with productivity even lower than earnings per worker. These patterns together suggest that private equity firms are increasing the gap between productivity and earnings per worker.

Based on Tables 3 and 4, private equity continuing establishments gained in productivity in relative terms compared with controls, but experienced some reduction in earnings per worker. The within-establishment relative growth rates of productivity and earnings per worker for continuing establishments for targets and controls are presented in Table 5. The results in Table 5 show that in terms of growth rates at the establishment level, continuing establishments of target firms did not exhibit statistically significant differences in growth rates relative to controls for productivity, but exhibited a 3 log point decline in earnings per worker relative to controls. Thus, from either exercise, the productivity-earnings gap increased for continuing plants for targets relative to controls.

It might seem to be a puzzle that Tables 3 and 4 show a substantial productivity gain for continuing establishments of targets while Table 5 shows no such gain. The productivity gain reflected in Tables 3 and 4 incorporates both any within-establishment growth rate effects as well as any improved allocation of activity across continuing establishments. Thus, comparing the results in Tables 3, 4 and 5 indicates that the gains in productivity for continuing establishments stems mainly from the improved allocation and not from within-establishment increases. That is, private equity firms improve productivity at target firms by more efficiently organizing activity across target establishments rather than improving productivity within plants[22].

Table 5 shows the average patterns for targets vs controls for productivity and earnings per worker growth. It is instructive to characterize the establishment-level relationship between productivity and earnings growth for the whole distribution, as depicted in Figure 6. It is apparent that for both targets and controls, there is a positive correlation – that is, plants with increases in value added per worker also show an increase in earnings per worker. Interestingly, the correlation between productivity and earnings growth per worker is somewhat higher for targets than controls – for targets, the correlation is 0.17 while it is 0.11 for controls. These correlations suggest that both targets and controls share productivity gains with workers, but there is a stronger positive relationship for targets relative to controls.

Before turning to the overall productivity implications of our findings, it is useful to note that in unreported results, we have examined whether the results in Tables 3, 4 and 5 are systematically different by type of private equity transaction. Using a simple two-way classification of transactions distinguishing between public-to-private and all other deals, we found little in the way of systematic,

[22] There is a similar positive allocation effect on earnings. Within-establishment earnings per worker growth is 3.2 log points less for targets relative to controls from Table 5 but Tables 3 and 4 show targets have 1.1% less growth in earnings per worker. The difference between these reflects increasing activity at the higher earnings (and higher productivity) per worker plants for targets.

significant differences across this classification of deals. We note, however, that small sample problems make inferences from additional sub-divisions difficult. In Tables 3, 4 and 5, we are restricted to private equity transactions in manufacturing for multi-unit, two-year continuing firms that are also in the ASM sample. In addition, we are already decomposing establishments into continuing, entering, exiting, acquired and divested establishments.

5.C: Micro and aggregate net effects of private equity transactions on productivity

In this section, we quantify the total productivity gains from private equity transactions using the results from Tables 2, 3 and 4 along with the productivity decomposition in equation (1). Recall that the productivity effects identified in Tables 2 and 3 are all deviations from the productivity levels of continuing establishments for controls in years t and $t+2$ respectively. As such, it is useful to express the terms in decomposition (1) using such deviations as follows (see page 32 for the variable definitions)[23]:

$$\Delta P_t = s^C_{t+k}(P^C_{t+k} - \tilde{P}^C_{t+k}) + s^N_{t+k}(P^N_{t+k} - \tilde{P}^C_{t+k}) + s^A_{t+k}(P^A_{t+k} - \tilde{P}^C_{t+k}) - s^C_t(P^C_t - \tilde{P}^C_t) - s^X_t(P^X_t - \tilde{P}^C_t) - s^D_t(P^D_t - \tilde{P}^C_t) + \tilde{P}^C_{t+k} - \tilde{P}^C_t$$

Each of the terms in this expression is examined relative to the productivity of continuing establishments of controls, where the latter are denoted by a tilde. This same decomposition can be used for both targets and controls; taking the difference between the two yields an estimate of the productivity growth gains of targets relative to controls. The deviation terms for both targets and controls are provided in Tables 3 and 4 for years t and $t+2$ respectively, so that we can quantify each of the terms in the above expression for k equal to 2. The shares of continuers, entrants, exits, acquisitions and divestitures are provided in Table 2 for t and $t+2$ respectively.

The resulting difference-in-difference (that is, the difference in productivity growth over the two-year horizon for targets relative to controls) is presented in Table 6. Our findings indicate that on average two years after the private equity transaction, private equity firms have a 1.84 log point productivity growth gain relative to controls. About 72% of this gain is due to the improved productivity growth of continuing establishments and about 36% of this gain is due to net entry (entering plants having higher productivity than exiting plants). Net acquisitions contribute negatively. If we exclude net acquisitions, the gain is about 2 log points[24].

In interpreting these productivity growth gains, it is important to emphasize that this is not the average productivity growth of targets but rather the productivity growth differential of targets relative to controls. A productivity growth differential of about 2 log points is substantial since the average productivity growth over a two-year horizon for all of manufacturing is about 7 log points for the period from 1980 to 2005.

To provide further perspective on the magnitude of the contribution of the productivity growth differential, Figure 7 illustrates the cumulative real output (value-added) gains from the transactions between 1980 and 2005 under alternative assumptions about the duration of the gains. To calculate the tabulations in Figure 7, we use the 1.99 productivity differential, as it seems appropriate to exclude the contribution of net acquisitions for this purpose (as net acquisitions involve changing the ownership of existing plants and so any gains/losses are offset by losses/gains by other firms)[25]. We apply the same estimated differential for all years for this exercise[26].

Using the estimated productivity growth differential, we calculate the extra real output from each cohort of targets. An open question is how long-lasting these gains turn out to be. In Figure 7, we show the cumulative gains across a range of 'depreciation factors' from 0 to 1. A depreciation factor of 0 assumes that the gains are permanent. A depreciation factor of 1 assumes the gains are temporary – that they disappear immediately after the two-year horizon. A depreciation factor of 0.5 assumes that half of the gains are eliminated for each year beyond the two-year horizon.

Figure 7 shows that if the gains are permanent, private equity transactions from 1980 to 2005 created an additional US$ 15 billion (in inflation-adjusted 2007 dollars) of real output in 2007. If the gains are completely transitory, then the additional gains are about US$ 4 billion (representing only the gains from 2005 itself). Under a modest depreciation factor of 0.1, the additional real output created is about US$ 10 billion.

5.D: The impact of private equity on productivity as credit conditions vary

The analysis in the prior sections quantifies the average effect of private equity transactions on productivity, jobs and earnings using the pooled set of transactions from 1980 to 2005. Economic conditions obviously varied over this period. Given the current financial crisis in 2008, an obvious question is whether the impact of private equity transactions on productivity varies with economic conditions in general and with credit market conditions in particular. The economic downturn in 2008 has been driven by the meltdown of

[23] This transformation of equation (1) takes advantage of the fact that the shares across groups within a year sum to 1 so that the productivity terms in each year can be deviated from a reference group in a given year – in this case the productivity of continuing establishments of control firms.

[24] In using the shares from Table 2, we are including the activity of firms whose primary activity is in manufacturing but who also may have activity in non-manufacturing. This would imply that we are imputing our findings for manufacturing establishments to non-manufacturing establishments. We have checked the robustness of our results to using shares based only on the manufacturing activity of targets and controls. We find a very similar pattern with the net growth differential (excluding net acquisitions) of 1.91 log points (compared with the 1.99 log point difference when using the shares from Table 2). This difference has only modest effects on the tabulations in Figure 6. Note the latter reflects the output gains only for the manufacturing components of the firm.

[25] Using the 1.84% productivity differential yields similar quantitative implications. For example, the cumulative value added creation under the zero depreciation scenario is about US$ 14 billion using the 1.84% differential.

[26] We apply the 1.99% productivity differential to all deals from 1980 to 2005. Recall that in estimating this differential we have included industry-year controls, as well as controls for the firm size and firm age distribution. We apply the differential to all private equity transactions in manufacturing captured in Figure 2b that are in the ASM sample. We use propensity score weights to generate aggregates (we have checked and our propensity score-weighted version of Figure 2b closely mimics that in Figure 2b). Note that this means we are using this 1.99% differential for all manufacturing transactions, regardless of whether the transaction is part of the regression analysis. That is, we use the regression analysis sample to generate the productivity deviation estimates and then apply this to the entire set of manufacturing private equity transactions.

financial markets and an associated 'credit crunch'. While our analysis does not include the 2008 data, there is considerable variation over the 1980-2005 period in the state of credit markets. In this subsection, we explore the sensitivity of our results to variation in credit market conditions.

One of the features of the 2008 crisis, as well as earlier credit crunches, is that interest rate spreads across different types of debt increase. There is a flight to quality in debt markets, so the spread between corporate bonds and Treasuries increases. In like fashion, there is an increase in the spread between bonds with different quality ratings. As illustrated in Figure 8, the spread between AAA- and BB-rated corporate bonds varies substantially over time. In the current crisis, the spread has increased substantially. The same pattern appears in earlier credit crunches, with an especially high spread around 1990.

The separate AAA and BB interest rate series depicted in Figure 8 are monthly averages of the relevant interest rates, while our productivity and jobs data for targets and controls are on an annual basis. We take the annual average of the monthly series and take the difference between these annual averages, which we denote as the Diff Annual Average in Figure 8. For our analysis in this section, we create a variable called 'spread', which is the deviation of annual spread measured from its overall time series mean from 1980 to 2005. The mean annual average spread is 3.7% over the 1980-2005 period (our sample period). The deviation of the spread from this mean over our sample period reaches a high of 4.97% in 1990. As is clear from Figure 2, most of the private equity transactions in our sample are in the 1990-2005 period. The average mean deviation over this latter period is 0.44%.

We merge this spread series into our 1980-2005 analysis sample and explore extensions of our regression specifications in Tables 3 and 4 that permit the effects in Tables 3 and 4 to vary with the interest rate spread. For each type of effect estimated in Tables 3 and 4, we include an additional interaction term with the spread variable. For example, we include terms such as 'Private Equity Continuer*Spread'. This specification yields estimates of each of the effects in Tables 3 and 4 that vary with the interest rate spread. In estimating these extended specifications, we use the same samples and controls as in Tables 3 and 4[27].

We illustrate the implications of the variation in the estimated coefficients in Figure 9[28]. To generate Figure 9, we compute the estimated difference in the productivity growth of continuing establishments between targets and controls, as well as the difference in productivity between entering and exiting establishments for different levels of the interest rate spread in the relevant current year. Recall that from Tables 3 and 4 the average difference in the productivity growth from continuing establishments between targets and controls is about 1.4 log points. Figure 9 shows that this difference increases with the interest rate spread variable. At a value of the spread equal to zero (that is the spread equal to its long-run mean), the gain is essentially zero. At a value of 0.44 (the mean deviation over the 1990-2005 period), the gain from continuing establishments is about 1.4 log points (the value we report from Tables 3 and 4). At a value of 1, the gain for continuing establishments is 3.3 log points. At a value of 4, the gain from continuing establishments is about 13.5 log points. Thus, interestingly, private equity transactions conducted during times of credit crunches yield an even larger gain from the restructuring and reallocation among continuing establishments.

From Table 3, the average difference between targets and controls in the productivity of exiting establishments is 4.6 log points, with target exits having lower average productivity. This effect contributes to the positive net productivity gain for targets since doing a better job of shutting down low-productivity establishments raises average productivity. Figure 9 shows that this difference in the productivity gain from exit also increases with the interest rate spread. At a value of the spread equal to zero, there is no gain. For a value equal to 1, the gain is already substantial at 4.1 log points. For a value of 4, the gain is very large at 20.1 log points.

Finally, the results in Table 4 show that there is a sizeable gap in the productivity of entrants for targets relative to controls. The average gap as estimated in Table 4 is 13.5 log points. This also contributes positively to the net productivity growth gain of targets relative to controls. Figure 9 shows that this positive entry differential diminishes with the interest rate spread. At a value of the spread at zero, the gain is very large at 21.5 log points but falls to -5.1 log points at a value of the spread equal to 4.

In sum, we find evidence that in terms of the restructuring of continuing establishments and the shutting down of low-productivity establishments, transactions done during credit crunches yield even larger productivity gains at target firms relative to controls. We also find, however, that the productivity gap of entrants between targets and controls diminishes in times of credit crunches. Overall, though, the evidence is at least suggestive that private equity targets are better than controls in making the difficult choices needed to restructure businesses and increase productivity in times of financial crisis.

[27] A challenge in permitting the effects to vary with credit market conditions is that the specifications in Tables 3 and 4 already include a very rich set of controls, namely, we control for the detailed industry (roughly 450 industries) interacted with year, firm size and firm age controls. We found that when we attempted to estimate the same model, but allowing the target and control effects for continuing, exiting, entering, acquisitions and divestitures to vary with the interest spread, that some of the interaction effects were not identified (namely those for private equity acquisitions and divestitures). To estimate the effects in Figure 9, we made our controls somewhat coarser. Specifically, we used detailed industry interacted with a period variable that changed only every two years while keeping the firm size and age controls the same. We found that the results reported in Tables 3 and 4 are largely robust to this change and we were able to identify all of the interaction effects with the interest rate spread. We also note that all of the interaction effects we estimated are significant at least at the 10% level (and most at the 5% level).

[28] We do not report results on interest spreads for acquisitions and divestitures because, as noted in the previous subsection, these transactions reflect gains for one firm but offsetting losses for another firm. Also, note that in interpreting Figure 9 the productivity differentials have not been weighted by the respective share of activity accounted for by continuing, entering and exiting establishments (as was done in Table 6). We know from Table 2 that most activity is accounted for by continuing establishments. We did not weight the results in Figure 9 by the activity shares (although the regression results are appropriately employment-weighted), as this would require an in-depth analysis of how the patterns of entry and exit vary for targets vs controls across economic conditions. We leave this latter analysis for future work.

6. CONCLUSIONS

This paper explores the productivity, earnings and employment outcomes for private equity transactions in the US using firm- and establishment-level data. Our findings highlight the importance of analysing the restructuring and reallocation effects within firms, as well as the changes through entry, exit, acquisitions and divestitures.

We find that target firms of private equity transactions experience an intensification of job creation and destruction activity, establishment entry and exit, and establishment acquisition and divestiture. On net, we find that this intensification of reallocation yields a substantial productivity growth differential (about 2%) within two years following the transaction. About two-thirds of this differential is due to improved productivity among continuing establishments of the firm (including the effects of improved allocation among continuing establishments of the firm) and about one-third due to the contribution of net entry. The contribution of net entry is dominated by our finding that target firms are much more likely to close underperforming establishments than comparable firms. The resulting effect on real output for target firms is large. We estimate that private equity transactions completed between 1980 and 2005 yielded as much as US$ 15 billion of extra output in 2007 at target manufacturing firms.

We find similar patterns for earnings per worker, although we find less of a positive impact on earnings per worker from continuing establishments of the target firms. We do find that the correlation between the growth in productivity and earnings per worker after private equity transactions is higher at target firms than at comparable firms.

Our analysis focuses on private equity transactions from 1980 to 2005. As such, our analysis sample does not include transactions and activity during the current financial crisis (in 2008). While we cannot yet address this question directly, we examine fluctuations in credit market conditions, for example the deterioration in credit conditions in the early 1990s, over the course of the 1980 to 2005 period to get a sense of how the current crisis might affect private equity targets. Interestingly, we find evidence that the relative productivity gains at targets from the restructuring of continuing establishments, as well as the productivity gains from shutting down poorly performing establishments, actually increase in credit market crunches. These findings suggest that private equity firms are better than comparable firms in making the difficult choices of restructuring and shutting down poorly performing establishments in times of economic downturns.

Our findings on the intensification of restructuring and reallocation hold for the entire private sector, while our findings for productivity are restricted to the manufacturing sector and also restricted to measures of labour productivity. The manufacturing sector has been an important area of activity for private equity transactions, but it would clearly be of interest for many reasons to extend our analysis of productivity effects beyond manufacturing in future work. The data infrastructure for productivity analysis is much richer for manufacturing, but extending the analysis to other sectors would permit even richer analysis of the productivity, earnings and employment outcomes – for example, digging deeper into the effects of different types of transactions (for example, are the consequences of public-to-private deals different?) and analysing the outcomes over longer horizons. Analysing outcomes over longer horizons would permit study of the longer-run implications of private equity transactions. Extending our analysis to explore total factor productivity, as well as the restructuring and reallocation of physical capital, would also be of clear interest.

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Figure 1: Number of US target events: Targets matched and total

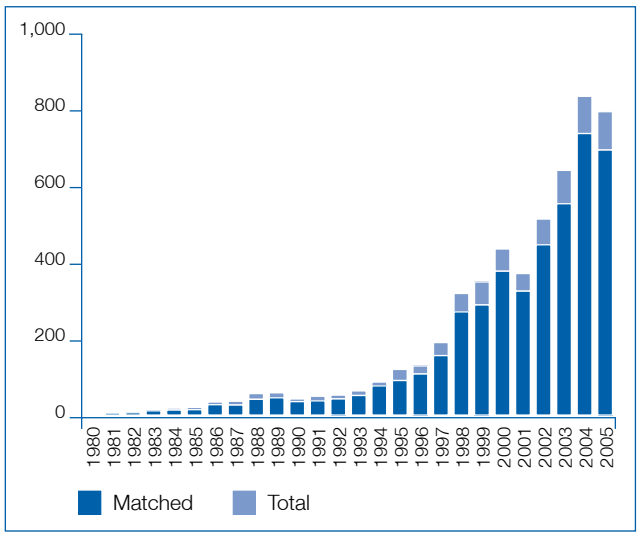


Figure 2a: Employment under private equity targets: by year and as a percentage of economy

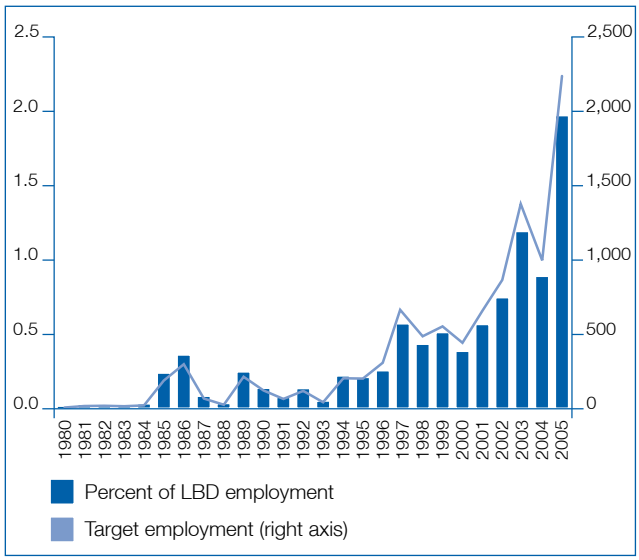


Figure 2b: Manufacturing employment under private equity targets: year and as percentage of manufacturing sector employment

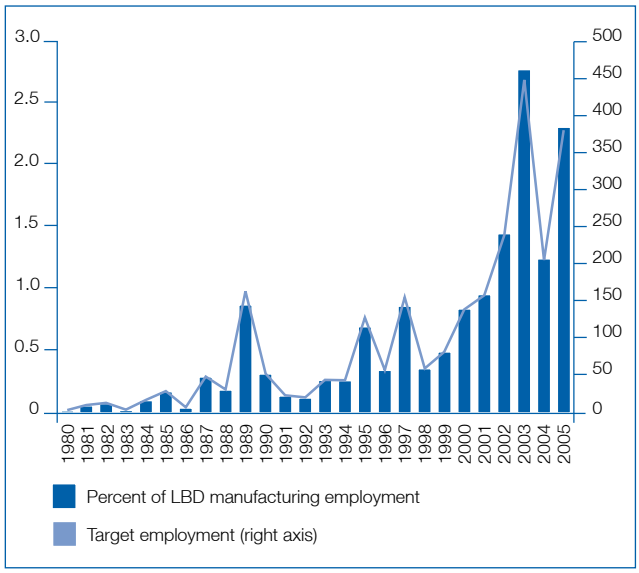
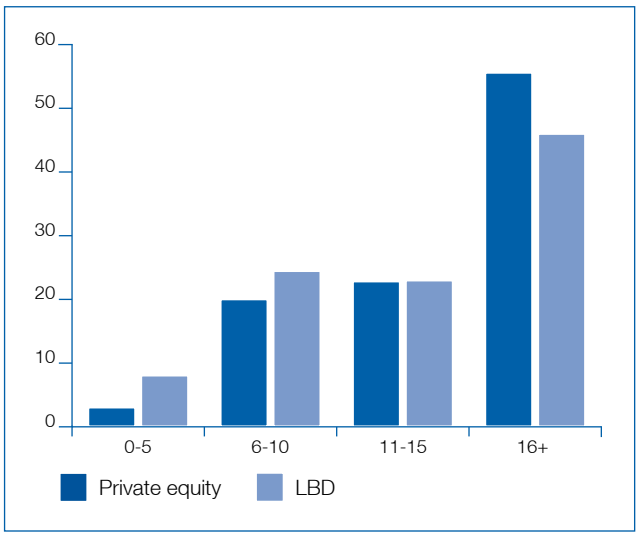
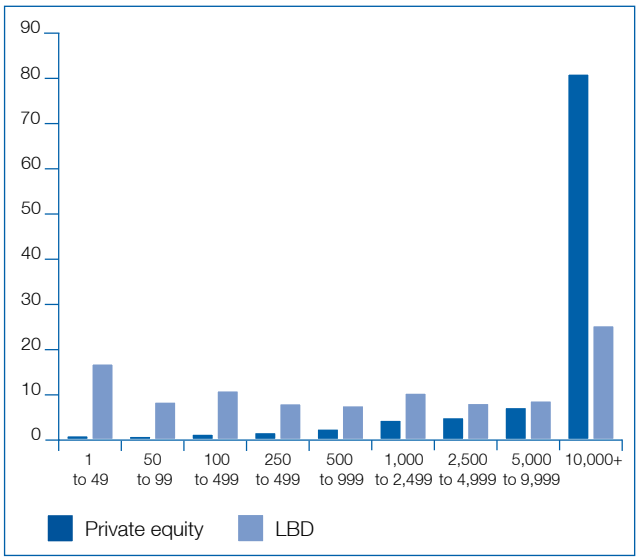


Figure 3: Age distribution of manufacturing firms: All vs.targets (employment-weighted)



Size distribution of manufacturing firms: All vs. targets (employment-weighted)



Industry distribution of manufacturing establishments: all vs targets (1980-2001, employment-weighted)

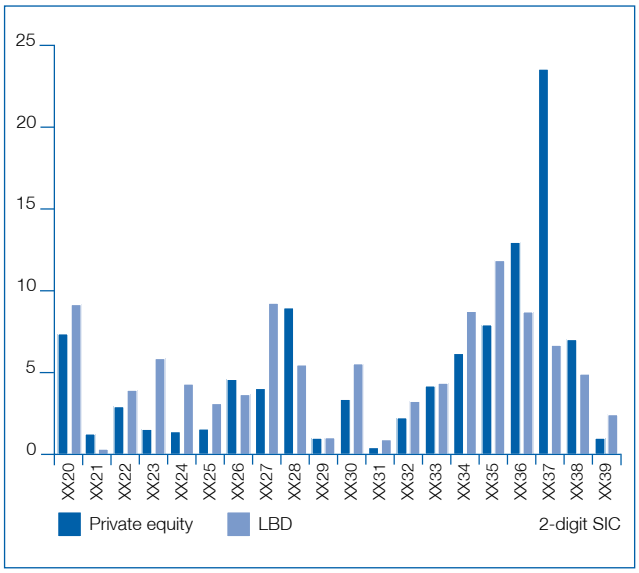


Figure 4: Hypothetical establishment exit thresholds for private equity target firms and controls with identical productivity distributions

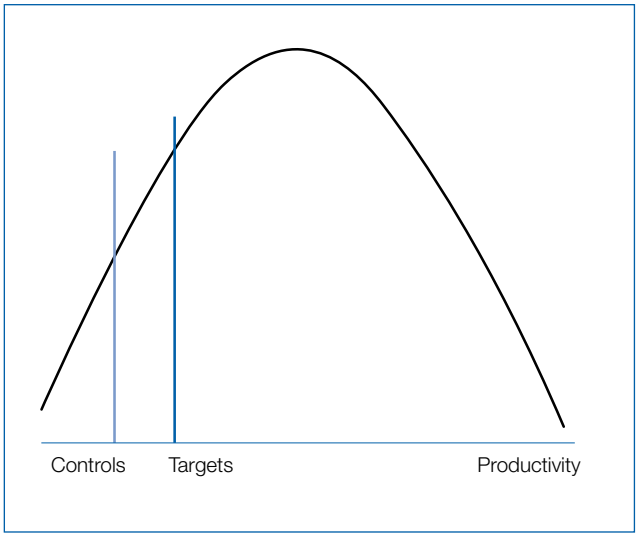
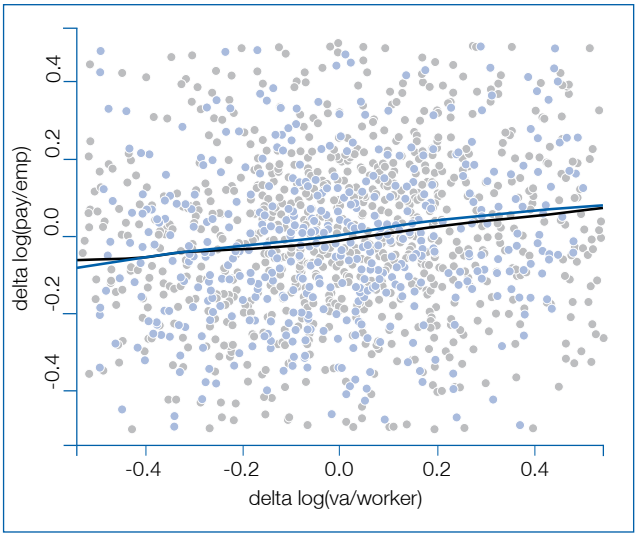


Figure 6: Plant-level log changes in value-added per worker and earnings per worker



Note: Depicted are two-year differences in log value added per worker and log earnings per worker for targets (blue circles) and controls (grey circles). A random sample of controls is depicted. The black line is a non-parametric curve fit through targets and the blue line is a non-parametric curve fit through controls.

Figure 5: Exit probability for plants by deciles of within-industry*year labour productivity distribution

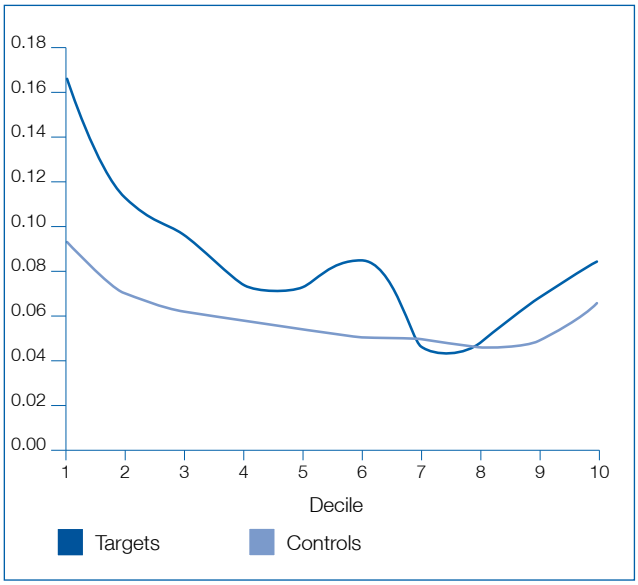


Figure 7: Extra output per year as of 2007 implied by productivity growth differential for private equity transactions in manufacturing from 1980 to 2005

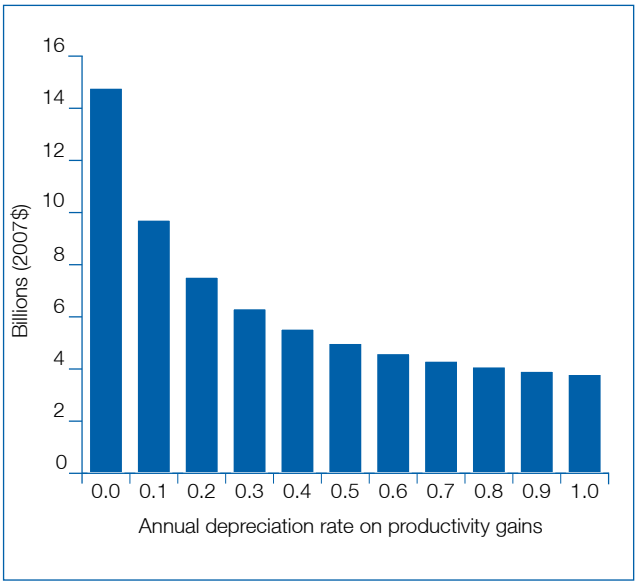


Figure 8: Interest rate spread between AAA and BB bonds

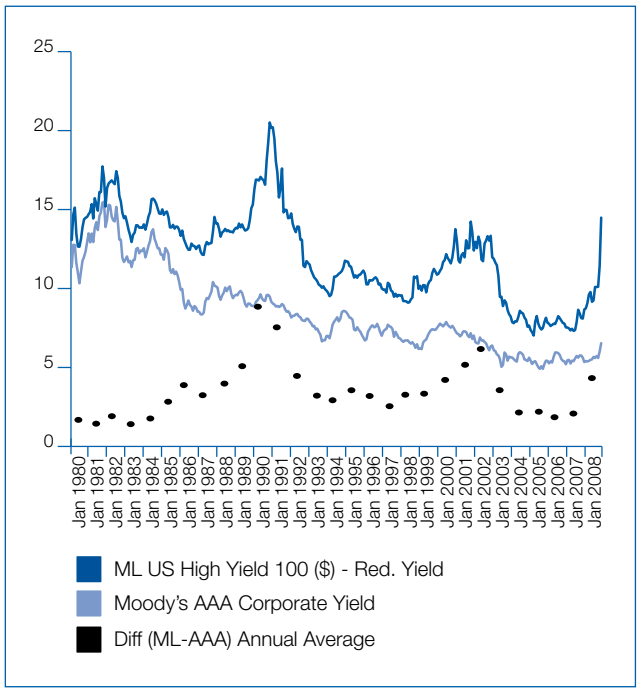
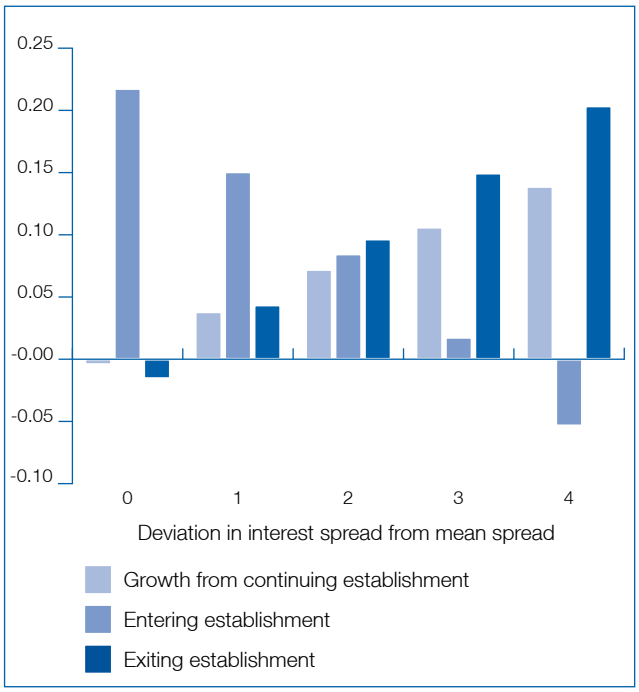


Figure 9: Differences in productivity growth components between targets and controls



Note: The interest rate spread is the annual average of the difference between the BB-rated and AAA-rated bonds. The reported values on the x-axis are the deviations from the mean spread over the 1980-2005 period.

Table 1: Greenfield entry, establishment exit, acquisitions and divestitures (two-year employment-weighted rates) – All sectors

	Targets	Controls
Greenfield entry rate	14.9	9.0
Establishment exit rate	-16.7	-8.1
Establishment acquisition rate	7.4	4.7
Establishment divestiture rate	-5.8	-2.9
Continuing establishment net growth rate	-1.7	-0.1
Weighted two-year growth rate	-1.9	2.6

Reported are employment-weighted means of rates as percentage of average of firm employment in event year and event year + 2.

Table 2: Greenfield entry, establishment exit, acquisitions and divestitures (two-year employment-weighted rates) – Manufacturing firms

	Targets	Controls
Greenfield entry rate	5.5	4.4
Establishment exit rate	-6.9	-6.1
Establishment acquisition rate	5.6	5.1
Establishment divestiture rate	-6.6	-3.7
Continuing establishment net growth rate	-0.9	-2.7
Weighted two-year growth rate	-3.2	-3.0

Rates are based on employment-weighted contributions of category as percentage of average of employment in event year and event year + 2.

Table 3: Productivity and earnings per worker – differences in event year

Parameter	Labour productivity	Earnings per worker
Private equity continuer	0.037***	0.011*
	(2.81)	(1.93)
Control exit	-0.152***	-0.078***
	-(35.98)	-(44.15)
Private equity exit	-0.198***	-0.107***
	-(3.87)	-(4.95)
Control divestiture	-0.106***	-0.035***
	-(25.19)	-(19.74)
Private equity divestiture	-0.021	0.006
	-(0.630)	(0.430)
Number of observations	672,183	672,560
R2	0.489	0.733

All specifications control for industry-year effects, firm size and firm age effects. Estimation is weighted using employment and propensity score weights. T-statistics in parentheses. *** represents significant at 1% level, ** at 5% level and * at 10% level.

Table 4: Productivity and earnings per worker – differences two years after event

Parameter	Labour productivity	Earnings per worker
Private equity continuer	0.051***	0.000
	(3.84)	(0.05)
Control entry	-0.177***	-0.103***
	-(30.24)	-(42.81)
Private equity entry	-0.042	-0.017
	-(0.52)	-(0.51)
Control acquisition	-0.077***	-0.030***
	-(19.22)	-(18.10)
Private equity acquisition	-0.104***	0.006
	-(2.61)	(0.35)
Number of observations	665,922	666,263
R2	0.497	0.713

All specifications control for industry-year effects, firm size and firm age effects. Estimation is weighted using employment and propensity score weights. T-statistics in parentheses. *** represents significant at 1% level, ** at 5% level and * at 10% level.

Table 5: Differences in growth rates of productivity and earnings per worker for continuing plants

Parameter	Labour productivity	Earnings per worker
Private equity	-0.008	-0.032**
	-(0.47)	-(2.49)
Number of observations	292,936	337,108
R2	0.241	0.396

All specifications control for industry-year effects, firm size and firm age effects. Estimation is weighted using employment and propensity score weights. T-statistics in parentheses. *** represents significant at 1% level, ** at 5% level and * at 10% level.

Table 6: Two-year productivity growth gain from private equity

Total productivity growth gain	1.84
Total excluding acquisition/divestiture	1.99
Share of total from:	
Continuing establishments	0.72
Net entry	0.36
Net acquisition	-0.08

Part 3

Leveraged Buyouts – Evidence from French Deals

Leveraged Buyouts – Evidence from French Deals[1]

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1. INTRODUCTION

This paper examines how leveraged buyout (LBO) transactions impact corporate growth in France and it expands on existing literature that focused primarily on LBO transactions in the US and UK throughout the 1980s by investigating LBO transactions in France over a more recent time frame of 1994-2004.

Research by Kaplan [1989], Lichtenberg and Siegel [1990], Baghat et al. [1990] all focused on LBO transactions during the 1980s when corporate restructuring was prevalent in the US. Amess and Wright [2007] focused on transactions in the UK while Davis et al. [2008] examined LBO deals in the US over a longer time period (1980-2004).

The findings from these papers, however, may not be fully representative of more recent LBO transactions. The 1980s was a decade of intense corporate restructuring in the US, in the face of international competition and the deregulation of many industries (Jensen [1993]). Firms that underwent LBO transactions primarily cut costs and downsized activity in firms that operated in mature industries. Since the 1980s, part of the private equity industry has focused on new sources of value creation; for example, funds may select underdeveloped firms, and accelerate their growth.

By shifting the focus to France, this paper investigates the possibility that some LBOs aim to expand the scale and scope of their target's activities outside of the UK and US. France provides us with a natural testing ground for our claim that some LBOs can be viewed as accelerators of corporate development, primarily for two reasons. First, France is a country with many family-managed businesses (see for example Faccio and Lang [2002] for evidence on publicly listed firms), which may sometimes lack the managerial and financial expertise needed to take advantage of all growth opportunities. Using a restricted sample of medium-sized, privately held firms, Bloom and Van Reenen [2007] find that management practices tend to be poor in family-managed firms. Thus, focusing on France allows us to study an economy with many 'hidden gems' with significant margins of improvement and growth. Second, recent work suggests that French credit and stock markets may not be as well developed as those previously studied in the US and the UK, and that access to external finance may be more difficult for medium-sized firms in France than in the UK or the US[2].

We first identify 830 French deals between 1994 and 2004, using two sources of data: SDC Platinum and Capital IQ[3]. We restrict attention to transactions that involve: (1) a 100% change in ownership where at least one of the new owners is a private equity fund, and (2) the use of leverage to finance the deal. Our sample is representative of the typical LBO deal in international datasets: our French deals have a similar size to deals shown in US or UK data (see Strömberg [2008]). Separate data sources suggest that the use of leverage is as prevalent in the French market as in these two countries. The only difference is that the number of transactions is slightly smaller in France, controlling for the size of the economy. Thus, France has comparable LBO transaction size and capital structure to the US and UK.

We then track the performance of targets from three years before and until three years after the deal using accounting data from tax files. We compare their evolutions with a carefully constructed 'control group' of similar firms. Like most existing studies on LBO transactions in the UK and US, we find that LBOs in France lead to a large and statistically significant increase in profitability of the target. This is unsurprising but comforting. We find that French LBO targets tend to grow significantly more than comparable firms, both in terms of jobs and assets. This effect is statistically significant and economically large: between the three years preceding the transaction, and the four years that follow it, excess job, asset and sales growths of LBO targets are 13%, 11% and 13% respectively. This effect is robust. First, we

[1] The authors gratefully acknowledge financial support from the World Economic Forum, and thank Per Strömberg for invaluable help with the Capital IQ dataset. We also thank Laurent Bach for sharing his ownership data with us. This paper, while the authors' sole responsibility, benefited from insightful comments by Vicente Cuñat, Steve Davis, John Haltiwanger, Josh Lerner and Per Strömberg.

[2] According to Djankov, McLiesh and Shleifer [2006], the ratio of private credit to GDP in France is 0.9, as opposed to 1.4 in the UK and the US. According to recent data put together by Beck et al [2000], the ratio of private credit plus stock market capitalization to GDP is equal to 1.7 in France, versus 2.7 in the UK, 3.5 in the US. Finally, France scores low on many dimensions of investor protection, such as the creditor rights index reported in Djankov et al. [2006]. Against this background, it is at least plausible that private equity could offer an alternative source of finance for small and medium-sized enterprises such as the ones we study.

[3] We have cross-validated deal classification as LBO in these two databases using external sources (company websites, financial press).

check that our findings are there both for LBOs occurring before and after 2000, which marks the midpoint of the sample. Second, we verify that targets grow, not because of restructuring or the acquisition of other companies, but most likely through organic growth. Third, we find that targets are not more likely to go bankrupt than their comparable twins. Hence, even accounting for attrition, targets grow much faster than comparable firms. Fourth, we find that targets operating in industries with a stable, protected labour force do not grow faster than controls. This suggests that the protective French labour laws do not prevent us from observing the cost-cutting LBOs that the existing literature has focused on. Fifth, in view of the current developments on credit markets, we ask how robust post-LBO growth has been to the sharp economic downturn of 2000. We find no difference between deals done in 1998-1999 (when valuations were inflated and leverage was high) and deals realized in 2001-2002 (when valuations and debt ratios were lower).

Last, we propose an explanation for this intriguing finding: in France, private equity funds act as a substitute for weak capital markets. We bring two pieces of evidence in favour of this hypothesis. First, we would expect that former divisions of larger companies were less likely to be financially constrained before the transaction than family-owned firms. Consistent with this hypothesis, we find that after a divisional buyout, firms are not accompanied by post-transaction growth, while 'private-to-private' deals are followed by very strong growth. Second, in the spirit of Rajan and Zingales [1998], we focus on industries where internal capital is typically insufficient to finance investment. We find that post-LBO growth of targets is higher in these industries, but only for private-to-private transactions (there is no effect on divisional buyouts). These two pieces of evidence suggest that buyouts foster growth by alleviating financial constraints, however, the existing literature suggests the contrary: since firms are highly levered after an LBO, they struggle to pay back their debt, and therefore have to forgo valuable investment opportunities. Chevalier [1995], and Chevalier and Scharfstein [1996] find evidence of such debt overhang in the supermarket industry. The reasons for this difference are that, compared with these two studies, (1) we look at France, a less financially developed country, (2) we look at smaller, initially privately held, firms and (3) the LBO business model has evolved beyond cost-cutting since the 1980s.

Section 2 describes the data used. Section 3 establishes the fact that target growth is accelerated following an LBO. Section 4 provides evidence that financial constraints are relaxed after the deal. Section 5 concludes.

2. DATASET

2.A: Data construction

To analyse the impact of LBO transactions at the company level, we used three different databases: SDC Platinum and Capital IQ (to isolate transactions) and BRN (for financial statements).

First, we retrieved all the deals from the SDC Platinum database with the following characteristics: (i) they were completed between 01/01/1994 and 31/12/2004; (ii) the target company was incorporated in France; and (iii) deals were classified as 'LBO' by this database[4]. These criteria were fulfilled by 603 deals. We then supplemented our coverage with transactions from Capital IQ. From the Capital IQ dataset, we selected all 972 deals that were: (1) announced between 1994 and 2004; (2) either 'closed' or 'effective'; and (3) are reported by Capital IQ as being 'LBOs'. We then cross-validated, using external data sources (company websites, financial press) as well as synopses available from these two datasets, that the deals classified as LBOs were indeed LBOs in the classical sense (that is, they involved a change in control and the use of debt to finance the transaction). The two datasets overlapped, thus we started with 1,193 transactions.

Most of the targets were medium-sized, privately held firms, therefore, we obtained financial statements from tax files (called BRN) available from the statistical office (INSEE)[5]. Our transaction and accounting data do not have the same identifier so we matched them by company name. Names are not always identical in both databases, so in case of ambiguity we resorted to company websites and annual reports. The matching process reduced the sample size to 830 deals, of which 450 came from SDC and 492 came from Capital IQ.

One possible concern at this stage is that our data construction technique does not account for the group structure that is so prevalent among French firms. Many firms have subsidiaries that are 100% controlled and that may hold more assets or employees than the parent company. If an LBO is followed by a simplification of the corporate structure that leads to the consolidation of all assets and jobs in the target firm, we will overestimate the post-LBO growth of the firm.

We deal with this important issue in three steps. First, notice that the asset of a subsidiary is generally already included in the fixed assets of the parent firm via the value of the parent's equity holdings (in the financial fixed assets line). Second, for each LBO target, we try to make sure that we focus on the main entity with the most real activity, instead of just a holding that owns various subsidiaries but has no operation. We do this using company websites and annual reports and by looking at employment and sales figures. Third, we use another data source, Liaisons Financières (LIFI) available from the statistical office, which collects ownership links between parents. The limitation of this database is that it is a survey, but coverage is good

[4] Definition of an LBO according to SDC: an LBO occurs when an investor group, investor, or firm offers to acquire a company, taking on an extraordinary amount of debt, with plans to repay it with funds generated from the company or with revenue earned by selling off the newly acquired company's assets. SDC considers an LBO if the investor group includes management or the transaction is identified as such in the financial press and 100% of the company is acquired.

[5] See Bertrand, Schoar and Thesmar [2007] for a description of these data.

during the time period that we consider. Using this survey, we find that only 20% of our targets have one subsidiary or more. As a result, we do not report results using subsidiary data in most regressions, but use this information in various robustness checks.

A second concern is that we may have missed many divisional buyouts, as in such cases the target may not be an independent legal entity before the transaction (but just a division of the selling firm). As it turns out, in our 830 LBOs, there are still 234 divisional buyouts (28%) according to SDC and Capital IQ. This fraction is not changed much by the matching process: before matching, 31% of our transactions (out of 1,193 deals) are divisional buyouts. This means that sold divisions tend to be independent legal entities, with their own accounts, before the transaction. On this front, the group structure of the selling entity, very common in France, helps us in following the performance of the division spun off: both before and after the transaction, divisions typically have their own accounts, and makes them available to the tax administration.

All in all, we find that the total number of employees of firms that underwent an LBO between 1994 and 2004 stands at 146,854. This represents approximately 1.1% of the employment in our accounting data, and some 0.7% of total French employment.

Using financial statements, we retrieve the following variables: number of employees; net assets; working capital; fixed assets; EBITDA; net income; and industry classification (two- and four-digit). We measure vertical integration as gross margin, the ratio of value added (sales minus intermediary inputs) divided by sales. The share of export is the ratio of foreign sales to total sales. Profitability is measured through return on asset (ROA), that is, EBITDA divided by total net assets. All ratios are winsorized above the 95th and below the 5th percentiles. We also report results on total fixed assets, tangible fixed assets and on working capital, which is computed as trade receivables plus inventories minus payables.

2.B: Building the control group

In order to analyse the impact of LBO operations, we compare the targets of such transactions to similar companies that did not undergo an LBO. The choice of an adequate control group requires some caution, as our sample has mostly medium-sized, privately held firms. Heterogeneity is much more dramatic than among listed firms: in a given four-digit industry, size may range from four to 4,000 employees.

A matching company (a twin) meets the following criteria:

- It belongs to the same two-digit sector as the target;
- The number of employees one year before the LBO is in the +/- 50% bracket of the employment of the target company; and
- The ROA one year before the LBO is in the +/- 50% bracket of the ROA of the target company.

If there are more than five twins, we simply keep the five nearest neighbours to the target (as in Guo et al. [2008]. The choice of ROA and employment is clearly driven by the fact that those measures will be the focus of our investigation, and that they tend to mean revert. Regarding the +/- 50% bracket, there is a trade-off between matching accuracy and the need to get a twin for as many LBO targets as possible. At this 50% level, only 46 targets have no twin. If we require employment and ROA to be both at most 20% away from the target, the number of targets with no twin rises to more than 100[6].

The matching methodology allows us to add 3,913 'twin' companies to the sample, that is, 4.7 twins by target. By construction, the two groups are not too different, as evidenced by Table 1. Targets have on average 182 employees, and a turnover of some €167million. The twins are smaller than the targets, in particular in the lower quartiles of the size distributions. The matching on ROA is much more successful, in particular in upper quartiles, which are nearly identical. Finally, pre-LBO growth is very similar for targets and their twins, for jobs and sales as well as total assets. This is particularly comforting given that we did not match on pre-event growth. As a result, growth dynamics after the event will not be affected by the fact that targets grow differently before the deal.

2.C: Industry-level variables

In Section 4, we will use industry-level measures of dependence on external finance and exposure to labour market rigidities.

We measure financial dependence at the industry level using the universe of non-listed firms as represented by the tax files (this excludes very small firms and non-corporations). We follow the methodology of Rajan and Zingales [1998]. For each firm in our sample, for each year, we calculate the difference between capital expenditures (CAPEX) and gross cash flows, normalized by CAPEX. Gross cash flows are computed by taking net income plus depreciation and amortization minus change in working capital (inventories plus receivables minus payables)[7]. This ratio thus measures the fraction of CAPEX that is financed externally (mostly via debt issue). We then remove outliers and compute a mean per two-digit industry over the 1990-2006 period, using all firms present in the tax files.

We measure industry exposure to labour market rigidity by using the 1998 wave of the REPONSE survey[8]. This survey is run every six years by the French Ministry of Labour, and collects information about working conditions at the employee level in a large number of French firms. We use two variables that we first compute at the firm level. The first variable is the fraction of workers that belong to a union, which measures the ability of workers to resist

[6] However, regression results presented below are almost unchanged with this smaller sample.

[7] In alternative (non-reported) specifications, we used a measure closer to cash flows from operations (gross cash flows plus interest payments). This alternative measure gives very similar results both in terms of statistical and economic significance. In the main text, we report regression results with gross cash flows because these are the ones used in Rajan and Zingales' [1998] paper. As a third robustness check, we computed the ratio of financial dependence only for firms with more than 100 employees, which are presumably more immune to credit rationing; again our results went through.

[8] For a description of this dataset, see Acemoglu et al. [2007].

restructuring. The second variable is the firm-level fraction of workers that are hired under fixed-term contracts (FTC), which measures the fraction of the labour force that is 'flexible', since, although it is costly to anticipate the termination of FTC, the firm does not have to renew them when they mature (typical duration is one year). We then separately aggregate these two firm-level rigidity measures at the two-digit industry level.

3. POST-LBO GROWTH: EVIDENCE AND ROBUSTNESS

3.A: Main results

Figure 2 presents the evolution of targets' 'excess' performances before and after the transaction. In the spirit of Kaplan [1989], we first compute, for each target and each year before or after the LBO, the difference between its performance and the median performance of its twin taken the same year. We call this the 'excess ROA' of the target. We then compute the change in excess ROA between each year t and three years before the operation. Finally, we compute the mean of such evolutions of excess ROA, and report this in Figure 2. It clearly appears that the average operation is followed by an improvement in operating profitability by four percentage points. The timing of the improvement offers convincing evidence that large changes occur around the deal, and serves as a validation of our data construction methodology. The relative flatness of the evolution of ROA prior to the deal year gives us confidence in the construction of our 'twins'. Unreported t-tests (as well as Wilcoxon tests of median equality) suggest that this sharp increase in ROA is highly significant (at 1%) from year one.

To formalize our statistical tests, we perform the following regression, which is in the spirit of the 'natural experiment' literature[9]:

$$Y_{jt} = a_j + \delta_t + POST_t + POST_t \times LBO_j + \varepsilon_{jt} \qquad (1)$$

where j is a firm index and t a time (year) index. $POST$ equals 1 for observations of targets (or twins) after the target's LBO date up to the fourth year after the LBO date. LBO is equal to 1 for targets, and 0 for twins. This regression includes firm and time fixed effects. As recommended by Bertrand, Duflo and Mullainathan [2003], we cluster error terms at the firm x $POST$ level. Results are reported in Table 2. Y stands for ROA (column 1), the log of EBITDA (column 2), the log of fixed assets plus working capital (column 3), as well as other measures of size of operations: log sales (column 4) and log employment (column 5).

LBOs appear to be associated with an increase of some six percentage points in operating performance. This is economically large, as in the sample operating profitability is on average 30% and its standard deviation is about 50%. Perhaps more surprisingly, operating assets of LBO targets increase by 11% more than their control group. This strong increase in operating assets is accompanied by a strong increase in sales (13%) and employment (13%). These last results stand in sharp contrast with the findings of Kaplan [1989], who finds that the post-LBO increase in profitability stems from a decrease in assets, while maintaining operating income constant. In our sample of (smaller) LBOs, firm size increases, but profits increase even more, suggesting that the firm is taking advantage of previously unexploited growth opportunities.

In the spirit of Figure 2, we supplement regression results of Table 2 with a display of the timing of job creation after the LBO. To make Figure 3, we first computed, for each firm in the target and control samples, the change in log employment between three years before the LBO and each year t. Then, for each target, we took the median value of such cumulative employment growth of twins, and subtracted it from the target's own cumulative growth. We then computed the mean of such 'excess growth' for all targets, for each year starting three years before the LBO. Approximately a third of overall employment growth takes place in the year following the buyout. Differential job growth is positive and statistically significant, whether we use a Wilcoxon median test or a student test (whose results we do not report to save space).

3.B: How does value creation take place?

In Table 3, we first try to look at further measures of firm behaviour that may explain the source of post-LBO growth. One possibility is that targets outsource part of their production to more efficient domestic suppliers, or cost-effective foreign firms. This can be measured through the ratio of intermediate input consumption to total sales, which we use as the dependent variable in column 1. As far as this ratio is concerned, there is no difference in evolution between LBO targets and their twins. In column 2 of Table 3, we look at the share of working capital in total assets. It is often argued that LBOs generate part of their wealth by reducing the need to finance working capital, with leaner inventories and quicker payments by customers. This tends to reduce financing needs for working capital, allowing the target to invest more in productive assets. Consistent with this view, it appears that LBO targets experience a relative decline (by one percentage point) in the share of working capital in capital employed. This effect is statistically significant at 2% but is economically small: the sample mean of this ratio is 42%, and the cross-sectional standard deviation about 30%. Finally, we ask if the growth in LBO targets can be explained by an expansion on international markets. Again, the effect is strongly significant, but economically small. The share of export in sales increases by one percentage point. For the sake of comparison, the sample mean of the share of exports in total sales is 12%. One possibility is that our linear model does not fit the data very well, as 40% of the firms in our sample do not export at all.

3.C: Robustness checks

The magnitude of these effects raises some concerns. First, it could be that private equity funds simply pick targets that have already grown very fast. To address

[9] See Bertrand et al. [2003] for a brief survey. This literature attempts to quatitatively evaluate economic mechanisms using 'shocks' that naturally affect firms or individuals in the economy. This literature insists on the need for 'treatment', and 'control groups' of economic agents that are not affected by the shocks. In our study, treatment firms are LBO targets, and control firms are the twins.

this concern, we re-ran regression (1) but included an interaction term designed to control for pre-LBO growth:

$$Y_{jt} = a_j + \delta_t + POST_t + POST_t \times LBO_j + POST_t \times GR_j + \varepsilon_{jt}$$

where GR is firm sales growth, in the three years preceding the transaction. The additional term on the right-hand side captures the fact that LBO targets, compared with their twin firms, may initially start with stronger growth. We run these regressions in Table 4, panel A, for all five left-hand side variables of Table 2. Unsurprisingly, pre-LBO growth is a strong predictor of post-LBO growth, but it does not affect our initial estimates.

Second, there could have been a change in the business model of leveraged buyouts. We checked the robustness of our findings across sub-periods in Table 4, panel B, where we ran the same regressions as in Table 2, separately for years before and after 2000. There does not appear to be a significant change across sub-periods in post-LBO profitability and growth.

Third, we needed to take into account the fact that targets may initially have subsidiaries or 'sister companies' that belong to the same group and which are part of the entity bought out. One possible outcome of the LBO could be a legal simplification, where the buyout target is merged with its subsidiaries and its sisters. This would mechanically increase employment in the target, by adding the employment of its sister companies or its subsidiaries. To check this, we used three alternative employment and asset measures in Table 5. We kept the target level measures of employment and assets but restricted the sample to firms that have no subsidiary. This reduces the sample by approximately one third. Regression results for such 'simple targets' are reported in column 1 (log employment) and column 4 (log of fixed tangible assets, a subset of total fixed assets reported in Table 2). Post-LBO growth is not affected, compared with estimates of Table 3. Then, we took all targets, but collapsed employment and tangible fixed assets of the targets and their potential subsidiaries, even before the transaction[10]. Regression results using such consolidated figures are reported in column 2 (for employment) and column 5 (for tangible assets). Again, these estimates are barely affected by this manipulation. Lastly, we collapsed the target's employment and assets with its sister companies, that is, companies that have the same parent firms. We did this because in some instances, we selected as the target the firm with the most operations, which is possibly itself a subsidiary of a holding that was, in effect, the real target. This consolidation is done in columns 3 and 6, and again confirms that post-LBO growth is about 12%.

A fourth concern was selection. When a firm closes a plant, it still appears in our sample the year after, so that the negative contribution of plant closure to firm job growth still appears in our data. But when the firm itself disappears from our sample, theoretical job growth should be -100%, while it is unreported in our data. One possible approach could be to extend each firm's data by one observation, with employment equal to 0, in the fashion of existing studies on job creation and destruction (Davis et al. [1996]). The limitation of this approach, however, is that firms may disappear from our sample simply because their assets are merged with another entity: this has no reason to lead to job destruction. To get around this problem, we used the bankruptcy files at INSEE, which report the identifying numbers and date of filing of all bankrupt firms and we found no difference in bankruptcy rates between targets and twins: 6.1% of targets and 6.1% of twins will be bankrupt at some point; 3.5% of both twins and targets will be bankrupt within the three years following the buyout. The attrition rate from our tax files was much larger: 14.9% for targets versus only 12.3% for twins. This is consistent with targets being sold off to groups that absorb their assets and jobs, not with targets going bankrupt more often.

A fifth concern came from the fact that the rigidity of labour laws in France may perturb the results. For instance, the OECD ranks French law as the sixth most protective among the 28 member countries (OECD, 2004). Because it is difficult to lay off workers in France, we do not observe in our data the 'cost-cutting' buyouts that are possibly more prevalent in the US and the UK, where labour markets are more flexible (the UK and US rank respectively second and first in terms of labour market flexibility in the 2004 OECD study). Hence, the observed mean post-LBO growth should be mechanically higher in the French sample. To test for this selection effect, we asked if post-LBO growth is on average higher in industries where employment rigidity is higher. We ran the following modified version of (1):

$$Y_{jt} = a_j + \delta_t + POST_t + RIGID_j \times POST_t + POST_t \times LBO_j + RIGID_j \times POST_t \times LBO_j + \varepsilon_{jt}$$

where Y stands for employment, assets (in logs). $RIGID$ is one of the two measures of employment rigidity and is defined at the industry level using the REPONSE survey (see Section 2.D): fraction of unionized workers and minus the fraction of workers under fixed-term contracts.

Estimates of the above equation are reported in Table 6. From columns 1 (assets) and 2 (employment), it is apparent that post-LBO growth is no more prevalent in industries where employment is rigid, which suggests that the selection effect described above may not be very strong. In the last column, we observe that, when employment is rigid, profitability increases more after the transaction. This is consistent with another selection effect: given how difficult it is to reduce the workforce, LBOs only occur when they are very profitable. This could be an explanation of why the profitability of the typical French LBO could be higher than in countries with a more flexible labour market. However, the French labour market does not explain why typical LBO transactions in France would be motivated more by growth strategies.

[10] We focus on tangible fixed assets since these are the assets that can be consolidated between a target and its subsidiaries. For a parent firm, another part of fixed assets is financial assets, which includes equity holding in, and loans to, subsidiaries. Consolidating such assets would amount to double counting the subsidiaries' assets. This is why we focus on tangible assets.

3.D: Economic downturn and post-LBO growth

The recent credit market squeeze has raised concerns about the sustainability of the private equity model. As we see it, in France, the current crisis is hitting LBO targets through three channels:

i. There is no credit around, either from banks or from the funds themselves. Hence, external finance is completely lacking for firms who seek to invest.

ii. The pre-crisis period was a credit market bubble, and as a result, valuations were inflated. The result is that targets will struggle to pay back the huge debt that was issued to purchase them. Even if they keep afloat, they will not manage to gather the resources necessary to invest and grow.

iii. The global economic slowdown reduces sales. This reduces the ability of firms to pay back the debt used to finance the LBOs.

In this section, we look at the impact of the 2001-2002 economic slowdown on LBO targets. This last slowdown is not exactly comparable to today's credit market meltdown: the late 1980s and the early 1990s would probably be a better comparison, but this period is not in our sample. Such an analysis was performed, on large public-to-private transactions, by Kaplan and Stein [1993]. In particular, they found that deals made during the overheated period of 1985-1989 were 20 times more likely to default than deals struck during 1981-1984. The credit market bubble of the late 1980s indeed led to inflated valuations and poorly designed capital structures that rendered ex-post debt renegotiation difficult. These defaults led to bankruptcy courts – which does mean liquidation – in approximately one third of the cases. Unfortunately, however, the very large deals of Kaplan and Stein are unlikely to be representative of our modern-day LBOs.

We believe, however, that the 2001 crisis is informative for two reasons. First, economic growth in France slowed down as dramatically in the 2001-2002 period as it currently has (see Figure 4). Between 2000Q2 and 2001Q2, quarterly growth went from 1% to -0.3%, and stayed around 0.1% for the better part of 2001 and 2002; between 2007Q3 and 2008Q2, GDP growth went from about 0.6% to -0.3%. Thus, the reduction in demand between the two downturns may be of similar magnitude. Second, the valuation and capital structure of deals were not very different in the pre-subprime crisis than they were before the burst of the high tech bubble. Using a global sample of large transactions from Capital IQ, Axelson et al. [2007] shows (their Figure 1) that the mean enterprise value-to-EBITDA ratio was about eight in 2006, pretty much the same level as in 1998. Also, the 2006 mean debt-to-EBITDA ratio was the same as in the late 1990s (about five).

Thus, the post-2000 crisis and the current crisis may share similarities from the perspective of buyout targets. To see how the past crisis affected post-LBO growth and survival, we simply ran regression (1) separately for buyouts started in 1998-1999, and buyouts started in 2001-2002. If the crisis affected post-LBO growth, we would expect pre-2000 buyouts to suffer more as credit market and demand conditions tighten, than post-2000 buyouts that could take advantage of the 2003 recovery. Results are reported in Table 7 using: (1) post-LBO job growth; (2) post-LBO asset growth; and (3) probability of exiting the sample within three years after the deal. This probability of exit overestimates bankruptcy probability since many firms exit the sample because they are merged with another entity (such as an acquiring firm).

As it turns out, post-LBO growth is actually lower (but still positive) for deals made in 2001 than for deals made in 1999, but the difference is not statistically significant. It thus seems that the post-2000 economic downturn did not really reduce post-LBO growth in a significant way.

4. FINANCIAL CONSTRAINTS AND POST-LBO GROWTH

4.A: Why LBOs may alleviate financial constraints

The behaviour described above appears to be very dissimilar to pre-existing studies, in particular those that focused on large public-to-private transactions (listed company turned private by a financial sponsor) but also small private-to-private deals previously investigated in the literature (for recent evidence see Amess and Wright [2007], and Davis et al. [2008]). Both types of studies found evidence consistent with private equity funds implementing measures that aimed at downsizing the firm's operation, while maintaining its ability to create value (that is, holding EBITDA constant). Such a discrepancy between those results and ours begs for a more thorough investigation, which we attempt to provide here.

The difference may come from the fact that credit constraints are more prevalent in France. As stated in the introduction, Djankov et al. [2006] show that the provision of private credit is quite low in France. This may be due to the fact that the bankruptcy law scores low on their index (0 out of 4): secured creditors are not first in line during liquidation, nor are they given control in the process of bankruptcy.

Against this background, our hypothesis is that small and medium-sized enterprises in France are credit constrained, and that LBO funds alleviate these constraints by making the firm a 'more credible' borrower. There are several plausible explanations for which this could be the case. First, LBO funds may introduce new members to the executive suite, which may reassure bankers. Second, LBO funds bring financial expertise and connections to hitherto financially unsophisticated firms. Third, LBO firms may substitute for former family owners, as transparent and activist shareholders. Because they are active monitors (Shleifer and Vishny, [1986]), they exert a positive externality on debt holders who are more senior claimants.

Whatever the reasoning behind it, such a backing may help firms with growth opportunities to raise capital (mostly bank debt, but also quasi-equity, such as mezzanine debt) to finance their investment. In Appendix A, we provide a model to formalize our intuition: pre-LBO targets are financially constrained, while post-LBO targets are not.

4.B: Private-to-private transactions vs divisional buyouts

One implication of our hypothesis is that, in France, firms that are initially financially unconstrained do not grow after the LBO. Subsidiaries of larger firms are a good example of such firms, since they benefit from internal capital markets (see for instance, Hoshi, Kashyap and Scharfstein [1991] for evidence from Japanese groups).

Following this intuition, in Table 8, we break the sample down into divisional buyouts, where the seller is a parent firm, and private-to-private transactions, which typically involve an individual or a founding family who wishes to withdraw. In column 1, we look at operating performance (ROA): both types of operations are followed with an increase in profitability. This increase is slightly larger for divisional buyouts than for initially 'pure' private firms, but the difference is statistically significant. This is not entirely surprising since both types of operations are supposed to generate value for the private equity fund, but this leaves open the question whether the increase in profitability is achieved with the same method. In columns 2 and 3, we look at firm size (total assets and employment), and find striking differences. Post-LBO growth is much smaller, and statistically insignificant, following divisional buyouts. Following a private-to-private transaction, post-LBO job or asset growth is about 16%, significantly larger than zero. Post-divisional buyouts are, however, not followed by any statistically meaningful growth.

4.C: Financial constraints and post-LBO growth

Another implication of our hypothesis is that we observed stronger post-LBO growth when the target structurally needs external finance to grow, that is, retained earnings are not enough to sustain optimal growth. To test this, we followed Rajan and Zingales [1998] and compared industries with high dependence on external finance to industries with low dependence. We expected post-LBO growth to be higher in industries with strong dependence on external finance. More specifically, we ran the following set of regressions:

$$Y_{jt} = a_j + \delta_t + POST_t + FD_j \times POST_t + POST_t \times LBO_j + FD_j \times POST_t \times LBO_j + \varepsilon_{jt}$$

for firm j in year t. Y stands for log employment or the log of assets. FD_j is the industry-level measure of a firm's dependence on external finance, whose construction is described in Section 2.D.

Regression results are reported in Table 9. Panel A focuses on private-to-private deals. Column 1 looks at post-LBO asset growth. For private-to-private deals, the interaction term $POST \times LBO \times FD$ is statistically significant at 5%, which suggests that targets in financially dependent industries tend to grow significantly faster after the buyout. Going from the 25th percentile of financial dependence to the 75th percentile increases the level of financial dependence by about 0.3. Hence, the post-LBO asset growth difference between these two industries would be 6% annually. This has to be compared with a mean excess post-LBO growth, for private-to-private deals, of about 16% (Table 7). The employment regression in column 2, panel A, leads to the same conclusions, both in terms of statistical and economic significance. There is, however, no difference in post-LBO profitability growth, which is consistent with targets in non-financially constrained industries achieving profit growth through cost-cutting. In panel B, we run the same regression for divisional buyouts, which do not experience any post-LBO growth (Table 7). Consistent with the idea that former divisions were not financially constrained, we find no growth difference across industries.

5. CONCLUSION

This paper provides some evidence that LBOs may actually alleviate credit constraints and be an engine of growth for small and medium-sized enterprises. In France, LBO targets experience a very strong growth in sales, assets and employment after the deal, in particular when they were previously more likely to be credit constrained.

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APPENDIX A: A SIMPLE MODEL

Firms have initial wealth W, and maximise NPV as given by:

$$\frac{F(K)}{1+r} = rK$$

where K is total assets. We assume that the only mean of external finance is debt (there is no external equity market), and that debt capacity is given by: $(\gamma + \varepsilon)K$ where γ measures the country level of financial development (say, because of bankruptcy law) and ε the industry level of financial constraints (say, because of asset tangibility). Baker, Stein and Wurgler [2003] call ε the inverse of the degree of equity dependence. When ε is low, firms cannot pledge a big part of their assets, and therefore have to issue equity to finance investment.

We assume that former divisions of large firms, as well as post-LBO targets are not constrained (for instance because they can tap unmodeled equity or quasi-equity markets, or simply because they are able to convince bankers to lend to them). In this case, firm size is given by:

$$K = K^* = F'^{-1}(1 + r)$$

Pre-LBO family firms have no choice, they need to take on debt and choose:

$$K = K^F = \frac{W}{1-\gamma-\varepsilon}$$

In writing this, we implicitly assume that

$$K^F < K^*$$

Post-LBO firm growth is given by:

$$\Delta K = F'^{-1}(1+r) - \frac{W}{1-\gamma-\varepsilon}$$

which is decreasing in W, γ and ε. Post-LBO growth is smaller in countries with more developed financial systems (this is for the difference between our results and existing ones based on US or UK data). Post-LBO growth is larger in industries where equity dependence is high (low ε). Post-LBO growth is larger in industries where the need for external finance is high (low W).

A limitation of this model is that it does not explain why families are not able to convince bankers to breach the debt capacity constraint as large groups or LBO funds do. There can be several explanations:

1. Family owners lack the connections or expertise to issue risky debt or quasi-equity debt. They also lack the backing of a large industrial or financial group.
2. Non-family shareholders would help in making the firm a more credible borrower (external monitors, in particular residual claimants, do have a positive externality on more senior debt holders).

APPENDIX B: HOW DIFFERENT ARE FRENCH LBOs FROM THOSE OF THE REST OF THE WORLD?

Figure 1 shows the number of LBOs per year in our sample. Overall, the number of deals first peaks in 1999, after which LBO activity declines somewhat but does not collapse; it then picks up again in 2003 and 2004. This pattern is similar to the evolution recorded by Davis et al. [2008] in their US sample, but there are, in total, less deals in our sample (they have more than 5,000 deals over the 1981-2004 period). Part of the reason for this is that the US economy is larger than the French economy (GDP is six times bigger). Adjusted for size, French LBO activity looks comparable to that of the US.

The types of sellers involved in our French transactions do not differ much from the typical LBO in the rest of the world. Six per cent of the deals are public-to-private transactions in France as well as in Strömberg's 2008 sample of LBOs around the world. Fifty-one per cent are pure private-to-private transactions, in France as in the rest of the world. We have 28% of divisional buyouts, against 26% in Strömberg's sample. We have more secondary buyouts (19% versus 13%), that is, transactions involving a financial vendor (most often another private equity fund). Finally, only 1% of our targets are labelled "distressed", but this figure is also very small in Strömberg's sample (2%).

Deal size and capital structure of LBOs is very similar to international data. According to Strömberg [2008], who uses Capital IQ only, the median deal size (in terms of enterprise value) is US$ 64 million in the US, and US$ 36 million in the UK. In our French extract of Capital IQ, it is US$ 63 million. We also have reason to believe that the use of debt is as pervasive in our French sample as in the transactions studied in previous papers. While unfortunately it is impossible to obtain reliable data on the level of debt of deals in our sample, we can use figures from Standard and Poor's to obtain the mean debt-to-EBITDA ratio of deals in France, the UK and the US. Sampling deals made between 2003 and 2006, S&P reports a mean debt-to-EBITDA ratio of 4.8 for France (232 observations) and the UK (240), and 4.2 for the US (410). Thus, we have good reason to believe that our French transactions are very similar in terms of size and capital structure to international LBOs.

Finally, it seems that our transactions involve firms that are older than the US targets studied by Davis et al. [2008]. In their sample, about 50% of the firms are over 10 years old, while 25% are less than five years old. In our sample, 85% of our targets are over 10 years old, and only 5% less than five years old. It is important to notice that, on the age dimension, targets do not differ from their twins, even though the twin selection was not made on age. This gives us confidence in thinking that our twins really are comparable with the targets they are designed to benchmark. This US–France comparison simply suggests that firms are, in general, older in France. It is also consistent with the idea that LBOs involve more mature firms in Continental Europe than in the US or the UK.

APPENDIX C : FIGURES

Figure 1: Number of LBOs per year in the sample

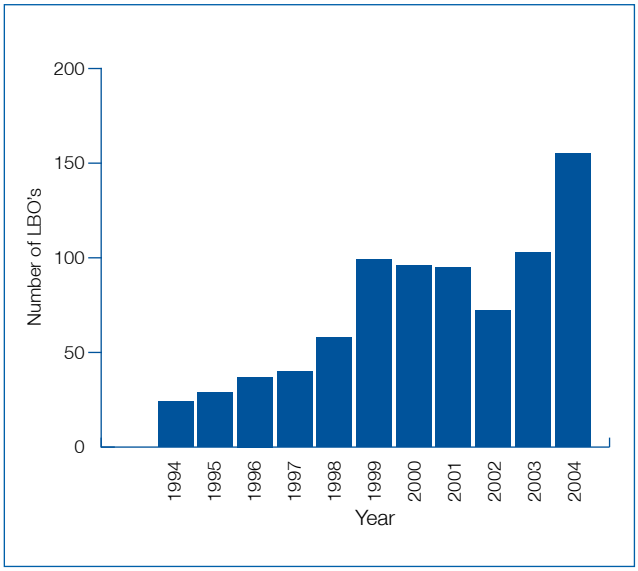


Figure 2: Mean adjusted profitability increase around the LBO

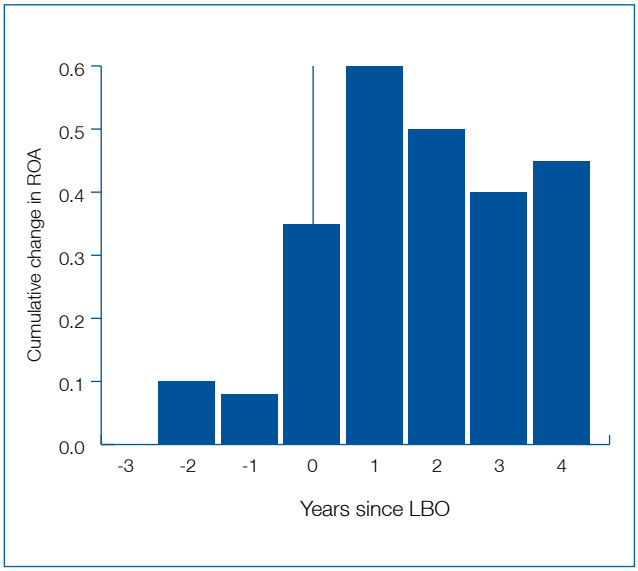


Figure 3: Mean adjusted log (employment) increase around the LBO

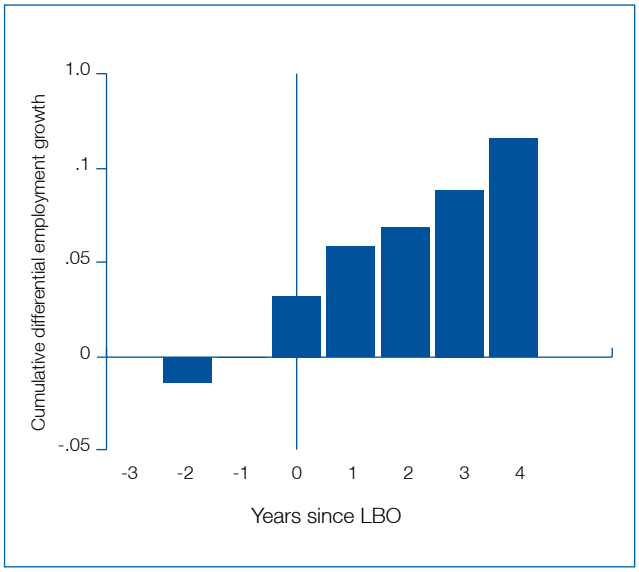
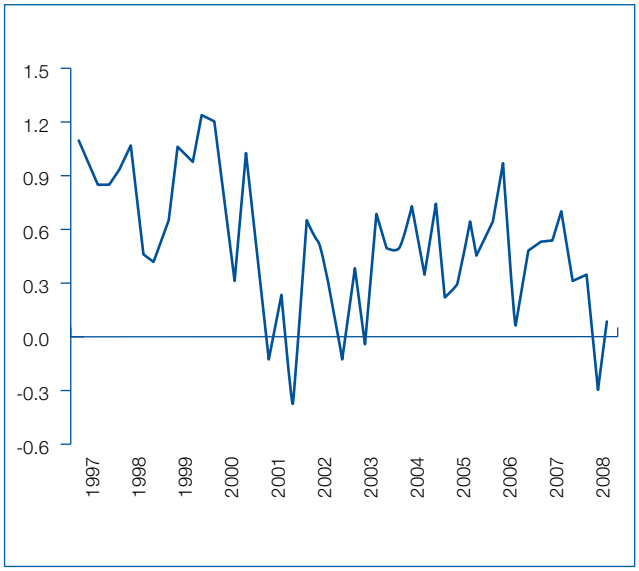


Figure 4: Quarterly GDP growth in France: 1997Q2-2008Q3



APPENDIX C: TABLES

Table 1: Financial characteristics of LBO targets and control firms

Variable	MEAN	Q1	Q2	Q3	OBS
Panel A: Targets					
Sales (m€)	167	14	50	167	830
Employment	182	26	61	226	830
Fixed assets	62	1	5	20	830
Economic assets	75	3	10	32	830
Sales growth (%)	11	0	7	16	800
Employment growth (%)	4	-2	2	10	830
FA growth (%)	12	1	8	21	774
EA growth (%)	14	2	8	21	776
ROA	32	7	25	50	830
Panel B: Twins					
Sales (m€)	140	8	29	110	3,913
Employment	138	23	54	169	3,913
Fixed assets	42	1	2	10	3,913
Economic assets	51	1	4	18	3,913
Sales growth (%)	9	0	6	14	3,743
Employment growth (%)	6	-1	3	11	3,745
FA growth (%)	6	1	7	17	3,692
EA growth (%)	10	1	8	20	3,712
ROA	35	10	26	49	3,913

Note: for each firm, each variable is averaged over the three years before the transaction. This table shows the distribution of this pre-transaction outcome. Each twin is assigned to a given target, so that it also has a transaction date (even though it does not face any transaction). All variable names are self-explanatory: economic assets is the sum of fixed assets and operating working capital. ROA is EBITDA normalized by shareholders' equity plus debt minus trade payables.

Table 2: Operating profitability and its drivers

	ROA	log(EBITDA)	log(FA+WC)	log(Sales)	log(empl)
post x LBO	0.06***	0.15***	0.11***	0.13***	0.13***
	(0.01)	(0.03)	(0.02)	(0.03)	(0.02)
post	-0.02*	-0.07***	-0.04***	-0.12***	-0.05***
	(0.01)	(0.02)	(0.01)	(0.06)	(0.01)
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	28,053	26,614	32,375	32,631	32,512

Note: Sample made of LBO targets and their twins (see text for details). OLS estimates. Error terms are clustered at the deal x post level. *, **, *** mean statistically significant at the 10%, 5% and 1% levels.

Table 3: Firm behaviour

	Intermediate inputs / sales	WC / (FA + WC)	Exports / sales
post x LBO	0.01	-0.01**	0.01***
	(0.01)	(0.01)	(0.00)
post	0.01	0.00	-0.00
	(0.01)	(0.01)	(0.00)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	28,717	32,631	28,717

Note: Sample made of LBO targets and their twins (see text for details). OLS estimates. Error terms are clustered at the deal x post level. *, **, *** mean statistically significant at the 10%, 5% and 1% levels.

Table 4: Robustness to selection on pre- LBO growth and to period selection

	ROA	log(EBITDA)	log(FA+WC)	log(Sales)	log(empl)
Panel A: including trend controls					
post x LBO	0.06***	0.14***	0.10***	0.12***	0.11***
	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)
post	-0.01	0.30***	0.28***	0.36***	0.30***
x pre LBO sales growth	(0.01)	(0.03)	(0.02)	(0.03)	(0.02)
Observations	25,619	25,502	32,463	26,973	30,396
Panel B: Sub-period robustness					
Year<2000					
post x LBO	0.10***	0.07	0.10***	0.15***	0.11***
	(0.03)	(0.06)	(0.04)	(0.05)	(0.04)
Observations	11,812	10,325	11,863	11,863	11,811
Year>=2000					
post x LBO	0.09***	0.17***	0.10***	0.12***	0.09***
	(0.02)	(0.04)	(0.02)	(0.04)	(0.03)
Observations	16,629	16,643	20,600	16,864	20,701

Note: Sample made of LBO targets and their twins (see text for details). OLS estimates. Panel A controls for pre-LBO growth by adding to the right-hand side of equation (1) an interaction between firm-level pre-LBO growth and the POST dummy. Panel B estimates the basic specification of equation (1) separately for pre- and post- 2000 transactions. Error terms are clustered at the deal x post level. *, **, *** mean statistically significant at the 10%, 5% and 1% levels.

Table 5: Sensitivity to employment and asset measures

	Log(employment)			Log(tangible fixed assets)		
	Stand-alones only	Target + subsidiaries	Target + sisters	Stand-alones only	Target + subsidiaries	Target + sisters
post x LBO	0.14***	0.13***	0.08***	0.14***	0.14***	0.10**
	(0.02)	(0.02)	(0.02)	(0.03)	(0.04)	(0.04)
post	-0.06***	-0.05***	-0.04***	-0.05***	-0.13***	-0.12***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)	(0.03)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	23,454	32,512	32,532	23,023	33,024	33,024

Note: Sample made of LBO targets and their twins (see text for details). OLS estimates. Error terms are clustered at the deal x post level. *, **, *** mean statistically significant at the 10%, 5% and 1% levels.

Table 6: Employment rigidity and post-LBO growth

	log(FA+WC)	log(empl)	ROA
Panel A: Rigidity = unionization rate			
post x LBO	0.15***	0.09**	0.02
	(0.04)	(0.04)	(0.04)
post x LBO	0.00	0.00	0.01**
x Rigidity	(0.00)	(0.00)	(0.00)
Observations	16,990	17,196	15,131
Panel B: Rigidity = – fraction of FTC in industry			
post x LBO	0.15***	0.13***	0.21***
	(0.05)	(0.05)	(0.05)
post x LBO	0.01	0.01	0.02***
x Rigidity	(0.01)	(0.01)	(0.01)
Observations	16,990	17,196	15,131

Note: Sample made of LBO targets and their twins (see text for details). OLS estimates. We estimate variants of equation (1), where all terms are interacted with the industry-level measure of labour market rigidity described in the main text. We report in Panel A the coefficients for post x LBO and post x LBO x rigidity when rigidity is measured through the fraction of unionized workers. In Panel B, rigidity is minus the fraction of workers under fixed-term contracts. Error terms are clustered at the deal x post level. *, **, *** mean statistically significant at the 10%, 5% and 1% levels.

Table 7: Pre-crisis deals and post-LBO growth

	Log(emp)		Log(FA+WC)		Exit	
	1999-2000	2001-2002	1999-2000	2001-2002	1999-2000	2001-2002
post x LBO	0.20***	0.11***	0.17***	0.09***	-	-
	(0.04)	(0.04)	(0.04)	(0.03)		
post	-0.06***	-0.02	-0.01	0.01	-	-
	(0.02)	(0.02)	(0.03)	(0.02)		
LBO	-	-	-	-	0.03	-0.01
					(0.03)	(0.03)
P-value for equality	0.12		0.18		0.27	
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8,341	7,277	8,370	7,255	1,126	967

Note: Sample made of LBO targets and their twins (see text for details). OLS estimates. Dependent variables are log of target employment (columns 1-2), log of target economic assets (columns 3-4) and a dummy equal to 1 if the firm exits the sample in the three years following the deal (columns 5-6). Columns 1,3,5 restrict the sample to deals struck in 1999 or 2000, while columns 2,4,6 restrict the sample to deals made in 2001 or 2002. Error terms are clustered at the deal x post level. *, **, *** mean statistically significant at the 10%, 5% and 1% levels.

Table 8: Divisional buyouts vs private-to-private transactions

	ROA	log(WC+FA)	log(empl)
Divisional BO			
post x LBO	0.08***	0.03	0.05
	(0.02)	(0.04)	(0.04)
Observations	7,792	8,828	8,880
Private-to-private			
post x LBO	0.05***	0.16***	0.17***
	(0.02)	(0.02)	(0.02)
Observations	16,797	18,830	18,891
Test equality	0.40	0.01***	0.01***

Note: Sample made of LBO targets and their twins (see text for details). OLS estimates. Error terms are clustered at the deal x post level. *, **, *** mean statistically significant at the 10%, 5% and 1% levels.

Table 9: Post-LBO growth: financially dependent versus non-financially dependent industries

	log(FA+WC)	log(empl)	ROA
Panel A: Private-to-private			
post x LBO	0.02	0.05	0.04
	(0.07)	(0.05)	(0.03)
post x LBO	0.16**	0.14***	0.01
x Fin. dep.	(0.08)	(0.06)	(0.03)
Observations	18,830	18,891	16,797
Panel B: Divisional BO			
post x LBO	0.00	0.09	0.01
	(0.10)	(0.07)	(0.07)
post x LBO	0.03	-0.05	0.09
x Fin. dep.	(0.12)	(0.08)	(0.08)
Observations	8,828	8,880	7,792

Note: Sample made of LBO targets and their twins (see text for details). OLS estimates. We estimate variants of equation (1), where all terms are interacted with the industry-level measure of financial dependence described in the main text. We report in Panel A the coefficients for post x LBO and post x LBO x Financial dependence only, focusing on deals where the seller is a private person. In panel B, we focus on deals where the seller is a larger group/corporation. Error terms are clustered at the deal x post level. *, **, *** mean statistically significant at the 10%, 5% and 1% levels.

Part 4

What Drives Private Equity Activity and Success Globally?

What Drives Private Equity Activity and Success Globally?

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1. INTRODUCTION

In recent years, there has been an explosion of private equity investing in emerging markets. From 2004 to 2007, the dollars raised by funds investing in the emerging economies of Asia, Russia and the former Soviet Union, Latin America and the Middle East and Africa have increased between eight- and thirty-fold[1]. While the structure and consequences of private equity investing in the United States and Great Britain are increasingly well understood, we know far less about the private and social returns of investments in emerging economies.

It is unclear whether the less developed infrastructure and financial and regulatory systems create obstacles or opportunities for private equity investors in emerging markets. The finance and growth literature suggests that financial development is beneficial for attracting capital. However, private equity investors bring a different set of skills from traditional institutional investors and may thrive in developed nations where they can exploit market inefficiencies.

More specifically, it is generally believed that the three main areas where private equity investors add value are financial engineering, governance engineering and operational engineering (see Kaplan and Strömberg [2008]):

- Financial engineering refers to steps to add value by making capital structure more efficient – that is, decreasing the cost of capital. Typically, this goal is achieved in buyouts by taking on leverage and bringing in outside capital.
- Governance engineering refers to processes that create value by improving incentives and monitoring in the companies that private equity investors finance. These steps can include the imposition of formal monitoring techniques and compensation that links pay to performance.
- Operational engineering refers to initiatives by private equity funds to improve the firms they finance through the provision of formal and informal consulting services to boost production processes, working capital management, marketing and product mix, and related areas.

It is plausible to assume that the costs and benefits of these activities depend on the institutional environment. On the one hand, a sufficiently developed institutional environment may be a necessary condition for private equity investing to work. For instance, Black and Gilson [1998] argue that well-developed equity markets are a necessary condition for venture capital investing to work, because venture investors rely on the ability to exit their investments through initial public offerings (IPOs). On the other hand, private equity may thrive in markets that work less efficiently and create value by making illiquid investments. This claim can be supported by the observation that the most successful years for buyout investing in the United States were the years 1991 through 1993 and 2001 through 2003, periods when alternative sources of debt and equity capital were largely unavailable.

To address this issue, we have created what we believe is the most comprehensive sample of private equity investments across nations. We look at the nature and outcomes of these private equity deals across nations that differ in the developments of their financial sectors, governance, regulatory systems and operational infrastructures.

We use a variety of measures to characterize the financial, governance and operational environments of the countries in our sample. We then relate these measures to deal volumes and characteristics. In the final section, we also examine transaction structures and outcomes (for instance, the type of exit).

We find seven patterns:

- Emerging markets account for a very modest share (under 4% on a dollar-weighted basis) of private equity activity over the years 1990 through 2008. The share has grown in recent years, particularly in the growth equity category.
- Private equity represents a greater share of the gross domestic product (GDP) in nations that are wealthier and whose per capita GDP is growing more quickly.
- Financial markets matter for private equity activity. Interestingly, only equity market development matters for the development of private equity, not the provision of debt, and the effects are particularly strong for venture capitalists. One interpretation is that exiting through public offerings is particularly important for these firms. Otherwise, we find little support for the suggestions of the importance of the institutional environment for financial engineering.

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[1] Emerging Markets Private Equity Association, http://www.empea.net/pdf/2007FundraisingReview_FINAL.pdf (accessed 20 October 2008).

- The measures of governance engineering are somewhat inconsistent. Protections of minority shareholder rights explain the level of private equity activity, but only for venture firms, suggesting again the importance of healthy exit markets. Few consistent results appear for buyouts.
- The measures of operational engineering appear to be particularly important for buyout activity. In particular, the presence of barriers to free trade, greater complexity in establishing new entities and greater corruption are associated with fewer leveraged buyouts (LBOs).
- Transaction structures respond to the economic environment. Minority transactions are associated with faster-growing countries. The presence of syndicated investments is associated with larger deals and with less favourable fundraising environments, which may be attributable to liquidity constraints.
- Deals in wealthier countries worldwide, especially venture capital transactions, are more likely to fail. Because we do not observe returns to transactions, we cannot say whether the benefits from their potentially greater successes compensate for their greater risk. Deals undertaken in 'hotter' private equity markets – for example following relatively large private equity fundraising markets—are more likely to fail and less likely to experience a successful exit.

This paper is related to a number of earlier papers that examine the cross-country determinants of private equity. A number of studies (for example Gompers and Lerner [1998]) have examined the determinants of private equity activity in a single nation. We are aware of three efforts to undertake cross-country comparisons. The most influential of these, Jeng and Wells [2000], examines the determinants of private equity activity in 21 countries; Mayer, Schoors and Yafeh [2005] looks at venture activity in four nations; Aizenman and Kendall [2008] focuses on venture capital volume across a broad sample of countries.

The plan of this paper is as follows: in Section 2, we develop a set of hypotheses that we will test in the analysis; Section 3 describes the construction of the sample; we present the analysis in Section 4; and the final section concludes the paper.

2. HYPOTHESES

Many accounts of the private equity industry in the United States and Great Britain have suggested that there has been an evolution of the strategies employed by the groups over the years. In particular, many of the pioneering groups that emerged during the 1980s were characterized by an emphasis on financial engineering. As the private equity market has matured in the developed world, financial engineering – and, to some extent, governance engineering – has become a commodity. Private equity firms have started to differentiate themselves by an emphasis on adding operational value.

This process of evolution in the United States and Great Britain poses the central question for this paper: what is the potential of private equity funds to add value across countries through these routes? In this section, we will consider each of the three routes to creating value in turn.

Developing economies are typically characterized by underdeveloped financial systems. Using most frequently employed metrics, both the extent and liquidity of equity and debt financing are typically underdeveloped. These considerations suggest two contrasting hypotheses:

H_0: Lower financial development results in financial engineering being more difficult, making private equity investments less profitable or less likely to succeed. This view suggests that private equity transactions should be less frequent in emerging markets, and less likely to succeed in countries with limited financial development.

H_1: Lower financial development creates more opportunities for private equity funds to add value through financial engineering and bringing in outside capital when local capital markets are imperfect. Private equity activity may benefit from limited financial development if these firms can address market failures that emerge in these settings. These investors may be more likely to undertake deals where the benefits are purely financial – for example simply raising capital for companies – in countries where financial development is more limited.

One possibility is that the impact of debt and equity markets may be different. For instance, the absence of equity markets may create opportunities for private equity funds. Firms that would otherwise go public may need instead to rely on private equity investors. Alternatively, the presence of active debt markets may be a vital complement to these investments.

With regards to the provision and effectiveness of governance engineering, the state of development of legal institutions is a crucial consideration. Emerging markets are often characterized by a lower ability to enforce contracts and property rights. These observations again suggest two contrasting hypotheses:

H_0: In emerging markets, contracts cannot be written in an optimal way due to the limited ability to enforce these agreements. These limitations make private equity investing less profitable in other settings. In support of this claim, Lerner and Schoar [2005] show that in emerging economies where civil disputes take less time to resolve, private equity groups are more likely to employ convertible preferred stock, which theory suggests lead to more efficient contracts. In these nations, returns to private equity investments are higher than in those where investors are apparently unable to employ such agreements.

H_1: Alternatively, poor institutional environment may lead to badly governed firms. If private equity groups can overcome these difficulties successfully, they may have more investment opportunities in these markets.

The final pair of hypotheses relate to operational engineering. In many emerging economies, the underlying infrastructure, the extent of good business practices and the availability of human capital, among other features, are at a lower level. We can formulate two contrasting views as to how it may affect the value of operational engineering:

H_0: The lack of operational infrastructure makes it harder for private equity investors to add value. Even if the fund managers have insights that can improve the firms' operations considerably, they are unlikely to be able to identify the skilled managers and consultants to implement

them. Similarly, the limited skills of other businesses and poor infrastructure are likely to make it difficult to implement policies that have worked well in developed markets, such as just-in-time inventory management and targeted marketing campaigns.

H_1: A contrasting view is that inexperienced managers and unsophisticated business practices give rise to lots of 'low-hanging fruit', that is, opportunities to introduce modest changes that have a significant economic impact.

3. DATA SOURCES

We employed two broad sources of data in the analysis. The first characterized the countries in which the investments were made; the second characterized the private equity transactions themselves. Regarding the first task, we discuss the sources of the key country-level independent variables in Section 4 as we employ them. The construction of the sample of investments, however, requires a more extended discussion.

We use the Capital IQ database to construct a base sample of private equity transactions. We select all private placements and M&A transactions in Capital IQ where the acquirer(s) include (at least) one investment firm that has a reported investment interest in at least one of the following stages: Seed/Startup, Early Venture, Emerging Growth, Growth Capital, Bridge, Turnaround, Middle Market, Mature, Buyout, Mid Venture, Late Venture, Industry Consolidation, Mezzanine/SubDebt, Incubation, Recapitalization, or PIPEs.

In order to track the ultimate fate of these transactions, we first match this sample with the Capital IQ acquisition database to obtain any subsequent M&A transaction that our LBO firms have been involved in. This gives us information that is used to infer trade-sale exits, divestments and add-on acquisitions. We then match our sample firms with the Securities Data Company (SDC) and Capital IQ IPO databases to track down prior and subsequent initial public offerings. Finally, we conduct extensive web searches on a firm-by-firm basis to infer the ultimate outcomes of these transactions[2].

Although we are confident we have constructed the most comprehensive database of private equity transactions to date, we will still only have a partial coverage of these transactions for three reasons. First, our sampling does not pick up all the private equity transactions in the Capital IQ database, due to the nature of the Capital IQ classification methodology, as discussed in Strömberg [2008]. Second, even when the Capital IQ classification is correct, there are a number of judgement calls that have to be made. For example, the distinctions between venture capital, growth equity and buyouts are not always sharp. Moreover, we do not include add-on acquisitions by LBO firms as separate LBO transactions, although again the distinction is not always sharp. Third, Capital IQ started its data service in 1999 and its coverage has increased over time. Although Capital IQ has been back-filling its data using various sources, its coverage is likely to be incomplete for the earlier part of the sample.

Strömberg [2008] was able to assess the coverage of the US and Western European buyouts by comparing the Capital IQ data with that in published studies using other sources. Given the paucity of systematic research in emerging market private equity, we are limited in our ability to calibrate the completeness of the database. Nonetheless, we can assess the completeness of the database by comparing our sample with the databases of the Emerging Markets Private Equity Association (EMPEA). EMPEA is an umbrella trade association that represents the private equity industry in all emerging market nations. As part of its mandate, it has compiled the records of development finance institutes and other major limited partners from intensive interviews and other sources, creating what it believes to be a virtually complete listing of funds active in emerging market private equity.

A comparison of investor names indicates that our sample includes transactions by at least 1,066, or 63%, of the 1,694 private equity groups in EMPEA's compilation. EMPEA does not have a total number of deals by each organization, therefore it is impossible to characterize the weighted coverage. From a qualitative review of the unmatched firms in the EMPEA list, however, it is clear that many of the firms missing from our sample are: (a) small, locally based funds not captured by Capital IQ; (b) subsidiaries of joint ventures of larger groups, whose deals Capital IQ appears to consolidate under the parent entity's name; or (c) government-owned or sponsored funds apparently not covered by Capital IQ.

4. THE ANALYSIS

This section presents the key analyses we undertake with these data. We begin with summary statistics, and then analyze the three sets of hypotheses delineated above.

4.A: Summary statistics

Tables 1 and 2 display the total number of transactions by geographical region and the type of private equity investment. Based on the criteria delineated above, we have a sample of 76,398 transactions closed by private equity investors worldwide from 1984 through September 2008. (For the rest of the analysis, we will ignore observations prior to 1990, since these are likely to be incomplete.)

The classifications of Venture Capital, Growth Capital, Leveraged Buyouts and PIPEs follow the classifications in Capital IQ. 'Other Acquisitions' refers to M&A transactions undertaken by private equity funds that are not classified as leveraged buyouts or similar classifications, such as a going-private transaction, management buyout, JV/LBO in Capital IQ. 'Other Private Placement' refers to private placements undertaken by private equity funds that are not classified as a venture capital or growth capital transaction in Capital IQ. For the bulk of the analyses, we have ignored roughly 10% of the transactions in the final two categories, as these appear to be an amalgam of different types of transactions.

[2] PIPE transactions, which remain publicly traded after the investment, posed a challenge to the outcome classification scheme. We exclude cases where private equity groups sell their stakes in PIPEs from many of the analyses below.

Several geographical breakdowns deserve special discussion, as follows: 'Rich Asia Pacific' consists of Japan, Singapore, Hong Kong, Macao, South Korea, Australia and New Zealand; all other Asia-Pacific countries are classified as 'Developing Asia'. 'Rich Middle East' consists of United Arab Emirates, Saudi Arabia, Kuwait, Bahrain and Israel; all other Middle East countries are included in the 'Developing Africa and Middle East' group. 'Western Europe' consists of the European Union countries as well as Norway, Switzerland, the Mediterranean Islands and the British Channel Islands, as well as the Caribbean islands of Anguilla, British Virgin Islands, Aruba, Bahamas, Bermuda and Cayman Islands. All other Caribbean Islands are included in the 'Latin America and Caribbean' region.

Several interesting patterns emerge from this analysis. Venture capital accounts for more than 43%, and growth capital for 16% of all transactions undertaken, while buyouts only account for 22% and PIPEs 7%. When weighting by volume, however, the picture changes dramatically. Buyouts and other similar acquisitions account for the vast majority of private equity transactions in terms of volume (more than 80%). All tabulations are in millions of 2008 US dollars[3].

The developed world accounts for 97% of all private equity activity in terms of US dollar volume and 94% in terms of number of transactions. Within the group of rich regions, North America accounts for 58% of volume, Western Europe for 34%, and other developed countries in Asia and the Middle East for about 5% of worldwide volume[4]. The North American dominance is particularly large in venture capital. Growth capital deals, however, are disproportionately large in the developing world and in the Middle East.

Tables 3 through 6 present the aggregate volume data by year, for all transactions, and is then broken up into buyout, venture and other deals. The explosion of activity in the mid-2000s, particularly among leveraged buyouts, is readily apparent. The growing share of transactions in 'Developing Asia', 'Rich Middle East' and other emerging markets in recent years is also clear. Again, all figures are in millions of 2008 US dollars.

4.B: Testing the hypotheses

In each of the regressions below, we undertake a similar approach. In particular, we undertake the analyses at the country level: that is, we use as the dependent variable the average ratio of the volume of private equity transactions (or private equity transactions of a given type) to gross domestic product over the 1990 to 2008 period. We obtain the gross domestic product, both in aggregate and on a per capita basis, from the World Bank (2007 and earlier years). We use this approach, rather than separate observations for each country and each year, because we are concerned about the non-independence of the observations. Given that the features of the countries change slowly, we may be getting inflated significance levels if we use annual data in a pooled panel regression.

In each table, we will use independent variables associated with one of the hypotheses delineated above. Due to the uncertainty of the data prior to 1990, as noted above, we use this later cut-off point. We undertake the regressions in levels (using the average volume of private equity transactions as a percentage of GDP as the dependent variable) and in logarithms (using the log of per capita private equity transactions and other measures). Our measures of GDP per capita, whether in logs or levels, are expressed in tens of thousands of 2008 US dollars. In the log specification, observations will be dropped if there are no transactions in a given country.

In Table 7, we take an initial look at the relationship between GDP and private equity activity. The dependent variables are as before. The key independent variable is the average GDP per capita and is taken from the World Bank (2007 and earlier years). We find that wealthier nations have more private equity activity, even though the transactions are scaled by GDP. This relationship holds true for all transaction types, from venture capital to buyouts (GC denotes Growth Capital).

In Table 8, we turn to examining the financial engineering hypotheses. In particular, we add two measures of financial market development: the average ratio of stock market development to GDP; and the average ratio of private credit to GDP. These two measures are computed between 1990 and 2006 and are again taken from the World Bank (2007 and earlier years). In these regressions, we control not just for the level of GDP, but also its average annual growth.

In these regressions, the result that rich countries have more private equity activity remains. We also find that activity is higher in countries with higher GDP growth, with the exception of growth capital deals. Turning to our hypotheses, local stock market development seems important and positive for deal activity, while local credit market development does not have significant explanatory power.

The effect of public market development seems to be strongest for venture capital deals. One possible interpretation of this result is that local financial markets are important because they provide an IPO exit route, which may be particularly important for venture activity (consistent with the arguments of Black and Gilson [1998] and the findings of Jeng and Wells [2000]). The effects of public market activity may be weaker in other transactions for two reasons: there may be other exit routes, such as trade sales, more readily available for these transactions; or alternatively, the presence of public exits may simultaneously stimulate (by providing an exit route) and depress (by providing an alternative source of

[3] One very important caveat is that the transaction value for an M&A transaction is typically measured as the value of the company acquired, while the transaction value for a private placement (which includes VC and growth capital transactions) is measured as the amount of capital provided. To make this comparable with tabulation of private equity fundraising, one should: (1) adjust the LBO volumes for the fraction of equity put into the deal (that is, maybe only 30% of the transaction value); and (2) adjust for the fraction of the equity acquired by the private equity fund to the extent this is less than 100% (which it will be, for example, if the private equity fund teams up with a strategic buyer, or if the seller retains a fraction in the firm). We will explore this issue in a future draft.

[4] The relative LBO volumes differ somewhat from the figures in Strömberg [2008], where Western Europe had around 40% of the activity and North America 52%. The main reasons for this are: (1) the slightly different imputation procedure (that now includes non-LBOs in the estimation procedure), and (2) the inclusion of non-sponsored MBO deals and buyouts sponsored by investment firms without a reported investment stage interest in the earlier paper.

financing that firms can tap into in lieu of private equity) these deals. Because of the greater information problems surrounding venture deals, this second effect may be less important for these transactions. The weak effects for buyouts and the unimportance of private debt capital undercut the suggestions of the importance of the local environment for financial engineering in these settings.

We then examine in Tables 9 through 11 the relationship between private equity transactions and the contractual environment, in which we seek to test the hypotheses under the heading of 'governance engineering'. The additional independent variables used are:

(1) the logarithm of the number of calendar days to enforce a contract of unpaid debt worth 50% of the country's GDP per capita, taken from Djankov, McLiesh and Shleifer [2007];

(2) an index aggregating creditor rights, following La Porta, et al. [1998]. The index ranges from 0 (weak creditor rights) to 4 (strong creditor rights). It was computed for 2003 and is taken from Djankov et al. [2008];

(3) the Index of Economic Freedom Property Rights Index, compiled by the Heritage Foundation. The property rights measure is an assessment of the ability of individuals to accumulate private property, secured by clear laws that are fully enforced by the state. Again, a higher number is associated with more freedom. This measure is again obtained from Djankov et al. [2008].

Overall, the results are quite unimpressive. There is weak evidence that creditor rights matter for LBO transaction volume, although only for the log specification. Similarly, there is weak evidence that the Property Rights Index matters for venture and LBO volume, although again only for the log specification. There is, however, a high correlation between stock market development and the various creditor and property rights variables, which introduces a potential multicollinearity problem that may reduce the statistical power of the results.

We take another attempt to examine the governance hypotheses in Table 12. The independent variable is an index of minority shareholder rights formed by adding one when:

(1) the country allows shareholders to post their proxy vote;

(2) shareholders are not required to deposit their shares prior to the general shareholders' meeting;

(3) cumulative voting or proportional representation of minorities on the board of directors is allowed;

(4) an oppressed minorities mechanism is in place;

(5) the minimum percentage of share capital that entitles a shareholder to call for an extraordinary shareholders' meeting is less than or equal to 10% (the sample median); and

(6) when shareholders have preemptive rights that can only be waived by a shareholders' meeting.

(Source: La Porta et al. [1998]) The range for the index is from 0 to 6, with a higher score associated with more minority rights. Our rationale for including this measure is that these rights are likely to affect the ability of private equity investors to exit investments via IPOs. Shareholders may be reluctant to purchase stakes in firms where private equity groups have major holdings unless they have such minority protections.

In the regressions, we find that minority shareholder rights are important for venture and growth capital deals, but not for LBOs. This is consistent with the exit story delineated above: that is, the ability to exit via an IPO and convince new minority shareholders to buy the stock is much more important for venture investors.

Our final look at the governance hypotheses in Table 13 employs a broader measure of investor protection. This measure, which is on a score of 0 to 10, is the result of a principal component analysis of disclosure requirements, liability standards and minority shareholder rights. (Source: La Porta, Lopez-de-Silanes and Shleifer [2006]) Once again, a high score indicates a country with more protection of investors.

These results are very similar to the analysis of minority shareholder protection in Table 12. (Indeed, this measure may be preferable due to its more comprehensive nature.) Consistent with the earlier results, investor protection does not impact LBO activity, but it does impact venture activity and, to some extent, growth equity and PIPEs. This is consistent with the idea that this measure captures the ability to undertake successful stock market exits, which is most relevant for these investments. Interestingly, the inclusion of this variable also decreases the effect of stock market capitalization.

Next, we turn to the relationship between private equity volume and the business environment, which allows us to explore the hypotheses delineated as 'operational engineering' above. The key independent variable in Table 14 is the Economic Freedom of the World Freedom to Trade Internationally Index from the Fraser Institute. This index measures taxes on international trade, regulatory trade barriers, the size of the trade sector relative to the expected level for the nation, black-market exchange rates and international capital market controls. A higher index score means more freedom to trade. It is obtained from Djankov et al. [2008].

The regression analysis suggests that the absence of trade barriers significantly increases private equity activity in aggregate. The effect seems driven by LBO activity, though the buyout analysis is only significant when we use logarithms. This result might partially be due to the industry mixture: the industries that buyout investors traditionally focus on may be more prone to these kinds of trade distortions. There appears to be some multicollinearity between the trade measure and that of stock market capitalization, though, which suggests a need for a degree of caution in the interpretation of the results.

A second barrier to private equity transactions may be restrictions on employment changes. In the analysis in Table 15, we use as the key independent variable an employment rigidity index. This index is itself an average of three sub-indices: a difficulty of hiring index; a rigidity of hours index; and a difficulty of firing index. The measure is taken from Djankov et al. [2008], and was originally derived from the World Bank's Doing Business series and Botero et al. [2004].

Again, a higher index means a more favourable environment for operational engineering, that is, less rigidity.

Unlike Jeng and Wells [2000], we are unable to find any relationship between employment rigidities and private equity activity when GDP and stock market capitalization are controlled for. These barriers do not seem to play any major (or consistent) role for private equity activity.

Our next measure, analysed in Table 16, looks at barriers to entrepreneurship. We look at the number of procedures required to start a business, which is computed by the World Bank in its Doing Business database. This variable includes all procedures that are officially required for an entrepreneur to start up and formally operate an industrial or commercial business. Here, a higher measure means more rigidity. Across the nations, there is a mean of 9 steps and a maximum of 17.

Here we get a strong result. The complexity of business regulation is indeed a significant negative for private equity activity in general and the effect is particularly strong for LBO activity. Perhaps surprisingly, these rigidities do not appear to affect VC activity in any significant way.

An alternative way to look at the effectiveness of operational engineering is to look at corruption. In environments rife with corruption, the ability of private equity investors to effect significant changes may be stymied. The independent variable in Table 17 is an index measuring the exercise of public power for private gain in the year 2000. It captures aspects ranging from the frequency of additional payments to get things done to the effects of corruption on the business environment. A higher index indicates a lower level of corruption. (Source: Kaufmann, Kraay and Mastruzzi [2003])

The results shown are somewhat stronger. There are no consistent patterns on the aggregate level. Buyouts, however, appear to be sensitive to the volume of corruption: less corrupt nations are associated with a high volume of these deals. The same pattern appears when it comes to venture transactions when using logs. (The negative coefficient on the corruption index in one of the PIPE regressions is more difficult to explain.) One problem is that we only have this variable for a limited number of observations, which may account for the limited explanatory power.

The penultimate analysis in this section in Tables 18 and 19 looks at the impact of taxes. The ability to optimize firms' taxes may be an important source of value in these transactions (see Kaplan [1989]). In these tables, we employ two measures that (rather imperfectly) capture the ability of private equity investors to add value through changing the tax structure. The first of these is the time needed to comply with taxes (in hours per year). The measure captures the time to prepare, file and pay (or withhold) three major types of taxes: the corporate income tax; value added or sales tax; and labour taxes, including payroll taxes and social security contributions. The source is the World Bank's Doing Business database. The second measure is the tax rate for the highest bracket of all taxes on corporate income. For different corporate taxes (for instance, federal, state and local), the measure takes into account the deductibility of one or more of those taxes when computing the tax rate for corporate income. This measure is obtained from Djankov et al. [2008].

The tax measures do not seem to have a significant effect on private equity activity. While the coefficient is generally negative, it is almost always insignificant. (The positive effect of taxes on PIPEs is counterintuitive and probably indicative of something else.) Given the relatively imprecise relationship between these two proxies and the ability of private equity investors to reduce the tax rates of the firms in their portfolio, our interpretation of this result must be cautious.

In Table 20, we examine the impact of all the explanatory variables simultaneously. We report a multinomial regression, in which we employed all the key independent variables used in the tables above. While our interpretation must be cautious, as a number of these explanatory variables correlate with each other, the results may indicate the robustness of the associations seen above. Among the most striking results were the strong association between GDP per capita and the volume of private equity transactions, the lack of significance of the measures of the nations' financial market conditions and their suitability for governance engineering, and the explanatory power for LBO activity of a number of proxies of the conduciveness for operational engineering in the various countries (particularly in the levels specification).

Table 21 presents another way to analyse private equity activity, which is to examine the determinants of volume of investments in a given country on an annual basis. Per capita GDP, GDP growth and the property rights and freedom to trade indexes now have time series as well as cross-section variation. Moreover, we control for the time-series effect of conditions in the private equity market, measured as the aggregate sum of fundraising in the US market (as computed by VentureXpert) normalized by US stock market capitalization in the year preceding the transaction. (In unreported regressions, we use as an alternative proxy the difference between the London Interbank Offered Rate (LIBOR) and the average rating for BB bond offerings for that country and year, taken from Datastream. The results are qualitatively similar to the private equity fundraising variable.) Note that all other variables only vary cross-sectionally.

As opposed to the previous analysis, the panel results show that volume of investment is positively related to private equity fundraising (and in unreported specifications, negatively related to high-yield spreads), as could be expected. The other country effects are similar. Two exceptions are the corruption index and the time needed to comply with taxes, which both go the opposite way compared to what was expected (for instance, a high corruption index, which denotes low corruption, is associated with less investment). Since these variables do not change year by year, and their sign and significance is different from the cross-sectional analysis, these results should be taken with a grain of salt.

4.C: Determinants of transaction structure and success

While there may be less clear predictions ex ante, we can also look at the ways in which transaction structures and outcomes vary with the conditions of the country and the market.

The first set of supplemental analyses looks at the characteristics associated with transactions of various types. We begin with some summary statistics, reported in Table 22. 'Syndicated deals' are deals where there are more than

one investor participating in the transaction. 'Non-PE investor in syndicate' denotes deals where in addition to at least one private equity fund investor, there is also at least one investor that is not a private equity fund in the syndicate. 'Minority deal' denotes transactions where the investor syndicate acquires less than 50% of the equity in the target company. We also look at whether the investor group just includes domestic and/or foreign investors, where the classification of 'domestic' and 'foreign' investors is done at the country of the target firm.

Not surprisingly, some of the most dramatic differences appear when comparing transactions of different types. LBO deals are less likely to be syndicated, less likely to involve non-PE fund investors, and very unlikely to be minority deals. The opposite is true for venture deals. Cross-border deals also vary significantly across region, being the least likely in North America, Western Europe and the Rich Middle-East countries. Hence, this decision seems to be significantly driven by the availability of a domestic private equity industry. Finally, minority deals seem overall to be less likely in the developing world, consistent with Lerner and Schoar [2005].

In the next two tables, we examine econometrically the drivers of investment structure. In Table 23, we examine the determinants of cross-border deal activity. The dependent variable in regressions (1) through (3) is a dummy variable taking the value of 1 if at least one of the participating investors is based in the same country as the target company. The dependent variable in regressions (4) through (6) is a dummy variable taking the value of 1 if at least one of the participating investors is based in a different country than the target company.

In Table 24, we examine the determinants of minority transactions, syndication and the participation of investors that are not private equity firms. The dependent variable in regressions (1) through (3) is a dummy variable taking the value of 1 if investors acquire a minority stake in the target company. The dependent variable in regressions (4) through (6) is a dummy variable taking the value of 1 if there are at least two investors participating in the deal. The dependent variable in regressions (7) through (9) is a dummy variable taking the value of 1 if the investment syndicate includes at least one investor that is not a private equity firm.

We observe the following patterns in the two tables:

- The results indicate that cross-border deals are less common in developed country deals and less common for US and Western European targets. Similarly, in countries with better investor protection (and more developed stock markets), cross-border deals are less common. This is inconsistent with the view that local investors are more crucial when local knowledge is more important, which is presumably the case in developing countries, and more consistent with developing countries being unable to develop a local private equity industry, thus having to rely on foreign investors. The one exception is 'procedures to start a business', our 'operating engineering' measure, which is positively related to the presence of local investors and negatively related to cross-border deal activity.
- There is some indication that cross-border deals are also more likely for larger deals, but less likely for buyouts, although this result is sensitive to the multicollinearity between these variables. Finally there is a strong trend towards more cross-border deal activity over time, while there are no clear-cut relations with market conditions.
- Minority transactions and deals involving non-PE investors are associated with those in faster-growing nations, although the interpretation is not clear. Syndicated deals are less likely in environments with extensive fundraising. Similarly, syndication and non-PE investors are more likely for larger transactions. These results collectively suggest that private equity fund liquidity constraint is an important driver of syndication.
- There is no consistent relationship between country governance and infrastructure variables and deal structures.

The second analysis in this section looks at what happened to these investments. Table 25 shows the exit status of the transaction by 1 July 2008, sorted by geographical region and the type of private equity investment. (In Panel A, we use all investments through 2008, even though the prospects that the recent deals will be exited are considerably lower; in Panel B, we only use transactions through 2005, which have had at least two-and-a-half years to be exited.)

The analysis focuses on the type of exit: that is, whether the firm was liquidated or went bankrupt, was acquired, or went public. (The remaining firms' outcomes are still to be determined.) Although we cannot observe the returns that the investments garner, a substantial body of research suggests that, at least in developed nations, the most successful investments in general are those that go public. We report results for different classes of private equity transactions.

The higher fraction of exited transactions in Western Europe and the US could be an indication of three factors. First, it may reflect the greater success of investments in these markets. Second, it may reflect underreporting of exits outside of these regions, in emerging economies in particular, so failed deals are likely to be hidden in 'unknown exits' and 'not exited' deals. Third, the higher failure rates in US and Canada, and in 'Rich Middle East' (this result is largely driven by Israeli companies), may reflect the greater representation of venture-backed companies in these markets. (Israeli firms, while only accounting for 2.3% of all venture transactions in total, represent 35.4% of all VC transactions outside of North America and Western Europe.) The reported failure is higher in venture capital and lower in LBO deals, as could be expected.

The final two tables examine these patterns econometrically. Table 26 examines the determinants of deal failure, with the dependent variable being a dummy variable taking the value of 1 if the company is out of business, liquidated, or financially reorganized by July 2008. In Table 27, the focus is conversely on deal success. The independent variable in regressions (1) through (5) is a dummy variable taking the value of 1 if the target company is exited by the investors and if, in addition, the company is either publicly traded or a subsidiary of another company in July 2008. The dependent variable in regressions (6) through (10) is a dummy variable taking the value of 1 if the target company is exited by the investors, and publicly traded in July 2008. PIPE transactions are excluded from the analysis.

Several patterns emerge from the analysis:

- Failures, particularly in VC investments, are more frequent for companies based in nations with larger per capita GDPs. Once again, this result may partially reflect the greater degree of reporting of these transactions. Alternatively, more risky deals are undertaken in richer countries, and in the US in particular.
- Investments that are raised in the wake of a robust private equity fundraising market are less likely to lead to an acquisition or an IPO and more likely to fail. This pattern is particularly true for venture deals. The pattern is consistent with a variety of work examining the impact of market cycles, which suggests that periods with substantial fund inflows lead to overinvestment and lower returns (for example, Kaplan and Schoar [2005], Lerner, Schoar and Wongsunwai [2007]). Similarly, in unreported regressions, failure rates are significantly lower (and when success is measured as the company either going public or being acquired, success is more likely) when interest rate spreads are higher, consistent with Axelson et al. [2008].
- Larger transactions are more likely to lead to an outcome of some type, whether success or failure. Presumably, there is greater room or pressure for a resolution. The result regarding failures seems counterintuitive but may be a result of underreporting and multicollinearity with deal type (since it does not hold for the buyout subsample).
- Given the modest expected returns and the large stakes, buyouts are less likely to be failures than other transactions, while venture and growth equity investments are most likely to fail. But buyouts are also less likely to unambiguously succeed as well.
- High creditor rights are positively related to failures, indicating that the ability of investors to force companies into bankruptcy may be important. Similarly, deals in countries with better investor protection are in a number of specifications more likely to experience a successful exit.
- Deals in less favourable operating engineering environments, measured as the number of procedures to start a business, are less likely to experience a successful exit for most specifications, and the results are particularly consistent for buyouts.
- Minority investments are more likely to be successful. Those with a non-private equity investor are less likely to have a successful outcome and more likely to be failures.

Combining the exit results with the earlier results on the determinants of volume we see that many of the variables that positively affect volume, such as better investor protection and fewer procedures to start a business, also increase the likelihood of a successful deal outcome. The notable exception is private equity fundraising activity, which not surprisingly increases deal volumes, but is negatively correlated with subsequent deal success, consistent with "too much money chasing too few deals" in these markets.

5. CONCLUSIONS

This paper seeks to understand the extent to which private equity investors add value to portfolio firms across nations. To do this, we estimate cross-national regressions, which seek to explain the average volume of private equity investments in each country by examining various features that are likely to be associated with different types of value creation.

We find several stark patterns as the data develop. On an aggregate level, emerging markets account for a relatively modest, though growing, share of private equity activity over the years 1990 through 2008. This pattern reflects the tendency of private equity to focus on nations that are wealthier and whose wealth is growing more quickly.

When we seek to relate the cross-national patterns of private equity to our proxies for the different types of value added, we find three results. Firstly, financial markets matter for private equity activity; however, only equity market development matters, not the provision of debt, and the effects are particularly strong for venture capitalists. Second, the measures of governance engineering are somewhat inconsistent; protections of minority shareholder rights have explanatory power, but only for venture firms. Finally, the measures of operational engineering appear to be important for buyout activity; in particular, the presence of barriers to free trade, greater complexity in beginning new businesses and more corruption are associated with fewer LBOs.

We also examine the relationship between national and market conditions and transaction structures and outcomes. We find that transaction structures respond to the economic environment. For example, the presence of syndicated investments is associated with less favourable fundraising environments and larger deals, suggesting the importance of capital constraints. Transactions in wealthier nations are more likely to fail, which presumably reflect the greater risks that investors in these markets are willing to take in these settings. Deals undertaken in 'hotter' private equity markets are less likely to experience a successful exit.

While we must be cautious in drawing conclusions from these associations, these results suggest a nuanced picture of private equity development. For venture investors, the ability to exit investments via the public market appears to be a critical factor. The results also suggest that barriers to the types of operational engineering that are frequently associated with buyouts can also deter these types of investments and make the ones that are undertaken less successful, suggesting the importance of this form of value-added. However, a large caveat to this analysis is that a sizeable fraction of worldwide historical private equity volume occurred in the last three years and most of these deals are not exited. As a result, a final verdict of the success drivers of private equity investment is yet to come.

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Table 1: Number of private equity transactions, 1990-2007, by region and transaction type

The table displays the total number of transactions by geographical region and type of private equity investment using a sample of 76,398 transactions closed by private equity investors worldwide from 1984 through 2007. The classification of Venture Capital, Growth Capital, Leveraged Buyouts, and PIPE follows the classification in Capital IQ. 'Other Acquisitions' refers to M&A transactions undertaken by private equity funds that are not classified as leveraged buyouts or similar transactions (for example, going-private transaction, management buyout, JV/LBO) in Capital IQ. 'Other Private Placement' refers to private placements undertaken by private equity funds that are not classified as a venture capital or growth capital transaction in Capital IQ. 'Rich Asia Pacific' consists of Japan, Singapore, Hong Kong, Macao, South Korea, Australia and New Zealand; a. All other Asia-Pacific countries are classified as 'Developing Asia'. 'Rich Middle East' includes United Arab Emirates, Saudi Arabia, Kuwait, Bahrain and Israel. All other Middle East countries are included in the 'Developing Africa and Middle East' group. 'Western Europe' consists of the European Union countries as well as Norway, Switzerland, the Mediterranean islands, the Channel islands, and the Caribbean islands of Anguilla, British Virgin Islands, Aruba, Bahamas, Bermuda and Cayman Islands; other Caribbean Islands are included in the 'Latin America and Caribbean' region. Totals may slightly differ due to rounding.

	North America	Rich Asia Pacific	Rich Middle East	Western Europe	Developing Africa Middle East	Developing Asia	Europe Central Asia	Latin America Caribbean	Total Developed World	Total Developing World	Total
VC No.	21,725	412	772	8,868	17	574	280	110	31,777	981	32,758
Row %	66.32%	1.26%	2.36%	27.07%	0.05%	1.75%	0.85%	0.34%	97.01%	2.99%	100.00%
Col %	48.49%	26.08%	55.30%	36.48%	2.18%	45.92%	19.13%	13.56%	44.08%	22.79%	42.89%
Growth Capital No.	6,218	311	317	4,949	67	154	319	114	11,795	654	12,449
Row %	49.95%	2.50%	2.55%	39.75%	0.54%	1.24%	2.56%	0.92%	94.75%	5.25%	100.00%
Col %	13.88%	19.68%	22.71%	20.36%	8.59%	12.32%	21.79%	14.06%	16.36%	15.19%	16.30%
LBO No.	8,412	410	50	7,664	97	81	314	103	16,536	595	17,131
Row %	49.10%	2.39%	0.29%	44.74%	0.57%	0.47%	1.83%	0.60%	96.53%	3.47%	100.00%
Col %	18.77%	25.95%	3.58%	31.52%	12.44%	6.48%	21.45%	12.70%	22.94%	13.82%	22.43%
PIPE No.	4,682	158	74	344	12	133	13	11	5,258	169	5,427
Row %	86.27%	2.91%	1.36%	6.34%	0.22%	2.45%	0.24%	0.20%	96.89%	3.11%	100.00%
Col %	10.45%	10.00%	5.30%	1.41%	1.54%	10.64%	0.89%	1.36%	7.29%	3.93%	7.10%
Other Acquisition	1,117	172	60	1,807	51	80	154	39	3,156	324	3,480
Row %	32.10%	4.94%	1.72%	51.93%	1.47%	2.30%	4.43%	1.12%	90.69%	9.31%	100.00%
Col %	2.49%	10.89%	4.30%	7.43%	6.54%	6.40%	10.52%	4.81%	4.38%	7.53%	4.56%
Other Private Placement	2,652	117	123	679	536	228	384	434	3,571	1,582	5,140
Row %	51.60%	2.28%	2.39%	13.21%	10.43%	4.44%	7.47%	8.44%	69.47%	30.78%	100.00%
Col %	5.92%	7.41%	8.81%	2.79%	68.72%	18.24%	26.23%	53.51%	4.95%	36.75%	6.73%
Total No.	44,806	1,580	1,396	24,311	780	1,250	1,464	811	72,093	4,305	76,385
Row %	58.66%	2.07%	1.83%	31.83%	1.02%	1.64%	1.92%	1.06%	94.38%	5.64%	100.00%
Col %	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%

Table 2: Private equity dollar transaction volume 1990-2007 by region and transaction type

The table displays total transaction volume in millions US dollars, deflated to 2008, by geographical region and type of private equity investment using a sample of 76,398 transactions closed by private equity investors worldwide from 1984 through December 2007. For the 22,892 transactions where transaction values are missing, these have been imputed by a fitted value from a regression of the log transaction-value-on-year dummies, dummies for the 10 main industry groups, dummies for the six main transaction types (VC, LBO, Growth Capital, PIPEs, Other Acquisitions, Other Private Placements), and 123 country dummies. The classification of Venture Capital, Growth Capital, Leveraged Buyouts, and PIPE follows the classification in Capital IQ. 'Other Acquisitions' refers to M&A transactions undertaken by private equity funds that are not classified as leveraged buyouts or similar transactions (for example, going-private transaction, management buyout, JV/LBO) in Capital IQ. 'Other Private Placement' refers to private placements undertaken by private equity funds that are not classified as a venture capital or growth capital transaction in Capital IQ. 'Rich Asia Pacific' consists of Japan, Singapore, Hong Kong, Macao, South Korea, Australia and New Zealand; all other Asia-Pacific countries are classified as 'Developing Asia'. 'Rich Middle East' consists of United Arab Emirates, Saudi Arabia, Kuwait, Bahrain and Israel; all other Middle East countries are included in the 'Developing Africa and Middle East' group. 'Western Europe' consists of the European Union countries as well as Norway, Switzerland, the Mediterranean islands, the British Channel islands and the Caribbean islands of Anguilla, British Virgin Islands, Aruba, Bahamas, Bermuda and Cayman Islands. Other Caribbean Islands are included in the 'Latin America and Caribbean' region. Totals may slightly differ due to rounding.

	Dev. Africa Middle East	Dev. Asia	Europe Central Asia	Latin America Caribbean	North America	Rich Asia Pacific	Rich Middle East	Western Europe	Total Developing World	Total Developed World	Total
Venture Capital	139.4	11,513.2	1,890.1	4,406.4	323,316.8	6,643.8	5,846.4	84,423.3	17,949.1	420,230.3	438,179.4
% of VC Vol	0.00%	2.6%	0.4%	1.0%	73.8%	1.5%	1.3%	19.3%	4.1%	95.9%	100.0%
% of Region PE Vol	0.5%	16.0%	3.8%	14.0%	10.3%	2.4%	29.6%	4.6%	9.8%	8.0%	8.0%
Growth Capital	706.8	16,142.8	1,840.4	3,332.1	132,416.0	5,981.0	1,911.3	60,616.6	22,022.1	200,924.9	222,947.0
% of GC Vol	0.3%	7.2%	0.8%	1.5%	59.4%	2.7%	0.9%	27.2%	9.9%	90.1%	100.0%
% of Region PE Vol	2.3%	22.4%	3.7%	10.6%	4.2%	2.2%	9.7%	3.3%	12.0%	3.8%	4.1%
LBO	26,041.9	23,743.2	38,808.1	17,152.6	2,269,944.5	119,014.6	5,600.5	1,419,545.7	105,745.8	3,814,105.3	3,919,851.1
% of LBO Vol	0.7%	0.6%	1.0%	0.4%	57.9%	3.0%	0.1%	36.2%	2.7%	97.3%	100.0%
% of Region PE Vol	85.0%	32.9%	78.5%	54.6%	72.3%	43.1%	28.3%	77.4%	57.6%	72.4%	71.9%
PIPE	943.8	10,460.0	74.0	785.3	152,728.4	12,925.0	1,059.1	19,404.8	12,263.1	186,117.3	198,380.4
% of Pipe Vol	0.5%	5.3%	0.0%	0.4%	77.0%	6.5%	0.5%	9.8%	6.2%	93.8%	100.0%
% of Region PE Vol	3.1%	14.5%	0.1%	2.5%	4.9%	4.7%	5.4%	1.1%	6.7%	3.5%	3.6%
Other Acquisitions	2,621.2	8,148.8	6,789.9	5,662.2	187,726.8	128,465.4	5,008.6	245,976.9	23,222.1	567,177.7	590,399.8
% of Other Acquisitions	0.4%	1.4%	1.2%	1.0%	31.8%	21.8%	0.8%	41.7%	3.9%	96.1%	100.0%
% of Region PE Vol	8.6%	11.3%	13.7%	18.0%	6.0%	46.5%	25.4%	13.4%	12.6%	10.8%	10.8%
Other Private Placements	181.0	2,141.3	36.8	93.6	73,686.2	3,372.9	330.5	4,084.2	2,452.7	81,473.8	83,926.5
% of Other PP Volume	0.2%	2.6%	0.0%	0.1%	87.8%	4.0%	0.4%	4.9%	2.9%	97.1%	100.0%
% of Region PE Volume	0.6%	3.0%	0.1%	0.3%	2.3%	1.2%	1.7%	0.2%	1.3%	1.5%	1.5%
Total	30,634.0	72,149.4	49,439.3	31,432.3	3,139,818.7	276,402.6	19,756.3	1,834,051.4	183,655.0	5,270,029.0	5,453,684.0
% of Total PE Volume	0.6%	1.3%	0.9%	0.6%	57.6%	5.1%	0.4%	33.6%	3.4%	96.6%	100.0%
% of Region PE Volume	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

Table 3: Total transaction volume by year and region

Definitions of the various regions are given in Table 1. All figures are in millions US dollars, deflated to 2008. Totals may slightly differ due to rounding.

Year	Dev. Africa Middle East	Dev. Asia	Europe Central Asia	Latin America Caribbean	North America	Rich Asia Pacific	Rich Middle East	Western Europe	Total
1990	27.3	0.0	23.4	0.0	23,024.8	62.2	6.7	9,101.8	32,246.2
1991	171.7	0.0	1.8	0.0	18,081.3	85.1	0.0	7,005.7	25,345.6
1992	7.3	0.0	39.5	0.0	30,062.4	5.9	3.8	7,277.7	37,396.5
1993	86.9	107.7	77.8	0.0	29,412.0	643.7	91.7	12,457.0	42,876.7
1994	20.1	251.7	74.4	74.0	38,029.8	998.7	44.0	12,188.8	51,681.4
1995	73.9	466.8	169.9	388.5	46,526.1	206.8	41.9	17,700.5	65,574.4
1996	78.5	140.5	169.3	1,210.9	62,105.4	573.7	140.4	23,240.6	87,659.4
1997	98.2	441.3	688.8	2,998.1	110,215.7	445.6	193.5	34,908.7	149,989.8
1998	616.6	1,207.4	573.9	3,865.4	149,705.5	1,767.1	495.8	60,152.7	218,384.5
1999	235.2	1,481.0	811.3	2,029.7	202,099.6	7,103.0	972.0	76,337.2	291,069.0
2000	1,965.3	2,726.7	1,131.6	3,475.7	242,311.3	55,911.8	2,221.4	106,257.1	416,000.8
2001	473.3	3,491.6	2,367.4	2,486.7	128,829.6	9,785.5	2,442.1	92,956.8	242,833.1
2002	449.9	566.4	4,626.0	466.8	138,408.4	6,204.5	656.0	99,706.0	251,084.0
2003	1,455.3	1,815.7	2,008.8	916.0	148,909.4	14,082.6	829.8	96,453.0	266,470.6
2004	1,102.5	1,956.0	2,766.8	2,197.0	235,632.6	17,452.9	1,998.5	182,694.8	445,801.0
2005	1,524.5	9,313.2	10,561.8	1,462.6	274,786.8	41,899.1	3,041.0	299,112.2	641,701.2
2006	7,615.7	29,658.1	12,490.5	4,948.5	523,987.5	58,902.4	3,281.3	387,256.6	1,028,140.7
2007	14,631.9	18,525.4	10,856.2	4,912.4	737,690.4	60,272.1	3,296.6	309,244.2	1,159,429.2
Total	30,634.1	72,149.5	49,439.2	31,432.3	3,139,818.6	276,402.7	19,756.5	1,834,051.4	5,453,684.1

Table 4: Venture capital dollar volume

Definitions of the various regions are given in Table 1. All figures are in millions US dollars, deflated to 2008. Totals may slightly differ due to rounding.

Year	Dev. Africa Middle East	Dev. Asia	Europe Central Asia	Latin America Caribbean	North America	Rich Asia Pacific	Rich Middle East	Western Europe	Total
1990	0.0	0.0	0.0	0.0	534.0	0.0	6.7	410.0	950.7
1991	0.0	0.0	1.8	0.0	707.1	0.0	0.0	130.6	839.5
1992	0.0	0.0	1.0	0.0	886.4	3.1	0.0	199.8	1,090.2
1993	0.0	0.0	8.4	0.0	1,303.6	10.5	0.0	299.5	1,622.1
1994	0.0	146.7	1.5	0.0	2,643.9	17.7	16.3	246.2	3,072.4
1995	0.0	171.1	7.7	0.0	3,060.5	13.8	10.3	268.6	3,532.0
1996	0.0	10.4	18.0	243.8	3,821.4	70.3	46.1	1,089.0	5,298.9
1997	0.0	115.8	7.0	1,016.1	5,320.7	205.8	55.5	1,524.9	8,245.8
1998	0.0	14.0	98.5	262.7	9,681.1	23.4	159.6	1,807.4	12,046.8
1999	9.0	326.5	163.8	618.6	32,602.4	505.1	342.8	5,553.7	40,122.0
2000	2.5	424.4	176.6	1,450.1	81,415.9	2,222.4	1,313.3	16,798.0	103,803.3
2001	25.6	2,101.5	85.1	237.3	38,003.2	417.7	753.7	14,075.4	55,699.7
2002	0.0	146.9	65.0	16.3	20,976.1	185.8	378.9	5,650.1	27,419.0
2003	0.0	339.6	63.5	4.9	17,461.0	171.0	314.4	3,421.1	21,775.5
2004	3.4	277.4	52.4	12.4	21,823.3	339.6	364.3	5,049.2	27,922.1
2005	17.2	2,070.7	156.1	88.7	24,785.1	627.3	519.7	7,791.8	36,056.7
2006	16.1	1,993.0	460.4	83.2	29,975.6	1,493.60	919.1	10,710.5	45,651.5
2007	65.5	3,375.1	523.0	372.4	28,315.5	336.6	645.7	9,397.3	43,031.2
Total	139.4	11,513.2	1,890.1	4,406.4	323,316.8	6,643.7	5,846.4	84,423.3	438,179.5

Table 5: LBO dollar volume

Definitions of the various regions are given in Table 1. All figures are in millions US dollars, deflated to 2008. Totals may slightly differ due to rounding.

Year	Dev. Africa Middle East	Dev. Asia	Europe Central Asia	Latin America Caribbean	North America	Rich Asia Pacific	Rich Middle East	Western Europe	Total
1990	27.3	0.0	23.4	0.0	21,576.2	52.7	0.0	7,128.1	28,807.7
1991	0.0	0.0	0.0	0.0	16,157.0	41.9	0.0	6,440.7	22,639.6
1992	0.0	0.0	27.9	0.0	23,907.2	0.0	0.0	6,655.6	30,590.7
1993	86.9	0.0	63.5	0.0	22,800.6	99.0	60.4	11,049.2	34,159.6
1994	19.1	0.0	64.6	58.7	29,268.2	229.2	0.0	10,514.3	40,154.1
1995	73.9	283.3	126.1	378.5	36,575.2	62.7	1.3	15,424.6	52,925.5
1996	62.2	36.5	96.2	722.4	41,129.1	413.8	48.2	19,809.1	62,317.6
1997	88.0	188.9	477.4	1,504.4	85,535.7	157	3.1	27,772.1	115,726.6
1998	565.0	778.2	301.8	1,497.8	108,561.8	1,228.8	23.9	48,354.1	161,311.3
1999	115.1	871.7	398.2	926.9	112,526.4	3,540.5	228.8	56,900.5	175,508.1
2000	1,705.4	574.6	705.8	1,216.7	92,696.2	2,733.2	91.0	62,172.4	161,895.3
2001	106.8	621.0	1,418.7	750.7	52,353.8	6,356.2	938.2	56,108.6	118,654.1
2002	392.6	17.2	4,298.6	113.1	84,071.0	4,555.4	100.8	68,789.8	162,338.5
2003	1,118.0	521.3	1,493.3	759.1	99,978.4	9,258.7	113.8	77,048.7	190,291.2
2004	462.6	264.3	2,100.8	851.7	171,322.0	8,566.4	122.4	148,371.2	332,061.3
2005	1,285.2	1,626.8	9,503.7	963.6	206,115.8	13,322.0	814.4	236,998.3	470,629.9
2006	6,643.2	13,650.8	10,218.4	4,435.8	442,544.3	38,018.8	1,511.6	325,933.0	842,955.9
2007	13,290.7	4,308.5	7,489.8	2,973.1	622,825.5	30,378.3	1,542.5	234,075.5	916,884.0
Total	26,041.9	23,743.2	38,808.1	17,152.6	2,269,944.5	119,014.6	5,600.5	1,419,545.7	3,919,851.1

Table 6: Other transaction dollar volume

Definitions of the various regions are given in Table 1. All figures are in millions US dollars, deflated to 2008. Totals may slightly differ due to rounding.

Year	Dev. Africa Middle East	Dev. Asia	Europe Central Asia	Latin America Caribbean	North America	Rich Asia Pacific	Rich Middle East	Western Europe	Total
1990	0.0	0.0	0.0	0.0	914.6	9.5	0.0	1,563.7	2,487.8
1991	171.7	0.0	0.0	0.0	1,217.3	43.2	0.0	434.4	1,866.5
1992	7.3	0.0	10.5	0.0	5,268.8	2.8	3.8	422.3	5,715.5
1993	0.0	107.7	5.9	0.0	5,307.8	534.1	31.3	1,108.2	7,095.0
1994	1.0	105.0	8.2	15.3	6,117.7	751.8	27.7	1,428.2	8,454.9
1995	0.0	12.3	36.0	10.0	6,890.5	130.4	30.3	2,007.3	9,116.8
1996	16.3	93.6	55.1	244.7	17,154.9	89.6	46.1	2,342.5	20,042.9
1997	10.2	136.6	204.4	477.6	19,359.4	82.8	134.8	5,611.7	26,017.4
1998	51.7	415.2	173.7	2,104.9	31,462.6	514.9	312.3	9,991.1	45,026.4
1999	111.1	282.8	249.2	484.2	56,970.8	3,057.3	400.5	13,883.0	75,438.9
2000	257.3	1,727.7	249.2	808.8	68,199.1	50,956.2	817.1	27,286.8	150,302.2
2001	340.9	769.1	863.6	1,498.7	38,472.6	3,011.5	750.1	22,772.7	68,479.3
2002	57.3	402.3	262.4	337.5	33,361.3	1,463.3	176.3	25,266.1	61,326.5
2003	337.3	954.8	452.0	152.0	31,470.0	4,652.9	401.5	15,983.2	54,403.9
2004	636.4	1,414.2	613.6	1,332.9	42,487.3	8,546.9	1,511.8	29,274.4	85,817.5
2005	222.2	5,615.7	901.9	410.3	43,885.8	27,949.8	1,706.9	54,322.1	135,014.6
2006	956.4	14,014.3	1,811.7	429.5	51,467.7	19,390.1	850.5	50,613.1	139,533.4
2007	1,275.7	10,841.7	2,843.5	1,566.9	86,549.4	29,557.1	1,108.3	65,771.4	199,514.1
Total	4,452.8	36,893.0	8,741.1	9,873.3	546,557.4	150,744.2	8,309.4	330,082.4	1,095,653.5

Table 7: Private equity transaction volume and national wealth

The dependent variable is private equity transaction volume relative to GDP, averaged over the period 1990-2008. The key independent value is the average GDP per capita (in real, PPP-adjusted, tens of thousands US dollars) between 1990 and 2006, which is from the World Bank (2007 and earlier years). The table shows coefficients (above) and *t*-statistics (below). Three stars denote coefficients significant at the 1% confidence level; two stars, 5%; and one star, 10%.

	(1) All Deals Vol/GDP	(2) All Deals Log Vol/GDP	(3) VC Vol/GDP	(4) VC Log Vol/GDP	(5) LBO Vol/GDP	(6) LBO Log Vol/GDP	(7) GC Vol/GDP	(8) GC Log Vol/GDP	(9) PIPE Vol/GDP	(10) PIPE Log Vol/GDP
GDP per Capita	4.643***		0.370***		3.057***		0.090***		0.061*	
	(6.997)		(3.750)		(6.279)		(3.377)		(1.946)	
Log GDP per Capita		1.369***		1.027***		1.203***		0.658***		0.237
		(9.120)		(5.392)		(7.368)		(3.886)		(0.533)
Constant	-0.699	-18.972***	-0.138	-18.584***	-0.417	-17.621***	0.094**	-15.180***	0.023	-12.033***
	(-0.912)	(-13.618)	(-1.493)	(-10.354)	(-0.621)	(-11.213)	(2.028)	(-9.344)	(0.760)	(-2.767)
Observations	107	104	107	82	107	75	107	82	107	49
R-squared	0.362	0.411	0.319	0.280	0.297	0.421	0.082	0.171	0.072	0.009

Table 8: The effect of financial development ('financial engineering')

The dependent variable is private equity transaction volume relative to GDP, averaged over the period 1990-2008. The key independent variables used are the averages of the ratio of stock market capitalization to GDP and private credit to GDP, which are from the World Bank (2007 and earlier years). The table shows coefficients (above) and *t*-statistics (below). Three stars denote coefficients significant at the 1% confidence level; two stars, 5%; and one star, 10%.

	(1) All Vol/GDP	(2) All Log Vol/GDP	(3) VC Log Vol/GDP	(4) VC Vol/GDP	(5) LBO Vol/GDP	(6) LBO Log Vol/GDP	(7) GC Vol/GDP	(8) GC Log Vol/GDP	(9) PIPE Vol/GDP	(10) PIPE Log Vol/GDP
Average Private Credit / GDP 1990-2006	-2.670	-0.508	-0.455	-0.486	0.163	-0.005	0.083	-0.220	0.101	1.155
	(-0.957)	(-0.764)	(-1.457)	(-0.797)	(0.070)	(-0.007)	(0.812)	(-0.388)	(0.828)	(1.359)
Average Stock Market Cap / GDP 1990-2006	7.637**	1.159***	0.387**	0.548	0.405	0.424	-0.041	0.148	0.281	0.581
	(2.020)	(2.695)	(2.151)	(1.320)	(0.219)	(0.801)	(-0.574)	(0.328)	(1.432)	(0.774)
GDP per Capita	4.041***		0.452***		3.189***		0.088**		-0.025	
	(5.130)		(3.026)		(4.269)		(2.556)		(-0.623)	
GDP Growth	0.466*		0.060*		0.344*		0.043		0.028*	
	(1.860)		(1.744)		(1.699)		(1.099)		(1.739)	
Log GDP per Capita		1.432***		1.355***		1.244***		0.879***		-0.023
		(5.676)		(4.563)		(4.298)		(3.875)		(-0.040)
Log GDP Growth		0.677*		0.151		0.227		0.129		1.194*
		(1.875)		(0.320)		(0.718)		(0.275)		(1.983)
Constant	-3.801***	-20.756***	-0.411**	-21.879***	-2.477***	-18.535***	-0.105	-17.427***	-0.139**	-12.298
	(-3.321)	(-9.346)	(-2.209)	(-8.272)	(-2.673)	(-6.914)	(-0.711)	(-8.885)	(-2.252)	(-2.254)
Observations	87	83	87	70	87	63	87	73	87	46
R-squared	0.566	0.508	0.383	0.426	0.400	0.500	0.142	0.287	0.317	0.148

Table 9: Deal volume and the contractual environment ('governance engineering')

The dependent variable is private equity transaction volume relative to GDP, averaged over the period 1990-2008. The key independent variable used is the log of number of calendar days to enforce a contract of unpaid debt worth 50% of the country's GDP per capita, from Djankov, McLiesh and Shleifer [2007]. The table shows coefficients (above) and *t*-statistics (below). Three stars denote coefficients significant at the 1% confidence level; two stars, 5%; and one star, 10%.

	(1) All Vol/GDP	(2) All Log Vol/GDP	(3) VC Vol/GDP	(4) VC Log Vol/GDP	(5) LBO Vol/GDP	(6) LBO Log Vol/GDP	(7) GC Vol/GDP	(8) GC Log Vol/GDP	(9) PIPE Vol/GDP	(10) PIPE Log Vol/GDP
Ln of days to enforce a contract	-0.066	0.082	0.128	-0.027	-0.778	-0.002	0.033	0.350	0.051*	-0.140
	(-0.080)	(0.273)	(0.993)	(-0.105)	(-1.064)	(-0.007)	-0.625	(1.287)	(1.797)	(-0.348)
Average Stock Market Cap / GDP 1990-2006	6.887*	0.918***	0.248*	0.304	0.477	0.500	0.003	0.132	0.337**	1.000
	(1.978)	(3.045)	(1.938)	(0.781)	(0.322)	(1.284)	(0.058)	(0.319)	(2.071)	(1.611)
GDP per Capita	3.209***		0.298***		2.712***		0.126***		0.028	
	(4.804)		(3.015)		(5.092)		(2.815)		(0.817)	
GDP Growth	0.261		0.032		0.085		0.039		0.031***	
	(1.199)		(1.386)		(0.547)		(1.303)		(2.756)	
Log GDP per Capita		1.360***		1.128***		1.163***		0.881***		0.195
		(5.806)		(4.157)		(4.309)		(3.998)		(0.403)
Log GDP Growth		0.486		-0.123		-0.051		0.052		1.278**
		(1.413)		(-0.246)		(-0.144)		(0.106)		(2.544)
Constant	-2.578	-20.475***	-1.027	-19.462***	3.683	-17.523***	-0.286	-19.411***	-0.466**	-13.053**
	(-0.462)	(-5.929)	(-1.274)	(-5.215)	-0.799	(-4.259)	(-0.830)	(-6.184)	(-2.218)	(-2.288)
Observations	85	82	85	68	85	64	85	72	85	48
R-squared	0.526	0.514	0.288	0.369	0.343	0.456	0.146	0.267	0.374	0.145

Table 10: Deal volume and the contractual environment ('governance engineering')

The dependent variable is private equity transaction volume relative to GDP, averaged over the period 1990-2008. The key independent variable used is an index aggregating creditor rights, following La Porta et al. [1998]. The index ranges from 0 (weak creditor rights) to 4 (strong creditor rights), based on 2003. The table shows coefficients (above) and *t*-statistics (below). Three stars denote coefficients significant at the 1% confidence level; two stars, 5%; and one star, 10%.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	All	All	VC	VC	LBO	LBO	GC	GC	PIPE	PIPE
	Vol/GDP	Log Vol/GDP	Vol/GDP	Log Vol/GDP	Vol/GDP	Log Vol/GDP	Vol/GDP	Log Vol/GDP	Vol/GDP	Log Vol/GDP
Creditor rights score	0.806*	0.038	-0.003	-0.148	0.245	0.276*	0.016	0.129	0.022	0.160
	(1.881)	(0.225)	(-0.057)	(-1.044)	(0.668)	(1.851)	(0.677)	(0.893)	(0.866)	(0.656)
Average Stock Market Cap / GDP 1990-2006	6.567**	0.879***	0.228*	0.355	0.510	0.381	-0.009	-0.011	0.319**	0.927
	(2.011)	(3.127)	(1.686)	(0.939)	(0.338)	(0.983)	(-0.144)	(-0.028)	(2.022)	(1.455)
GDP per Capita	3.169***		0.267***		2.882***		0.117***		0.014	
	(4.385)		(3.644)		(5.028)		(3.113)		(0.403)	
GDP Growth	0.213		0.029		0.093		0.037		0.029**	
	(1.064)		(1.292)		(0.600)		(1.233)		(2.557)	
Log GDP per Capita		1.343***		1.183***		1.105***		0.804***		0.246
		(6.234)		(4.584)		(4.682)		(3.931)		(0.508)
Log GDP Growth		0.473		-0.075		-0.137		-0.004		1.249**
		(1.341)		(-0.148)		(-0.387)		(-0.008)		(2.505)
Constant	-4.139***	-19.892***	-0.235*	-19.930***	-1.461	-17.347***	-0.106	-16.861***	-0.184***	-14.536***
	(-2.804)	(-9.371)	(-1.736)	(-7.861)	(-1.561)	(-7.356)	(-0.910)	(-8.399)	(-2.873)	(-3.039)
Observations	85	82	85	68	85	64	85	72	85	48
R-squared	0.537	0.513	0.272	0.375	0.337	0.481	0.144	0.250	0.366	0.149

Table 11: Deal volume and the contractual environment ('governance engineering')

The dependent variable is private equity transaction volume relative to GDP, averaged over the period 1990-2008. The key independent variable used is the Index of Economic Freedom Property Rights Index from the Heritage Foundation (reported in Djankov et al. [2008]). The Property Rights Index is an assessment of the ability of individuals to accumulate private property, secured by clear laws that are fully enforced by the state. The table shows coefficients (above) and *t*-statistics (below). Three stars denote coefficients significant at the 1% confidence level; two stars, 5%; and one star, 10%.

	(1) All Vol/GDP	(2) All Log Vol/GDP	(3) VC Vol/GDP	(4) VC Log Vol/GDP	(5) LBO Vol/GDP	(6) LBO Log Vol/GDP	(7) GC Vol/GDP	(8) GC Log Vol/GDP	(9) PIPE Vol/GDP	(10) PIPE Log Vol/GDP
Property rights index	-0.004	0.008	0.001	0.026*	0.015	0.025*	0.001	0.007	-0.002	0.012
	(-0.067)	(0.617)	(0.386)	(1.946)	(0.259)	(1.804)	(0.329)	(0.530)	(-1.070)	(0.435)
Average Stock Market Cap / GDP 1990-2006	6.612*	0.433	0.179	-0.088	0.043	0.092	-0.05	-0.16	0.330*	0.823
	(1.824)	(1.564)	(1.357)	(-0.220)	(0.028)	(0.244)	(-0.689)	(-0.350)	(1.889)	(1.285)
GDP per Capita	3.855***		0.291**		3.054***		0.141**		0.071	
	(3.216)		(2.573)		(2.886)		(2.069)		(1.628)	
GDP Growth	0.532**		0.060**		0.286*		0.075**		0.042***	
	(2.372)		(2.171)		(1.714)		(2.144)		(2.916)	
Log GDP per Capita		1.323***		0.708**		0.927**		0.815***		0.299
		(3.580)		(2.532)		(2.264)		(2.833)		(0.323)
Log GDP Growth		0.513*		0.099		0.279		0.222		1.611***
		(1.683)		(0.181)		(0.840)		(0.438)		(2.733)
Constant	-4.198	-19.636***	-0.429**	-17.143***	-2.256	-17.010***	-0.277	-17.248***	-0.162*	-15.970*
	(-1.566)	(-6.688)	(-2.013)	(-7.895)	(-0.933)	(-5.086)	(-1.476)	(-7.283)	(-1.703)	(-1.952)
Observations	67	67	67	58	67	58	67	63	67	43
R-squared	0.554	0.650	0.285	0.455	0.357	0.571	0.228	0.286	0.390	0.176

Table 12: Deal volume and the contractual environment ('governance engineering')

The dependent variable is private equity transaction volume relative to GDP, averaged over the period 1990-2008. The key independent variable used is an index of minority shareholder rights, which is formed by adding one when: (1) the country allows shareholders to mail their proxy vote; (2) shareholders are not required to deposit their shares prior to the general shareholders' meeting; (3) cumulative voting or proportional representation of minorities on the board of directors is allowed; (4) an oppressed minorities mechanism is in place; (5) the minimum percentage of share capital that entitles a shareholder to call for an extraordinary shareholders' meeting is less than or equal to 10% (the sample median); and (6) when shareholders have preemptive rights that can only be waived by a shareholders' meeting. The range for the index is from 0 to 6. It is based on La Porta et al. [1998]. The table shows coefficients (above) and *t*-statistics (below). Three stars denote coefficients significant at the 1% confidence level; two stars, 5%; and one star, 10%.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	All	All	VC	VC	LBO	LBO	GC	GC	PIPE	PIPE
	Vol/GDP	Log Vol/GDP	Vol/GDP	Log Vol/GDP	Vol/GDP	Log Vol/GDP	Vol/GDP	Log Vol/GDP	Vol/GDP	Log Vol/GDP
Shareholder Rights	0.632	0.102	0.100*	0.276*	0.392	-0.010	0.065**	0.283*	0.047*	0.307
	(1.118)	(0.906)	(1.906)	(1.692)	(0.845)	(-0.085)	(2.038)	(1.821)	(1.687)	(1.377)
Average Stock Market Cap / GDP 1990-2006	6.776*	0.381	-0.024	-0.308	0.091	0.269	-0.128	-0.445	0.226	0.289
	(1.739)	(1.418)	(-0.143)	(-0.676)	(0.051)	(0.675)	(-1.439)	(-0.938)	(1.107)	(0.456)
GDP per Capita	3.873***		0.365***		3.322***		0.168***		0.054	
	(4.798)		(3.764)		(4.891)		(3.662)		(1.212)	
GDP Growth	0.511		0.123**		0.394		0.063		0.071**	
	(1.061)		(2.141)		(1.119)		(1.637)		(2.230)	
Log GDP per Capita		1.459***		1.612***		1.507***		0.902***		0.715
		(6.403)		(5.773)		(5.518)		(3.552)		(1.239)
Log GDP Growth		0.651		0.313		0.502		0.062		1.879***
		(1.611)		(0.463)		(1.300)		(0.116)		(3.236)
Constant	-6.831***	-20.847***	-0.840***	-25.068***	-3.551***	-21.257***	-0.352**	-18.064***	-0.431***	-19.943***
	(-3.565)	(-9.001)	(-3.433)	(-8.956)	(-2.715)	(-7.827)	(-2.211)	(-7.396)	(-2.928)	(-3.256)
Observations	47	47	47	44	47	45	47	43	47	39
R-squared	0.647	0.710	0.285	0.537	0.478	0.632	0.294	0.353	0.415	0.213

Table 13: Deal volume and the contractual environment ('governance engineering')

The dependent variable is private equity transaction volume relative to GDP, averaged over the period 1990-2008. The key independent variable used is a measure of investor protection, which is the principal component of an analysis of disclosure requirements, liability standards and minority shareholder rights. The scale is from 0 to 10 and is based on La Porta, Lopez-de-Silanes and Shleifer [2006], with a higher index meaning more protections. The table shows coefficients (above) and *t*-statistics (below). Three stars denote coefficients significant at the 1% confidence level; two stars, 5%; and one star, 10%.

	(1) ALL Vol/GDP	(2) ALL Log Vol/GDP	(3) VC Vol/GDP	(4) VC Log Vol/GDP	(5) LBO Vol/GDP	(6) LBO Log Vol/GDP	(7) GC Vol/GDP	(8) GC Log Vol/GDP	(9) PIPE Vol/GDP	(10) PIPE Log Vol/GDP
Investor Protection Score	5.395*	0.172	1.033**	1.693*	3.315	-0.423	0.392*	0.958	0.427**	0.983
	(1.811)	(0.262)	(2.161)	(1.795)	(1.437)	(-0.578)	(1.866)	(1.085)	(2.312)	(0.795)
Average Stock Market Cap / GDP 1990-2006	6.353	0.448	-0.124	-0.359	-0.166	0.337	-0.142	-0.354	0.190	0.371
	(1.605)	(1.573)	(-0.612)	(-0.755)	(-0.094)	(0.795)	(-1.505)	(-0.727)	(0.910)	(0.530)
GDP per Capita	3.878***		0.364***		3.325***		0.170***		0.054	
	(4.949)		(4.116)		(4.951)		(3.773)		(1.362)	
GDP Growth	0.411		0.099**		0.333		0.060		0.062**	
	(0.894)		(2.107)		(0.890)		(1.550)		(2.095)	
Log GDP per Capita		1.455***		1.593***		1.509***		0.912***		0.697
		(6.328)		(5.574)		(5.533)		(3.379)		(1.196)
Log GDP Growth		0.678		0.209		0.559		0.075		1.889***
		(1.588)		(0.314)		(1.380)		(0.138)		(2.930)
Constant	-6.866***	-20.657***	-0.881***	-24.690***	-3.567***	-21.213***	-0.324**	-17.836***	-0.438***	-19.372***
	(-3.556)	(-8.668)	(-3.446)	(-8.428)	(-2.793)	(-7.674)	(-2.116)	(-6.769)	(-3.356)	(-3.267)
Observations	47	47	47	44	47	45	47	43	47	39
R-squared	0.654	0.706	0.325	0.537	0.485	0.635	0.294	0.318	0.448	0.195

Table 14: Deal volume and the business environment ('operational engineering'):

The dependent variable is private equity transaction volume relative to GDP, averaged over the period 1990-2008. The key independent variable used is the Economic Freedom of the World Freedom to Trade Internationally Index from the Fraser Institute (from Djankov et al. [2008]). This index measures taxes on international trade, regulatory trade barriers, size of the trade sector relative to expected, black-market exchange rates and international capital market controls, with a higher index implying more freedoms. The table shows coefficients (above) and *t*-statistics (below). Three stars denote coefficients significant at the 1% confidence level; two stars, 5%; and one star, 10%.

	(1) ALL Vol/GDP	(2) ALL Log Vol/GDP	(3) VC Vol/GDP	(4) VC Log Vol/GDP	(5) LBO Vol/GDP	(6) LBO Log Vol/GDP	(7) GC Vol/GDP	(8) GC Log Vol/GDP	(9) PIPE Vol/GDP	(10) PIPE Log Vol/GDP
Freedom to trade index	2.027	0.611**	0.045	0.537	0.972	0.710**	-0.012	0.173	-0.023	-0.828
	(1.591)	(2.229)	(0.370)	(1.639)	(1.033)	(2.157)	(-0.199)	(0.540)	(-0.405)	(-1.095)
Average Stock Market Cap / GDP 1990-2006	5.729*	0.236	0.167	-0.066	-0.304	0.041	-0.04	-0.157	0.327*	1.128
	(1.718)	(0.833)	(1.112)	(-0.157)	(-0.165)	(0.093)	(-0.538)	(-0.352)	(1.921)	(1.488)
GDP per Capita	2.923***		0.296***		2.878***		0.163***		0.046	
	(3.012)		(3.283)		(3.828)		(3.700)		(0.951)	
GDP Growth	0.343		0.056*		0.198		0.076**		0.044***	
	(1.618)		(1.922)		(1.191)		(2.054)		(2.725)	
Log GDP per Capita		1.155***		0.874***		0.994***		0.832***		1.102
		(4.249)		(3.494)		(2.950)		(3.325)		(1.095)
Log GDP Growth		0.278		-0.200		-0.086		0.138		2.166**
		(0.785)		(-0.388)		(-0.220)		(0.254)		(2.437)
Constant	-16.758**	-21.732***	-0.659	-20.696***	-7.722	-20.887***	-0.169	-18.178***	-0.085	-17.517***
	(-2.076)	(-10.576)	(-0.864)	(-8.462)	(-1.403)	(-8.534)	(-0.468)	(-8.364)	(-0.244)	(-2.777)
Observations	66	66	66	57	66	58	66	62	66	43
R-squared	0.569	0.677	0.282	0.428	0.360	0.581	0.225	0.287	0.383	0.202

Table 15: Deal volume and the business environment ('operational engineering')

The dependent variable is private equity transaction volume relative to GDP, averaged over the period 1990-2008. The key independent variable used is an employment rigidity index, based on World Bank (Doing Business) data and updated from Botero et al. [2004]. The index is an average of three sub-indices: a difficulty of hiring index, a rigidity of hours index and a difficulty of firing index. A higher index means lower rigidities. The table shows coefficients (above) and *t*-statistics (below). Three stars denote coefficients significant at the 1% confidence level; two stars, 5%; and one star, 10%.

	(1) ALL Vol/GDP	(2) ALL Log Vol/GDP	(3) VC Vol/GDP	(4) VC Log Vol/GDP	(5) LBO Vol/GDP	(6) LBO Log Vol/GDP	(7) GC Vol/GDP	(8) GC Log Vol/GDP	(9) PIPE Vol/GDP	(10) PIPE Log Vol/GDP
Employment rigidity index	-0.021	-0.001	-0.008*	-0.011	-0.012	-0.009	-0.001	-0.002	-0.003	-0.014
	(-0.758)	(-0.101)	(-1.947)	(-0.996)	(-0.432)	(-0.899)	(-0.496)	(-0.192)	(-1.408)	(-0.661)
Average Stock Market Cap / GDP 1990-2006	6.226*	0.498*	0.057	-0.029	-0.082	0.155	-0.067	-0.124	0.275	0.685
	(1.704)	(1.693)	(0.380)	(-0.064)	(-0.047)	(0.364)	(-0.754)	(-0.274)	(1.545)	(1.073)
GDP per Capita	3.795***		0.320***		3.309***		0.159***		0.038	
	(5.207)		(4.009)		(5.310)		(4.011)		(1.078)	
GDP Growth	0.513**		0.054*		0.278		0.074**		0.040***	
	(2.200)		(1.877)		(1.563)		(2.135)		(2.708)	
Log GDP per Capita		1.437***		1.191***		1.383***		0.915***		0.555
		(6.716)		(4.815)		(4.869)		(4.555)		(0.919)
Log GDP Growth		0.492		0.005		0.196		0.201		1.554***
		(1.610)		(0.010)		(0.510)		(0.406)		(2.787)
Constant	-3.365*	-20.206***	-0.039	-19.604***	-1.254	-19.363***	-0.185	-17.707***	-0.111	-17.068***
	(-1.851)	(-8.678)	(-0.202)	(-7.799)	(-0.882)	(-6.112)	(-1.207)	(-8.580)	(-1.141)	(-2.795)
Observations	67	67	67	58	67	58	67	63	67	43
R-squared	0.556	0.647	0.311	0.416	0.357	0.540	0.230	0.283	0.400	0.179

Table 16: Deal volume and the business environment ('operational engineering')

The dependent variable is private equity transaction volume relative to GDP, averaged over the period 1990-2008. The key independent variable used is the number of procedures to start a business from World Bank (Doing Business) data, from Djankov et al. [2008]. This variable includes all procedures that are officially required for an entrepreneur to start up and formally operate an industrial or commercial business. The table shows coefficients (above) and *t*-statistics (below). Three stars denote coefficients significant at the 1% confidence level; two stars, 5%; and one star, 10%.

	(1) All Vol/GDP	(2) All Log Vol/GDP	(3) VC Vol/GDP	(4) VC Log Vol/GDP	(5) LBO Vol/GDP	(6) LBO Log Vol/GDP	(7) GC Vol/GDP	(8) GC Log Vol/GDP	(9) PIPE Vol/GDP	(10) PIPE Log Vol/GDP
Procedures to start a business	-0.295**	-0.105**	-0.016	-0.040	-0.277**	-0.140***	0.010	-0.006	-0.003	-0.041
	(-2.146)	(-2.293)	(-0.693)	(-0.698)	(-2.452)	(-3.108)	-0.759	(-0.108)	(-0.497)	(-0.431)
Average Stock Market Cap / GDP 1990-2006	6.393*	0.387	0.176	0.121	-0.058	0.186	-0.038	-0.084	0.316*	0.829
	(1.770)	(1.510)	(1.257)	(0.297)	(-0.036)	(0.521)	(-0.554)	(-0.207)	(1.836)	(1.328)
GDP per Capita	3.188***		0.283***		2.739***		0.178***		0.03	
	(4.358)		(4.261)		(4.381)		(4.083)		(0.814)	
GDP Growth	0.464**		0.057**		0.223		0.077**		0.041***	
	(2.329)		(2.036)		(1.607)		(2.184)		(2.841)	
Log GDP per Capita		1.237***		1.091***		1.103***		0.900***		0.422
		(5.220)		(4.091)		(3.951)		(3.503)		(0.604)
Log GDP Growth		0.386		-0.049		-0.001		0.206		1.540**
		(1.178)		(-0.095)		(-0.004)		(0.396)		(2.583)
Constant	-0.488	-17.273***	-0.175	-18.714***	1.816	-15.632***	-0.369*	-17.611***	-0.183	-15.947**
	(-0.234)	(-6.465)	(-0.568)	(-6.306)	(1.235)	(-4.959)	(-1.851)	(-5.953)	(-1.428)	(-2.075)
Observations	66	66	66	57	66	57	66	62	66	42
R-squared	0.561	0.673	0.286	0.406	0.370	0.587	0.230	0.284	0.383	0.166

Table 17: Deal volume and the business environment ('operational engineering')

The dependent variable is private equity transaction volume relative to GDP, averaged over the period 1990-2008. The key independent variable used is a corruption index measuring "the exercise of public power for private gain" in the year 2000. It captures aspects ranging from the frequency of additional payments to get things done to the effects of corruption on the business environment. A higher index indicates a low level of corruption. The source is Kauffman, Kraay and Mastruzzi [2003]. The table shows coefficients (above) and *t*-statistics (below). Three stars denote coefficients significant at the 1% confidence level; two stars, 5%; and one star, 10%.

	(1) All Vol/GDP	(2) All Log Vol/GDP	(3) VC Vol/GDP	(4) VC Log Vol/GDP	(5) LBO Vol/GDP	(6) LBO Log Vol/GDP	(7) GC Vol/GDP	(8) GC Log Vol/GDP	(9) PIPE Vol/GDP	(10) PIPE Log Vol/GDP
Corruption index	0.042	0.416	0.010	0.677*	2.896**	0.661**	-0.012	0.584	-0.186**	0.022
	(0.024)	(1.443)	(0.069)	(1.871)	(2.616)	(2.313)	(-0.197)	(1.584)	(-2.120)	(0.030)
Average Stock Market Cap / GDP 1990-2006	7.319*	0.428	0.061	-0.091	-0.051	0.202	-0.07	-0.258	0.298	0.542
	(1.824)	(1.533)	(0.396)	(-0.213)	(-0.034)	(0.571)	(-0.882)	(-0.566)	(1.592)	(0.839)
GDP per Capita	3.874**		0.362*		0.735		0.183**		0.224**	
	(2.697)		(1.970)		(0.631)		(2.422)		(2.447)	
GDP Growth	0.644		0.144**		0.342		0.077*		0.089**	
	(1.423)		(2.428)		(0.914)		(1.716)		(2.225)	
Log GDP per Capita		1.008**		0.776		0.762		0.272		0.674
		(2.279)		(1.517)		(1.634)		(0.555)		(0.815)
Log GDP Growth		0.595		0.215		0.301		0.061		2.023***
		(1.369)		(0.300)		(0.742)		(0.100)		(2.946)
Constant	-5.772**	-16.605***	-0.670**	-16.921***	0.009	-14.540***	-0.26	-11.887**	-0.543**	-18.970**
	(-2.104)	(-4.003)	(-2.288)	(-3.563)	(0.004)	(-3.274)	(-1.564)	(-2.597)	(-2.607)	(-2.373)
Observations	47	47	47	44	47	45	47	43	47	39
R-squared	0.640	0.720	0.265	0.536	0.535	0.669	0.247	0.346	0.457	0.189

Table 18: Deal volume and the business environment ('operational engineering')

The dependent variable is private equity transaction volume relative to GDP, averaged over the period 1990-2008. The key independent variable used is the time needed to comply with taxes, recorded in hours per year from World Bank (Doing Business) data and Djankov et al. [2008]. The indicator measures the time to prepare, file and pay (or withhold) three major types of taxes: the corporate income tax; value added or sales tax; and labour taxes, including payroll taxes and social security contributions. The table shows coefficients (above) and *t*-statistics (below). Three stars denote coefficients significant at the 1% confidence level; two stars, 5%; and one star, 10%.

	(1) All Vol/GDP	(2) All Log Vol/GDP	(3) VC Vol/GDP	(4) VC Log Vol/GDP	(5) LBO Vol/GDP	(6) LBO Log Vol/GDP	(7) GC Vol/GDP	(8) GC Log Vol/GDP	(9) PIPE Vol/GDP	(10 PIPE Log Vol/GDP
Time to comply with taxes	0.001	0.000	0.000	0.001	0.000	0.000	0.000*	0.001**	0.000	0.001*
	(1.011)	(0.904)	(0.758)	(1.621)	(0.126)	(-0.468)	(1.908)	(2.411)	(1.374)	(1.913)
Average Stock Market Cap / GDP 1990-2006	6.670*	0.557**	0.194	0.237	0.135	0.306	-0.023	0.051	0.323*	0.971
	(1.865)	(2.104)	(1.425)	(0.582)	(0.082)	(0.805)	(-0.357)	(0.128)	(1.894)	(1.625)
GDP per Capita	3.874***		0.324***		3.309***		0.183***		0.042	
	(5.338)		(3.991)		(5.41)		(4.344)		(1.151)	
GDP Growth	0.547**		0.062**		0.290*		0.079**		0.043***	
	(2.355)		(2.173)		(1.676)		(2.227)		(2.971)	
Log GDP per Capita		1.466***		1.249***		1.349***		1.028***		0.764
		(5.854)		(4.212)		(4.138)		(5.592)		(1.154)
Log GDP Growth		0.522		0.108		0.186		0.331		1.795***
		(1.656)		(0.209)		(0.471)		(0.676)		(3.235)
Constant	-4.841***	-20.686***	-0.429***	-20.990***	-1.857*	-19.375***	-0.380**	-19.424***	-0.259***	-20.277***
	(-3.110)	(-7.919)	(-2.731)	(-6.723)	(-1.817)	(-5.545)	(-2.318)	(-10.279)	(-3.198)	(-2.917)
Observations	67	67	67	58	67	58	67	63	67	43
R-squared	0.555	0.650	0.285	0.422	0.356	0.536	0.268	0.337	0.387	0.190

Table 19: Deal volume and the business environment ('operational engineering')

The dependent variable is private equity transaction volume relative to GDP, averaged over the period 1990-2008. The key independent variable used is the statutory corporate tax rate (in per cent) from Djankov et al. [2008]. The tax rate is for the highest bracket of all taxes on corporate income, taking into account the deductibility of one or more of those taxes when computing the tax base for corporate income. The table shows coefficients (above) and *t*-statistics (below). Three stars denote coefficients significant at the 1% confidence level; two stars, 5%; and one star, 10%.

	(1) All Vol/GDP	(2) All Log Vol/GDP	(3) VC Vol/GDP	(4) VC Log Vol/GDP	(5) LBO Vol/GDP	(6) LBO Log Vol/GDP	(7) GC Vol/GDP	(8) GC Log Vol/GDP	(9) PIPE Vol/GDP	(10) PIPE Log Vol/GDP
Statutory tax rate	-0.149	-0.020	0.014	-0.002	-0.114	-0.036	0.009	-0.01	0.009*	0.114***
	(-1.132)	(-0.966)	(1.154)	(-0.080)	(-1.020)	(-1.480)	(1.440)	(-0.332)	(1.779)	(3.249)
Average Stock Market Cap / GDP 1990-2006	6.241*	0.490*	0.218*	0.163	-0.136	0.284	-0.024	-0.10	0.339*	1.172*
	(1.826)	(1.833)	(1.701)	(0.396)	(-0.075)	(0.701)	(-0.345)	(-0.245)	(1.929)	(1.775)
GDP per Capita	3.813***		0.313***		3.325***		0.157***		0.034	
	(5.146)		(3.971)		(5.290)		(4.267)		(0.991)	
GDP Growth	0.346		0.077**		0.147		0.086**		0.054***	
	(1.512)		(2.198)		(0.909)		(2.373)		(3.198)	
Log GDP per Capita		1.415***		1.181***		1.326***		0.901***		0.734
		(6.167)		(4.554)		(4.458)		(4.404)		(1.128)
Log GDP Growth		0.367		0.012		-0.03		0.139		2.383***
		(1.049)		(0.021)		(-0.078)		(0.232)		(3.874)
Constant	0.918	-19.284***	-0.862*	-19.934***	2.192	-17.871***	-0.559**	-17.270***	-0.548***	-24.027***
	(0.184)	(-8.068)	(-1.862)	(-6.639)	(0.490)	(-5.460)	(-2.188)	(-6.773)	(-2.721)	(-3.233)
Observations	67	67	67	58	67	58	67	63	67	43
R-squared	0.567	0.651	0.299	0.407	0.371	0.552	0.251	0.284	0.422	0.267

Table 20: Multinomial regression analysis

The dependent variable is private equity transaction volume relative to GDP, averaged over the period 1990-2008. The independent variables used are those in the earlier tables. The table shows coefficients (above) and *t*-statistics (below). Three stars denote coefficients significant at the 1% confidence level; two stars, 5%; and one star, 10%.

	(1) All Vol/GDP	(2) All Log V/G	(3) VC Vol/GDP	(4) VC Log V/G	(5) LBO Vol/GDP	(6) LBO Log V/G	(7) GC Vol/GDP	(8) GC Log V/G	(9) PIPE Vol/GDP	(10) PIPE Log V/G
Average Private Credit / GDP 1990-2006	-4.061	0.055	-0.319	-1.535	2.671	0.271	0.157	0.050	-0.182	-0.746
	(-0.888)	(0.077)	(-1.004)	(-1.611)	(0.772)	(0.316)	(0.852)	(0.047)	(-1.032)	(-0.415)
Ln of days to enforce a contract	-0.151	0.221	0.373	0.213	-0.559	0.043	0.228*	0.697**	0.068	0.100
	(-0.105)	(1.141)	(1.063)	(0.564)	(-0.419)	(0.165)	(1.970)	(2.651)	(1.238)	(0.178)
Creditor rights score	1.519**	0.286**	-0.011	-0.317	0.424	0.263	0.068	0.100	0.002	-0.087
	(2.160)	(2.254)	(-0.083)	(-1.592)	(0.612)	(1.576)	(1.458)	(0.501)	(0.063)	(-0.218)
Property rights index	0.046	-0.013	-0.012	0.061	-0.061	-0.009	-0.003	0.003	0.009	0.083
	(0.324)	(-0.360)	(-0.475)	(1.087)	(-0.646)	(-0.286)	(-0.354)	(0.062)	(1.224)	(1.006)
Investor protection score	10.384**	0.416	0.554	1.812	2.941	-0.005	0.190	0.486	0.557**	0.456
	(2.310)	(0.467)	(1.129)	(1.257)	(0.823)	(-0.005)	(0.892)	(0.394)	(2.515)	(0.144)
Corruption index	-2.977	0.176	0.221	0.086	2.398	0.343	0.115	0.991	-0.299*	-0.780
	(-0.954)	(0.369)	(0.661)	(0.146)	(1.144)	(0.573)	(0.943)	(1.569)	(-2.014)	(-0.531)
Freedom to trade index	2.954	0.179	0.280	0.332	-0.411	-0.041	0.083	0.034	0.092	-0.888
	(1.409)	(0.527)	(1.027)	(0.580)	(-0.266)	(-0.098)	(0.776)	(0.061)	(1.036)	(-0.813)
Employment rigidity index	0.060	0.010	-0.016**	-0.008	0.025	0.008	0.003	0.017	-0.003	-0.012
	(0.732)	(0.742)	(-2.167)	(-0.438)	(0.359)	(0.561)	(0.743)	(0.991)	(-1.252)	(-0.336)
Procedures to start a business	-0.537	-0.089	0.018	0.095	-0.552**	-0.099	0.018	-0.019	0.015	0.076
	(-1.601)	(-1.137)	(0.332)	(0.816)	(-2.057)	(-1.304)	(0.681)	(-0.152)	(1.145)	(0.404)
Time to comply with taxes	0.002**	0.001	0.000	0.000	0.002*	0.000	0.000	0.001	0.000	0.000
	(2.090)	(1.082)	(0.308)	(0.241)	(1.755)	(0.976)	(0.675)	(0.955)	(0.139)	(0.010)
Statutory tax rate	-0.011	-0.005	0.021	0.023	-0.057	-0.02	0.017*	0.026	0.013	0.089
	(-0.062)	(-0.184)	(1.384)	(0.618)	(-0.373)	(-0.658)	(1.864)	(0.504)	(1.591)	(1.266)
Average Stock Market Cap / GDP 1990-2006	6.410*	0.274	-0.12	0.204	-1.402	0.050	-0.105	0.053	0.261	1.308
	(1.837)	(0.732)	(-0.396)	(0.374)	(-0.630)	(0.076)	(-0.900)	(0.084)	(1.387)	(0.935)
GDP per Capita	4.626**		0.496**		0.809		0.200*		0.228**	
	(2.228)		(2.354)		(0.442)		(2.034)		(2.747)	
GDP Growth	-0.412		0.140*		0.100		0.125**		0.062	
	(-0.580)		(1.903)		(0.207)		(2.374)		(1.294)	
Log GDP per Capita		1.414***		0.725		1.172**		0.089		0.740
		(2.921)		(0.956)		(2.171)		(0.115)		(0.449)
Log GDP Growth		0.380		-0.110		0.185		0.174		2.418
		(0.533)		(-0.115)		(0.296)		(0.158)		(1.355)
Constant	-27.484	-21.968***	-4.651	-23.746***	12.753	-16.971***	-3.347**	-17.048***	-2.545***	-21.704
	(-1.280)	(-5.388)	(-1.515)	(-4.066)	-0.652	(-3.095)	(-2.741)	(-3.013)	(-3.065)	(-1.618)
Observations	43	43	43	40	43	42	43	40	43	36
R-squared	0.769	0.807	0.453	0.660	0.613	0.757	0.525	0.492	0.695	0.302

Table 21: Multinomial regression analysis using annual data

The dependent variable is US dollar volume of private equity transactions over GDP at the country-year level. 'Lagged GDP/ Capita' is GDP per capita, expressed in PPP-adjusted tens of thousands of US dollars, for the country in the preceding year. 'Lagged GDP growth' is real growth in GDP per capita for the country in the preceding year. 'US PE fundraising (lag)' is fundraising by US-based private equity funds as a percentage of US stock market capitalization in the preceding year. The Heritage Foundation Property Rights Protection Index and the Freedom International Trade Index are now measured by country and year. The other variables are defined as in previous tables and do not vary across years. Regression (3) includes year fixed effects. The table shows coefficients (above) and *t*-statistics (below). Three stars denote coefficients significant at the 1% confidence level; two stars, 5%; and one star, 10%. Standard errors are clustered at the country level.

	(1) All Deals Vol/GDP	(2) All Deals Vol/GDP	(3) All Deals Vol/GDP
GDP/cap (lag)	4.823***	4.645***	4.468***
	3.036	5.162	5.148
GDP growth (lag)	-0.047	0.025	-0.028
	-0.203	0.356	-0.399
Year	0.582**	0.360***	0.440***
	2.527	4.178	3.825
Average Stock Market Cap / GDP 1990-2006	5.384**	1.7	1.745*
	2.209	1.636	1.687
Creditor rights score	1.432**	0.645*	0.638*
	2.407	1.857	1.834
Investor protection score	6.639**	5.237***	5.246***
	2.156	3.227	3.219
Corruption index	-2.610**	-1.731***	-1.642***
	-2.043	-3.364	-3.236
Procedures to start a business	-0.417	-0.21	-0.216
	-1.615	-1.304	-1.348
Time to comply with taxes	0.002*	0.001*	0.001*
	1.958	1.969	1.916
PE Fundraising (lag)	0.760**	0.317**	
	2.103	2.152	
Average Private Credit / GDP 1990-2006	-2.184		
	-0.677		
Ln of days to enforce a contract	0.024		
	0.019		
Yearly Property Rights Index	0.068		
	1.406		
Yearly Freedom to Trade Index	0.564		
	0.596		
Employment rigidity index	0.084		
	1.29		
Statutory tax rate	-0.094		
	-0.825		
Constant	-1,182.016**	-726.691***	-880.954***
	-2.559	-4.219	-3.838
Observations	337	772	772
R-squared	0.188	0.223	0.254

Table 22: Private equity deal characteristics by region and transaction type

The table reports various deal characteristics by geographical region and type of private equity investment using a sample of 76,398 transactions closed by private equity investors worldwide from 1984 through September 2008. The classification of Venture Capital, Growth Capital, Leveraged Buyouts and PIPE follows the classification in Capital IQ. 'Other Acquisitions' refers to M&A transactions undertaken by private equity funds that are not classified as leveraged buyouts or similar transactions (for example, going private transaction, management buyout, JV/LBO) in Capital IQ. 'Other Private Placement' refers to private placements undertaken by private equity funds that are not classified as a VC of growth capital transaction in Capital IQ. 'Rich Asia Pacific' includes Japan, Singapore, Hong Kong, Macao, South Korea, Australia and New Zealand. All other Asia-Pacific countries are classified as 'Developing Asia'. 'Rich Middle East' includes United Arab Emirates, Saudi Arabia, Kuwait, Bahrain, and Israel. All other Middle East countries are included in the 'Developing Africa and Middle East' group. 'W. Europe' includes the EU countries as well as Norway, Switzerland, the Mediterranean islands, the English Channel islands and the Caribbean islands of Anguilla, British Virgin Islands, Aruba, Bahamas, Bermuda and Cayman Islands. Other Caribbean Islands are included in the 'Latin America and Caribbean' region. 'Syndicated deals' are deals where there is more than one investor participating in the transaction. 'Non-PE investor in syndicate' denote deals where in addition to at least one private equity fund investor there is also at least one investor that is not a private equity fund in the syndicate. 'Minority deal' are deals where the investor syndicate acquires less than 50% of the equity in the target company. Classification of 'domestic' and 'foreign' investors are done at the target country level.

	VC	Growth Capital	LBO	PIPE	Other Acquisition	Other Private Placement	Total	Number of observ.
% Syndicated deals	65.6	42.4	24	47	35.3	80	50.8	76,398
% with non-PE fund investor in syndicate	14.5	10.7	5.1	13.6	24.2	11.1	11.9	76,398
% Minority deal	99.5	99.3	0.9	98.9	56.8	59.9	72.7	76,398
% with only domestic investors	71	76	78.2	70.1	65.5	74.5	73.3	76,398
% with only foreign investors	9.1	12.9	16.9	14.2	25.1	5.2	12.5	76,398
% with both dom. & for. investors	19.9	11.1	5	15.7	9.4	20.4	14.2	72,825

	Developing Africa Middle East	Developing Asia	Eastern Europe, Central Asia	Latin America Caribbean	USA & Canada	Rich Asia Pacific	Rich Middle East	W. Europe
% Syndicated deals	77.3	47.5	40.0	67.7	56.4	39.4	59.3	40.0
% with non-PE fund investor in syndicate	2.4	7.8	4.0	3.1	14.3	12.4	10.7	8.9
% Minority deal	19.2	76.2	50.9	33.2	79.3	64.6	88.6	64.3
% with only domestic investors	60.9	17.6	43.2	17.5	80.5	43.9	47.0	68.0
% with only foreign investors	31.5	64.6	50.0	70.4	5.3	41.1	19.9	18.6
% with both dom. & for. investors	7.7	17.8	6.8	12.0	14.2	15.1	33.1	13.4

Table 23: Determinants of cross-border deal activity

The dependent variable in regressions (1) through (3) is a dummy variable taking the value of one if at least one of the participating investors is based in the same country as the target company. The dependent variable in regressions (4) through (6) is a dummy variable taking the value of one if at least one of the participating investors is based in a different country than the target company. 'GDP/Capita (lag)' is GDP per capita, expressed in real, PPP-adjusted tens of thousands of US dollars, for the country in the preceding year. 'PE Fundraising (lag)' is fundraising by US-based private equity funds as a percentage of US stock market capitalization in the preceding year. 'Number of investors' is the number of distinct investors participating in the deal. The other variables are defined as in previous tables and do not vary across years. The table shows coefficients (above) and *t*-statistics (below). Three stars denote coefficients significant at the 1% confidence level; two stars, 5%; and one star, 10%. Standard errors are clustered at the country level.

	(1) Same Country	(2) Same Country	(3) Same Country	(4) Diff Country	(5) Diff Country	(6) Diff Country
GDP/cap (lag)	0.080***	0.093***	0.067***	-0.100***	-0.173***	-0.147***
	(7.490)	(7.155)	(3.610)	(-6.090)	(-8.527)	(-4.034)
GDP growth (lag)	-0.001	-0.001	0.000	0.000	-0.001	0.000
	(-0.296)	(-0.358)	(-0.033)	(0.063)	(-0.207)	(-0.074)
Creditor rights score		-0.003	0.000		0.001	0.005
		(-0.448)	(0.038)		(0.139)	(0.757)
Investor protection score		0.135***	0.131***		-0.240***	-0.282***
		(5.810)	(6.408)		(-5.661)	(-6.605)
Procedures to start a business		0.011***	0.010**		-0.026***	-0.025***
		(3.011)	(2.446)		(-4.707)	(-3.133)
PE Fundraising (lag)		-0.003***	-0.002*		0.000	0.002
		(-2.689)	(-1.662)		(0.060)	(1.191)
Year		-0.010***	-0.007***		0.022***	0.018***
		(-5.524)	(-3.298)		(7.419)	(4.166)
Log Transaction Value		-0.014	-0.021*		0.080***	0.047*
		(-1.077)	(-1.830)		(4.222)	(1.869)
Number of investors in deal			0.027***			0.054***
			(8.672)			(23.826)
Target in US or W. Europe			0.061			-0.141**
			(1.609)			(-2.295)
VC	0.056*	0.008	-0.039**	0.100	0.320***	0.153***
	(1.951)	(0.340)	(-2.042)	(1.621)	(10.464)	(3.607)
Growth Equity	0.047*	-0.004	-0.038**	0.002	0.273***	0.115***
	(1.686)	(-0.205)	(-2.181)	(0.032)	(7.272)	(3.235)
PIPE	-0.01	-0.059	-0.118*	0.140***	0.398***	0.165**
	(-0.316)	(-0.949)	(-1.923)	(3.038)	(10.186)	(2.043)
Observations	63,994	62,462	62,462	63,994	62,462	62,462

Table 24: Determinants of minority transactions, syndication and the participation of investors that are not private equity firms

The dependent variable in regressions (1) through (3) is a dummy variable taking the value of one if investors acquire a minority stake in the target company. The dependent variable in regressions (4) through (6) is a dummy variable taking the value of one if there are at least two investors participating in the deal. The dependent variable in regressions (7) through (9) is a dummy variable taking the value of one if the investment syndicate includes at least one investor that is not a private equity firm. The independent variables are defined as in previous tables. The table shows coefficients (above) and *t*-statistics (below). Three stars denote coefficients significant at the 1% confidence level; two stars, 5%; and one star, 10%. Standard errors are clustered at the country level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Minority	**Minority**	**Minority**	**Syndicated**	**Syndicated**	**Syndicated**	**Non-Fin**	**Non-Fin**	**Non-Fin**
GDP/cap (lag)	-0.001	-0.016	-0.004	0.075***	0.015	0.014	0.014	0.01	0.014
	(-0.104)	(-1.561)	(-0.303)	(7.391)	(0.512)	(0.387)	(1.449)	(0.813)	(1.061)
GDP growth (lag)	0.003	0.007***	0.007***	0.004	-0.004	-0.004	0.006**	0.003	0.003
	(1.014)	(2.902)	(2.775)	(0.887)	(-0.900)	(-0.926)	(2.373)	(0.772)	(0.762)
Creditor rights score		-0.011***	-0.011***		-0.035*	-0.035*		-0.004	-0.005*
		(-3.684)	(-3.427)		(-1.690)	(-1.702)		(-1.475)	(-1.666)
Investor protection score		0.002	-0.006		0.009	0.010		-0.007	-0.010
		(0.100)	(-0.381)		(0.152)	(0.168)		(-0.268)	(-0.390)
Procedures to start a business		0.000	0.000		-0.010	-0.010		-0.005*	-0.004*
		(-0.063)	(0.125)		(-1.591)	(-1.640)		(-1.731)	(-1.719)
PE Fundraising (lag)		0.000	-0.001		-0.012***	-0.012***		-0.002	-0.002
		(-0.262)	(-0.435)		(-6.543)	(-6.208)		(-0.888)	(-0.928)
Year		0.003*	0.001		0.004	0.004		-0.003**	-0.003**
		(1.844)	(0.784)		(0.775)	(0.747)		(-1.961)	(-2.263)
Log Transaction Value		-0.029***	-0.029***		0.095***	0.095***		0.034***	0.034***
		(-3.288)	(-3.426)		(7.451)	(7.490)		(15.001)	(14.278)
VC	0.858***	0.811***	0.810***	0.411***	0.618***	0.618***	0.106***	0.204***	0.203***
	(32.290)	(55.615)	(53.670)	(6.594)	(6.915)	(6.904)	(23.859)	(31.236)	(29.330)
Growth Equity	0.346***	0.306***	0.306***	0.215***	0.420***	0.420***	0.084***	0.221***	0.220***
	(40.220)	(70.581)	(69.532)	(3.259)	(4.750)	(4.741)	(10.894)	(17.237)	(16.404)
PIPE	0.176***	0.160***	0.159***	0.211***	0.381***	0.381***	0.116***	0.263***	0.261***
	(36.861)	(58.471)	(55.057)	(3.777)	(4.382)	(4.363)	(8.383)	(14.190)	(13.324)
Target in US or W. Europe			-0.032			0.006			-0.016
			(-1.254)			(0.084)			(-1.036)
Observations	65,468	63,933	63,933	65,468	63,933	63,933	65,468	63,933	63,933

Table 25: Private equity deal outcomes by region and transaction type

The table shows exit status of the transaction by 1 July 2008, sorted by geographical region and type of private equity investment using a sample of 76,398 transactions closed by private equity investors worldwide from 1984 through September 2008. The classification of Venture Capital, Growth Capital, Leveraged Buyouts and PIPE follows the classification in Capital IQ. 'Other Acquisitions' refers to M&A transactions undertaken by private equity funds that are not classified as leveraged buyouts or similar transactions (for example, going private transaction, management buyout, JV/LBO) in Capital IQ. 'Other Private Placement' refers to private placements undertaken by private equity funds that are not classified as a VC of growth capital transaction in Capital IQ. 'Rich Asia Pacific' includes Japan, Singapore, Hong Kong, Macao, South Korea, Australia and New Zealand. All other Asia-Pacific countries are classified as 'Developing Asia'. 'Rich Middle East' includes United Arab Emirates, Saudi Arabia, Kuwait, Bahrain and Israel. All other Middle East countries are included in the 'Developing Africa and Middle East' group. 'W. Europe' includes the EU countries as well as Norway, Switzerland, the Mediterranean islands, the English Channel islands and the Caribbean islands of Anguilla, British Virgin Islands, Aruba, Bahamas, Bermuda and Cayman Islands. Other Caribbean Islands are included in the 'Latin America and Caribbean' region. 'Acquired' means that all of the target company investors have exited and that, in addition, the target company is a subsidiary of another company according to Capital IQ. 'Public' means that all of the target company investors have exited and that, in addition, the target company is publicly traded according to Capital IQ. 'Failed' means that the target company is out of business, liquidated or financially reorganized according to Capital IQ. 'Unknown exit' means that all investors in the transaction have exited the deal, but that the company is still recorded as an independent private company in Capital IQ. Finally, 'Not exited' means that not all investors who participated in the transaction have exited the target company.

Panel A: All transactions.

	VC	Growth Capital	LBO	PIPE	Other Acquisition	Other Private Placement	Total
% of the number of transactions where the target company is							
Acquired	24.5	30.1	26.2	15	15.6	29.1	24.9
Public	1.4	4.6	2.5	17.6	3.1	11.8	3.9
Failed	5.5	5.5	2.9	5.6	2.5	5.6	4.8
Unknown exit	4.8	12	14.7	2.1	6.9	3.9	8.1
Not exited	63.8	47.8	53.7	59.8	71.8	49.7	58.3
Number of observations	31,799	11,908	16,670	5,307	3,364	3,059	72,107

	Developing Africa and Middle East	Developing Asia	Eastern Europe, Central Asia	Latin America Caribbean	USA & Canada	Rich Asia Pacific	Rich Middle East	W.Europe	Total
% of the number of transactions where the target company is									
Acquired	9.8	5.7	16	15.3	29.2	17.7	15.7	19.5	24.9
Public	1.6	2	2.9	2.4	5	2.3	2.9	2.1	3.9
Failed	0	0.1	1.3	0.3	6.1	1.5	5.2	2.9	4.8
Unknown exit	6.6	1.5	15.1	11.6	5.9	7.4	4.9	12.5	8.1
Not exited	82	90.6	64.8	70.5	53.8	71.1	71.4	63	58.3
Number of observations	244	1,033	1,076	380	43,316	1,445	1,295	23,318	72,107

Panel B: Transactions between 1995 and 2005 only.

	VC	Growth Capital	LBO	PIPE	Other Acquisition	Other Private Placement	Total
% of the number of transactions where the target company is							
Acquired	30.9	30.4	31.6	19.7	22.6	33.9	30
Public	1.4	4.2	2.7	22.6	4.7	14.3	4.4
Failed	7.2	5.9	3.3	6.3	3.9	7	6
Unknown exit	6.3	12.2	19.1	2.7	10.1	4.7	9.9
Not exited	54.3	47.2	43.2	48.6	58.8	40.1	49.8
Number of observations	22,616	10,267	10,358	3,515	1,891	2,279	50,926

	Developing Africa and Middle East	Developing Asia	Eastern Europe, Central Asia	Latin America Caribbean	USA & Canada	Rich Asia Pacific	Rich Middle East	W.Europe	Total
% of the number of transactions where the target company is									
Acquired	12.8	13.1	22.8	18.4	34.2	22.8	19.7	24.1	30
Public	2.7	4.1	3.7	3	5.5	2.6	3.7	2.5	4.4
Failed	0	0.2	1.6	0.3	7.4	1.9	7.2	3.7	6
Unknown exit	10.7	3	22.1	13.2	6.9	9.9	6.4	15.6	9.9
Not exited	73.8	79.6	49.7	65.1	46	62.8	63.1	54.1	49.8
Number of observations	149	436	696	304	31,326	989	929	16,097	50,926

Table 26: Determinants of failures

The dependent variable is a dummy variable taking the value of one if the company is out of business, liquidated or financially reorganized by July 2008. The dependent variables are defined as in previous tables. The table shows coefficients (above) and *t*-statistics (below). Three stars denote coefficients significant at the 1% confidence level; two stars, 5%; and one star, 10%. Standard errors are clustered at the country level.

	(1) All	(2) All	(3) All	(4) Buyout Only	(5) VC Only
GDP/cap (lag)	0.024***	0.030***	0.021***	0.002	0.025**
	(3.290)	(4.009)	(2.680)	(0.297)	(2.448)
GDP growth (lag)	0.006**	-0.001	0.006**	0.003***	0.006**
	(2.264)	(-1.260)	(2.223)	(6.118)	(1.993)
Creditor rights score	0.006***	0.006***	0.006***	0.002	0.007***
	(4.265)	(3.903)	(3.876)	(1.564)	(3.636)
Investor protection score	0.005	0.007	0.006	0.034***	-0.011
	(0.338)	(0.557)	(0.359)	(2.662)	(-0.740)
Procedures to start a business	0.001	0.000	0.001	0.000	0.001
	(0.570)	(0.034)	(0.413)	(0.127)	(0.784)
Log Transaction Value	0.005***	0.003***	0.004***	-0.001	0.008***
	(6.867)	(5.210)	(4.962)	(-1.080)	(6.942)
VC	0.045***	0.028***	0.028***		
	(8.754)	(7.416)	(3.162)		
Growth Equity	0.045***	0.024***	0.022**		
	(12.861)	(9.732)	(2.563)		
PIPE	0.086***	0.068***	0.053***		
	(15.747)	(17.325)	(5.636)		
PE Fundraising (lag)	0.002***		0.002***	0.000	0.004***
	(3.182)		(3.363)	(-0.478)	(6.614)
Year	-0.010***		-0.010***	-0.003***	-0.014***
	(-10.135)		(-8.530)	(-3.620)	(-10.103)
Home-country investor in deal			0.004	-0.001	0.001
			(0.613)	(-0.236)	(0.129)
Minority deal			0.013	0.021	0.017
			(1.592)	(1.368)	(1.568)
Non-PE fund investor in deal			0.004***	0.003	0.006***
			(2.934)	(1.195)	(3.976)
Number of investors in deal			0.001	-0.002**	0.001**
			(1.435)	(-2.110)	(2.460)
Target in US or W. Europe			0.009	0.017***	-0.003
			(0.650)	(4.286)	(-0.167)
Year FE	No	Yes	No	No	No
Observations	60,759	60,759	60,759	15,115	29,458

Table 27: Determinants of deal success

The dependent variable in regressions (1) through (5) is a dummy variable taking the value of one if the target company is exited by the investors, and if in addition the company is either publicly traded or a subsidiary of another company in July 2008. The dependent variable in regressions (6) through (10) is a dummy variable taking the value of one if the target company is exited by the investors, and publicly traded in July 2008. PIPE transactions are excluded from the analysis. The independent variables are defined as in previous tables. The table shows coefficients (above) and *t*-statistics (below). Three stars denote coefficients significant at the 1% confidence level; two stars, 5%; and one star, 10%. Standard errors are clustered at the country level.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Pub Acq	Pub Acq	Pub Acq	Pub Acq	Pub Acq	Public	Public	Public	Public	Public
VARIABLES	All	All	All	Buyout	VC	All	All	All	Buyout	VC
GDP/cap (lag)	0.016	0.038***	-0.005	-0.042	-0.011	0.002	0.003	0.003	-0.001	0.000
	(0.814)	(3.009)	(-0.171)	(-1.395)	(-0.437)	(0.775)	(1.335)	(1.298)	(-0.240)	(0.002)
GDP growth (lag)	-0.003	-0.004*	-0.003	-0.002	-0.006	0.000*	0.000	0.000	0.001***	0.000
	(-0.827)	(-1.735)	(-0.596)	(-0.379)	(-1.098)	(1.903)	(0.214)	(1.616)	(2.695)	(-0.397)
Creditor rights score	0.003	0.006	0.004	0.013**	-0.007**	0.000	0.000	0.000	-0.001	0.000
	(0.724)	(1.472)	(1.078)	(2.177)	(-2.227)	(0.044)	(0.307)	(0.158)	(-0.959)	(0.605)
Investor Protection Score	0.082**	0.069***	0.095***	0.064*	0.106***	-0.008*	-0.007**	-0.006	-0.013**	-0.001
	(2.550)	(2.799)	(2.777)	(1.742)	(3.413)	(-1.940)	(-2.544)	(-1.569)	(-2.062)	(-0.388)
Procedures to start a business	-0.013***	-0.012***	-0.014***	-0.013***	-0.009*	-0.001*	0.000	-0.001	-0.002***	0.000
	(-3.070)	(-2.905)	(-2.802)	(-2.788)	(-1.787)	(-1.745)	(-1.644)	(-1.552)	(-3.395)	-0.671
Log Transaction Value	0.038***	0.036***	0.032***	0.020***	0.033***	0.004***	0.003***	0.004***	0.006***	0.001***
	(16.148)	(12.937)	(10.225)	(3.318)	(8.190)	(7.425)	(8.108)	(7.540)	(6.178)	(4.990)
VC	0.101***	0.080***	0.006			0.005***	0.005***	-0.006		
	(3.912)	(3.241)	(0.297)			(4.378)	(4.597)	(-0.851)		
Growth Equity	0.114***	0.087**	0.021			0.025***	0.020***	0.005		
	(2.780)	(2.248)	(0.761)			(14.229)	(10.925)	(0.695)		
PE Fundraising (lag)	-0.014***		-0.014***	-0.017***	-0.013***	-0.001***		-0.001***	-0.001***	-0.000**
	(-10.813)		(-8.942)	(-8.390)	(-7.913)	(-5.843)		(-6.120)	(-7.196)	(-2.149)
Year	-0.045***		-0.042***	-0.033***	-0.045***	-0.003***		-0.004***	-0.003***	-0.002***
	(-23.943)		(-16.337)	(-10.010)	(-15.286)	(-10.488)		(-11.443)	(-6.388)	(-13.127)
Home-country investor in deal			-0.016	-0.039***	0.023			-0.007***	-0.005*	-0.005***
			(-0.846)	(-2.991)	-1.587			(-4.583)	(-1.785)	(-3.197)
Minority deal			0.063***	0.047	0.099***			0.010*	0.029***	0.001
			(3.136)	(1.093)	(4.308)			(1.837)	(3.054)	(0.346)
Non-PE fund investor in deal			-0.023***	-0.012	-0.027***			-0.002**	-0.007***	-0.001*
			(-6.427)	(-0.931)	(-6.477)			(-1.990)	(-4.395)	(-1.668)
Number of investors in deal			0.013***	0.005	0.012***			0.000	0.001	0.000
			(16.640)	(0.713)	(16.542)			(-0.499)	(1.107)	(-0.341)
Target in US or W. Europe			0.066**	0.069**	0.040*			-0.002	0.005	-0.001
			(2.542)	(2.176)	(1.852)			(-0.685)	(0.934)	(-0.284)
Year FE	No	Yes	No	No	No	No	Yes	No	No	No
Observations	55,727	55,727	55,727	15,115	29,458	55,727	55,727	55,727	15,115	29,458

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Much of his research focuses on the structure and role of venture capital and private equity organizations. (This research is collected in three books, *The Venture Capital Cycle*, *The Money of Invention* and the forthcoming *Boulevard of Broken Dreams*.) He also examines policies towards intellectual property protection, particularly patents, and how they impact firm strategies in high-technology industries. (The research is discussed in the book *Innovation and Its Discontents*.) He founded, raised funding for, and organizes two groups at the National Bureau of Economic Research (NBER): Entrepreneurship and Innovation Policy and the Economy. He is a member of a number of other NBER groups and serves as co-editor of their publication *Innovation Policy and the Economy*.

In the 1993-94 academic year, he introduced an elective course for second-year MBAs on private equity finance. In recent years, 'Venture Capital and Private Equity' has consistently been one of the largest elective courses at Harvard Business School. The course materials are collected in *Venture Capital and Private Equity: A Casebook*, now in its fourth edition. He also teaches a doctoral course on entrepreneurship and organizes an annual executive course on private equity.

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