An analysis of private equity funds: an investor's perspective

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An Analysis of Private Equity Funds: An Investor's Perspective

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A dissertation submitted in fulfillment of the requirements for the degree of Doctor of Philosophy (Ph.D.)

School of Banking and Finance

Australian School of Business

September 2014

THE UNIVERSITY OF NEW SOUTH WALES
Thesis/Dissertation Sheet

Surname or Family name: **Azzi**

First name: **Sarah**

Abbreviation for degree as given in the University calendar: **PhD**

School: **School of Banking and Finance**   Faculty: **Australian School of Business**

Title: **An Analysis of Private Equity Funds:**
An Investor's Perspective

Abstract

This dissertation provides a detailed exploration of private equity (PE) funds from the perspective of investors. The PE asset class has experienced tremendous growth over the past few decades and is now a significant mainstay in the portfolios of many institutional investors. This dissertation examines both the unlisted and listed PE markets and the influence of information asymmetries on investor preferences and outcomes.

The first study investigates the drivers and performance implications of investor demand in PE funds. Investor demand is proxied by PE fund oversubscription, calculated as the commitments raised by a PE fund relative to the target fund size. The results indicate that PE funds are more likely to be oversubscribed when investors perceive macroeconomic conditions at the time of fundraising to be conducive to the investment strategy. Additionally, investors are found to exhibit fund selection abilities in the buyout space but not in the venture sub-asset class in which information asymmetries are more pronounced.

The second study employs a new dataset to examine the decisions and performance of local and foreign investors investing in China-focused PE funds. The Chinese market provides a unique setting for this study because it can be viewed as a quasi-segmented market due to information constraints and legal barriers. The results show that foreigners are more likely to seek fund characteristics that lessen their information asymmetry and provide additional diversification. Moreover, there is evidence that domestic-backed PE funds exit a greater number of portfolio companies and secure higher returns on exit relative to foreign-backed funds.

The third study evaluates the announcement returns and liquidity effects of investment and exit announcements made by listed PE entities. Using an international sample, the analysis finds that both types of announcements result in wealth gains to shareholders. Liquidity, as measured by trading volume and the Amihud illiquidity ratio, increases significantly on days surrounding these announcements. Additionally, a listed PE entity's stage focus, financing style, and organizational form are shown to affect announcement returns and stock liquidity.

This dissertation contributes to the literature on PE, investor decisions, and information asymmetry. The findings have significant implications for both PE investors and fund managers.

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Acknowledgments

It gives me immense pleasure to acknowledge the many individuals who have supported me with this dissertation.

First and foremost, I would like to thank my supervisor, Associate Professor Jo-Ann Suchard, for her guidance, expertise and invaluable advice. Her relentless support and encouragement ensured I remained motivated throughout the dissertation process. Additionally, I wish to express gratitude to other faculty members at UNSW, especially Professor Ron Masulis and Mark Humphrey-Jenner, for their stimulating discussions. The services provided by the department staff, including Shirley Webster, Stephanie Osbourne and Ashley Coull, have also been most helpful. Additionally, I am appreciative of the financial support provided by the university in the form of a scholarship and travel assistance to present my work at several international conferences.

I wish to acknowledge the insights provided by many of my esteemed industry colleagues. I am truly grateful to Ray King for supporting my decision to pursue a PhD. Other practitioners who deserve a special mention include Ross Barry, Scott McNally, Helen Murdoch, Sam Armstrong and Paul Ranocchiari.

I would like to thank my PhD peers, in particular Sidharth Sahgal, Amy Kwan, Seul Koo, Lee Smales and Grant Colthup, who helped make the dissertation process more enjoyable. I am also indebted to my friends and cousins, who remained by my side despite me having limited time to spend with them over the last few years.

Finally, I extend my most heartfelt thanks to my family, including my mum, dad and brother, Adel, for their patience and love. I am truly obliged to my husband, Erik, whose unwavering support and constant care ensured that I remained focused and determined throughout this journey.

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List of Abbreviations

BMI	Broad Market Index
CAR	Cumulative Abnormal Returns
CAV	Cumulative Abnormal Trading Volume
CSRC	China Securities Regulatory Committee
EMPEA	Emerging Markets Private Equity Association
FIP	Foreign-Invested Partnership
FIVCIE	Foreign-Invested Venture Capital Investment Enterprise
GDP	Gross Domestic Product
GP	General Partner
HQ	Headquarters
IPO	Initial Public Offering
IRR	Internal Rate of Return
IT	Information Technology
JV	Joint Venture
LP	Limited Partner
M&A	Mergers and Acquisitions
MOC	Ministry of Commerce
NDRC	National Development and Reform Commission
NSSF	National Social Security Fund
PE	Private Equity
PME	Public Market Equivalent
QFLP	Qualified Foreign Limited Partners

R&D	Research and Development
RMB	Renminbi
S&P	Standard & Poor's
SAFE	State Administration of Foreign Exchange
SDC	Securities Data Corporation
SME	Small and Medium enterprise
UK	United Kingdom
US	United States

Chapter 1. Introduction

1.1.   Motivation of the Dissertation

The scale and importance of the private equity (PE) industry has intensified in recent times. As of mid-2013, PE funds managed US$2.5 trillion in portfolio assets and held over US$1 trillion in new capital commitments ("dry powder") available to deploy into investments (Preqin 2014b). Additionally, in early 2014, there were over 2,000 PE funds in the market seeking to raise aggregate commitments of US$750 billion, further confirming the sustainability of the asset class (Preqin 2014a).

PE general partners (GPs) or managers create considerable economic value at an industry and portfolio company level through the provision of their capital and skill. PE investment improves productivity (Lichtenberg and Siegel 1990; Bernstein et al. 2010; Acharya et al. 2013), contributes to employment growth (Bernstein et al. 2010; Puri and Zarutskie 2012), enhances corporate governance practices (Baker and Gompers 2003; Hochberg 2012), fosters innovation (Kortum and Lerner 2000; Popov and Roosenboom 2009; Lerner et al. 2011), and stimulates new business creation (Samila and Sorenson 2011).

The purpose of this dissertation is to investigate PE from the perspective of investors or limited partners (LPs).[1] PE now has a prominent place in the portfolios of most institutional investors. Pension funds allocate, on average, five percent of their assets under management to PE, while PE allocations for university endowments/family offices and sovereign wealth funds are closer to 10 percent and 18 percent, respectively.

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[1] Prior literature on the PE/LP relationship has predominantly examined contracts between LPs and GPs, preferences of LPs, and performance across LPs (e.g. Lerner et al. 2007; Gompers and Lerner 1996, 1998; Sensoy et al. 2013; Harris et al. forthcoming).

The asset class is also likely to represent an even larger part of portfolios in future, with target allocations, for pension funds at least, in excess of current levels (Talmor and Vasvari 2014).

As PE managers (agents) invest capital on behalf of their investors (principals), the relationship between the two parties is associated with information asymmetry problems and agency conflicts (Jensen and Meckling 1976). LPs can suffer from adverse selection when selecting GPs to invest with (due to hidden information), or moral hazards (arising from hidden actions) when investing with GPs who prioritize their own objectives (Eisenhardt 1989). This dissertation focuses on the behavior and performance of PE fund investors in the presence of varying degrees of information asymmetries.

Information asymmetry problems are particularly acute in PE markets due to the illiquid nature of investments, lack of mandatory disclosure requirements (Cumming and Walz 2010), and subjectiveness of portfolio company valuations (as examined by Jenkinson et al. 2013 and Brown et al. 2013). Notwithstanding, the degree of information asymmetry faced by PE investors can be ameliorated or exacerbated depending on the structure and governance features of the PE fund (which are formalized in contracts) and the characteristics of the investments being made (Sahlman 1990; Gompers and Lerner 1996; Amit et al. 1998; Gompers and Lerner 1999; Lerner and Schoar 2004; Axelson et al. 2006; Litvak 2009; Kandel et al. 2011).[2]

In this dissertation, we first empirically investigate the causes and consequences of investor demand in PE funds. The fund selection skills of investors are critical in PE, as the asset class is more opaque and characterized by greater information asymmetries

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[2] Past studies have also demonstrated that particular types of investors are better equipped at bridging information asymmetries between GPs and LPs (Lerner et al. 2007; Dyck and Pomorski 2012).

than public markets. We proxy for investor demand by PE fund oversubscription, calculated as the level of commitment amounts received by a fund compared to its target size.[3] Additionally, we analyze buyout and venture funds separately, as the information asymmetries faced by venture funds (and their investors) are more acute due to their investment in riskier early-stage companies (Gompers 1995).

We find that investors commit to funds when they perceive macroeconomic conditions to be attractive for their investment strategy. Venture strategies are in favor in high GDP growth environments, whereas investor demand for buyout funds is heightened when credit spreads are tighter. Moreover, we detect a positive, albeit concave, relationship between oversubscription and future performance for buyout funds (but not venture funds). We therefore deduce that investors exhibit skills in selecting buyout funds but fall short in the venture space where information asymmetry is more severe.

Second, we contrast the preferences and performance of local and foreign investors in PE funds in China. The Chinese market presents a unique framework to examine PE as it effectively operates as a quasi-segmented market due to information constraints and legal barriers. In contrast to offshore investors, domestic investors are faced with larger information asymmetries and are likely to have lower risk appetites.

We find that foreign investors are more likely to invest with firms that are more experienced (consistent with Merton 1987) and not government-affiliated (supported by Fernald and Rogers 2002). Foreigners also favor larger funds and funds that allocate a smaller portion of their commitments to China, confirming their preference for fund

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[3] To our knowledge, two prior studies have used the oversubscription variable (and both have been in different contexts). Lerner et al. (2007) use the variable to create a subsample of observations. Freiburg and Grichnik (2013) include oversubscription as a control when predicting the reinvestment decisions of investors.

characteristics that lessen information asymmetry and provide additional diversification. We also examine the dollar amount that an investor commits to a particular PE fund and find that the size of an investor's commitment amount is not influenced by the location of the investor, but is determined by fund characteristics such as size, sequence, and stage. Larger commitments are made to bigger funds and lower sequence funds, revealing the ease of access of these funds rather than preference. Larger allocations are also made to buyout funds, reflecting the shortage of buyout funds available in China. In terms of performance, we find evidence that domestic investor-backed PE funds exit investments at higher return multiples relative to PE funds supported by foreign investors.

Third, we explore the listed, rather than unlisted, PE market. Unlike unlisted funds, listed PE entities tend to have indefinite time horizons, immediate access to capital, and no requirement to distribute proceeds from exited investments. These characteristics make the need to reduce information asymmetry between managers and investors more critical in a listed context.

We examine the market reaction and liquidity effect of investment and exit announcements made by listed PE entities. In addition, we investigate the effect of the characteristics of the listed PE firm on announcement returns and liquidity. We categorize listed PE vehicles based on investment stage, type of financing provided, and number of products managed. We contend that the use of investment-related announcements by a PE manager is a means of reducing information asymmetry, as the announcements provide investors with signals of the skills and capabilities of a listed PE firm. We find that investment and exit announcements result in wealth gains to shareholders and serve to lessen information asymmetry. Liquidity also increases significantly around announcements. We observe that the market reacts more positively

to investment announcements made by venture investors, supporting the hypothesis that venture managers invest in companies with more value-creating potential. Additionally, larger and newer listed PE entities, and transactions where the listed PE firm and target are in the same region experience higher abnormal returns upon announcing acquisitions. The market reacts less positively to exits executed by listed PE firms that manage multiple products or provide equity financing, and to deals sold to a syndicate of buyers. Regarding liquidity, we find that exit announcements made by venture investors generate increased trading volume and that investment announcements by non-venture-focused entities and equity investors reduce the Amihud illiquidity ratio.

The remainder of this chapter includes an explanation of the mechanics of PE funds, a discussion of the contribution to the literature, a description of the structure of the dissertation, and a list of related presentations and awards.

1.2. Mechanics of PE Funds

PE is defined as the equity financing of private and illiquid companies at various stages of their lifecycle. For the purposes of this study, the PE asset class encompasses management buyouts/buy-ins, expansion/growth capital, and venture capital. Most PE strategies focus on a particular stage in the lifecycle of the companies in which they invest. Venture funds invest in young, high-growth firms, whereas the focus for buyout funds is typically large, mature businesses (Metrick and Yasuda 2010). Expansion/growth funds invest in companies that are in a phase of development between venture and buyouts.

PE firms typically make PE investments through fund vehicles. These firms can be independently owned or captive (typically affiliated with banks, corporations, or

governments). Independent PE firms raise equity capital from institutional investors and high net-worth individuals, while captive funds may invest capital from their (or their parent company's) balance sheet, as well as third-party capital. The two also differ in terms of their organizational and incentive structures and their strategic objectives (Gompers and Lerner 2000; Van Osnabrugge and Robinson 2001; Hellman et al. 2008; Brander et al. 2010; Fang et al. 2013).

PE firms usually seek to launch a PE fund every few years. A PE fund is often structured as a limited partnership with a 10-year term, including five years where the GP can make new investments. Investors subscribe for commitments at the time a fund is raised, but it is drawn down progressively (referred to as staging commitments). During the life of the fund, the GP's role is to source, actively manage and monitor, and divest investments (Gompers and Lerner 2004). A diagram of a PE fund is provided below in Figure 1.1.
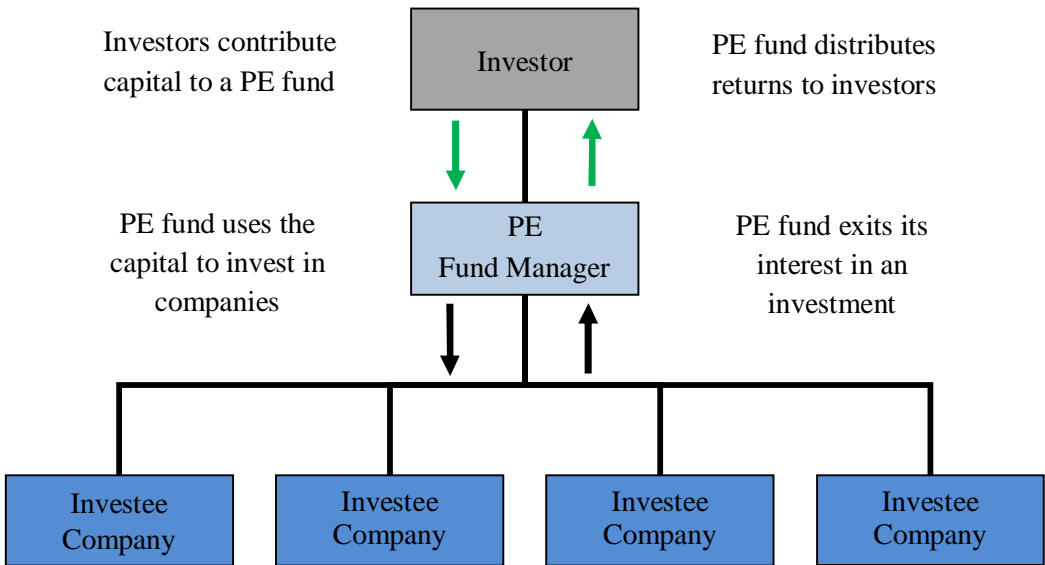
Figure 1.1 Flowchart of a PE Fund

This dissertation contributes to the limited body of literature that focuses on the interaction between PE funds and investors. We define investors as the parties that provide funding to PE fund managers in order for them to make investments in portfolio companies. Agency problems exist in a PE setting, as investors (agents) provide capital to PE firms (principals) to make investments on their behalf. Investors must pay the PE firm a management fee and, if certain conditions are met, a performance fee (carry) for managing a fund (with the latter designed to reduce moral hazards). The base and performance fees that are charged appear to be uniform across GPs, but there are many subtle variations in the fee model (Metrick and Yasuda 2010). GPs also usually make a personal commitment into the fund (Robinson and Sensoy 2013), which assists to alleviate agency problems. The structure of most PE funds prevents investors from being closely involved in investment decision making and management; therefore, they must rely on PE managers to make decisions on their behalf. As a means of reducing information asymmetries, investors receive insights into the fund portfolio through periodic reports that are furnished by most PE funds, as well as via annual meetings held by the GP.

The relationship between PE funds and their investors is governed by a legal contract (typically a partnership agreement) that stipulates the terms of the PE fund and the rights and responsibilities of both parties (as studied by Gompers and Lerner 1996, 1999; Lerner and Schoar 2004; Litvak 2009). Sahlman (1990) argues that the specific structures and governance features of PE funds (as detailed in the fund agreement), including the staging of commitments, performance-based compensation, finite lifespan, and requirement to distribute proceeds, have been effective in overcoming agency problems. Through a theoretical framework, Axelson et al. (2006) demonstrate that the financial structure of a PE fund is effective in alleviating some of the conflicts. Chung et

al. (2010) use a learning-based model to argue that the prospect of future fundraising motivates PE funds to perform well. In contrast, Kandel et al. (2011) assert that the limited lifespan of a PE fund may lead a GP to make suboptimal decisions.

1.3. Contribution to the Literature

Research in the field of PE is limited, but it has grown considerably as the asset class has received traction with investors. This dissertation seeks to bridge multiple strands of literature with a common theme of investigating the preferences and performance of PE fund investors.

This dissertation relates more broadly to studies exploring investor behavior amidst information asymmetries. The focus of Chapter 1 is to examine the fund selection skills of investors in PE – an asset class where information asymmetries are particularly pronounced. Chapter 1 contributes to the growing body of literature analyzing the fund selection skills of investors across asset classes including equities, real estate and hedge funds (Gruber 1996; Zheng 1999; Sapp and Tiwari 2004; Agarwal et al. 2004; Keswani and Stolin 2008; Frazzini and Lamont; 2008; Ding et al. 2009; Baquero and Verbeek 2009; Agarwal et al. 2013; Andonov et al. 2013; Baquero and Verbeek 2014). Moreover, in Chapter 1, we distinguish between buyout and venture investments, as information asymmetry is expected to be considerably more poignant in the latter due to the early-stage nature of investments (Gompers 1995). Chapters 2 adds to the large body of literature on information asymmetries between foreign and domestic investors in public markets (Shukla and van Ingewen 1995; Brennan and Cao 1997; Kang and Stulz 1997; Choe et al. 1999; Grinblatt and Keloharju 2000; Froot et al. 2001; Hau 2001; Griffin et al. 2004; Dvorak 2005; Aggarwal et al. 2005; Baik et al.

2010; Leuz et al. 2010). We specifically investigate the behavior and performance of foreign and local investors investing in PE funds in China. We focus on the Chinese PE market because it differs from other markets due to its legal structure and information constraints. In Chapter 3, we explore the listed PE market, examining the effectiveness of investment-related announcements as a signaling device to reduce information asymmetries (as proposed in the seminal paper by Spence 1973).

This dissertation is also closely related to the literature on PE funds. The first two chapters contribute to the analysis of the preferences of PE fund investors. Fried and Hisrich (1989), Barnes and Menzies (2005), and Groh and Liechtenstein (2011b) use survey data to explore the selection criteria employed by investors in relation to PE funds. Gompers and Lerner (1998) find that the probability of raising a new fund (and in some cases the size of the fund) is affected by the age, size, and past performance of the GP. Kaplan and Schoar (2005), Chung et al. (2012) and Hochberg et al. (2014) additionally show that the ability of GPs to raise follow-on funds (and the size of those funds) is determined by their past performance. Cumming et al. (2005) reveal that fundraising is greater among firms that provide financial and strategic advice, report higher returns, and offer lower fixed management fees. Balboa and Marti (2007) find that the volume of funds raised is positively related to the size of the GP, the percentage of the volume of IPO and trade sales divestments to total volume divested, and the number of investments previously made by the GP (but adversely related to the ratio of investments to investment professionals). Lerner et al. (2007) examine the factors that drive an LP's decision to reinvest in a fund and identify past performance, higher capital flows into the PE industry, and geographic proximity of the GP as key variables. Another related stream of research focuses on the macroeconomic factors that drive fundraising in PE funds (Poterba 1989; Gompers and Lerner 1998; Black and Gilson

1998; Jeng and Wells 2000; Balboa and Marti 2007; Groh and Liechtenstein 2011a). Chapter 1 investigates the fund characteristics and macroeconomic conditions that drive investor demand more generally. We adopt a novel approach to measuring investor demand (through oversubscription levels) and corroborate earlier findings relating to the influence of certain factors on the demand for PE funds. In Chapter 2, we employ a new dataset that allows us to examine and contrast the biases of foreign and domestic investors regarding China-focused PE funds.

Additionally, the first two chapters augment the literature on the performance of the PE asset class. Although PE outperforms listed markets on a gross-of-fees basis (Cochrane 2005), the value provided by PE funds on a net-of-fee basis (the return received by the investor) had been disputed until more recently, when substantial levels of outperformance relative to public markets were documented (Phalippou and Gottschalg 2009; Ljungqvist and Richardson 2003; Kaplan and Schoar 2005; Robinson and Sensoy 2011; Higson and Stucke 2012; Harris et al., forthcoming). The aforementioned papers mainly focus on the performance of the PE asset class as a whole, while the first two chapters of this dissertation investigate performance on a more disaggregated basis. In more closely related studies, Lerner et al. (2007), Hochberg and Rauh (2013), and Sensoy et al. (2013) analyze PE performance based on investor type, while Dyck and Pomorski (2012) focus on investor size. DaRin and Phalippou (2014) observe that larger investors undertake more rigorous due diligence. Chapter 1 of this dissertation examines the fund-picking abilities of investors more broadly, rather than a particular investor type. Unlike prior studies, we measure investor performance by examining the future performance of PE funds that enjoyed higher investor demand at the time of fundraising. Chapter 2 delves into investor geography, rather than type, and the associated information asymmetries presented by location. To

our knowledge, this is the first study to investigate the performance of local and foreign investors in PE funds in China.

In contrast to the first two chapters, which focus on unlisted PE, Chapter 3 contributes to the emerging literature on listed PE. The listed PE market, which enables investors to access PE by investing in publicly traded PE entities (defined as listed funds or companies that invest in PE), has made the PE asset class accessible to retail investors. Academic research in this area has largely focused on the risk and performance of publicly traded firms and the listed PE asset class more broadly (Martin and Petty 1983; Brophy and Guthner 1988; Bilo et al. 2005; Herschke and Lahr 2009; Kaserer et al. 2010; Jegadeesh et al. 2010). Cumming et al. (2011) examine the determinants of European institutional investor allocations to listed PE. Müller and Vasconcelos (2012) assess abnormal returns around exit announcements made by listed PE managers. Chapter 3 of this dissertation analyzes the information obtained by investors from investment-related announcements made by listed PE entities. In addition to corroborating earlier findings regarding the wealth effects of exit announcements, we examine the market reaction to investment announcements and the liquidity impacts of both types of announcements. Moreover, we reveal the influence that characteristics of the listed PE entity (stage focus, financing style, and organizational form) have on returns and liquidity.

1.4. Structure of the Dissertation

This dissertation explores the PE asset class in three different settings. Chapters 2–4 contain their own introduction, literature review, empirical analysis and conclusion. More specifically, the dissertation is structured as follows.

Chapter 2 examines investor demand in PE funds. More specifically, we analyze PE fund oversubscription (measuring subscription as the level of actual commitment amounts received by a fund compared to its target size) and investigate the determinants of oversubscription and the performance of oversubscribed finds relative to funds that are in less demand.

Chapter 3 focuses on the behavior and performance of foreign and domestic investors in China-focused PE funds. We examine the Chinese market because it is characterized by information constraints and legal barriers that are not observed in other countries.

Unlike Chapter 2–3, Chapter 4 investigates the listed PE market. Specifically, we analyze the effect of investment and exit announcements made by listed PE vehicles on their stock price and liquidity. In addition, we assess any associated effects from the characteristics of the listed PE firm.

Chapter 5 concludes with a summary of the main findings, a discussion of the implications, and suggestions for future research.

1.5.   Dissertation-related Presentations and Awards

The research included in this dissertation has been presented at several international conferences, as detailed below.

Chapter 3 was presented at the 2013 China International Conference in Finance (Shanghai, China), the Third Annual Online Workshop on Venture Capital and PE in the Asia Pacific Region (Sydney, Australia), and the 2013 China Finance Review

International Conference (Shanghai, China). The paper received the Emerald Best Paper Award at the latter conference.

Chapter 4 was presented at the 2012 Annual Meeting of the Academy of Entrepreneurial Finance (New York, United States (US)).

Chapter 2. PE Funds and Investor Demand

Chapter Summary

We examine oversubscription in PE funds. We observe that funds raised when macroeconomic conditions are conducive to their investment strategy are more likely to be oversubscribed. More specifically, venture capital fund oversubscription is positively related to GDP growth, while investor demand for buyout funds is higher when credit spreads are tighter. We also find a positive, albeit concave, relationship between oversubscription in buyout funds and future performance that continues to hold when controlling for past performance. No such relationship exists for venture funds. We conclude that PE investors display fund selection ability in the buyout space, but they are unable to identify outperforming funds in the venture capital sub-asset class, where information asymmetry is more pronounced.

2.1. Introduction

With a record 2,084 PE funds on the fundraising trail in early 2014 targeting aggregate commitments of US$750 billion, the choice set for investors in PE has ballooned, making fund selection an increasingly difficult task (Preqin 2014). While the burgeoning literature has sought to understand the investment decisions of investors and the level of skill they exhibit in selecting funds (e.g., Keswani and Stolin 2008 in mutual funds, Andonov et al. 2013 in real estate, and Agarwal et al. 2004 in hedge funds), limited focus has been placed on the PE asset class (Lerner et al. 2007; Hochberg and Rauh 2013; Sensoy et al. 2013).

The purpose of this paper is to examine the determinants of PE fund subscription levels and the impact of subscription on performance in order to better understand the investment decisions of investors and their ability to select superior performing funds. PE in this paper includes buyouts, venture capital, and growth funds. Fund subscription refers to the level of actual commitments received by a fund compared to its target size. When PE managers (or GPs) launch a new PE fund (typically every few years), they set a target size for the fund to indicate to investors the amount of commitments they are seeking to raise. This target size is determined with regard to the GPs' resourcing levels, the available deal opportunity set, their capital deployment pace, their portfolio construction intentions, and the general expectations of the investors. In some cases, they may also set a minimum fund size and a hard cap (the absolute maximum amount of commitments they would be willing to accept) for the fund. Funds that are able to raise commitments from investors above (below) their initial target size or hard cap are referred to as oversubscribed (undersubscribed) funds.

Funds that investors anticipate will be oversubscribed are highly sought after and affect the PE allocation decisions of investors. Due to fund size capacity constraints, investors seeking exposure to an oversubscribed fund may be allocated reduced commitment amounts or excluded from investing in the fund entirely. Investors typically determine whether to invest in a fund based on their assessment of the investment strategy and the ability of the team to execute the strategy, the terms of the fund and alignment of interest with investors, the track record of the organization and the individuals involved, and the outlook on the market opportunity (corroborated by Fried and Hisrich 1989, Barnes and Menzies 2005, and Groh and Liechtenstein 2011b). In cases where investors are aware from the onset of fundraising that a fund will be oversubscribed, their decision to invest may also reflect "herding" behavior (as rationalized more generally, for example, by Bikhchandani et al. 1992 and Froot et al. 1992).

First, we investigate the determinants of oversubscription and examine the influence of both macroeconomic conditions and fund characteristics. We measure oversubscription as the actual amount raised by a fund relative to its target size. In terms of external factors, we find that investors commit to funds when they perceive investment opportunities for the fund to be more attractive. Venture funds are likely to be more oversubscribed when macroeconomic conditions are positive (as proxied by GDP growth), consistent with Gompers and Lerner (1998) who observe that venture fundraising is positively associated with GDP growth. Similarly, buyout funds raised when credit spreads are tighter are more likely to be oversubscribed (supporting Ljunqvist et al. 2007, who find a positive relationship between credit conditions and buyout fund activity). Additionally, we find that buyout funds seeking to raise a

considerably larger pool of capital compared to their predecessor funds are less likely to be oversubscribed.

Second, we examine the relationship between the oversubscription of a fund and its future performance. We find a positive, albeit concave, relationship between oversubscription and buyout fund performance. Buyout funds that are oversubscribed tend to exhibit better performance than their peers, but funds that are excessively oversubscribed display a decline in performance. However, oversubscription does not impact performance for venture funds. In contrast to buyout funds that invest in large, mature businesses, venture funds focus on young, high-growth firms that are associated with more information asymmetries (Gompers and Lerner 2001). These companies tend to be riskier, harder to value, and take longer to exit by the GP (Hochberg et al. 2014). Therefore, it is not surprising that investors experience difficulty in forecasting the performance of venture funds. In addition, we find that buyout funds have better performance relative to venture funds; however, within the spectrum of venture, growth/expansion funds outperform (consistent with Nahata 2008). Higher sequence funds have higher returns, but this is predominantly driven by venture funds (consistent with Sensoy et al. 2013).

We next divide the sample into first-time funds and follow-on funds, including past performance as a control in the latter. The results continue to hold for both sub-samples. For both buyout funds and venture funds, we find that the final (and not interim) performance of a prior fund is a significant positive indicator of future performance. Investors clearly take into consideration other factors in addition to the prior track record of a GP when determining whether to allocate to a fund (as corroborated by Sensoy et al. 2013). However, it appears that while investors are

reasonably astute at predicting the performance of buyout funds, this is not the case for venture funds.

This paper has important implications for the investment decision-making processes of PE investors. We provide greater clarity on how investors make their investment decisions. When accessing oversubscribed funds, many investors may make sub-optimal decisions from a portfolio construction perspective in order to secure relationships with top-rated managers. We shed some light on the potential for oversubscribed funds to outperform. We also demonstrate that the assessment of PE funds extends beyond merely examining past returns. Engaging consultants, fund of funds, and other intermediaries with PE knowledge to assist with PE fund selection could prove valuable for less sophisticated investors, especially in the realm of venture investing.

The remainder of this chapter proceeds as follows. Section 2.2 details the related literature and our hypotheses. Section 2.3 describes the data. Section 2.4 outlines our results and Section 2.5 concludes.

2.2. Literature Review and Hypotheses

The fund allocation decisions and fund selection ability of investors has historically been examined within and across various asset classes. Focusing on mutual funds, Gruber (1996), Zheng (1999), and Keswani and Stolin (2008) deduce that investors have fund selection skills based on their observations that the short-term performance of mutual funds that receive inflows perform better than funds that experience outflows (contradicted by Frazzini and Lamont 2008, and Sapp and Tiwari 2004). Within hedge funds, the evidence is mixed regarding the ability of investors to

allocate capital across funds (Agarwal et al. 2004; Ding et al. 2009; Baquero and Verbeek 2009; Baquero and Verbeek 2014). Additionally, Agarwal et al. (2013) find that institutions that invest directly in hedge funds outperform investors using fund of hedge funds. For real estate funds, Andonov et al. (2013) observe that the direct real estate investments of pension funds (which are usually invested through funds) tend to meet their benchmark thresholds, with the exception of US pension plans.

The recent literature on the investment decisions of investors within PE is more closely related to this study. Lerner et al. (2007) examine the PE fund investment decisions of investors from 1991 to 1998 and observe considerable heterogeneity in the ability of investors to forecast future performance, with endowments outperforming other institutions due to their superior experience and access. The authors also divide their sample into oversubscribed and undersubscribed funds and find that their results continue to hold. Sensoy et al. (2013) undertake a similar study and find that endowments no longer outperform other investors on their PE investments post-1998. The authors also find evidence indicating that endowment outperformance in earlier years was attributed not to their skill, but to their superior access to venture funds that had fund size constraints. Hochberg and Rauh (2013) find a home-state investment bias in the PE portfolios of institutional investors, particularly public pension funds, which are subject to political pressures and poor management. Dyck and Pomorski (2012) find that pension plans with larger PE holdings perform substantially better in PE than those with smaller PE investments. They attribute part of this outperformance to cost savings generated by the superior negotiating power of large investors and their greater use of lower-cost approaches to access PE. This paper contributes to this literature by

examining the determinants of PE fund oversubscription and the effect of investor demand (over- or undersubscribed funds) on subsequent performance.[4]

We conjecture that investors allocate to a PE fund when they perceive macroeconomic conditions to be conducive to the fund strategy. Attractive investment opportunities for fund managers should lead to greater demand by investors. Gompers and Lerner (1998) argue that a fast-growing economy is associated with better PE investment opportunities, finding that venture capital fundraising is influenced by higher GDP growth, lower capital gains tax rates, and increases in research and development (R&D) expenditure. Similarly, Kaplan and Schoar (2005) find that funds raised when market conditions are positive are more likely to raise a follow-on fund. The availability of exit channels also appears to influence PE fundraising, with Black and Gilson (1998) finding that the quantity of venture capital-backed initial public offerings (IPOs) in a given year is positively correlated to venture capital fundraising in the following year. In an IPO setting, Derrien (2005) observes that the level of oversubscription for an IPO is related to the existing market conditions at the time of the IPO. Thus, the first hypothesis is as follows:

Hypothesis 1: Favorable macroeconomic conditions at the time of fundraising are positively related to fund oversubscription.

Our expectation is that the characteristics of a PE manager raising a fund will also influence the level of oversubscription. Several studies have used surveys to explore the criteria that PE investors use to select PE funds, finding that allocations are

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[4] Subscription has been previously examined in an IPO setting. Koh and Walter (1989), Levis (1990), Cornelli and Goldreich (2003), and Derrien (2005) empirically document a positive relation between oversubscription, which is typically measured as total demand by volume submitted by investors divided by the volume initially offered to investors, and the initial returns of an IPO. Hanley (1993) and Kandel et al. (1999) use alternative measures of investor demand and find consistent evidence. Regarding long-run IPO performance, Derrien (2005) finds that oversubscription in an IPO leads to poorer long-term (18 months) performance.

predominantly based on an assessment of the management team, deal flow, historical performance, investment strategy, and alignment (Fried and Hisrich 1989; Barnes and Menzies 2005; Groh and Liechtenstein 2011b). Empirically, Kaplan and Schoar (2005), Chung et al. (2012), and Hochberg et al. (2014) show that the interim and final performance of predecessor funds increases the likelihood of a GP raising a follow-on fund, and it is positively related to the size of the follow-on fund. This is consistent with evidence of persistence, where follow-on funds raised by the same GP perform similarly to predecessor funds (Kaplan and Schoar 2005; Robinson and Sensoy 2011; Chung 2012; Chung et al. 2012; Hochberg et al. 2014). More recently, Harris et al. (2013) find that venture fund performance remains persistent post-2000, but that the results for buyout funds are less clear. We therefore also assert that a GP's prior track record should be positively related to the subscription levels of a fund. The investment decisions of investors are clearly influenced by past performance. They seek to invest with GPs that have previously performed well, with the expectation that future fund performance will mirror past fund performance. This leads to the second hypothesis:

Hypothesis 2: Follow-on funds raised by GPs with better past performance are more likely to be oversubscribed.

If investors possess any fund-picking ability, oversubscribed funds should perform better. Oversubscription signifies that investors are positive about the opportunity to invest in a fund. However, we argue that there is a positive but concave relationship between oversubscription and performance. Several studies have examined the relationship between fund size and performance, with ambiguous results. Kaplan and Schoar (2005) observe a positive concave relationship between fund size and performance for their sample of funds (but not for their sub-sample of buyout funds), meaning that larger funds have better performance, which diminishes as funds grow.

Robinson and Sensoy (2011) observe a similar concave relationship for both venture and buyout funds. Harris et al. (forthcoming) find that venture capital funds in the bottom quartile of fund size underperform, but they find no relationship between buyout fund size and performance. Higson and Stucke (2012) identify a positive relationship between size and performance for buyout funds. In contrast, Humphrey-Jenner (2012) and Lopez-de-Silanes et al. (forthcoming) note a negative relation between PE fund size and performance.

Funds that are excessively large may underperform for several reasons. Larger funds may face resourcing constraints. Lopez-de-Silanes et al. (forthcoming) attribute the underperformance of larger funds to diseconomies of scale, which serve to reduce the quality of the communication and attention allocated to an investment. Larger funds may also suffer from inadequate staffing levels. Human capital is important in PE, as a significant portion of returns are generated from a GP's value-add. Bottazzi et al. (2008) show that venture capitalists who are actively involved in recruiting, fundraising, and monitoring are associated with more successful portfolio companies. As a fund increases in size, a GP may struggle to appoint appropriately experienced staff. Their universe of quality deal flow may also become more limited. Cumming and Dai (2011) observe a convex relationship between fund size and the valuations of venture companies. They argue that larger funds have better negotiating power when acquiring investments, but when funds become unnecessarily large, they overpay for investments. They attribute this relationship to limited attention resulting from resourcing constraints. The universe of potential investments for larger firms is more restricted due to their minimum investment size, and this could be a further reason why they pay more for assets. Additionally, as funds increase in size, GPs may be inclined to invest in sectors outside of their expertise. Lopez-de-Silanes et al. (forthcoming) refer to this as

diseconomies of scope. Gompers et al. (2009) find evidence to suggest that specialist firms perform better than generalist firms, which invest in multiple sectors.

In contrast, undersubscribed funds imply that GPs have failed to raise their target fund size amount. Raising less than their desired target could motivate some managers to generate superior outperformance in the current fund to ensure that fundraising for a follow-on fund is more successful. However, we argue that smaller fund sizes for undersubscribed funds results in GPs performing poorly due to under-resourcing and sub-optimal portfolio construction. PE fees are directly related to fund size because they are based on committed capital (typically two percent per annum). Therefore, in the case of undersubscribed funds, GPs accrue less management fees than they had originally budgeted. This may lead the GP to lay off staff because they cannot support their current resource base. Undersubscribed funds may also constrain a manager's ability to create an appropriately diversified portfolio with suitable investments. When PE fund managers set their target fund size, they take into account the number of investments they plan to make, the amount they intend to invest in each deal, and their preference for minority or majority equity stakes. If funds are undersubscribed, managers may not be able to execute their optimal investment strategy, and this may compromise their returns. Therefore, the third hypothesis is as follows:

Hypothesis 3: There is a positive and concave relation between oversubscription and fund performance.

2.3. Data

2.3.1 Sample

Our primary source of data is Preqin, which predominantly obtains its data through Freedom of Information requests to US- and United Kingdom (UK)-based public pension funds (Axelson et al. 2013). We use daily PE fund cash flows provided by Preqin to calculate our fund performance measures, including internal rate of return (IRR), multiple, and Public Market Equivalent (PME).[5] Other PE fund-level variables are collected from Preqin, Capital IQ, LP Source and Venture Economics. With respect to macroeconomic variables, data on bond yields are collected from the Federal Reserve Bank of Saint Louis, gross domestic product (GDP) growth rates from the World Bank, and equity index returns from Datastream.

Preqin provides cash flow information for 2,274 funds raised between 1979 and 2012, but we were only able to obtain oversubscription data for 1,844 funds. As we focus only on US buyout and venture funds, we exclude non-US funds (360), real estate funds (134), special situations funds (74), natural resources funds (42), mezzanine funds (58), timber funds (3), infrastructure funds (29), co-investment funds (18), fund of funds (81), and secondaries funds (43). Our definition of venture funds includes funds listed as early stage, early-stage seed, early-stage start-up, venture (general), venture debt, balanced, expansion/late stage, and growth. Hochberg et al. (2014) similarly classify expansion and late-stage investments as venture. We remove funds that were raised after 2007 (198), as the cash flow history of these funds is too short.

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5 Preqin reports multiples and IRRs, but not PMEs. To ensure the reliability of our estimates, we assess the correlations between the performance measures we calculate from cash flows and those reported by Preqin. The measures are highly correlated. As at 31 December 2012, the correlations between Preqin's measures and the multiples and IRRs calculated by the cash flows were 0.9981 and 0.9921, respectively.

Our final sample includes 767 PE funds managed by 411 GPs, including 327 buyout funds and 440 venture funds. The sample covers funds raised during 1987 to 2007 and includes funds that are not liquidated so as not to limit the sample. PE funds self-report valuations on a quarterly basis. We require unrealized funds to have available net asset values between 31 March 2012 and 31 December 2012. We remove 31 observations where the last recorded fund value is prior to this period and the fund is not liquidated. A criticism of unrealized portfolio valuations is that they are highly subjective and potentially inflated (Phalippou and Gottschalg 2009). However, since 2008, PE funds have been required by the Financial Accounting Standards Board to mark their assets at fair value on a quarterly basis. In effect, this means that unrealized asset values should more accurately represent actual market values (Harris et al. forthcoming).

We also construct a sample of follow-on funds where performance on preceding funds is available. A fund is classified as a preceding fund if it is part of the same fund family. We measure the performance of the previous fund at two points in time. The first measure is *Interim Past Performance*, which is calculated at the time that investors had to decide whether to invest in the new fund (i.e., at the time of oversubscription). This variable is calculated at the year-end prior to the final close of the new fund. In instances where this value is not available, we measure the performance of the previous fund at any time in the two years prior to the new fund closing or in the year that the new fund closed. We require the previous fund to be at least two years into its fund life at the time this variable is calculated to ensure that performance is relatively meaningful. This measure is available for 164 funds, including 78 buyout funds and 86 venture funds.

We further create an ex-post performance variable, *Final Past Performance*, which measures the performance of the previous fund at the latest available reporting date between 31 March 2012 and 31 December 2012. Hochberg et al. (2014) assert that, in addition to hard information, incumbent investors collect soft information, which is unobservable, at the time of fundraising. However, the authors argue that final returns are a reasonable proxy for this soft information. The ex-post performance of the preceding fund is available for 271 funds, including 113 buyout funds and 158 venture funds.

Panel A and B of Table 2.1 shows the distribution of the sample during the period for buyout funds and venture funds, respectively. The first observation occurs in 1987[6] and the majority of observations occur after 1993. Buyout funds are more likely to be oversubscribed than venture funds. On average, a buyout fund is likely to raise almost 1.2 times its original target, whereas for a venture fund this figure is around 1.1 times. The maximum oversubscription for a buyout fund and venture fund in the sample is approximately 2.4 times their target size.

Panel C displays the distribution of the sample where the performance of a previous fund (measured ex-post) is available. This smaller sample of follow-on funds appears to be representative of the complete sample in terms of mean and median oversubscription levels.

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[6] The venture sample includes five data points that occur prior to 1987 (in 1983 and 1986), but these are removed to ensure that the venture and buyout sample begin in the same period.

Table 2.1 Summary Distribution by Vintage

The sample consists of 767 funds raised between 1987 and 2007. Panel A includes all buyout funds. Panel B includes all venture funds. Panel C is constrained to buyout and venture funds that have past performance measured at the latest date available.

Panel A: All Buyout Funds

Year	Number	Mean Over-subscription	Median Over-subscription	Minimum Over-subscription	Maximum Over-subscription
1987	3	1.264	1.175	1.117	1.500
1988	4	1.219	1.089	1.000	1.700
1989	3	1.238	1.238	1.000	1.475
1990	1	0.927	0.927	0.927	0.927
1991	0	n.a.	n.a.	n.a.	n.a.
1992	5	0.786	0.693	0.500	1.140
1993	9	1.281	1.221	1.010	1.900
1994	12	1.219	1.244	0.540	1.695
1995	9	1.217	1.167	0.927	1.750
1996	13	1.260	1.200	1.000	1.757
1997	16	1.274	1.233	0.721	2.000
1998	26	1.147	1.099	0.650	2.000
1999	18	1.213	1.213	0.800	1.657
2000	30	1.118	1.100	0.345	1.667
2001	13	1.169	1.008	0.472	2.400
2002	12	1.203	1.164	0.808	1.500
2003	10	1.073	1.021	0.888	1.290
2004	23	1.108	1.111	0.614	1.625
2005	38	1.157	1.101	0.775	1.570
2006	40	1.154	1.122	0.571	2.027
2007	42	1.158	1.143	0.500	1.833
Total	327	1.165	1.140	0.345	2.400

Panel B: All Venture Funds

Year	Number	Mean Over-subscription	Median Over-subscription	Minimum Over-subscription	Maximum Over-subscription
1987	4	1.227	1.222	0.943	1.490
1988	2	1.533	1.533	1.170	1.895
1989	4	0.872	0.874	0.687	1.066
1990	8	0.944	0.895	0.464	1.137
1991	2	1.021	1.021	1.008	1.033
1992	10	1.069	0.974	0.556	1.161
1993	8	1.105	1.114	0.986	1.296
1994	11	1.000	1.031	0.560	1.400
1995	14	1.121	1.158	0.564	1.647
1996	15	1.110	1.146	0.541	1.475
1997	17	1.185	1.225	1.000	1.667
1998	28	1.227	1.236	0.891	1.667
1999	35	1.167	1.277	0.962	2.260
2000	63	1.033	1.097	0.454	2.325
2001	40	1.050	1.046	0.426	1.500
2002	19	1.000	1.036	0.500	1.863
2003	15	1.053	1.020	0.400	1.650
2004	25	1.025	1.066	0.400	1.857
2005	28	1.017	1.031	0.660	1.333
2006	46	1.000	1.047	0.375	1.600
2007	46	1.069	1.052	0.320	1.500
Total	440	1.096	1.066	0.320	2.325

Panel C: All Funds with Final Past Performance Available

Year	Buyout Funds with Final Past Performance Available			Venture Funds with Final Past Performance Available		
	Number	Mean Over-subscription	Median Over-subscription	Number	Mean Over-subscription	Median Over-subscription
1987	1	1.175	1.175	1	1.490	1.490
1988	0	n.a.	n.a.	0	n.a.	n.a.
1989	1	1.238	1.238	1	1.000	1.000
1990	0	n.a.	n.a.	2	0.607	0.607
1991	0	n.a.	n.a.	0	n.a.	n.a.
1992	0	n.a.	n.a.	2	0.828	0.828
1993	2	1.184	1.184	3	1.052	1.002
1994	2	1.124	1.124	2	0.843	0.843
1995	1	1.000	1.000	3	1.173	1.091
1996	3	1.234	1.200	3	1.040	1.039
1997	6	1.400	1.330	6	1.179	1.159
1998	9	1.126	1.088	17	1.204	1.200
1999	7	1.204	1.176	9	1.160	1.036
2000	10	1.149	1.171	22	1.072	1.086
2001	4	1.391	1.186	11	1.126	1.151
2002	6	1.125	1.108	5	1.116	1.125
2003	3	1.178	1.235	6	0.954	0.996
2004	6	0.981	0.950	8	1.100	1.096
2005	13	1.113	1.067	13	1.069	1.026
2006	16	1.216	1.144	28	1.033	1.000
2007	23	1.207	1.143	16	1.111	1.093
Total	113	1.182	1.167	158	1.085	1.080

2.3.2 Variables

Each of the variables used in this study are defined in Table 2.2 and explained in more detail as follows.

Table 2.2 Variable Definitions

Variable	Definition
Oversubscription	The total amount raised by a fund divided by its target size.
Oversubscription Squared	Oversubscription squared.
PME	The PME is calculated as the ratio of outflows to inflows discounted by the cumulative returns on the Standard & Poor's (S&P) 500 Index during the same period (similar to Kaplan and Schoar 2005). The natural log of the PME is used in the main analysis, and the raw PME is used in robustness tests.
IRR	The IRR of a fund calculated using fund cash flows. The natural log of one plus the IRR is used in the main analysis, and the raw IRR is used in robustness tests.
Multiple	The sum of the value of the fund plus distributions divided by the amount invested by the fund. The natural log of the multiple is used in the main analysis, and the raw multiple is used in robustness tests.
Interim Past Performance	The performance of the previous fund at the time the current fund was raised. Performance is measured as PME, IRR or multiple.
Final Past Performance	The performance of the previous fund at the latest reporting date. The last recorded net asset value for unrealized funds is between 31 March 2012 and 31 December 2012. Performance is measured as PME, IRR or multiple.
ln(Fund Size)	The natural log of the fund size in US dollars.
ln(Previous Size)	The natural log of the prior fund size in US dollars.
ln(Change in Fund Size)	The natural log of the change in fund size. The change in fund size is defined as the current fund size divided by the size of the previous fund.
I(Anticipated Change in Fund Size)	An indicator variable that takes the value of one if the anticipated change in fund size is greater than 2.1 times the current fund size. The anticipated change in fund size is defined as the target size of the current fund divided by the actual size of the previous fund.
ln(Fund Sequence)	The natural log of the fund sequence number of a PE fund.
Fund Vintage	The year that a fund had its final closing.

Our main variable of interest, *Oversubscription*, is calculated as the actual amount raised by a PE fund divided by the target size of the PE fund (as per Lerner et al. 2007).[7] Some PE funds impose both a target and a hard-cap limit on the fund size. The hard cap is the absolute maximum amount of commitments that a GP can accept

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[7] Lerner et al. (2007) use oversubscription only as a breakpoint to divide their sample. The variable is also used by Freiburg and Grichnik (2013), who include it as a control when predicting the reinvestment decisions of investors.

into the fund without approval from investors. A hard cap is often introduced at the request of, and to an amount determined in consultation with, investors. In some instances, the target cap and hard cap for a fund are identical. In other cases, a hard cap for a fund is not specified. Notwithstanding, our expectation is that the presence of a hard cap is more likely to be relevant to the sample of venture funds rather than buyout funds. Sensoy et al. (2013) identify abnormal fund growth (which effectively represents a hard cap) only in venture funds raised pre-1999. As hard-cap details are not readily available, we use target size as a proxy because it indicates the target amount that a GP is seeking to raise. *Oversubscription Squared* is the squared term of *Oversubscription.* *Oversubscribed* is an indicator variable that equals one if the total amount raised by a fund is greater than or equal to its target size, and zero otherwise.

We use three measures of fund performance. *PME* is the public market equivalent, which is calculated as the ratio of fund outflows to fund inflows discounted by the cumulative returns on the S&P 500 during the same period (similar to Kaplan and Schoar 2005). *IRR* is the internal rate of return of a fund, which is calculated using fund cash flows. *Multiple* is the sum of the value of the fund plus the distributions of the fund divided by the amount invested by the fund. The performance of the prior fund is measured at the time the current fund was raised (*Interim Past Performance*) and at the latest available date *(Final Past Performance)*. In each of our models, we use the same measure of performance (PME, IRR, or multiple) to proxy for past performance as that used to measure the current fund's performance. For the purposes of our univariate and multivariate tests, we apply the log transformation to each of the performance variables (including IRR, where we take the log of one plus IRR) to account for their skewness.[8]

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[8] We use the non-log transformed performance variables (IRR, PME and multiple) in robustness tests.

We also control for other fund characteristics. *Ln(Fund Sequence)* refers to the natural log of the fund sequence number of a PE fund. The first fund raised by a particular PE manager would have a fund sequence number of one, while the next fund raised would have a fund sequence number of two, and so on. For PE firms that manage multiple PE funds that pursue different strategies (e.g., venture-focused funds and small buyout funds), each strategy is viewed independently for the purpose of the fund sequence variable. Higher sequence funds are often raised by more experienced managers and usually deliver higher returns than funds with lower sequence numbers (Kaplan and Schoar 2005). *Fund Vintage* refers to the year that a fund had its final closing.

To control for fund size, we use *ln(Fund Size)*, which is measured as the natural log of the fund's total commitments in US dollars. *ln(Previous Size)* is the natural log of the prior fund's total commitments in US dollars. *Change in Fund Size* is the actual fund size divided by the size of the predecessor fund. *Anticipated Change in Fund Size* is the target fund size divided by the size of the predecessor fund. We also create an indicator variable to capture extreme expected changes in fund size. *I(Anticipated Change in Fund Size)* takes the value of one if the anticipated change in fund size from a predecessor fund to a follow-on fund is greater than double (specifically, larger than or equal to 2.1 times).

We also incorporate several macroeconomic variables into our analysis, which are measured in the year prior to the fund's final closing. To proxy for debt market conditions, we use *Lagged Credit Spread*, defined by Phalippou and Zollo (2005) as the difference between the corporate BAA bond yield (which represents the cost of debt for PE managers) and the 10-year Treasury rate. Similarly, Ljunqvist et al. (2007) use BAA bonds as a proxy for corporate bonds. Phalippou and Zollo (2005) find that investments

made when credit spreads are low have better performance. Guo et al. (2010) find that firms that increase their leverage as a result of a buyout display better cash flow performance. *Lagged GDP Growth* is the real GDP growth rate. Gompers and Lerner (1998) and Phalippou and Zollo (2005) find that PE investment performance is positively correlated to GDP growth. In contrast, Diller and Kaserer (2009) observe that the annualized GDP growth rate over the lifetime of a fund has a negative effect on the final return of European PE funds. Jeng and Wells (2000) argue that GDP growth has no effect on venture investing. *Lagged Market Return* is the annual return of the S&P 500.

Table 2.3 reports descriptive statistics for the US buyout and venture funds in the sample. Approximately 60 percent of the funds are venture-focused, and around 80 percent of funds are able to raise at least their target size. However, on average, funds tend to be oversubscribed by 1.13 times their target. Approximately 18% of funds have a target size that is greater than or equal to 2.1 times the previous fund size (as denoted by I(Anticipated Change in Fund Size)). In most cases, the final performance of a prior fund turns is better than the unrealised performance generated at the time the follow-on fund is raised (referred to as interim performance). In unreported results, we also observe that, on average, a follow-on fund is raised when the prior fund is 4.2 years into its fund life.

Of the 327 buyout funds in our sample, 74 percent (242) were oversubscribed, nine percent (29) raised total commitments equal to their target size, and 17 percent (56) were undersubscribed. The I(Oversubscribed) variable captures both oversubscribed and subscribed funds. The average buyout fund was raised in 2001 and is a third-time fund. The mean (median) buyout fund size is US$1,478 million (US$650 million), implying that fund size is highly skewed. The average buyout fund has a PME of 1.32, an IRR of 12 percent, and a multiple of 1.6x.

Of the 440 venture funds, 61 percent (266) raised commitments in excess of their target, 18 percent (78) were subscribed, and 22 percent (96) failed to reach their targets. The I(Oversubscribed) variable captures both oversubscribed and subscribed funds. Around 12 percent of the venture funds in the sample have a focus on expansion, growth, or later-stage investing. The average fund raised approximately US$400 million in 2001 and generated a PME of 1.2, an IRR of nine percent, and a multiple of 1.6x. However, these performance variables are highly skewed and have been driven by a few highly successful venture funds. Nine venture funds in the sample have delivered IRRs in excess of 100 percent. The median equivalents of the performance measures are considerably lower, with the median PME of 0.9 implying that venture funds have underperformed listed markets.

Table 2.3 Descriptive Statistics

This table contains the fund-level summary statistics of the sample. Table 2.2 contains the variable definitions.

Panel A: All Funds

Variable	Obs.	Mean	Standard Deviation	Median
Oversubscription	767	1.125	0.285	1.099
I(Oversubscribed)	767	0.802	0.399	1.000
PME	767	1.268	1.430	1.059
Prior Fund PME (interim)	164	1.056	0.428	0.966
Prior Fund PME (final)	271	1.533	2.025	1.181
Multiple	767	1.615	1.929	1.293
Prior Fund Multiple (interim)	164	1.185	0.433	1.070
Prior Fund Multiple (final)	271	1.947	2.313	1.470
IRR	767	0.105	0.316	0.072
Prior Fund IRR (interim)	164	0.107	0.308	0.037
Prior Fund IRR (final)	271	0.158	0.431	0.096
Fund Size (US dollars)	767	873.144	1845.337	332.000
Previous Fund Size (US dollars)	398	625.136	1019.159	276.750
Change Fund Size	398	1.852	0.960	1.667
Anticipated Change in Fund Size	398	1.649	0.792	1.500
I(Anticipated Change in Fund Size)	398	0.181	0.385	0.000
Fund Sequence Number	767	3.540	2.304	3.000
I(Venture)	767	0.574	0.495	1.000
I(Buyout)	767	0.426	0.495	0.000
Fund Vintage	767	2001	4.830	2001

Panel B: Buyout Funds

Variable	Obs.	Mean	Standard Deviation	Median
Oversubscription	327	1.165	0.290	1.140
I(Oversubscribed)	327	0.829	0.377	1.000
PME	327	1.321	0.549	1.253
Prior Fund PME (interim)	78	1.243	0.460	1.203
Prior Fund PME (final)	113	1.524	0.580	1.481
Multiple	327	1.581	0.688	1.461
Prior Fund Multiple (interim)	78	1.354	0.451	1.267
Prior Fund Multiple (final)	113	1.827	0.716	1.695
IRR	327	0.121	0.142	0.106
Prior Fund IRR (interim)	78	0.205	0.273	0.149
Prior Fund IRR (final)	113	0.157	0.123	0.135
Fund Size (US dollars)	327	1478.175	2491.188	650.000
Previous Fund Size (US dollars)	163	1027.386	1271.874	500.000
Change Fund Size	163	1.992	0.955	1.800
Anticipated Change in Fund Size	163	1.698	0.769	1.584
I(Anticipated Change in Fund Size)	163	0.172	0.378	0.000
Fund Sequence Number	327	3.159	1.952	3.000
Fund Vintage	327	2001	4.954	2002

Panel C: Venture Funds

Variable	Obs.	Mean	Standard Deviation	Median
Oversubscription	440	1.096	0.279	1.066
I(Oversubscribed)	440	0.782	0.413	1.000
PME	440	1.229	1.828	0.901
Prior Fund PME (interim)	86	0.887	0.313	0.817
Prior Fund PME (final)	158	1.539	2.610	0.982
Multiple	440	1.640	2.478	1.143
Prior Fund Multiple (interim)	86	1.033	0.355	0.951
Prior Fund Multiple (final)	158	2.033	2.969	1.270
IRR	440	0.093	0.399	0.033
Prior Fund IRR (interim)	86	0.019	0.312	-0.026
Prior Fund IRR (final)	158	0.159	0.556	0.048
Fund Size (US dollars)	440	423.496	926.222	240.450
Previous Fund Size (US dollars)	235	346.128	671.867	178.000
Change Fund Size	235	1.755	0.954	1.591
Anticipated Change in Fund Size	235	1.615	0.807	1.461
I(Anticipated Change in Fund Size)	235	0.187	0.391	0.000
Fund Sequence Number	440	3.823	2.498	3.000
Fund Vintage	440	2001	4.731	2000
I(Growth)	440	0.116	0.320	0.000

We present univariate statistics in Table 2.4. Panel A compares buyout funds and venture funds. Buyout funds tend to be larger, have lower fund sequence numbers and better performance relative to venture funds. When oversubscription is measured as a continuous variable, buyout funds are also more likely to be oversubscribed. However, there is not a significant difference in the proportion of oversubscribed funds with a buyout focus compared to those with a venture focus. Panel B compares the 615 oversubscribed funds in the sample to the 152 undersubscribed funds. Undersubscribed funds have significantly lower performance, as measured by PME, IRR, or multiple.[9] Undersubscribed funds also tend to be smaller than oversubscribed funds.

Table 2.4 Univariate Statistics by Oversubscriptions

This table compares the characteristics of funds. Panel A provides a comparison of the 327 buyout funds and 440 venture funds in the sample. Panel B compares the 152 undersubscribed funds to the 615 oversubscribed funds. Oversubscribed funds are defined as funds that raise total commitments that are at least equal to their target size. Table 2.2 contains the variable definitions. For continuous variables, we test the significance of differences between means (medians) using t-tests (Mann–Whitney tests). For the binary variables, we compare proportions and medians (chi square test). ***, ** and * denote significance at the 1, 5 and 10 percent levels, respectively.

Panel A: Buyout Funds versus Venture Funds

Variable	Buyout Funds		Venture Funds		Comparison of Means or Proportions	Comparison of Medians
	Mean	Median	Mean	Median		
I(Oversubscription)	0.829	1.000	0.782	1.000	0.047	0.000
Oversubscription	1.165	1.140	1.096	1.066	0.069***	0.074***
ln(PME)	0.190	0.226	-0.147	-0.104	0.337***	0.330***
ln(IRR)	0.106	0.101	0.053	0.033	0.053***	0.068***
ln(Multiple)	0.376	0.379	0.113	0.134	0.263***	0.245***
ln(Fund Size)	6.547	6.477	5.485	5.482	1.062***	0.995***
ln(Fund Sequence)	0.961	1.099	1.109	1.099	-0.148***	0.000***
Fund Vintage	2001	2002	2001	2000	0.499	2.000

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[9] When multiple is used as the performance measure only means (not medians) are significantly different.

Panel B: Undersubscribed Funds versus Oversubscribed Funds

Variable	Oversubscribed Funds Only		Undersubscribed Funds Only		Comparison of Means or Proportions	Comparison of Medians
	Mean	Median	Mean	Median		
ln(PME)	0.030	0.066	-0.140	0.037	-0.170**	-0.029**
ln(IRR)	0.085	0.074	0.040	0.054	-0.045**	-0.020**
ln(Multiple)	0.251	0.261	0.121	0.249	-0.130*	-0.012
ln(Fund size)	6.037	5.892	5.537	5.460	-0.500***	-0.432***
ln(Fund Sequence)	1.059	1.099	0.993	1.099	-0.066	0.000
I(Venture)	0.546	1.000	0.498	0.000	0.048	1.000
I(Growth)	0.086	0.000	0.062	0.000	0.024	0.000
I(Buyout)	0.368	0.000	0.441	0.000	-0.073	0.000
Fund Vintage	2001	2001	2001	2000	0.367	1.000

2.4. Results

2.4.1 Determinants of Oversubscription

2.4.1.1 Impact of Macroeconomic Conditions and Fund Characteristics

We first examine the cyclicality of oversubscription. In Table 2.5, we assess the relationship between the continuous measure of oversubscription and macroeconomic factors. We control for GDP growth, credit spreads, and the return on the S&P 500, each measured in the year prior to the fund vintage year.[10] We also include the performance of the predecessor fund calculated at the time of fundraising (measured as a PME) and the size of the prior fund. Additionally, we use an indicator variable to capture instances where there is an extreme expected increase in fund size from the predecessor fund to the follow-on fund. I(Anticipated Change in Fund Size) takes the value of one if the anticipated change in fund size from a predecessor fund to a follow-on fund is expected to be at least 2.1 times the prior fund, and zero otherwise. Standard errors are adjusted for vintage and PE firm clustering.

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[10] For both buyout funds and venture funds, each relevant macroeconomic factor is initially examined separately, as the variables are significantly correlated. The correlation coefficient between: credit spreads and market returns is -0.4309; credit spreads and GDP growth is -0.2568; and GDP growth and market returns is 0.5331.

Panel A of Table 2.5 examines buyout funds. In Column 1, as a proxy for macroeconomic conditions, we include credit spreads. Ljungqvist et al. (2007) observe that buyout firms are less likely to make investments when debt is more expensive (measured by wide credit spreads). This is further supported by Demiroglu and James (2010), who focus on the effect of a PE firm's reputation, finding that more reputable groups are more likely to partake in a buyout investment when credit risk spreads are low and lending standards are lax. Axelson et al. (2013) also identify a negative relationship between credit spreads and buyout leverage levels. Moreover, Phalippou and Zollo (2005) find that PE funds that acquire investments at a time of low credit spreads have higher performance.

Consistent with Hypothesis 1, we observe a significant and negative relationship between oversubscription and credit spreads. In Columns 2–3, we control for additional macroeconomic variables, including GDP growth and market return, to examine their effect. In all cases, we continue to find that buyout funds are more likely to be oversubscribed when debt market conditions are favorable (as evidenced by narrower credit spreads). Buyout funds generate a key component of their returns from leverage. The availability of cheap credit enables fund managers to more highly gear their underlying investments, thereby potentially increasing their returns. Ljunqvist et al. (2007) find that buyout funds accelerate their investment pace and generate higher returns when credit is loose (as supported by Phalippou and Zollo 2005 and Demiroglu and James 2010). Intuitively, one would expect investors to commit to a buyout fund when they perceive that investment opportunities for that particular strategy are attractive.

In relation to control variables, in Panel A we find that the coefficient on the previous fund size variable is positive and marginally significant. Larger buyout funds

may have better reputations and be more recognizable to the market. We also observe that the anticipated change in fund size variable is negative and significant. Buyout funds seeking to considerably increase their fund size compared to their prior fund are less likely to be oversubscribed. A GP seeking to raise a considerably larger follow-on fund may find it difficult to meet, let alone exceed, their fundraising target. It may also be the case that investors are concerned with the larger fund size, which may result in a GP deviating from its historical investment strategy. Additionally, we find that higher sequence buyout funds are less likely to be more oversubscribed. This is difficult to interpret and may merely reflect that older GPs are more realistic in setting target fund sizes.

In Panel B of Table 2.5, we focus on venture funds. Our main macroeconomic variable is GDP growth. Gompers and Lerner (1998) and Romain and van Pottelsberghe (2004) find that venture fundraising and activity are positively influenced by GDP growth. In Column 1, we solely examine GDP growth, and we add credit spreads and the market return in Columns 2–3. We find that GDP growth is likely to lead to oversubscription in each case (providing further support for Hypothesis 1). A strong growing economy improves deal flow for venture capital funds (as supported by Gompers and Lerner 1998). In bullish economic environments, entrepreneurs are more likely to seek external capital to fund growth opportunities.

In contrast to Hypothesis 2, we find a positive but insignificant relationship between interim past performance and oversubscription. This may be because investors are utilizing other information that is not being captured in the aggregate performance measures used in this study (e.g., exit rates, as supported by Black and Gilson 1998).

As a robustness test, in unreported results, we re-estimate the models in Table 2.5 with alternative performance measures (IRR and multiple) and find consistent

results. We also include vintage fixed effects (and remove the macroeconomic variables from the model) and, consistent with Table 2.5, we find a positive but insignificant relationship between oversubscription and prior fund performance. Additionally, we modify the breakpoint for the indicator variable, I(Anticipated Change in Fund Size), to determine whether it alters our results. We define an extreme change as one where the follow-on fund is 2.2, 2.3, 2.4, or 2.5 times larger than the predecessor fund. In each case, our results remain consistent, except for the coefficient on the variable of the previous fund size, which at times is insignificant.

Table 2.5 Determinants of Oversubscription

This table includes ordinary least estimates. Panels A and B examine buyout and venture funds, respectively. Table 2.2 contains the variable definitions. In parentheses are t-statistics based on standard errors adjusted for vintage and PE firm clustering. ***, ** and * denote significance at the 1, 5 and 10 percent levels, respectively.

Panel A: Buyout Funds

Dependent Variable	Oversubscription		
Lagged Credit Spread	-0.156***	-0.171***	-0.165***
	(-2.919)	(-2.776)	(-3.041)
Lagged GDP Growth		-0.015	-0.020
		(-0.588)	(-0.553)
Lagged Market Return			0.048
			(0.224)
ln(Previous Size)	0.048*	0.048*	0.047*
	(1.751)	(1.702)	(1.714)
I(Anticipated Change in Fund Size)	-0.092*	-0.096**	-0.093**
	(-1.733)	(-2.016)	(-2.155)
Interim Past Performance (PME)	0.071	0.065	0.067
	(0.663)	(0.614)	(0.620)
ln(Fund Sequence)	-0.172**	-0.173**	-0.171**
	(-2.191)	(-2.160)	(-2.111)
Constant	1.439***	1.520***	1.521***
	(8.182)	(6.065)	(6.113)
Pseudo R Squared	0.0562	0.0450	0.0319
N	78	78	78

Panel B: Venture Funds

Dependent Variable	Oversubscription		
Lagged GDP Growth	0.080***	0.091***	0.099***
	(3.094)	*(3.022)*	*(2.980)*
Lagged Credit Spread		0.038	0.030
		(0.592)	*(0.488)*
Lagged Market Return			-0.085
			(-0.614)
ln(Previous Size)	-0.026	-0.030	-0.029
	(-1.259)	*(-1.246)*	*(-1.191)*
I(Anticipated Change in Fund Size)	-0.032	-0.037	-0.038
	(-0.442)	*(-0.524)*	*(-0.529)*
Interim Past Performance (PME)	0.138	0.132	0.128
	(1.629)	*(1.520)*	*(1.467)*
ln(Fund Sequence)	0.041	0.045	0.041
	(0.622)	*(0.654)*	*(0.594)*
I(Growth)	0.019	0.012	0.011
	(0.244)	*(0.155)*	*(0.136)*
Constant	0.937***	0.839***	0.840***
	(8.046)	*(4.536)*	*(4.641)*
Pseudo R Squared	0.0856	0.0780	0.0686
N	86	86	86

2.4.2 Oversubscription and Fund Performance

This section analyzes the relationship between oversubscription and future fund performance. Oversubscription is considered to be exogenous when considered in the context of future performance as oversubscription is measured at the time of investment while performance is measured at a future date. In Table 2.6, we include final fund performance as the dependent variable.[11] Performance is measured as PME, IRR, or multiple. We control for fund size, fund sequence, fund type (where appropriate), and include vintage fixed effects. Oversubscription is represented by an indicator variable, where one denotes oversubscribed or subscribed funds, and zero refers to undersubscribed funds. We classify oversubscribed and subscribed funds together to account for funds that have a hard-cap provision. If a fund has a hard cap that is

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[11] In cases where a fund is unrealized and has not been wound up, we calculate performance using the latest net asset values available between 31 March 2012 and 31 December 2012.

identical to its target size, it may be oversubscribed (i.e., it has excess investor interest), but it would be classified as subscribed in the data because the hard cap would restrict the GP from accepting additional commitments into its fund.

We first examine all funds (buyout and venture) in the sample jointly. We find a significant positive relationship between performance and the oversubscription dummy. However, when the sample is divided into buyout and venture funds, the relationship remains positive but is largely insignificant. This could be due to the small number of undersubscribed observations (97 venture funds and 57 buyout funds), or it could imply a non-linear relationship between oversubscription and performance. In relation to control variables, we find that higher sequence funds have higher returns, but this is predominantly driven by venture funds (consistent with Chung et al. 2012). In terms of stage, buyout funds have better performance relative to venture funds. Within venture funds, growth/expansion funds outperform other funds. This is corroborated by Nahata (2008) who observes that seed or early-stage investments are less likely to be exited successfully (defined as an exit by IPO or acquisition) and attributes this to their riskier nature.

Table 2.6 Oversubscription Dummy and Fund Performance

Panel A includes all funds, Panel B includes only buyout funds and Panel C includes only venture funds. The dependent variable in each case is a measure of fund performance, and it is estimated using ordinary least squares regression. An indicator variable is used to measure oversubscription. Table 2.2 contains the variable definitions. In parentheses are t-statistics based on standard errors adjusted for heteroskedasticity and firm clustering. All regressions control for vintage and PE-type fixed effects, whose coefficient estimates are suppressed. ***, ** and * denote significance at the 1, 5 and 10 percent levels, respectively.

Panel A: All Funds

Dependent Variable (log)	PME	Multiple	IRR
I(Oversubscribed)	0.141**	0.126*	0.040**
	(2.041)	*(1.836)*	*(2.233)*
ln(Fund Size)	0.044*	0.032	0.003
	(1.813)	*(1.402)*	*(0.449)*
ln(Fund Sequence)	0.092**	0.103**	0.033**
	(2.095)	*(2.477)*	*(2.540)*
I(Venture)	-0.277***	-0.225***	-0.049***
	(-4.771)	*(-4.163)*	*(-3.095)*
Constant	0.011	0.876***	0.128***
	(0.051)	*(3.894)*	*(3.065)*
Pseudo R Squared	0.0900	0.1810	0.1229
N	767	767	767

Panel B: Buyout Funds

Dependent Variable (log)	PME	Multiple	IRR
I(Oversubscribed)	0.056	0.041	0.006
	(0.953)	*(0.775)*	*(0.339)*
ln(Fund Size)	0.011	-0.003	0.001
	(0.504)	*(-0.151)*	*(0.123)*
ln(Fund Sequence)	-0.015	0.001	-0.002
	(-0.343)	*(0.024)*	*(-0.222)*
Constant	0.604***	1.539***	0.230***
	(3.151)	*(7.515)*	*(5.791)*
Pseudo R Squared	0.1293	0.2091	0.1451
N	327	327	327

Panel C: Venture Funds

Dependent Variable (log)	PME	Multiple	IRR
I(Oversubscribed)	0.181*	0.162	0.055**
	(1.694)	*(1.522)*	*(2.022)*
ln(Fund Size)	0.102**	0.097**	0.008
	(2.454)	*(2.420)*	*(0.616)*
ln(Fund Sequence)	0.117*	0.121**	0.044**
	(1.892)	*(2.037)*	*(2.376)*
I(Growth)	0.397***	0.374***	0.095***
	(3.305)	*(3.254)*	*(3.267)*
Constant	-0.834***	0.010	0.006
	(-2.803)	*(0.035)*	*(0.105)*
Pseudo R Squared	0.1363	0.2492	0.1958
N	440	440	440

In Table 2.7 we examine the relationship between future fund performance and a continuous measure of oversubscription. To account for the potential non-linear relationship between the two variables, we include Oversubscription Squared as an independent variable. In the case of buyout funds, we find a significant positive relationship between oversubscription and performance. Additionally, the coefficient of Oversubscription Squared is significant and negative irrespective of the performance measurement used. This implies a positive, albeit concave, relationship between oversubscription and performance, consistent with Hypothesis 3. Buyout funds that are oversubscribed tend to exhibit better performance than their peers, but funds that are excessively oversubscribed show a decline in performance. Robinson and Sensoy (2011) observe a similar concave relationship between fund size and performance. The estimated coefficients indicate that the inflection point of the curve lies around 1.2 times[12]. This implies that buyout funds that are more than 1.2 times oversubscribed are likely to show deterioration in their performance. There are 135 observations (representing about 41% of the buyout fund sample) where buyout fund oversubscription is greater than the inflection point.

Oversubscription is likely to be affected by "herding" of investors, whereby they elect to invest in a particular PE fund on observing that other investors have committed to the fund (see Bikhchandani et al. 1992 and Froot et al. 1992 for more general examples of herding). The relationship between oversubscription and performance may be influenced by the skills, experience and reputation of the investor base. Whilst data limitations preclude such analysis, one would expect the concave relationship between

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[12] The inflection point is equal to the negative of the coefficient of the linear term divided by two times the coefficient of the quadratic term. Depending on the measurement used (i.e. PME, multiple or IRR), the inflection point is between 1.16-1.23 times.

oversubscription and performance to be exacerbated by "herding" of non-reputable investors.

In terms of venture funds, we do not find a significant relationship between oversubscription and performance. This result is inconsistent with Hypothesis 3. However, there are a number of potential explanations. It is considerably more difficult for investors to evaluate venture investments. Venture funds typically invest in young, high-growth firms that are characterized by uncertainty and informational asymmetries (Gompers and Lerner 2001). As a result, Chung et al. (2012) observe that there is greater variance and less informativeness in the returns of venture funds compared to buyout funds. While buyout investments tend to deliver more consistent return outcomes, venture deals are more variable and have a higher probability of delivering exceptional returns (a 'home run') or being written off. Moreover, Harris et al. (2013) find that the dispersion between top- and bottom-quartile funds is considerably greater for venture funds relative to buyout funds. Venture funds are also likely to take longer to break even and exit portfolio companies compared to buyout deals (Ljungqvist and Richardson 2003). For these reasons, investors may find it more difficult to interpret the performance of venture funds and make accurate future investment allocations. At the time of due diligence of a venture fund, an investor would seek to develop a forecast of the ultimate return of the manager's prior funds. This forecast is formed by a quantitative examination of the return to date of the prior funds, as well as through discussions with the manager regarding the outlook for each of the remaining underlying assets. Thus, due to the nature of venture investing, our results indicate that investors are not particularly adept at predicting the performance of venture funds. In relation to control variables, we find that, similar to prior results in Table 2.6, higher

sequence funds have better performance, and growth-focused venture funds outperform earlier-stage venture funds.

Table 2.7 Oversubscription and Fund Performance

This table includes all funds. Panel A displays buyout funds and Panel B displays venture funds. The dependent variable in each case is a measure of fund performance, and it is estimated using ordinary least squares regression. Table 2.2 contains the variable definitions. In parentheses are t-statistics based on standard errors adjusted for heteroskedasticity and firm clustering. All regressions control for vintage fixed effects, whose coefficient estimates are suppressed. ***, ** and * denote significance at the 1, 5 and 10 percent levels, respectively.

Panel A: Buyout Funds

Dependent Variable (log)	PME	Multiple	IRR
Oversubscription	1.056***	0.939***	0.223*
	(2.828)	(2.755)	(1.897)
Oversubscription Squared	-0.429***	-0.386***	-0.096**
	(-3.018)	(-2.937)	(-2.237)
ln(Fund Size)	0.018	0.003	0.003
	(0.793)	(0.139)	(0.506)
ln(Fund Sequence)	-0.029	-0.013	-0.007
	(-0.686)	(-0.347)	(-0.621)
Constant	0.002	1.001***	0.104
	(0.008)	(3.509)	(1.225)
Pseudo R Squared	0.1468	0.2263	0.1590
N	327	327	327

Panel B: Venture Funds

Dependent Variable (log)	PME	Multiple	IRR
Oversubscription	-0.428	-0.377	0.121
	(-0.666)	(-0.607)	(0.551)
Oversubscription Squared	0.275	0.248	-0.023
	(1.114)	(1.064)	(-0.290)
ln(Fund Size)	0.106**	0.100**	0.007
	(2.392)	(2.331)	(0.544)
ln(Fund Sequence)	0.131**	0.135**	0.047**
	(2.095)	(2.236)	(2.433)
I(Growth)	0.397***	0.375***	0.094***
	(3.342)	(3.299)	(3.234)
Constant	-0.630	0.186	-0.066
	(-1.409)	(0.442)	(-0.517)
Pseudo R Squared	0.1342	0.2479	0.1911
N	440	440	440

As a robustness test, we divide the sample into first-time funds and follow-on funds. In Table 2.8, we replicate the models undertaken in Table 2.7, but we restrict our sample to first-time funds to alleviate reverse causality concerns. For first-time buyout funds, we find a similar concave positive relationship between oversubscription and future performance. The venture results remain largely insignificant.

Table 2.8 Oversubscription and First Time Fund Performance

This table includes only first-time funds. Panel A displays buyout funds and Panel B displays venture funds. The dependent variable in each case is a measure of fund performance, and it is estimated using ordinary least squares regression. Table 2.2 contains the variable definitions. In parentheses are t-statistics based on standard errors adjusted for heteroskedasticity and firm clustering. All regressions control for vintage fixed effects, whose coefficient estimates are suppressed. ***, ** and * denote significance at the 1, 5 and 10 percent levels, respectively.

Panel A: Buyout Funds

Dependent Variable (log)	PME	Multiple	IRR
Oversubscription	2.071**	1.818**	0.500*
	(2.547)	(2.148)	(1.947)
Oversubscription Squared	-0.757**	-0.660**	-0.185**
	(-2.587)	(-2.151)	(-2.064)
ln(Fund Size)	-0.039	-0.053	-0.014
	(-0.780)	(-1.083)	(-0.996)
Constant	-0.447	0.822	-0.004
	(-0.747)	(1.365)	(-0.020)
Pseudo R Squared	0.1135	0.1353	-0.0757
N	66	66	66

Panel B: Venture Funds

Dependent Variable (log)	PME	Multiple	IRR
Oversubscription	3.108	2.968	1.512*
	(1.216)	(1.214)	(1.815)
Oversubscription Squared	-1.054	-0.984	-0.526
	(-1.108)	(-1.088)	(-1.652)
ln(Fund Size)	0.128	0.121	-0.013
	(1.213)	(1.206)	(-0.348)
I(Growth)	0.312	0.340	0.094
	(1.243)	(1.440)	(1.512)
Constant	-3.103**	-2.109	-0.814*
	(-1.996)	(-1.418)	(-1.686)
Pseudo R Squared	-0.0470	-0.0122	0.0233
N	86	86	86

In Table 2.9, we constrain the sample to follow-on funds. The sample size is reduced in these regressions because past performance information is only available for a subset of funds. We use two measures of past performance. During the fundraising for a follow-on fund, a GP provides investors with information on the performance of their predecessor funds. This includes both actual historical performance to date and their forecasts of the final performance expected from predecessor funds. In this analysis, we include the performance of the predecessor fund measured at the time the follow-on fund is being raised (interim performance), as well as the latest performance available for the predecessor fund (final or ex-post performance). The latter is designed to capture the soft information that investors are provided with during the due diligence process (Hochberg et al. 2014). Several prior studies have shown some evidence of persistence in performance across PE funds raised by the same GP (Kaplan and Schoar 2005; Chung 2012; Robinson and Sensoy 2011; Hochberg et al. 2014; Harris et al. 2013).

We also control for either fund size or the change in fund size from the preceding fund to the current fund. Metrick and Yasuda (2010) and Chung (2012) observe that venture capital performance deteriorates with increased capital inflows, inferring that the skills required for managing venture investments are not scalable. This contrasts with their findings for buyout funds, which appear to be less adversely affected by increasing capital flows.

In Panels A and B of Table 2.9, similar to prior results, we find a concave relationship between oversubscription and buyout fund performance. Funds that are oversubscribed perform better than less subscribed funds, but this relationship deteriorates if a fund is excessively oversubscribed. For buyout funds, we observe an

insignificant relationship between the performance of a predecessor fund (measured at the time of oversubscription) and the performance of a future fund. However, the ex-post past performance of buyout funds is strongly positively related to future performance (similar to results in Kaplan and Schoar 2005; Robinson and Sensoy 2011; Chung 2012). However, even after accounting for past performance, the oversubscription variables remain strongly significant, confirming that oversubscription in buyout funds is neither merely a proxy for past performance nor the result of a return chasing strategy. When undertaking due diligence on a fund, investors clearly take into consideration other fund characteristics in addition to past performance. This is supported by Sensoy et al. (2013), who find that investors use information in returns of previous funds as well as other private information they collect (e.g., through quarterly reports) when making reinvestment decisions.

In the case of venture funds, we find mixed results, as shown in Panels C and D of Table 2.9. We find weak evidence of a concave relationship between oversubscription and performance.[13] This finding is consistent with Kortweg and Sorensen (2014), who develop a variance decomposition model to evaluate PE fund performance that distinguishes between the skill and luck of the PE manager. The authors find that venture capital performance is largely due to luck (rather than skill), making it more difficult for LPs to identify top-quartile venture capital funds.

We find a positive but insignificant relationship between the interim performance of a predecessor fund and the performance of a follow-on fund. This is consistent with Phalippou (2010), who argues that when using an ex-ante performance measure, only poor performing venture funds (as opposed to better performing funds) exhibit signs of persistence. In addition, we find a significant positive relationship

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[13] This relationship is not consistently significant across both performance measures.

between the final past performance of a venture fund and the performance of the next fund (similar to Kaplan and Schoar 2005; Hochberg et al. 2014; Harris et al. 2013). The final performance of a predecessor fund predicts the performance of a venture-focused follow-on fund. However, investors fall short in forecasting the final performance of venture funds using the interim performance and other information provided to them at the time of the fundraising of a follow-on fund.

Table 2.9 Oversubscription and Follow-on Fund Performance

This table includes only follow-on funds. Panels A and B display buyout funds using alternative measures of fund size. Panels C and D display venture funds using alternative measures of fund size. The dependent variable in each case is a measure of fund performance, and it is estimated using ordinary least squares regression. We include additional controls relevant to follow-on funds. The measure of performance of the previous fund in each instance is the same performance measure that is used as the dependent variable in each regression. Table 2.2 contains the variable definitions. In parentheses are t-statistics based on standard errors adjusted for heteroskedasticity and firm clustering. All regressions control for vintage fixed effects, whose coefficient estimates are suppressed. ***, ** and * denote significance at the 1, 5 and 10 percent levels, respectively.

Panel A: Buyout Funds with Fund Size

Dependent Variable (log)	PME	Multiple	IRR	PME	Multiple	IRR
Past Performance Measurement Period	Interim			Final		
Oversubscription	2.345**	1.906**	0.639***	1.690***	1.434***	0.513***
	(2.385)	(2.308)	(2.942)	(2.972)	(2.931)	(4.169)
Oversubscription Squared	-0.806**	-0.661**	-0.223***	-0.630***	-0.536***	-0.189***
	(-2.494)	(-2.476)	(-3.151)	(-3.285)	(-3.207)	(-4.553)
Past Performance	0.043	0.130	0.004	0.269**	0.297***	0.283***
	(0.364)	(1.212)	(0.076)	(2.288)	(2.766)	(2.900)
ln(Fund Size)	0.048	0.023	0.011	0.019	-0.001	-0.001
	(1.024)	(0.557)	(0.956)	(0.593)	(-0.043)	(-0.110)
ln(Fund Sequence)	-0.037	-0.043	-0.016	-0.050	-0.037	-0.005
	(-0.371)	(-0.519)	(-0.648)	(-0.710)	(-0.650)	(-0.316)
Constant	-1.750**	-0.960	-0.398**	-0.232	0.444	-0.104
	(-2.280)	(-1.534)	(-2.657)	(-0.515)	(1.096)	(-1.110)
Pseudo R Squared	0.1558	0.1814	0.1849	0.2916	0.4432	0.3500
N	78	78	78	113	113	113

Panel B: Buyout Funds with Change in Fund Size

Dependent Variable (logs)	PME	Multiple	IRR	PME	Multiple	IRR
Past Performance Measurement Period	Interim			Final		
Oversubscription	2.542**	2.064**	0.691***	1.780***	1.487***	0.532***
	(2.516)	(2.458)	(3.076)	(2.960)	(2.887)	(4.018)
Oversubscription Squared	-0.849**	-0.690**	-0.233***	-0.649***	-0.546***	-0.193***
	(-2.533)	(-2.523)	(-3.200)	(-3.294)	(-3.196)	(-4.473)
Past Performance	0.052	0.138	0.011	0.276**	0.295***	0.283***
	(0.451)	(1.332)	(0.219)	(2.304)	(2.745)	(2.866)
ln(Change in Fund Size)	-0.042	-0.084	-0.016	-0.040	-0.042	-0.016
	(-0.235)	(-0.534)	(-0.395)	(-0.296)	(-0.369)	(-0.578)
ln(Fund Sequence)	0.003	-0.028	-0.007	-0.039	-0.043	-0.007
	(0.035)	(-0.350)	(-0.306)	(-0.607)	(-0.811)	(-0.488)
Constant	-1.777**	-0.912	-0.369**	-0.190	0.433	-0.109
	(-2.563)	(-1.563)	(-2.462)	(-0.446)	(1.122)	(-1.202)
Pseudo R Squared	0.1433	0.1820	0.1755	0.2902	0.4442	0.3517
N	78	78	78	113	113	113

Panel C: Venture Funds with Fund Size

Dependent Variable (logs)	PME	Multiple	IRR	PME	Multiple	IRR
Past Performance Measurement Period	Interim			Final		
Oversubscription	1.583*	1.286	0.150	-1.097	-1.218	-0.330
	(1.670)	(1.490)	(0.508)	(-1.077)	(-1.267)	(-1.216)
Oversubscription Squared	-0.967**	-0.779*	-0.136	0.500	0.567	0.169
	(-2.081)	(-1.833)	(-1.117)	(1.004)	(1.221)	(1.223)
Past Performance	0.684	0.291	0.564	0.271***	0.256**	0.304***
	(1.209)	(0.677)	(1.265)	(2.783)	(2.532)	(3.999)
ln(Fund Size)	0.055	0.102	0.022	-0.025	-0.018	-0.017
	(0.546)	(1.172)	(0.528)	(-0.462)	(-0.341)	(-1.172)
ln(Fund Sequence)	-0.070	-0.094	0.010	0.071	0.083	0.042
	(-0.445)	(-0.695)	(0.166)	(0.727)	(0.895)	(1.543)
I(Growth)	0.198	0.208	0.058	0.173	0.169	0.037
	(0.929)	(1.150)	(0.664)	(0.974)	(1.053)	(1.016)
Constant	-0.252	0.582	0.170	0.669	1.238***	0.263**
	(-0.553)	(1.631)	(1.031)	(1.411)	(2.850)	(2.209)
Pseudo R Squared	0.1414	0.1287	0.1766	0.3279	0.4179	0.2923
N	86	86	86	158	158	158

Panel D: Venture Funds with Change in Fund Size

Dependent Variable (logs)	PME	Multiple	IRR	PME	Multiple	IRR
Past Performance Measurement Period		Interim			Final	
Oversubscription	2.268**	2.191***	0.325	-0.391	-0.488	-0.125
	(2.380)	(2.747)	(1.157)	(-0.374)	(-0.491)	(-0.497)
Oversubscription Squared	-1.200**	-1.090***	-0.196	0.261	0.319	0.097
	(-2.604)	(-2.709)	(-1.636)	(0.526)	(0.689)	(0.782)
Past Performance	0.695	0.320	0.557	0.273***	0.256***	0.301***
	(1.289)	(0.753)	(1.243)	(2.877)	(2.636)	(3.815)
ln(Change in Fund Size)	-0.151	-0.165	-0.028	-0.259**	-0.260**	-0.081*
	(-1.137)	(-1.264)	(-0.506)	(-2.186)	(-2.362)	(-1.958)
ln(Fund Sequence)	-0.072	-0.059	0.019	-0.008	0.011	0.009
	(-0.545)	(-0.514)	(0.305)	(-0.091)	(0.132)	(0.388)
I(Growth)	0.236	0.263	0.069	0.198	0.197	0.044
	(1.111)	(1.555)	(0.793)	(1.154)	(1.269)	(1.246)
Constant	-0.350	0.588*	0.001	0.331	0.912*	0.137
	(-0.731)	(1.740)	(0.005)	(0.690)	(1.980)	(1.176)
Pseudo R Squared	0.1465	0.1255	0.1748	0.3481	0.4376	0.3059
N	86	86	86	158	158	158

As a robustness test, the models in Table 2.7 to Table 2.9 are estimated with the non-log transformed performance variables (IRR, PME and multiple). Ordinary least squares regression is used to estimate IRR and PME, and Tobit models are used for multiples. Additionally, we exclude observations prior to 1991 to ensure that the small number of observations in this period are not driving our findings. In each case, our results generally remain qualitatively unchanged[14].

2.5. Conclusion

The fundraising success of PE funds is characterized by a lack of uniformity. Some PE managers are able to close funds relatively quickly, while others experience drawn-out raisings or have to delay or abandon their ambitions. Additionally, certain

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[14] When re-estimating Panel A Table 2.7 and using IRR as a performance measure, the coefficient on oversubscription is positive but insignificant.

GPs are able to attract more investor interest in their funds than they are able to accommodate within their fund size limitation. This gives them the power to select the investors they allow into their funds, as well as the respective commitment amounts contributed by those investors. Lured by the prospect of superior performance, investors often modify or compromise their investment strategy and processes to invest with these oversubscribed funds. Some engage consultants or fund of fund providers to facilitate access. Many grapple with the decision of whether to accept the reduced commitment amounts offered by the GP in order to secure a relationship with a top-rated manager, despite the amount being below their optimal size. Others allocate to first-time funds to guarantee future access to a GP's second- (or third-) time fund, which may be oversubscribed. Investors who are able to access these oversubscribed funds frequently tout their ability to do so, while investors who are excluded from investing (or have their allocation reduced) are routinely disappointed. However, there is no evidence to date regarding the performance of oversubscribed funds.

The purpose of this paper is to examine the factors that affect investor demand for a PE fund and to determine whether oversubscribed funds outperform. Investors are more likely to invest in a fund (leading to its oversubscription) when macroeconomic conditions are favorable for the fund strategy. Venture funds are more likely to be oversubscribed when GDP growth is high, whereas buyout investors are more likely to invest when credit spreads are narrower. Additionally, we find that buyout funds that are seeking to considerably increase their fund size are less likely to be oversubscribed.

In terms of performance, buyout funds that are oversubscribed are more likely to outperform undersubscribed funds, but their performance deteriorates as they raise excess capital. This relationship continues to hold when we control for the performance of predecessor funds. Conversely, venture fund oversubscription does not lead to better

performance. Venture funds invest in riskier companies that take longer to realize by the GP, making their valuation difficult for investors.

Our findings can assist investors in their PE allocation decisions, as we provide insights into the merits of allocating to oversubscribed funds where the capacity for investors (particularly new investors) is often constrained.

Further research could examine the relationship between oversubscription and investor attributes dependent on data availability. This could include investigating the implications of the number of investors and the type, location, and experience of an investor on oversubscription and performance. Moreover, an interesting extension to this study would be an analysis of the relationship between performance and the time taken by a PE fund to reach a first and final close. Similar to oversubscription, the expectation would be that quicker fundraisings imply higher investor demand and may therefore be associated with superior future performance relative to funds with more drawn-out raisings.

Chapter 3. Investment Decisions of Foreign and Local Investors in PE Funds in China

Chapter Summary

We examine the investing behavior of foreign and domestic investors in PE funds who invest in China. The Chinese PE market can be considered a quasi-segmented market due to information constraints and legal barriers. It is also characterized by information asymmetries between domestic and foreign investors and differing investor risk appetites. The results show a clear distinction between the investment attitudes of domestic and foreign investors in PE funds in China. We find that offshore investors are more likely to invest with firms that are more experienced and not government-affiliated. Foreigners are also more likely to invest in larger funds and funds that allocate a smaller portion of their commitments to China, which supports the view that they seek fund characteristics that lessen information asymmetry and provide additional diversification. We show that the size of an investor's commitment amount is determined by fund characteristics such as size, sequence, and stage, but not by the location of the investor. In terms of performance, we find some evidence indicating that domestic investor-backed PE funds exit a greater number of companies, and that their exited investments deliver higher returns relative to exits executed by PE funds supported by foreign investors.

3.1. Introduction

Understanding investment behavior is a topic that has attracted considerable academic attention for decades. Various international studies have examined the investment allocation decisions of investors in foreign-listed markets, including Kang and Stulz (1997) in the context of Japan, Grinblatt and Keloharju (2000) in Finland, Choe et al. (1999) in Korea, and Dahlquist and Robertsson (2001) in Sweden. Related to this area of study, researchers have also sought to determine whether local investors have an informational advantage or disadvantage relative to foreign investors, but they have generally found inconclusive results (Hau 2001; Grinblatt and Keloharju 2000; Dvorak 2005). This paper contributes to this issue by examining the investing preferences of PE fund investors in China. We use the term PE to refer to buyouts, venture capital, growth, and mezzanine strategies. Sensoy et al. (2013), Hochberg and Rauh (2013), and Lerner et al. (2007) also analyze the investment decisions of PE investors, but their focus is on US markets and the type of institutional investor rather than their geographic location.

China provides a unique setting to study investor behavior. Groh et al. (2012) rank China as the most attractive emerging country (and the twenty-second most attractive country on a global basis) for PE investors, based on the Global Venture Capital and PE Country Attractiveness Index. Further, the PE market in China is now of a considerable size, with China-focused PE funds raising around US$23 billion in 2012 (Ernst & Young 2012) and investing circa US$16 billion in 2011, representing in excess of five percent of the value of PE investments made globally.[15]

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[15] According to the European Union Chamber of Commerce in China and Bain & Company.

A focus on the Chinese PE market allows us to examine a type of quasi-segmented market (Jorion and Schwartz 1986). Segmentation arises in China because domestic investors tend to invest with Chinese PE managers due to both their preference to deal with Chinese parties and regulations that support investment by local institutions in Renminbi- (RMB) denominated funds. In contrast to non-RMB funds, RMB funds use RMB as their base currency and are subject to simpler and quicker regulatory approval processes. Foreign investors, on the other hand, are more disposed to deal with foreign managers with whom they are familiar, and are encouraged by onerous foreign exchange controls to invest in non-RMB-denominated vehicles. In this context, China is a contrast to developed markets, where it is very common to observe PE funds that derive their capital from a combination of domestic and foreign investors (rather than solely domestic or foreign investors). This segmentation of the Chinese PE market provides an attractive framework to examine the investment patterns of foreign and domestic investors.

This study uses a new dataset of China-focused PE funds, their managers, and their investors, compiled by the ChinaVenture Group. The comprehensive sample includes 1,448 China-focused PE funds and 2,184 investments in PE funds made by 1,234 domestic and foreign investors during 1998 to 2011. The data enable us to observe the dollar amount that an investor has committed to a PE fund. We analyze the Chinese PE market, PE funds operating in the market, and investors making allocations to these funds.

The Chinese stock market is characterized by large information asymmetries between investors (Chakravarty et al. 1998; Chan et al. 2008). Larger information asymmetries are even more likely to exist between domestic and foreign investors in the Chinese unlisted PE market. This is due to the immaturity of the PE market, the

uncertain regulatory environment, and the cultural and legal difficulties involved in executing transactions, compounded by the general lack of transparency evident in the PE asset class. It is arguable that minimal information asymmetry exists in more mature PE markets due to the strong familiarity of, and experience gained by, investors in these markets. We posit that due to informational asymmetries, offshore investors should favor PE strategies that serve to reduce their informational disadvantage. In addition, foreign and local investors will differ in their risk appetites (as observed by Ma 1996 in the Chinese listed market), with Chinese investors likely to be more risk-seeking. For foreigners, regardless of the medium, an investment into China presents a significant investment risk, and this should lead them to allocate investments to funds with more risk-averse attributes.

We examine the characteristics of investors, PE managers, and PE funds to determine the factors that influence the likelihood that a fund will receive investments from offshore investors, domestic investors, or a combination of both. Largely in line with our hypotheses, we observe a clear distinction between the investment behavior of domestic and foreign investors in PE funds in China. We find that compared to local investors, offshore investors are more likely to invest with firms that are more experienced (consistent with Merton 1987) and not government-affiliated (supported by Fernald and Rogers 2002, who examine the Chinese stock market). Foreigners also favor larger funds and funds that allocate a smaller portion of their commitments to China, which supports the hypothesis that they seek fund characteristics that lessen information asymmetry and increase their diversification. Foreign-backed funds are also less likely to be RMB-denominated funds. Joint venture (JV) capital funds, which are funds that receive capital from a combination of foreign and domestic investors, have similar features to foreign funds. One notable exception is that JV funds are more likely

to have lower fund sequence numbers, indicating that JV managers rarely raise follow-on funds. This may be because JV structures are established for a specific 'one-off' purpose, or it may suggest that JV funds are typically unsuccessful unions.

We also examine the determinants of the dollar amount that an investor commits to a particular PE fund. We find that the investor's location and type do not explain the size of their commitment amount, but that certain fund characteristics influence the amount they commit. Larger commitments are made to bigger funds and lower sequence funds, revealing the ease of access of these funds rather than preference. Larger allocations are also made to buyout funds, reflecting the shortage of buyout funds available in China to investors.

Further, we predict that Chinese investors are likely to outperform foreign investors on their PE investments. We argue that the informational advantage of domestic investors should lead them to make superior PE investments relative to their foreign counterparts. Additionally, should Chinese investors be risk-seeking (as suggested by Ma 1996), they should invest in funds that yield higher returns. Moreover, Chinese investors should exhibit better fund-picking abilities because they have a smaller universe of funds to select from, as they are constrained in their ability to invest offshore due to strict capital controls. We use the performance of foreign funds and domestic funds to make inferences about the performance of investors in those funds. In our analysis, we use both the number of exits executed by a fund and deal exit multiples as proxies for performance. Consistent with their informational advantage, we find that domestic capital funds are likely to exit a greater number of companies (although our result is marginally significant), and that their exited investments generate higher returns. Further, deals exited via an IPO and longer duration deals are likely to generate a higher exit multiple.

Our study is relevant to both investors and PE funds. The PE market in China is relatively immature, and little is known about investor behavior. We offer insights into PE funds, as we identify the manager and fund characteristics sought by investors. We also reveal to investors the investment biases of a cross-section of institutions investing in China.

The remainder of this chapter proceeds as follows. Section 3.2 provides a summary of the structure of the Chinese PE market. Section 3.3 details the related literature and our hypotheses. Section 3.4 describes the data. Section 3.5 outlines our univariate results, while Section 3.6 discusses our multivariate results. Section 3.7 concludes.

3.2. Structure of the Chinese PE Market

3.2.1 Investors in China

An aim of this paper is to examine the investment decisions of foreign and domestic investors in China. We define investors as the parties that provide funding to a PE fund manager in order for them to make investments in portfolio companies. In developed markets, the typical organizational form for a PE fund is a limited partnership where investors are LPs and the PE fund manager assumes the role of the GP. LP structures in China, however, only gained popularity in 2007 when the Partnership Enterprise Law of China was amended, allowing domestic institutions to invest as limited liability partners and improving the tax treatment of limited partnerships (Cao 2012). Prior to this, common Chinese PE investment vehicles included trusts and companies. Foreign institutions were permitted to participate in Chinese partnership structures in 2010.

Domestic corporations and government agencies were the early investors in Chinese PE, in contrast to developed economies where pension funds, insurance companies and endowments have been the largest PE contributors (Harris 2010). More recently, domestic investors in Chinese PE tend to be China's national pension fund (the National Social Security Fund), provincial governments, state-owned enterprises, insurance companies (e.g., China Life), local companies, and high net-worth individuals (UBS 2011).

Each institution type in China is regulated by a governing body and is subject to institution-specific laws regarding PE investment. Most of these policies promote investment by these institutions into onshore funds managed by local partners rather than offshore funds. With respect to Chinese pension funds, permission to invest in PE is obtained on an individual basis and is granted by the Chinese Insurance Regulatory Commission and the Ministry of Human Resources and Social Security. The exception is the National Social Security Fund (NSSF), which was permitted in April 2008 to invest up to 10 percent of its assets in domestic PE. Historically, Chinese insurance companies have had to obtain approval by the China Insurance Regulatory Commission to invest in PE on a case-by-case basis. However, in August 2010, insurance firms were granted permission to invest up to five percent of their assets in domestic PE, with their powers extended in 2012 to enable investment of 10 percent of their assets in PE, including foreign PE subject to certain conditions. Commercial banks are prohibited from investing in non-banking institutions or companies, and they are regulated by the China Banking Regulatory Commission. In 2008, securities firms were granted permission by the China Securities Regulatory Commission to establish their own PE arms (Emerging Markets Private Equity Association (EMPEA) 2008).

Anecdotally, there are considerable differences between most domestic and non-Chinese investors. Foreign investors are "typical" PE investors who seek to invest in funds that have five-year investment periods, 10-year terms, and that target multiples of two times their invested monies and IRRs in excess of 16 percent.[16] Conversely, Chinese investors reportedly seek investments with much shorter holding periods of around one to three years and significantly higher returns (around four times their invested monies). Additionally, investors differ in terms of the level of reporting they expect from their managers. While offshore investors are typically content with receiving quarterly reports, domestic institutions reportedly require more "hand-holding", such as one-on-one meetings, to receive an update or discuss developments (EMPEA 2008). According to Lin (2013), Chinese investors also vary from passive foreign investors because they often seek to involve themselves in the decision making of a PE fund and to exert influence over the PE manager.

3.2.2 PE Managers and Funds in China

The Chinese PE market is complex and difficult to navigate. Rules and laws pertaining to PE funds differ at a provincial level, and there has been a spate of regulatory changes affecting the sector. Both local and foreign PE fund managers operate in China, as well as a number of joint Chinese–foreign ventures. The market predominantly comprises RMB funds, but funds denominated in other currencies (mostly US dollars) are also prevalent. An RMB fund is established and governed under Chinese law and adopts RMB as its base currency, meaning that drawdowns and

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[16] According to the Coller Private Equity Winter 2010–11 Barometer, 44 percent of PE investors surveyed expect returns of 16–20 percent from the investments their underlying PE managers make in 2010 and 2011. Twelve percent of respondents expect returns of 21–25 percent, while four percent anticipate returns to exceed 25 percent. Other investors were more bearish, with 28 percent expecting returns in the range of 11–15 percent and 12 percent forecasting less than 10 percent (Coller Capital 2011).

distributions made by the fund are in RMB, which is not freely convertible and is subject to foreign exchange controls, thus compounding the difficulties for non-Chinese investors.

Global PE managers with Chinese fund offerings tend to be established, independent PE firms. They typically have longer track records than their Chinese counterparts and offer more hands-on skills and value additive capabilities to portfolio firms. They also provide investee companies with increased listing options and access to offshore markets to enable penetration of their product or service, or to undertake cross-border add-on acquisitions (Humphery-Jenner and Suchard 2013). Conversely, Chinese managers often have strong local networks, including connections with government entities, universities, and corporations. JV funds (often referred to as sino-foreign joint PE funds) are funds that are managed by both a domestic and a foreign manager. Through a JV, foreign partners can gain access to local networks and political connections, while the Chinese partner benefits from a larger capital base and experienced PE skills provided by the foreign partner.

In terms of investment vehicles, RMB funds can be either domestic-invested or foreign-invested. Domestic-invested RMB funds are typically only available to Chinese investors and are the preferred investment structure for these investors. They are denominated in RMB and are typically structured as limited partnerships, investment companies, or trusts (Ashurst 2010). Domestic-invested RMB funds have the simplest and fastest government approval processes, are not faced with currency conversion-related issues, and have the ability to invest in most sectors, thereby expanding their pool of potential deals. Foreigners can invest in domestic-invested RMB funds in limited cases by either acting as the fund manager (through a Chinese equity investment

management company that has a contract with a fund) or by investing in a fund via a subsidiary that has RMB available (Rothstein 2012).

Foreign investors typically invest in China via foreign-invested RMB funds or non-RMB-denominated funds (offshore funds). Compared to Chinese investors, foreigners investing in China face greater regulatory constraints, foreign exchange convertibility hurdles, tax treatment issues, and access to only certain sectors without restrictions. Foreign investors must obtain government approval on a deal-by-deal basis prior to investing in certain areas because foreign investment is encouraged, restricted, or prohibited in certain industries and sectors (as detailed in the Foreign Direct Investment Catalogue). To invest in any deal, foreign funds also need to obtain foreign investment clearance from the Chinese Ministry of Commerce (MOC). Foreign exchange conversion approval from the State Administration of Foreign Exchange (SAFE) is also required prior to investing in, and exiting from, an investment. Depending on the size and industry characteristics of a deal, approval to make an investment may also be required from the National Development and Reform Commission (NDRC). In 2006, the Chinese government introduced additional regulation requiring offshore investors to obtain MOC clearance to secure controlling stakes in some industries, and it gave the regulatory body greater powers to veto or scale back deals. When listing an investment, a foreign firm may also be required to seek approval from China's MOC, SAFE and/or the China Securities Regulatory Committee (CSRC) (Niu 2011).

Foreign-invested RMB funds are denominated in RMB and receive their capital from either foreign investors or a combination of foreign and domestic investors. They may offer some advantages over foreign currency funds, including more expedient regulatory approvals. Foreign-invested RMB funds are typically structured as Foreign-

Invested Venture Capital Investment Enterprises (FIVCIEs) or Foreign-Invested Partnerships (FIPs). FIVCIEs were introduced in 2003 to allow foreign PE firms to streamline the MOC approval process for technology investments, and they offer some improvements to the SAFE approval process. Most FIVCIEs are co-operative JVs (Niu 2011). FIPs were established in 2010 to allow foreign firms to form partnerships in China. FIPs can benefit from a streamlined MOC process, but they are still subject to the SAFE approval process. The Qualified Foreign Limited Partners (QFLP) program was introduced in 2011 to allow foreign managers that qualify to circumvent all or part of the Chinese investment approval regime depending on their investor base.

Offshore funds (or non-RMB funds) are formed in jurisdictions outside of China (typically the Cayman Islands or British Virgin Islands), denominated in a foreign currency, and usually structured as limited partnerships. Chinese companies that receive foreign currency funding are treated as foreign investment enterprises, meaning that they are subject to additional regulations (Chan 2012). Domestic investors can invest in offshore funds, but they face foreign exchange issues and generally must seek case-by-case approval to access foreign currency (EMPEA 2008). Domestic investors that have offshore subsidiaries or access to foreign capital can avoid this approval process.

Apart from the currency in which they operate, there are vast differences between offshore funds and RMB-denominated onshore funds. Non-RMB-denominated funds are structured as typical PE funds, sporting 10-year terms, five-year investment periods, and a fund size of around a few hundred million dollars. They usually raise successor funds every two to four years with commitments contributed by investors that are not involved in the management of the fund. In contrast, RMB funds often have a shorter fund life of around five years, a smaller fund size, and typically call capital from their investors much less frequently (two or three times per year). RMB funds also raise

successor funds much faster, with fundraisings occurring more often than annually (York 2008).

In the current environment, many PE firms offer both domestic-invested RMB funds and non-RMB-denominated funds in order to access all available opportunities. This can lead to conflicts of interest between the various fund investors (usually of particular concern for foreign investors) relating to the allocation of time and opportunities, as well as appropriate valuations in cases where the funds acquire positions in the same investment at different times.

3.3. Literature and Hypotheses

The aim of this paper is to analyze the Chinese PE market and examine the preferences of investors in PE funds in China. Sparse research has been undertaken on developing PE markets, including China (Tianwei Zhang 2002; Batjargal and Liu 2004; Ahlstrom and Bruton 2003, 2006; Ippolito 2007; Wang and Wang 2011; Dai et al. 2011; Humphery-Jenner and Suchard 2013). This study complements research that has examined the behavior of PE fund investors, largely in developed markets (Europe and the US). A few studies (notably Fried and Hisrich 1989; Barnes and Menzies 2005; Groh and Liechtenstein 2011b) have explored the criteria that PE investors use to select PE funds and have found that allocations are principally based on an assessment of the management team, deal flow, historical performance, investment strategy, and alignment. Hochberg and Rauh (2013) find that all types of institutional investors, particularly public pension funds, exhibit a significant bias to home-state investments in their PE portfolios. They find that local pension funds do not have an informational advantage, as they underperform on their in-state PE investments. Rather, they find that

overweighting by public pension funds is due to political pressures and poor management on the part of the investor. Focusing on data from 1991 to 1998, Lerner et al. (2007) find that there is heterogeneity in the performance of PE investments across investor types, with endowments outperforming other institutions due to their superior experience and access. Sensoy et al. (2013) examine investor performance post-1998 and find that endowments no longer outperform other investors on their PE investments.

We analyze a type of quasi-segmented market by examining the unlisted PE market in China. Several studies have examined the segmentation evident in the Chinese stock market (Bailey 1994; Ma 1996; Sun and Tong 2000; Chan et al. 2008). According to Jorion and Schwartz (1986), market segmentation is typically the result of indirect barriers, including information constraints, or legal barriers, such as regulatory constraints, tax differentials, and ownership restrictions (supported by Stulz 1981; Gultekin et al. 1989; Stulz and Wasserfallen 1995). In China, segmentation arises due to both of these reasons. Local investors typically invest with Chinese PE managers because they have a preference to deal with local parties and are typically restricted by regulation to investing in RMB-denominated funds. Conversely, foreign firms are encouraged to invest in non-RMB-denominated vehicles, largely due to onerous foreign exchange controls, and they are also more disposed to deal with foreign managers with whom they are familiar. In our empirical analysis, we show clear evidence that foreign investors are more likely to invest in non-RMB-denominated PE funds, while local investors favor investment in RMB-denominated PE vehicles.

Based on this quasi market segmentation, we contend that foreign and local investors also differ in relation to their PE investment allocation decisions (apart from currency preferences). Several studies have examined domestic and offshore investor behavior in the context of Chinese stock markets. Bailey (1994) documents that classes

of shares in China that are restricted to foreigners typically trade at a discount compared to shares that are available to locals. This price difference has been attributed to various factors, including the risk differential between investors (Ma 1996), information asymmetry (Chan et al. 2008; Chakravarty et al. 1998), differential supply and demand hypothesis (Stulz and Wasserfallen 1995; Sun and Tong 2000), liquidity (Chen et al. 2001), and corporate governance (Tong and Yu 2012).

We posit that, similar to the listed market in China, the information asymmetry hypothesis and the risk differential hypothesis can be extended to explain investor behavior in the unlisted PE market. The risk differential hypothesis states that foreigners and local investors differ in their risk appetites. Ma (1996) observes that Chinese investors are speculative and may be "risk lovers" that expect to generate returns in the short term. Related to this, Mei et al. (2009) also show that Chinese investors engage in speculative trading. The information asymmetry hypothesis states that some investors may have an information advantage. Domestic institutions and individuals are arguably better informed than foreigners due to their cultural knowledge and networks (supported by Shukla and Van Inwegen 1995; Brennan and Cao 1997; Coval and Moskowitz 1999; Kang and Stulz 1997; Hau 2001; Baik et al. 2010). Conversely, foreigners may be at an advantage due to their experience (Grinblatt and Keloharju 2000; Froot et al. 2001). In China, Chan et al. (2008) argue that information asymmetry, which they measure by the price impact coefficient, adverse selection component, and the probability of informed trading, explains the price difference between shares restricted to non-Chinese investors and those available to local investors. Their results are consistent with Chakravarty et al. (1998), who develop a model based on Grossman and Stiglitz (1980), which incorporates market segmentation and asymmetric information, and empirically test their predictions using media coverage as a proxy for information asymmetry.

In terms of PE manager characteristics, we predict that foreigners are more likely to invest with more experienced PE managers relative to domestic investors. According to Merton's (1987) model, investors will seek to invest in stocks with which they are familiar (investor recognition) due to high information costs. We argue that there is likely to be greater information available on more experienced managers and that foreign PE investors are more likely to be aware of these firms. Additionally, the costs associated with gathering information are likely to be higher for foreigners, suggesting that they are more likely to invest with more experienced managers relative to domestic PE investors.

Moreover, we infer that, relative to domestic investors, foreigners are more likely to invest with non-government-affiliated managers. Fernald and Rogers (2002) observe that foreign investors in China's segmented stock market pay relatively lower prices for firms with high state ownership. Foreigners may shun politically affiliated PE funds for a number of reasons. A government backed fund may have objectives other than financial gain (Manigart et al. 2002). Consequently, it could be argued that foreigners have less interest in a fund with societal goals, relative to a Chinese investor that may have some vested interest. Fan et al. (2007) find that politically connected publicly listed Chinese firms exhibit poorer performance (as measured by accounting metrics and stock returns) and attribute this to their pursuit of objectives other than firm value maximization. Additionally, the investment professionals of a government backed fund may have less relevant PE experience (Leleux and Surlemont 2003). In this regard, supporting a politically affiliated manager is inconsistent with a foreigner investor's desire to reduce information asymmetry and risk. Lastly, it may be the case that government affiliated PE funds exhibit weaker corporate governance characteristics. Fan et al. (2007) find that the boards of publicly listed firms with

politically connected CEOs are more likely to have politically affiliated directors, fewer board members with business experience from unaffiliated firms, and less educated directors. This leads to the first hypothesis:

Hypothesis 1: Relative to domestic investors, foreign investors are more likely to invest with more experienced PE managers that are non-government-affiliated.

In terms of fund characteristics, we anticipate that foreign investors will seek to invest in larger funds, as they are associated with less information asymmetry. Gompers and Lerner (1998) find that fund size is determined by past performance and reputation. In the Chinese listed market, Fernald and Rogers (2002) observe that foreign investors in China pay a higher relative price for larger companies (measured by sales). This is also supported by Kang and Stulz (1997) who show that foreign investors in Japan invest primarily in large firms. Similarly, we expect foreigners to seek funds with higher fund sequence numbers. Lerner and Schoar (2004) purport that the sequence number of a fund is a reflection of the historical information that is available on that fund. This would mean that funds with larger sequence numbers are associated with less information asymmetry. In terms of geographical concentration, we expect non-local investors to be biased toward funds that are more internationally diversified. Dahlquist and Robertsson (2001) find that foreigners tend to overweight firms with large export sales, as they are more likely to be globally recognized. Additionally, an investment in China encompasses risk, and we anticipate that a foreign investor will seek to reduce that risk by investing in more diversified funds. In this respect, we anticipate offshore investors to favor funds that allocate more of their commitments to markets outside of China. Focusing on investment stage, we posit that foreign investors will prefer buyout-focused funds rather than venture- or growth-focused funds. Venture funds invest in riskier early-stage companies that have uncertain outlooks (Chen et al. 2009). This is

consistent with Fernald and Rogers' (2002) findings that foreign investors pay relatively less than Chinese residents for listed high-growth companies. Therefore, the second hypothesis is as follows:

Hypothesis 2: Relative to domestic investors, foreign investors are more likely to invest in higher sequence funds, larger funds, buyout-focused funds, and funds with a smaller allocation to China.

Further, we predict that Chinese investors are likely to outperform foreign investors on their PE investments. In addition to explaining investor preferences, the information asymmetry and risk differential hypotheses can be used to rationalize the relative performance of foreign and domestic investors. Understanding cultural norms and strong networks is extremely important in China (Bian 1994; Farh et al. 1998; Chua et al. 2009), arguably more so than PE expertise. This means that the informational advantage of domestic investors should lead them to make higher returning PE investments than their foreign counterparts. Chinese investors also have a smaller universe of potential PE investments to choose from because they are constrained in their ability to invest offshore due to strict capital controls (Sun and Tong 2000). Assuming a foreign and Chinese investor are identical in terms of time and resources spent researching PE, this may give the local investor a further advantage, as they have a narrower sample of PE funds to diligence.

Additionally, domestic investors may exhibit better performance as compensation for their risk taking. Ma (1996) suggests that Chinese investors are risk-seeking which should lead them to invest in funds that yield higher returns. Assuming hypothesis 2 is correct, foreign investors should favour funds with less risky attributes

including higher sequence funds, larger funds, buyout-focused funds, and funds with a smaller allocation to China. Consequently, the third hypothesis is as follows.

Hypothesis 3: Domestic investors are likely to outperform on their PE investments relative to foreign investors.

3.4. Data

3.4.1 Sample

The data are extracted from CV Source, which is a comprehensive dataset of PE investments in China. ChinaVenture Group, which is a research and consulting firm based in China, compiles the data from questionnaires, interviews, and mainstream media. It includes information on Chinese PE funds, their managers, and the investors that invest in them.

The final sample includes 1,448 PE funds managed by 871 managers, and 2,184 investments in PE funds made by 1,234 investors during 1998 to 2011. To be included in the sample, we require each observation to have the necessary control variables used in our analysis. Additionally, we exclude real estate funds and infrastructure funds. We use exchange rates provided by Datastream to convert non-US dollar amounts into US dollars. Figure 3.1 and Figure 3.2 show the distribution of the sample during the period. While the number of new non-RMB funds raised has been relatively stable over time, RMB-denominated funds have experienced a dramatic acceleration in fundraising, particularly since 2007. This surge in RMB funds can be attributed to regulatory changes permitting investment by certain domestic investors, the introduction of favorable amendments to the limited liability structure in China, and the increase in exit

channels available for PE investee companies with the formation of the Shenzhen Small and Medium Enterprise (SME) Board and the ChinaNext Board in 2003 and 2009, respectively (Cao 2012).
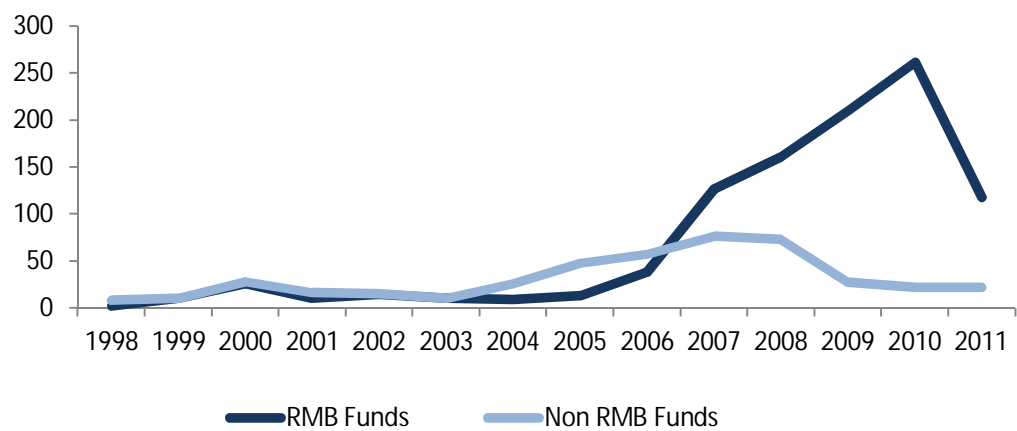
Figure 3.1 Distribution of PE Funds

Figure 3.1 displays the distribution of the 1,448 PE funds in the sample based on the fund closing date, and it divides the sample into RMB-denominated funds and non-RMB-denominated funds. There are 1,010 RMB funds and the 438 non-RMB funds in our sample.
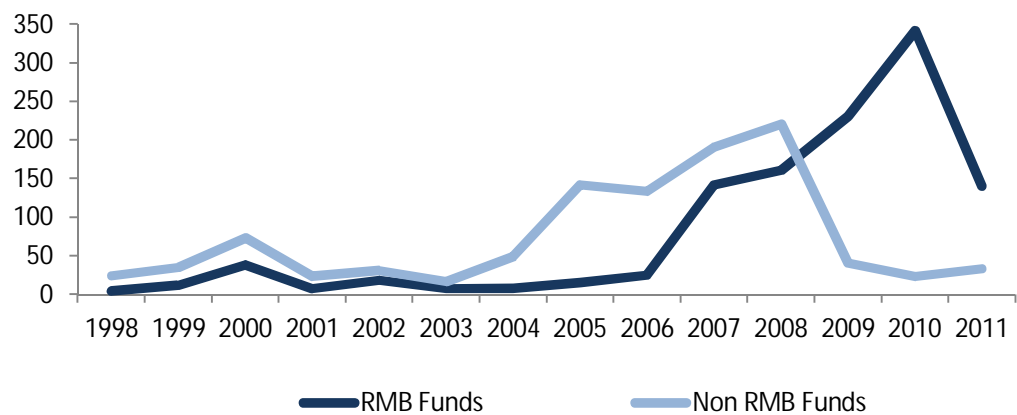
Figure 3.2 Distribution of PE Fund Investments Made by Investors

Figure 3.2 displays the distribution of the 2,184 PE investments made in 1,448 PE funds by 1,234 investors between 1998 and 2011. Of the 2,184 PE fund investments, 1,032 are investments in RMB funds and 1,152 are investments in non-RMB funds.

Each of the variables used in this study are defined in Table 3.1 and explained in more detail as follows.

Table 3.1 Variable Definitions

Fund Variable	Definition
I(Offshore Capital Fund)	An indicator variable that equals one if a fund's commitments come from non-domestic investors
I(Domestic Capital Fund)	An indicator variable that equals one if a fund's commitments come from domestic investors
I(JV Capital Fund)	An indicator variable that equals one if a fund has been funded by a combination of offshore and domestic investors
I(Government Affiliation)	An indicator variable that equals one if the fund is government-affiliated
Year Manager Founded	The year the PE manager was founded
Manager Experience	The year the PE fund closed minus the year the PE manager was founded
Fund Sequence	The fund sequence number of a PE fund
ln(Size)	The natural log of the PE fund's size in US dollars
Vintage	The year a fund had its final closing
Allocation to China	The percentage of fund commitments intended to be allocated to China
I(Buyout)	An indicator variable that equals one if a fund focuses on buyout-stage investments
I(Venture and Growth)	An indicator variable that equals one if a fund focuses on venture- or growth-stage investments
I(RMB Denominated)	An indicator variable that equals one if the fund is RMB-denominated
Number of Fund Exits	The number of exits executed by a PE fund
Number of Fund Investments	The number of investments made by a PE fund
Proportion of Exited deals	The number of fund exits divided by the number of fund investments
Exit Multiple	The value of the deal at exit divided by the amount invested in the deal

Investor Variable	Definition
ln(Investor Commitment)	The natural log of the amount the investor has contributed to a particular fund in US dollars converted at the date of the final fund closing
I(Offshore Investor)	An indicator variable that equals one if the investor derives their funding from overseas
Year Investor Founded	The year the investor was founded
ln(Investor Capital)	The natural log of the investor's capital under management in US dollars
Investor Years in China	The number of years between an investor's latest and first Chinese PE investment during the sample period
Investor Number of Investments	The number of investments an investor has made in China during the sample period
First China Investment	An indicator variable that equals one if the investment being made is the investor's first investment in China
Experienced China Investor	An indicator variable that equals one if an investor has been investing in China for more than five years
I(HQ Greater China)	An indicator variable that equals one if an investor's headquarters (HQs) is in mainland China, Hong Kong, Macau or Taiwan
I(HQ Americas)	An indicator variable that equals one if an investor's HQs is in the US, Canada or South America
I(HQ Europe)	An indicator variable that equals one if an investor's HQs is in Europe
I(HQ Other)	An indicator variable that equals one if an investor's HQs is in Asia (excluding greater China), New Zealand, Australia, South Africa or the Middle East
I(Corporate)	An indicator variable that equals one if the investor is a corporate entity
I(Government)	An indicator variable that equals one if the investor is a government-affiliated entity
I(Financial)	An indicator variable that equals one if the investor is a financial investor

3.4.2 Fund-level Variables

We define a fund according to the source of its capital. *Offshore Capital Fund* is an indicator variable that takes the value of one if a fund's commitments come from purely non-domestic investors, and zero otherwise. *Domestic Capital Fund* is an indicator variable that equals one if a fund derives its funding from purely domestic investors, and zero otherwise. *JV Capital Fund* is an indicator variable that equals one if a fund has been funded by a combination of offshore and domestic investors, and zero otherwise. A JV-funded fund is typically a PE fund that has been formed by two parties (usually PE managers and/or government entities) that are seeking an alliance in order to enhance their investing ability in China. The onshore party often provides the local knowledge and networks, while the foreign party offers hands-on PE skills.

We also control for other fund characteristics. We capture the experience of the PE manager using the variable *Manager Experience*, which is calculated as the year the fund closed minus the year the PE manager was founded. *Year Manager Founded* refers to the year in which the manager was founded. *Government Affiliated* is an indicator variable that takes the value of one if the fund is government-affiliated, and zero otherwise.[17] *Fund Sequence* refers to the fund sequence number of a PE fund. The first fund raised by a particular PE manager would have a fund sequence number of one, while the next fund would have a fund sequence number of two, and so on. For PE firms that manage multiple PE funds that pursue different strategies (e.g., venture-focused funds and small buyout funds), each strategy is viewed independently for the purpose of the fund sequence variable. Higher sequence funds are often raised by more experienced managers and usually deliver higher returns than funds with lower

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[17] Government-affiliated funds are defined as the funds of a PE firm that are fully/partly/indirectly owned by a provincial or central government or a state-related organization. The data were hand collected by searching Baidu.com.

sequence numbers (Kaplan and Schoar 2005). To control for fund size, we use *ln(Size)*, which is measured as the natural log of the fund's total commitments in US dollars. *Vintage* refers to the year a fund had its final closing.

Allocation to China is the percentage of fund commitments the PE manager intends to allocate to China. In this context, three types of funds exist: China funds that invest 100 percent of their commitments in mainland China; regional funds that typically allocate the majority of their commitments to mainland China, with the remainder apportioned to other Asian countries; and global funds that assign a very small amount of their commitments to China as part of a broader global strategy. The amount that a PE manager intends to allocate to China is likely to be very similar to the amount they actually allocate. PE funds have investment agreements with their investors that are established at the time a fund is raised. These agreements typically stipulate the investment universe for a fund, and there is often limited ability for the manager to deviate from these guidelines.

We also categorize funds by stage. The sample includes funds with a stage focus defined as one of the following: buyout, venture, growth, mezzanine, and multistage. The indicator variable *Buyout* takes the value of one where the fund focuses on buyout-stage investments, and zero otherwise. Similarly, *Venture and Growth* has a value of one where the focus of the fund is venture or growth investing, and zero otherwise. We combine venture and growth investments into a common variable because the terms venture and growth are typically used interchangeably in China, and funds that purport to invest in venture are typically undertaking more growth-style investments. *RMB Denominated* is an indicator variable that takes the value of one if the fund is RMB-denominated, and zero otherwise.

We measure the performance of foreign funds, domestic funds, and JV funds to make inferences about the performance of the investors in those funds. To measure fund performance, we use several measures. *Number of Fund Exits* represents the number of exits executed by a fund. We argue that a larger proportion of exited deals are likely to be good deals as a fund manager may be inclined to keep poor performing investments on their books rather than realize the negative return. This is consistent with Cumming and Dai (2010), who find that alternative investment funds have a tendency to misreport non-positive returns. We control for *Number of Investments*, which is the number of investments that a fund has made. As an alternative measure of performance, we use the *Proportion of Exited deals*, which is calculated by scaling the number of exits by the number of investments. For the deals where there is available information, we also estimate the *Exit Multiple* of the deal, which is calculated by dividing the value of the deal at exit by the amount invested in the deal.

The descriptive statistics for our sample of funds are provided in Table 3.2. Of the 1,448 PE funds in our sample, 28 percent are funded by offshore investors, 66 percent are funded by domestic investors, and seven percent are funded by a combination of domestic and offshore investors. Seventy percent of the funds (or 1,010) are RMB-denominated, and most of the funds are first-time funds. The average fund was raised in 2008 by a PE manager that was founded in 2002. The mean (median) fund size is US$243 million (US$39 million), showing that our variable is highly skewed. Twenty-three percent of funds have some government-affiliation. In relation to investment stage, the majority of funds are venture- or growth-focused, with only three percent targeting buyout investments. This is not surprising, as debt financing for acquisitions is not freely available in China, making buyout investments difficult to execute. In terms of geographical focus, the average fund allocates 89 percent of its

commitments to China, with the remainder of its commitments allocated to other countries in Asia or more globally. Eighty-four percent (1,207) of the funds in our sample allocate their entire commitment to mainland China, 10 percent (149) deploy their commitments more broadly into the Asian region (including greater China), and six percent (92) classify themselves as global funds.

3.4.3 Investor-level Variables

We define investors by their source of capital. We create an indicator variable called *Offshore Investor*, which has a value of one if an investor derives their funding from overseas, and zero if the investor obtains their funding domestically. To measure the amount an investor has committed to a particular fund, we use *ln(Investor Commitment)*, which is the natural log of the amount an investor has contributed to a particular fund in US dollars converted at the date of the final fund closing.[18] To account for an investor's funds under management, we use *ln(Investor Capital)*, which is measured as the natural log of an investor's capital under management in US dollars. *Year Investor Founded* refers to the year in which the investor was founded.

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[18] We take the natural log because the untransformed variable exhibits extreme skewness and kurtosis (4.774 and 33.977), and the log transformed variable is more normally distributed (0.277 and 2.749).

Table 3.2 Fund-level Descriptive Statistics

This table contains fund-level summary statistics. Table 3.1 contains the variable definitions.

Variable	Obs.	Mean	Standard Deviation	Median
Investor Commitment (US$m)	776	38.032	83.923	9.275
Year Manager Founded	1207	2002	9.401	2004
Fund Sequence	1448	1.366	1.149	1.000
Size (US$m)	1448	242.642	949.969	38.747
I(RMB Denominated)	1448	0.698	0.459	1.000
I(Offshore Capital Fund)	1448	0.278	0.448	0.000
I(Domestic Capital Fund)	1448	0.655	0.476	1.000
I(JV Capital Fund)	1448	0.068	0.251	0.000
I(Buyout)	1448	0.032	0.177	0.000
I(Venture and Growth)	1448	0.898	0.302	1.000
Allocation to China	1448	88.914	26.739	100.000
Vintage	1448	2008	2.988	2008
I(Government Affiliation)	1448	0.230	0.421	0.000

We capture the experience of the investor in China using time variant variables. Our first measure, *Investor Number of Investments*, is calculated as the number of investments an investor has made in China. Related to this measure, *First China Investment* is an indicator variable that equals one where the investment being made is the investor's first investment in China. Our second measure, *Experienced China Investor*, is an indicator variable that equals one where an institution has been investing in China for more than five years, with day zero defined as the date of the investor's first investment in China. We use this term because the investment period for most PE funds is five years, and this should give a firm adequate time to improve its understanding of the Chinese market. We also calculate *Investor Years in China*, which measures the number of years between an investor's first and last Chinese PE investment during our sample.

We define the headquarters (HQs) of an investor according to four regions and create corresponding indicator variables. *HQ Greater China* includes institutions with

HQs in mainland China, Hong Kong, Macau, and Taiwan. *HQ Americas* includes firms with HQs in the US, Canada, and South America. *HQ Europe* includes investors with HQs in European countries. *HQ Other* includes investors with HQs in Asia (excluding greater China), New Zealand, Australia, South Africa, and the Middle East. We also characterize investors according to their type. We divide investors into *Corporate Investor*, *Government Investor*, and *Financial Investor.* Government-affiliated entities encompass government agencies, sovereign wealth funds, and government matching funds. Financial investor defines fund of funds, public pension funds, universities and endowments, family offices, asset managers, banks and insurance companies, and PE firms. Corporate investor includes corporate entities, but it is likely to largely encompass high net-worth individuals that make PE investments though their companies.

The descriptive statistics for the sample of investors are provided in Table 3.3. A few of our variables are highly skewed. The average (median) investor was founded in 1988 (1998) and has US$24 billion (US$2 billion) under management. On average, each investor makes around two investments in China over the sample period and has been investing in China for approximately one year. Thirty percent of the institutions in the sample are offshore investors. Seventy-four percent are headquartered in greater China (including Hong Kong and Taiwan), with 13 percent in the Americas and seven percent elsewhere. The majority of the investor base is defined as corporates, with the remainder being government-affiliated entities and financial investors.

Table 3.3 Investor-level Descriptive Statistics

This table contains the investor-level summary statistics of the sample. Table 3.1 contains the variable definitions.

Variable	Obs.	Mean	Standard Deviation	Median
I(Offshore Investor)	1227	0.299	0.458	0.000
Year Investor Founded	948	1988	26.660	1998
Investor Capital (US$m)	210	24000	63000	2175
Investor Commitment (US$m)	439	22.246	62.579	6.184
Investor Years in China	1234	1.069	2.443	0.000
Investor Number of Investments	1234	2.083	2.836	1.000
HQs of Investor				
I(HQ Greater China)	1234	0.739	0.439	1.000
I(HQ Americas)	1234	0.125	0.331	0.000
I(HQ Europe)	1234	0.071	0.257	0.000
I(HQ Other)	1234	0.065	0.246	0.000
Type of Investor				
I(Corporate)	1234	0.528	0.499	1.000
I(Government)	1234	0.091	0.287	0.000
I(Financial)	1234	0.382	0.486	0.000

3.5. Univariate Results

3.5.1 Chinese PE Funds

In this section, we present the univariate statistics of PE funds in the Chinese market. In Table 3.4, we compare the 402 offshore-funded funds in our sample with the 984 domestic-funded funds. We exclude the 98 JV funds for the purposes of this analysis. We find evidence in support of our first two hypotheses and the information asymmetry hypothesis. Funds backed by foreigners are managed by more experienced managers that are less likely to be government-affiliated compared to local funds (as per Hypothesis 1). Offshore investors tend to invest in higher sequence number funds and considerably larger funds, with the mean size of a foreign PE fund in China around US$679 million versus US$64 million for a domestic fund. The majority of both foreign and local funds are venture-focused, but a foreign fund is more likely to be buyout-

focused relative to a domestic fund (nine percent of foreign funds are buyout-focused compared to 0.9 percent of local funds). Consistent with the quasi-segmented market structure evident in China, we find that only a small minority of foreign-backed funds are denominated in RMB (seven funds), and very few local funds are denominated in non-RMB currency (eight funds). Fund currency clearly influences the source of capital of a fund, and it is likely to be the initial, and most important, decision for investors.

Table 3.4 Differences in the Characteristics of Offshore Capital Funds and Domestic Capital Funds

This table compares the characteristics of Offshore Capital Funds. Table 3.1 contains the variable definitions. For continuous variables, we test the significance of differences between means (medians) using t-tests (Mann–Whitney tests). For the binary variables, we compare proportions and medians (chi square test). ***, ** and * denote significance at the 1, 5 and 10 percent levels, respectively.

Variable	Offshore Funds		Domestic Funds		Comparison of Means or Proportions	Comparison of Medians
	Mean	Median	Mean	Median		
Year Manager Founded	1995	1992	2005	2007	-9.455***	-15.000***
Fund Sequence	2.184	1.000	1.044	1.000	1.140***	0.000***
Size (US$m)	678.514	100.000	64.405	18.894	614.109***	81.106***
I(Buyout)	0.092	0.000	0.009	0.000	0.083***	0.000***
I(Venture and Growth)	0.791	1.000	0.940	1.000	-0.149***	0.000***
Allocation to China	61.893	20.000	99.911	100.000	-38.018***	-80.000***
Vintage	2006	2004	2008	2009	-2.517***	-5.000***
I(Government Affiliated)	0.040	0.000	0.315	0.000	-0.275***	0.000***
I(RMB Denominated)	0.017	0.000	0.992	1.000	-0.975***	-1.000***

In Table 3.5, we compare the 1,010 RMB-denominated funds in our sample with the 438 non-RMB-denominated funds. We observe similar patterns as Table 3.4. We find that RMB-denominated funds (which are typically supported by local investors) tend to be run by less experienced PE managers, are younger (an average vintage of 2008 compared to 2006 for non-RMB funds), and smaller (average fund size of US$71 million versus US$639 million for non-RMB funds). RMB funds attract less capital because they are typically restricted to raising money from domestic investors and are managed by PE firms with shorter track records (Bläute 2010). We also find that

relative to foreign funds, RMB funds are more likely to be venture- or growth-focused, government-affiliated, and to allocate more of their capital to opportunities in China.

Table 3.5 Differences in the Characteristics of RMB-denominated Funds and Non-RMB-denominated Funds

This table compares the characteristics of RMB funds versus non-RMB-denominated funds. Table 3.1 contains the variable definitions. For continuous variables, we test the significance of differences between means (medians) using t-tests (Mann–Whitney tests). For the binary variables, we compare proportions and medians (chi square test). ***, ** and * denote significance at the 1, 5 and 10 percent levels, respectively.

Variable	Non-RMB Funds		RMB Funds		Comparison of Means or Proportions	Comparison of Medians
	Mean	Median	Mean	Median		
Year Manager Founded	1996	1999	2005	2007	-8.774***	-8.000***
Fund Sequence	2.112	1.000	1.043	1.000	1.069***	0.000***
Size (US$m)	638.864	227.500	70.816	21.574	568.048***	205.926***
I(Offshore Capital Fund)	0.902	1.000	0.007	0.000	0.895***	1.000***
I(Domestic Capital Fund)	0.018	0.000	0.931	1.000	-0.912***	-1.000***
I(JV Capital Fund)	0.080	0.000	0.062	0.000	0.018	0.000
I(Buyout)	0.089	0.000	0.008	0.000	0.081***	0.000***
I(Venture and Growth)	0.795	1.000	0.944	1.000	-0.149***	0.000***
Allocation to China	63.838	80.000	99.788	100.000	-35.950***	-20.000***
Vintage	2006	2007	2008	2009	-2.447***	-2.000***
I(Government Affiliated)	0.062	0.000	0.303	0.000	-0.241***	0.000***

3.5.2 PE Fund Investors in China

In Table 3.6, we compare the characteristics of the PE fund investors in the sample. There are 860 domestic investors and 367 foreign investors. Our results indicate that local investors are younger and much smaller than their foreign counterparts. Foreign institutions are more likely to be older and larger because they are likely to invest in PE outside their home country only after having gained considerable exposure to the asset class within their home country. In relation to type, domestic investors are mostly corporate entities, while foreign investors are predominantly financial institutions. We note that our category of domestic corporate investors probably includes high net-worth individuals, who often make personal investments through

corporations they own. Over the sample period, foreign institutions are likely to make more investments in China—on average, close to three compared to around two for their domestic counterparts. Foreign investors in the sample are likely to be more institutional in their investment policies and, following their decision to allocate to PE in China, will invest considerable resources in identifying investments, undertaking due diligence, and investing in PE funds. For Chinese investors, on the other hand, allocation decisions are likely to be driven by relationships and may not be part of a larger strategy to increase their Chinese PE exposure.

Table 3.6 Differences in the Characteristics of Investors

This table compares the characteristics of foreign investors to domestic investors. Table 3.1 contains the variable definitions. For continuous variables, we test the significance of differences between means (medians) using t-tests (Mann–Whitney tests). For the binary variables, we compare proportions and medians (chi square test). ***, ** and * denote significance at the 1, 5 and 10 percent levels, respectively.

Variable	Foreign Investors		Domestic Investors		Comparison of Means or Proportion	Comparison of Medians
	Mean	Median	Mean	Median		
Year Investor Founded	1968	1981	1996	1999	28.353***	18.000***
Investor Capital (US$m)	36314	7750	3254	147	-33060***	-7750***
Investor Commitment (US$m)	30.403	11.000	21.250	4.583	-9.153	-6.417***
Investor Years in China	2.134	0.000	0.620	0.000	-1.514***	0.000***
Investor Number of Investments	2.924	1.000	1.730	1.000	-1.194***	0.000***
Headquarters of Investor						
I(Greater China)	0.123	0.000	1.000	1.000	0.877***	1.000***
I(Americas)	0.420	0.000	0.000	0.000	-0.420***	0.000***
I(Europe)	0.240	0.000	0.000	0.000	-0.240***	0.000***
I(Other)	0.218	0.000	0.000	0.000	-0.218***	0.000***
Type of Investor						
I(Corporate)	0.232	0.000	0.652	1.000	0.420***	1.000***
I(Government)	0.035	0.000	0.115	0.000	0.080***	0.000***
I(Financial)	0.733	1.000	0.233	0.000	-0.500 ***	-1.000***

3.5.3 Chinese PE Investments of Foreign and Local Investors

We next compare the investment decisions of foreign and local investors, where the sample includes 1,170 investments in PE funds made by domestic investors and 1,007 by foreigners. Panel A of Table 3.7 displays the results and shows that, consistent with Hypothesis 1 and the information asymmetry hypothesis, foreign investors tend to invest in more experienced PE managers and with firms that are not government-affiliated[19]. We also find that foreigners prefer larger funds, higher sequence funds, and funds that allocate less of their commitments to China. Compared to domestic institutions, foreigners are more likely to invest in a buyout-focused fund. These findings are consistent with our second hypothesis. Foreign investors also tend to make larger investments into funds (average commitment amount of US$66 million compared to US$25 million for domestic investors).

Demonstrating the quasi-segmented structure of the Chinese PE market, we find a clear preference by foreign institutions to invest in non-RMB funds and by domestic firms to invest in RMB-denominated funds. Based on this observation, as a robustness measure in Panel B of Table 3.7, we compare investments by Chinese investors in RMB funds and by foreigners in non-RMB funds. The sample is slightly reduced to 1,117 investments made by domestic institutions and 979 investments by foreign investors. The results are largely unchanged.

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[19] It can be argued that a foreign investor's preference to invest with experienced managers is driven by their currency constraints, as non- RMB denominated funds tend to be managed by more experienced managers. To alleviate this concern, we re-estimate Table 3.7 when limiting the sample to manager's founded after 2000 (477 GPs), and continue to observe that the Year Manager Founded variable is significantly different between foreign and domestic investors.

Table 3.7 Differences in the Characteristics of Fund Investments by Investor Type

This table compares the characteristics of PE fund investments by investor type. We divide investors into domestic investors and foreign investors. Panel A includes PE fund investments by investors in all funds. Panel B includes only observations where domestic investors invest in RMB-denominated funds or foreign investors invest in non-RMB-denominated funds. We compare investments by domestic and foreign investors in both panels. Table 3.1 contains the variable definitions. For continuous variables, we test the significance of differences between means (medians) using t-tests (Mann–Whitney tests). For the binary variables, we compare proportions and medians (chi square test). ***, ** and * denote significance at the 1, 5 and 10 percent levels, respectively.

Panel A: Investment by Domestic Investors and Foreign Investors in All Funds

Variable	Investment by Domestic Investors		Investment by Foreign Investors		Comparison of Means or Proportions	Comparison of Medians
	Mean	Median	Mean	Median		
Investor Commitment (US$m)	24.884	6.184	65.570	25.000	-40.686***	-18.816***
Year Manager Founded	2005	2007	1997	2000	7.251***	7.000***
Fund Sequence	1.026	1.000	2.329	2.000	-1.303***	-1.000***
Size (US$m)	116.790	33.884	941.508	360.000	-824.718***	-326.116***
I(JV Capital Fund)	0.106	0.000	0.072	0.000	0.034***	0.000***
I(Buyout)	0.012	0.000	0.202	0.000	-0.190***	0.000***
I(Venture and Growth)	0.939	1.000	0.693	1.000	0.246***	0.000***
Allocation to China	99.624	100.000	65.497	80.000	34.127***	20.000***
Vintage	2008	2009	2006	2006	2.700***	3.000***
I(Government Affiliated)	0.412	0.000	0.112	0.000	0.300***	0.000***
I(RMB Denominated)	0.955	1.000	0.028	0.000	0.927***	1.000***

Panel B: Investment by Domestic Investors in RMB Funds and Foreign Investors in Non-RMB Funds

Variable	Domestic Investors and RMB funds		Foreign Investors and Non-RMB Funds		Comparison of Means or Proportions	Comparison of Medians
	Mean	Median	Mean	Median		
Investor Commitment (US$m)	23.505	5.860	66.062	25.000	-42.557 ***	-19.140***
Year Manager Founded	2005	2007	1997	2000	7.457***	7.000***
Fund Sequence	1.011	1.000	2.367	2.000	-1.356***	-1.000***
Size (US$m)	112.541	30.570	963.242	392.000	-850.701***	-361.430***
I(JV Capital Fund)	0.074	0.000	0.047	0.000	0.027***	0.000***
I(Buyout)	0.007	0.000	0.207	0.000	-0.200***	0.000***
I(Venture and Growth)	0.950	1.000	0.684	1.000	0.266***	1.000***
Allocation to China	99.991	100.000	64.877	75.000	35.114***	25.000***
Vintage	2008	2008	2006	2006	2.808***	3.000***
I(Government Affiliated)	0.417	0.000	0.108	0.000	0.309***	0.000***

3.5.4 Effect of Experience

In Table 3.8 we examine PE fund investments by experienced investors versus inexperienced investors where experience specifically relates to investing in Chinese PE. In Panel A, we define an experienced institution as one that has made more than one investment in China during the sample period. An inexperienced institution is a firm that is making its first investment in China. We observe 1,127 investments where the investor is defined as inexperienced and 1,057 observations where the institution is defined as experienced. We find that experience leads to investments with more experienced managers, in larger funds, and in higher sequence funds. These characteristics are usually associated with more experienced and reputable PE firms. Higher sequence funds are more likely to be oversubscribed and difficult to access. Experienced investors are likely to have established networks through their prior experience, enabling them to access these funds. Compared to inexperienced firms, experienced investors are more likely to invest in funds with a larger portion of commitments allocated to regions outside of China and to buyout-focused funds, and are less likely to invest in venture and growth funds. More experienced investors commit larger amounts to PE funds, potentially indicating greater conviction in their investment decisions.

As a robustness test, we use an alternative definition of experience, where an institution is experienced if it has been investing in China for more than five years, irrespective of the number of investments it has made. We use five years as the investment period for most PE funds is a similar period, and this should give an institution adequate time to improve its understanding of the Chinese market. In this case, there are 1,525 observations involving inexperienced firms and 659 observations

that include experienced firms. The results are presented in Panel B of Table 3.8, and we observe similar trends as in Panel A, with the exception that non-experienced investors invest in more JV funds and younger funds.

Table 3.8 Differences in the Characteristics of Investors by Experience

This table compares the characteristics of experienced and inexperienced investors and their PE fund investments. We divide investors into domestic investors and foreign investors. In Panel A, experienced investors are those that have made more than one investment in China, while inexperienced investors are those that have made one investment in China. In Panel B, experienced investors are those that have been investing in China for five or more years, and inexperienced investors are those that have been investing in China for less than five years. Table 3.1 contains the variable definitions. For continuous variables, we test the significance of differences between means (medians) using t-tests (Mann–Whitney tests). For the binary variables, we compare proportions and medians (chi square test). ***, ** and * denote significance at the 1, 5 and 10 percent levels, respectively.

Panel A: Investment by Investors using First China Investment as a Measure of Experience

Variable	Investment by Experienced Investors		Investment by Non-experienced Investors		Comparison of Means or Proportions	Comparison of Medians
	Mean	Median	Mean	Median		
Investor Commitment (US$m)	59.448	17.789	16.394	4.608	43.054 ***	13.181***
Year Manager Founded	2000	2001	2002	2002	-2.093***	-1.000***
Fund Sequence	2.015	1.000	1.263	1.000	0.752***	0.000***
Size (US$m)	756.885	250.000	254.608	45.141	502.277***	204.859***
I(JV Capital Fund)	0.094	0.000	0.089	0.000	0.005	0.000
I(Buyout)	0.150	0.000	0.051	0.000	0.099***	0.000***
I(Venture and Growth)	0.760	1.000	0.888	1.000	-0.128***	0.000***
Allocation to China	77.876	100.000	89.530	100.000	-11.654***	0.000***
Vintage	2007	2008	2007	2008	0.581***	0.000
I(Government Affiliation)	0.235	0.000	0.311	0.000	-0.076***	0.000***
I(RMB denominated)	0.364	0.000	0.681	1.000	-0.317***	-1.000***

Panel B: Investment by Investors using Experienced China Investors as a Measure of Experience

Variable	Investment by Experienced Investors		Investment by Non-experienced Investors		Comparison of Means or Proportions	Comparison of Medians
	Mean	Median	Mean	Median		
Investor Commitment (US$m)	69.321	25.000	24.357	6.005	44.964 ***	18.995***
Year Manager Founded	1998	2000	2003	2004	-5.151***	-4.000***
Fund Sequence	2.360	2.000	1.310	1.000	1.050***	1.000***
Size (US$m)	936.432	350.000	308.106	53.000	628.326***	297.000***
I(JV Capital Fund)	0.071	0.000	0.100	0.000	-0.028**	0.000**
I(Buyout)	0.197	0.000	0.057	0.000	0.140***	0.000***
I(Venture and Growth)	0.707	1.000	0.877	1.000	-0.170***	0.000***
Allocation to China	65.736	100.000	91.734	100.000	-25.998***	0.000***
Vintage	2005	2006	2008	2008	-2.362***	-2.000***
I(Government Affiliation)	0.196	0.000	0.308	0.000	-0.076***	0.000***
I(RMB denominated)	0.215	0.000	0.662	1.000	-0.447***	-1.000***

3.6. Multivariate Results

3.6.1 Likelihood of Investment by Foreign and Local Investors

In Table 3.9, we use a logit model to assess the impact of PE fund characteristics on investments by foreign and local investors. As we observe that currency is likely to be the strongest determinant of investment, we constrain the sample to offshore non-RMB-denominated funds and domestic RMB-denominated funds. The dependent variable is a binary variable that equals one if a fund derives its capital from foreign investors and is denominated in a non-RMB currency, and zero if a fund is backed by local investors and is denominated in RMB. We include year fixed effects, and t-statistics are adjusted for heteroskedasticity and PE manager clustering.

We find that funds backed by foreign investors tend to be managed by more experienced PE managers and those that do not have a government affiliation, consistent with Hypothesis 1. We also find that offshore capital funds are larger and have higher fund sequence numbers. Further, foreigners are more likely to invest in PE

funds with a smaller allocation to China, and they are less likely to invest in venture-focused PE funds (although these results are marginally significant). These results support the information asymmetry hypothesis and our second hypothesis. They are also consistent with the belief that non-domestic investors are likely to be more risk-averse with their investment decisions due to their lack of familiarity with the market.

Table 3.9 Logit Model Predicting the Source of Capital of a PE Fund

This table contains a logit model that predicts whether a fund obtains its capital from domestic or foreign investors. The dependent variable equals one where a fund is foreign-backed and denominated in non-RMB currency, and zero where a fund is domestic-backed and denominated in RMB. Table 3.1 contains the variable definitions. In parentheses are t-statistics based on standard errors adjusted for heteroskedasticity and PE manager clustering. All regressions include year dummies, whose coefficient estimates are suppressed. ***, ** and * denote significance at the 1, 5 and 10 percent levels, respectively.

	Offshore non-RMB funds vs. Domestic Capital RMB Funds
Manager Experience	0.131***
	(3.530)
Fund Sequence	0.996***
	(3.096)
Allocation to China	-0.181*
	(-1.904)
ln(Size)	1.800***
	(9.292)
I(Buyout)	-0.997
	(-0.516)
I(Venture and Growth)	-1.745*
	(-1.923)
I(Government Affiliated)	-3.305***
	(-5.958)
Constant	12.903
	(1.335)
Pseudo R Squared	79.60%
N	1114

In Table 3.10, we report results from the multinomial logit regressions. In this case, we do not limit our sample based on currency. We include year fixed effects, and t-statistics are adjusted for heteroskedasticity and PE manager clustering. For ease of interpretation, we report marginal effects evaluated at the sample mean. The results

indicate that having an experienced PE manager serves to increase (decrease) the probability that a fund derives its funding from foreign (domestic) investors. Foreign funding is 36 percent (50 percent) less (more) probable if the PE manager has a government affiliation (consistent with Hypothesis 1). Funds with a smaller (larger) allocation to China are more likely to derive their funding from foreigners (locals). Fund size is also positively (negatively) related to the probability that a fund is backed by foreign (domestic) investors. Larger funds and those with less of a focus on China offer foreigners more diversification and are more likely to be globally recognized. However, inconsistent with Hypothesis 2 is the result that a fund's stage does not affect the probability that a fund has foreign investors. We find that currency continues to be a strong determinant in the investment allocation decision. Being RMB-denominated significantly decreases (increases) the probability that a fund has foreign (domestic) investors.

In terms of JV funds, we observe that they share many common features with foreign funds. The presence of a more experienced PE manager increases the probability that a fund is established as a JV fund. A JV may be the preferred structure for offshore managers that possess considerable PE investing expertise in developed markets but that lack the networks to solely manage a PE fund in China. The probability of a fund being a JV also increases when the fund size is larger, the allocation to China is smaller, and the fund denomination currency is non-RMB. However, unlike foreign funds, having a higher fund sequence number decreases the probability of a fund being a JV by 10 percent, potentially indicating that JV structures are being established for a specific purpose as "one-time" funds, or that they are not performing as originally intended.

Table 3.10 Multinomial Logit Models Predicting the Source of Capital of a PE Fund

This table contains multinomial logit models that predict whether a fund obtains its capital from domestic investors, foreign investors, or a combination of both. We report marginal effects evaluated at the sample mean. Table 3.1 contains the variable definitions. In parentheses are z-statistics. All regressions include year dummies, whose coefficient estimates are suppressed. ***, ** and * denote significance at the 1, 5 and 10 percent levels, respectively.

Marginal Effects	Offshore Capital Fund	Domestic Capital Fund	JV Capital
Manager Experience	0.016**	-0.030***	0.014***
	(2.418)	(-3.753)	(2.829)
Fund Sequence	0.039	0.065	-0.104**
	(1.334)	(1.144)	(-2.164)
Allocation to China	-0.010**	0.023***	-0.013**
	(-2.170)	(2.704)	(-2.428)
ln(Size)	0.116***	-0.199***	0.084***
	(3.315)	(-5.109)	(2.875)
I(Buyout)	-0.139	0.329	-0.190
	(-0.721)	(1.302)	(-0.867)
I(Venture and Growth)	-0.067	0.088	-0.021
	(-0.478)	(0.414)	(-0.145)
I(Government Affiliated)	-0.357***	0.499***	-0.142
	(-2.986)	(4.101)	(-1.639)
I(RMB Denominated)	-0.874***	1.331***	-0.458***
	(-3.870)	(6.108)	(-3.512)
Log Likelihood	-275.051		
Pseudo R Squared	72.54%		
N	1207		

3.6.2 Determinants of the Size of a PE Investment

We next examine the dollar commitments made by investors to PE funds to determine their preferences regarding certain fund characteristics. In Table 3.11, we undertake ordinary least squares regressions using the log transform of an institution's commitment amount to a particular fund as the dependent variable. We include year fixed effects, and t-statistics are adjusted for heteroskedasticity and investor clustering.

In Column 1 of Table 3.11, we find that there is no distinction between foreigners and domestic institutions in terms of the size of their commitment amount. Similarly, the type of institution plays no part in determining the amount an investor

commits to a fund. We find that investors are more likely to make smaller commitments when it is their first investment in China, reflecting their general risk-averseness. We also observe that larger commitments are made to bigger funds and lower sequence funds. This is likely due to access rather than preference. Investors are more likely to receive a larger allocation if a fund size is bigger. Similarly, lower sequence funds are less likely to be oversubscribed, meaning that investors are able to allocate the amount they desire to the fund. When a fund is oversubscribed, some investors will be denied access to the fund, while others will be permitted to invest but only a smaller amount than they would usually have preferred (typically referred to as having their allocation scaled back). We also find that larger allocations are made to buyout funds. This is likely due to the lack of alternatives available among buyout funds, as they do not feature prominently in the Chinese market. Buyout funds comprise a small portion of the Chinese PE market because control deals are difficult to secure and debt is not generally available. We also find that larger allocations are made to JV funds but this result does not hold in robustness tests, as shown in Table 3.12.

In Column 2 of Table 3.11, we introduce interaction terms between the offshore investor and the type of investor. The results are generally consistent with Column 1, with the exception of type of investor. The coefficient on Financial Investor remains positive, but it is now significant. Financial institutions are likely to be the most sophisticated of investors, and the large allocation amount may signify their conviction in their decision making. However, the interaction term for Offshore Investor and Financial Investor is negative and significant, suggesting that non-Chinese financial institutions are likely to make smaller allocations. This result supports our information asymmetry hypothesis. Domestic investors may make larger allocations as their

informational advantage leads them to be less risk-averse, or because they are able to secure larger allocations due to their stronger networks.

Table 3.11 Determinants of Investor Commitment Amounts

This table contains ordinary least squares estimates. The dependent variable in each case is the log transform of an investor's commitment amount to a particular fund. Columns 1 and 2 examine all funds. Column 2 includes interaction terms. Table 3.1 contains the variable definitions. In parentheses are t-statistics based on standard errors adjusted for heteroskedasticity and investor clustering. All regressions include year dummies, whose coefficient estimates are suppressed. ***, ** and * denote significance at the 1, 5 and 10 percent levels, respectively.

Ln(Investor Commitment Amount)	Commitments by All Investors	Commitments by All Investors
I(Offshore Investor)	-0.655	0.521
	(-1.347)	(1.058)
I(Government Investor)	0.034	-0.102
	(0.176)	(-0.555)
I(Financial Investor)	0.149	0.376**
	(0.983)	(2.324)
I(Offshore)* I(Government)		-0.559
		(-1.628)
I(Offshore)* I(Financial)		-1.467***
		(-4.246)
I(First China Investment)	-0.440***	-0.467***
	(-3.619)	(-4.009)
Manager Experience	-0.002	-0.004
	(-0.202)	(-0.529)
Fund Sequence	-0.129***	-0.113***
	(-3.294)	(-3.054)
ln(Size)	0.545***	0.551***
	(12.106)	(12.600)
I(JV Capital Fund)	0.451**	0.333*
	(2.480)	(1.739)
Allocation to China	-0.006	-0.006*
	(-1.584)	(-1.683)
I(Buyout)	0.687***	0.716***
	(3.389)	(3.591)
I(Venture and Growth)	0.244	0.217
	(1.212)	(1.062)
I(Government Affiliated)	0.147	0.166
	(1.214)	(1.358)
I(RMB Denominated)	-0.297	-0.224
	(-0.688)	(-0.516)
Constant	1.627**	1.673**
	(1.992)	(2.114)
Adjusted R Squared	47.54%	40.88%
N	670	670

In Table 3.12 as a robustness measure, we include an investor's capital under management as a control variable. DaRin and Phalippou (2014) find that larger investors undertake more rigorous due diligence and monitoring of their investments, and they are treated more favorably by PE managers. This regression severely reduces our sample size, as there are only 192 observations where there are data available for an institution's capital under management. As per Table 3.11, we find that being an offshore investor is not a determinant of the amount an investor allocates to a PE fund. However, we find several differences regarding investor type. The previous results indicate that financial investors make larger commitments to PE funds. We now find that they make smaller commitments when controlling for their capital under management. We also find that government investors allocate smaller amounts, implying that corporate investors actually make the largest commitments to PE funds when accounting for their funds under management. The coefficient on Investor Capital is positive and significant, implying that investors with more money make larger commitments. In terms of fund characteristics, the results are generally consistent with Table 3.11, with the exception of JV funds and First China Investment, which become insignificant.

3.6.3 Performance of Domestic and Foreign Investors

We next examine the performance of PE funds in China to determine whether one class of investor outperforms. As only local investors support domestic capital funds in China and offshore capital funds are solely backed by foreigners, examining the performance of these PE funds enables us to make inferences about the performance of the investors in those funds.

Table 3.12 Robustness: Determinants of Investor Commitment Amounts

This table contains ordinary least squares estimates. The dependent variable in each case is the log transform of an investor's commitment amount to a particular fund. Columns 1 and 2 examine all funds. Column 2 includes interaction terms. Table 3.1 contains the variable definitions. In parentheses are t-statistics based on standard errors adjusted for heteroskedasticity and investor clustering. All regressions include year dummies, whose coefficient estimates are suppressed. ***, ** and * denote significance at the 1, 5 and 10 percent levels, respectively.

Investor Commitment	Commitments by All Investors	Commitments by All Investors
I(Offshore Investor)	0.135	1.007
	(0.313)	(1.497)
I(Government Investor)	-1.089***	-0.980***
	(-3.025)	(-3.120)
I(Financial Investor)	-1.057***	-0.744**
	(-3.110)	(-2.317)
I(Offshore)* I(Government)		-0.604
		(-0.955)
I(Offshore)* I(Financial)		-0.945
		(-1.560)
ln(Investor Capital)	0.234***	0.229***
	(3.385)	(3.200)
I(First China Investment)	0.022	-0.000
	(0.080)	(-0.002)
Manager Experience	0.007	0.007
	(0.393)	(0.374)
Fund Sequence	-0.137***	-0.139***
	(-3.078)	(-3.109)
ln(Size)	0.592***	0.599***
	(5.024)	(5.059)
I(JV Capital Fund)	0.245	0.249
	(0.929)	(0.924)
Allocation to China	-0.011**	-0.011**
	(-2.006)	(-1.997)
I(Buyout)	0.636**	0.620**
	(2.457)	(2.468)
I(Venture and Growth)	0.461	0.443
	(1.283)	(1.252)
I(Government Affiliated)	0.320	0.348*
	(1.611)	(1.705)
I(RMB Denominated)	1.035**	1.034**
	(2.297)	(2.215)
Constant	-1.294	-1.521
	(-1.196)	(-1.348)
Adjusted Rsquared	63.05%	62.87%
N	192	192

In Column 1 of Table 3.13, we proxy performance using the number of exits executed by a fund. We argue that a larger proportion of exited deals are likely to be better performing deals because fund managers may be inclined to keep poor performing investments on their books rather than realize the negative return (Cumming and Dai 2010). In Column 2, we scale the number of fund exits by the number of fund investments to ensure that the number of investments is not driving our results. For both estimations, we remove JV funds as it is difficult to categorize them as either foreign- or domestic-backed.[20]

Consistent with Hypothesis 3, we find some evidence (the coefficients in both regressions are marginally significant) that domestic capital funds are likely to exit a greater number of companies and a greater proportion of their investments. Chinese investors are likely to have an information advantage over foreigners due to their understanding of cultural norms and strong networks (consistent with, for example, Grinblatt and Keloharju 2000; Dvorak 2005). This finding corroborates Cao's (2012) claim that the ability of a PE firm to list an investee company domestically is driven by a PE manager's political connections. The results also support the suggestion that Chinese investors are better at selecting funds because they have a smaller investment universe compared to foreign firms and they can devote more time to undertaking research on PE funds. Further, we find that the number of investments made by a fund is the strongest determinant of the number of exits.

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[20] We also remove the six observations for which we have exit information and for which the fund is either foreign-backed and RMB-denominated or domestic-backed and non-RMB-denominated to ensure that these outliers do not drive our results.

Table 3.13 Determinants of the Number of Fund Exits and Percentage of Fund Exits

Column 1 is an ordered logit, and the dependent variable is the number of exits made by a fund. Column 2 is an ordinary least squares regression, and the dependent variable is the number of exits made by a fund divided by the number of investments made by the fund. Table 3.1 contains the variable definitions. In parentheses are t-statistics based on standard errors adjusted for heteroskedasticity and PE manager clustering. All regressions include year dummies, whose coefficient estimates are suppressed. ***, ** and * denote significance at the 1, 5 and 10 percent levels, respectively.

Dependent Variable	Number of Exits	Number of Exits/ Number of Investments
I(Domestic Capital Fund)	0.595*	0.084*
	(1.700)	(1.679)
Number of Fund Investments	0.214***	
	(5.182)	
Manager Experience	-0.000	-0.001
	(-0.009)	(-1.078)
Fund Sequence	-0.123	-0.016
	(-1.495)	(-1.378)
Allocation to China	0.002	-0.001*
	(0.501)	(-1.709)
ln(Size)	0.176*	-0.026*
	(1.918)	(-1.887)
I(Buyout)	-0.831	-0.005
	(-1.455)	(-0.058)
I(Venture and Growth)	0.367	0.139**
	(1.073)	(2.101)
I(Government Affiliated)	0.024	0.042
	(0.087)	(0.942)
Constant		0.175
		(1.291)
Pseudo R-squared	16.18%	15.88%
N	552	552

In Table 3.14, we use the exit multiple of a deal as a measure of performance. The exit multiple is calculated by dividing the value of the deal at exit by the amount invested in the deal.[21] The sample contains exit data for 336 deals in 220 funds. Of these deals, 236 are exited by domestic funds and 100 are exited by foreign funds. Similar to

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[21] To ensure the reliability of the data, we remove observations where the size of the investment is less than one percent of the fund size or greater than 50 percent of the fund size.

Table 3.13, we exclude JV funds. Of the 336 realized investments, 94% are exited via IPO (317 observations) with the remainder exited via merger or acquisition (19 observations). We run an ordinary least squares regression and a Tobit regression with an investment's exit multiple as the dependent variable. The t-statistics are adjusted for heteroskedasticity and PE fund clustering.

In line with Hypothesis 3 and the results from Table 3.13, we find that investments made by domestic-backed funds (or RMB funds) have higher returns on exit. This is consistent with the information disadvantage of foreign investors and their preference for PE funds with less-risk seeking characteristics.

Additionally, we observe that deals exited via an IPO are likely to generate a higher exit multiple (as identified in previous literature, including Black and Gilson 1998). These findings are consistent with Cao (2012), who observes that RMB funds are more likely to exit via an IPO. We also find that longer duration deals deliver higher multiples of cost. "Quick flips", where a manager exits via an IPO soon after investment, are very common in China. Investments with longer holding periods may therefore give a manager additional time to implement value-adding initiatives, thereby bolstering their exit multiple. With respect to investment stage, we find that buyout deals are exited at higher exit multiples. This is likely to be attributed to a lack of competition in the space which should translate to higher returns for the limited funds undertaking buyout investments. We also find some evidence that venture deals deliver greater exit multiples. This may be because of the risky nature of these investments, which should lead to a higher return outcome.

Prior to 2005, the regulatory environment (due to the Chinese Government's adoption of the Issuance Quota System and the Channel Restriction System) impacted

the ability of a firm to undertake a public offering (Liu et al., 2012). To address these concerns, in unreported results we constrain the sample in Table 3.13 to exits made in 2005 onwards. Our results remain unchanged.

Table 3.14 Determinants of Exit Multiples

The dependent variable in each case is the exit multiple for an investment. Column 1 is an ordinary least squares regression and Column 2 is a Tobit regression. Table 3.1 contains the variable definitions. In parentheses are t-statistics based on standard errors adjusted for heteroskedasticity and PE fund clustering. All regressions include year dummies. ***, ** and * denote significance at the 1, 5 and 10 percent levels, respectively.

Exit Multiple	OLS	Tobit
I(Domestic Capital Fund)	3.247**	3.594**
	(2.060)	(2.272)
IPO	6.427***	5.994***
	(4.022)	(3.789)
Deal Size	-0.017	-0.017
	(-0.565)	(-0.556)
Deal Duration	2.062***	2.071***
	(3.252)	(3.316)
I(Buyout)	8.329**	8.399**
	(2.267)	(2.307)
I(Venture and Growth)	2.567**	2.392*
	(2.021)	(1.878)
I(Government Affiliated)	0.012	0.083
	(0.007)	(0.052)
Constant	-10.518***	-10.282***
	(-2.843)	(-2.814)
Pseudo R-squared	8.04%	1.70%
N	336	336

3.7. Conclusion

We examine the investing behavior of foreign and domestic investors in PE funds in China using a large new dataset of Chinese PE funds and their investors. The Chinese PE market can be considered a type of quasi-segmented market; thus, it provides a unique opportunity to examine investor behavior in an unlisted market. Segmentation arises in the Chinese PE market due to both indirect barriers, such as information constraints, and legal barriers, including regulatory constraints and

ownership restrictions. Due to these barriers, local investors commonly invest in RMB-denominated funds managed by Chinese firms, while foreigners often commit to non-RMB-denominated vehicles managed by foreign managers.

Large information asymmetries are likely to exist between domestic and foreign investors in the Chinese unlisted PE market because of the immaturity and lack of transparency of the PE market, the uncertain regulatory environment, and the important role of cultural sensitivities and networks in executing transactions. Further, foreign and local investors are likely to have differing risk appetites. Thus, the investment behavior of domestic and foreign investors in PE funds in China may differ.

The results reveal several biases exhibited by investors in Chinese PE funds. We find that offshore investors are more likely to invest with firms that are more experienced and not government-affiliated. Foreigners are also more likely to invest in larger funds and those with a smaller allocation to China, consistent with the view that they seek to invest in funds with attributes that increase their diversification and reduce their information disadvantage. We also examine the determinants of the dollar amount that an investor commits to a particular PE fund. We find that the size of the commitment amount is not explained by investor location, but it is influenced by fund characteristics such as size, sequence number, and whether the fund is buyout-focused. In terms of performance, we find some evidence to indicate that PE funds backed by domestic investors exit a greater number of companies. Additionally, investments exited by domestic-backed funds generate higher returns relative to exits executed by foreign-backed firms.

These results contribute to the recent research on the behavior of domestic PE fund investors in the US market (Lerner et al. 2007; Dyck and Pomorski 2012;

Hochberg and Rauh 2013). We suggest that future research considers not only institutional type, but also the geographic location of investors in PE funds.

Chapter 4. Listed PE, Announcement Returns and Liquidity

Chapter Summary

Using an international sample, Chapter 4 examines the market reaction and liquidity impact of investment and exit announcements made by listed PE firms. We find that both types of announcements result in wealth gains to shareholders and serve to reduce information asymmetry. Liquidity, as measured by trading volume and the Amihud illiquidity ratio, increases significantly on the days surrounding these announcements. We also analyze the effect of a listed PE entity's stage focus, financing style, and organizational form. We observe that the market reacts more positively to acquisitions made by venture investors and less positively to exits executed by listed PE firms that provide equity financing or manage multiple products. In terms of liquidity, exit announcements made by venture investors generate increased trading volume. Additionally, exit announcements made by asset managers and investment announcements made by non-venture-focused entities reduce the Amihud illiquidity ratio.

4.1. Introduction

Listed PE, which defines publicly traded companies making PE investments, emerged as an asset class in the 1990s. The listing of a PE entity arguably exacerbates the agency conflicts that unlisted PE funds are designed to alleviate. Typically, the PE fund cycle comprises the following stages: fundraising, sourcing, managing investments, and divesting (Gompers and Lerner 2004). In the unlisted market, the structure and governance features of PE funds assist in overcoming certain agency problems (Sahlman 1990). Unlisted PE funds are usually structured with a finite lifespan, where commitments are drawn down from investors as required, and distributions are returned to investors when received from investments (Litvak 2004), effectively helping to reduce agency conflicts. The cycle is intended to incentivize managers to manage their current fund in the interests of investors, as they must return to investors to raise a follow-on fund and ensure the longevity of their business. In the listed market, these core disciplining mechanisms are circumvented. Once a listed PE entity is floated, managers have immediate access to a pool of capital with no staging of commitments and, in most cases, they do not need to return distributions from realized investments. Most of the vehicles have an indefinite time horizon, thus enabling managers to evade the need to raise further funds requiring them to prove their performance. Thus, it is more critical to reduce information asymmetry between managers and investors in a listed context.

We contend that the use of investment-related announcements by a manager is a means of reducing information asymmetry. Investment and exit announcements provide investors with a deeper understanding of the skills and capabilities of a listed PE firm. During the fundraising process, PE firms proclaim to investors their ability to source

quality deals and exit these investments at attractive returns. By announcing an investment or an exit, a listed PE firm should be better able to signal firm value. Through these announcements, the listed PE firm puts its reputation at stake by revealing its true abilities to the market, thus conveying positive private information to outsiders. Therefore, investment-related announcements should reduce information asymmetry, increase firm value, and induce liquidity.

PE firms (listed and unlisted) have a corporate objective to buy and sell assets. They typically seek to add value to their portfolio companies and often take an active role in their management, with the primary goal of generating a financial gain on the sale of their investment. In this respect, the investment and exit announcements of a listed PE entity differ from acquisition and divestiture announcements of public operating firms. The latter parties typically acquire assets due to synergistic reasons, managerial motives or hubris (Berkovitch and Narayanan, 1993). They undertake divestitures for financing reasons, to reduce diversification, or to improve the operating efficiency of the assets being divested (Schlingemann et al., 2002). Bargeron et al. (2008) compare acquisitions by public firms and unlisted PE funds and find that target shareholders earn higher premiums if the bidder is a public company rather than a PE firm. The authors argue that the concentrated ownership structure of PE firms (and private firms more generally) incentivises managers to make acquisitions that maximize firm value.

The purpose of this paper is to examine listed PE firms. We investigate the market reaction and liquidity impacts of the investment and exit announcements made by listed PE firms. In addition, we explore whether the investment focus, financing style, and organizational form of the listed PE entity affects returns and liquidity.

We first investigate the return response to announcements and broadly find that the market reaction is positive and significant when a listed PE firm announces that it is investing in, or exiting, an investment. Shareholders experience a significant positive return of 1.88 percent from exit announcements and 0.52 percent from investment announcements around the three-day event window.

Second, we examine liquidity changes around both investment and exit announcements using trading volume and the Amihud illiquidity measure as proxies for the liquidity of the stock. Liquidity is an often-cited benefit of listed PE. A primary motivation for investors in listed PE rather than unlisted PE is to increase the liquidity of a highly illiquid asset class. Cumming et al. (2011) find that 89 percent of the investors they surveyed believed that listed PE offered improved liquidity. Compared to unlisted PE, shareholders can immediately buy and sell shares, and it is often argued that disclosure is better due to the strict reporting requirements associated with being listed.[22] However, in practice, the LP/GP relationship in the unlisted space is likely to lead to greater transparency, as there are usually a smaller number of LPs that commit considerable amounts of money and actively monitor their investments (or who have advisors to monitor these investments on their behalf). We observe a significant increase in liquidity around announcements. Trading volume increases, but the effect is more marked in the case of investment announcements, and the Amihud illiquidity ratio declines.

Third, we investigate the effect of listed PE firm characteristics on announcement returns and liquidity. An event study setting is useful as it alleviates causality concerns. We categorize listed PE firms based on investment stage, type of

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[22] Lowe (2011) states that while listed PE entities are required to make reports and accounts available, their disclosure is limited by commercial sensitivities. In contrast, unlisted PE firms provide their investors with detailed information.

financing provided, and number of products managed. In terms of investment announcements, we find that the market reacts more positively to acquisitions made by venture investors, supporting the hypothesis that venture managers invest in companies associated with more information asymmetry. Larger bidders, newer firms, and transactions where the listed PE firm and target are in the same region experience higher abnormal returns upon investment announcements. In the case of exit announcements, exits that are executed by listed PE firms that provide equity financing and asset managers (managers of multiple products) reduce shareholder value. Deals sold to a syndicate of buyers have a negative effect on listed PE returns. With respect to liquidity changes, we find that exit announcements made by venture investors generate increased trading volume. Additionally, exit announcements made by asset managers and investment announcements made by non-venture-focused firms and equity investors reduce the Amihud illiquidity ratio.

Our findings have significant implications for investors and PE funds. Listed PE is a relatively new asset class that, although similar to unlisted PE, behaves differently in relation to risk, return, and liquidity. Pension funds and other sophisticated investors typically elect to invest in listed PE rather than unlisted PE because it provides a means of making an illiquid asset class more liquid. We show that the liquidity of listed PE improves around announcements, and that stock price reactions surrounding announcements are positive. Moreover, we reveal that fund type should clearly be a consideration when deciding which listed PE vehicle to invest in, particularly for investors with liquidity considerations. We also offer insights for listed PE funds, as we show that the features of their investments affect market reactions to their stock. This may also assist unlisted PE funds, as they can better anticipate investor responses to their decisions.

The remainder of this chapter proceeds as follows. Section 4.2 provides a summary of the relevant literature and outlines the hypotheses. Section 4.3 describes the data. Section 4.4 outlines our univariate results, while Section 4.5 discusses our multivariate regression results. Section 4.6 concludes.

4.2. Literature and Hypotheses

There has been limited academic research undertaken on listed PE. Earlier studies have focused on the performance of publicly traded venture capital firms (Martin and Petty 1983; Brophy and Guthner 1988). More recently, performance studies have moved beyond venture to examine the risk and return of the broader listed PE asset class (Bilo et al. 2005; Herschke and Lahr 2009; Kaserer et al. 2010; Jegadeesh et al. 2010), as well as the net asset value discounts of listed PE funds (Kaserer and Lahr 2010). Rather than examining the characteristics of the listed PE vehicles themselves, Cumming et al. (2011) investigate the determinants of European institutional investors' allocations to listed PE and find that investment in listed PE is typically undertaken by smaller institutions with a penchant for liquidity and those seeking speedy exposure to the asset class, as well as administrative ease.

A related study by Müller and Vasconcelos (2012) examines exit announcements by listed PE managers. The study analyses a sample of 279 exit events announced by 17 listed PE companies drawn from the S&P Listed PE Index; however, more than half of their observations relate to one listed PE company. They find that the announcement of the sale of an investment by a listed PE firm triggers significantly positive abnormal returns of approximately 0.9 percent over a seven-day announcement period. Their results suggest that exits are more important when there is greater

information asymmetry, and that an exit via an IPO generates the most positive abnormal returns.

The purpose of this study is to examine the impact of both exit and investment announcements on stock returns and liquidity. In addition, we investigate the influence of the listed PE entity's characteristics on returns and liquidity.

Baron (1982) and Rock's (1986) asymmetric information models suggest that announcements will lessen the level of uncertainty that investors have about a listed PE manager's ability. Additionally, we expect that announcements will signal the quality of an offering to potential investors (e.g., Spence 1973). Therefore, we expect to observe positive abnormal returns when a listed PE firm announces that it is exiting an investment. A PE firm's exit of an investment can be viewed in a similar manner to the divestiture of an industrial corporation. Our expectation of a favorable market reaction to exit announcements is consistent with the literature on the positive wealth effects of divestitures (Hite and Owers 1983; Jain 1985; Mulherin and Boone 2000; Hanson and Song 2000). While realization announcements reflect a manager's ability to sell an asset, an investment announcement is evidence of the manager's skill in sourcing deals. Consequently, we expect a similar positive market response if a firm announces that it has sourced a deal. This expectation is consistent with the observed positive relationship between industrial firm acquisitions and returns (Asquith et al. 1983; Mulherin and Boone 2000; Masulis et al. 2007). Thus, our first hypothesis is as follows:

Hypothesis 1: There will be a positive market reaction when a listed PE firm announces that it is making an investment or exiting an investment.

In addition to eliciting a market reaction, we anticipate that an investment-related announcement will lead to an increase in the liquidity of the listed PE stock. We

use two commonly used proxies of liquidity, including trading volume (Atiase and Bamber 1994; Chae 2005; Chen and Sami 2013) and the Amihud ratio (Amihud 2002; Chordia et al. 2009).

Previous studies have found a positive relationship between liquidity and voluntary disclosures (Welker 1995; Healy et al. 1999; Leuz and Verrecchia 2000). Moreover, trading volume has been shown to increase with the release of public information (Beaver 1968; Jarrell and Poulsen 1989; Sanders and Zdanowicz 1992; Chae 2005). Therefore, we expect an increase in trading volume around announcements by listed PE firms. Conversely, we expect the Amihud illiquidity ratio (Amihud 2002) to decline as information asymmetry is reduced. This leads to our next hypothesis:

Hypothesis 2: Liquidity (as proxied by trading volume and the Amihud ratio) will increase once a listed PE firm announces that it is making or exiting an investment.

Following from Hypothesis 1, we expect that an announcing firm with certain characteristics will elicit a more positive market response. We categorize listed PE firms into three categories: (i) investment stage focus, (ii) financing style, and (iii) organizational form.

Similar to the unlisted PE market, listed PE funds can invest in management buyouts/buy-ins, expansion capital, and venture capital. We classify a listed PE entity according to whether it predominantly makes venture investments compared to buyout or expansion-stage investments. Venture capital is the investment in early-stage businesses, and it is inherently riskier and more unpredictable than later-stage investing. Venture investors are typically actively involved in the management and monitoring of their investments (Hellman and Puri 2002). Kortum and Lerner (2000) also find that venture capital has significantly affected innovation in the US economy, as measured by

an analysis of patenting patterns. We posit that investment announcements made by venture investors are likely to elicit a more positive market response, reflecting their tendency to acquire companies characterised by more acute information asymmetries. Similarly, in the case of exit announcements, we anticipate a higher return from venture deals as managers deliver on their substantial promises. We argue that the market is not myopic and that it is able to appreciate the long-term gains that can be achieved from a venture deal despite the greater levels of uncertainty surrounding the deal. Consistent with this idea, Moltchanski et al. (2010) find that regardless of higher uncertainty, innovative expenditures (R&D and information technology (IT)) generate higher abnormal returns relative to capital expenditure announcements, suggesting that the market rewards innovation. Relative to buyout investors, venture investors typically invest in more innovative businesses that require higher levels of R&D spending due to their stage of development. In a related study, Aboody and Lev (2000) find that R&D contributes to information asymmetry between managers and investors, and that insider gains in R&D-intensive businesses are significantly larger relative to firms that are not engaged in R&D. Investors in listed PE firms focused on venture may believe that they may yield some of these insider gains.

We also classify firms into their dominant method of financing. A PE firm may finance an acquisition through equity financing or debt financing. Those providing equity financing rather than mezzanine debt or loans expect to earn a higher return on their investment. As equity providers are more actively involved in monitoring and managing a firm than debt financiers, we conjecture that, consistent with the monitoring hypothesis (and the model proposed by Shleifer and Vishny 1986), investments made by equity providers are likely to lead to a more positive share price reaction. Similarly, exit announcements made by equity providers should elicit a more positive share

reaction, reflecting the higher anticipated returns.

Listed PE firms are also categorized into their organizational form. A firm may elect to manage one fund or multiple pools of capital (herein referred to as asset managers). Two schools of thoughts can apply to the value-adding acquisitions of asset managers. The ability of listed PE managers to manage multiple funds may be a reflection of their superior quality. Cumming et al. (2011) find that 14 percent of investors indicated that their decision to invest in listed PE was influenced by the fact that one of their unlisted PE fund managers also managed a listed PE fund. Conversely, listed PE firms that manage multiple funds may be viewed as asset gatherers that are less concerned with making quality acquisitions and more concerned with increasing funds under management. Firms that manage additional funds generate fees and carried interest from the management of these funds. Shareholders usually have a right to a stake of these fees and will share in the returns generated by these other vehicles (via carried interest). We view the ability of managers to raise multiple pools of capital as a signal of their quality. Thus, we anticipate that investment and exit announcements made by asset managers will have a more positive market reaction. Therefore, our next hypothesis is as follows:

Hypothesis 3: The market reaction around investment-related announcements made by a listed PE firm will be more positive for listed PE firms that: (i) are focused on venture, (ii) provide equity financing, or (iii) manage multiple products.

Further, we postulate that the characteristics of a listed PE firm will affect the liquidity of its stock around announcements. Gopalan et al. (2012) construct a model and provide supporting empirical results to show that there is a positive relationship between asset liquidity and stock liquidity, and that this relationship strengthens for

firms with low-growth opportunities, as measured by capital expenditure and market-to-book. Thus, consistent with the findings of Gopalan et al. (2012), we anticipate that listed PE firms with a penchant for venture deals and equity investments will experience lower stock liquidity around investment-related announcements, as these investments are arguably less liquid and are associated with greater future uncertainty.

Hypothesis 4: The liquidity of a listed PE firm's stock around investment-related announcements will be less for listed PE firms that are focused on venture or providing equity financing.

4.3. Sample and Variables

4.3.1 Announcements Sample

We identify listed PE firms using the list of members of LPEQ as well as the components for the S&P Listed PE Index and the LPX50.[23] We extract investment and exit announcements from the Securities Data Corporation (SDC) and Capital IQ. We identify mergers and acquisitions and IPOs from both databases. Exit announcements refer to an announcement where the seller of an investment is a listed PE entity. Investment announcements refer to an announcement where the buyer of an investment is a listed PE entity.

We identify 423 investment announcements made by 45 listed PE vehicles and 231 exit announcements made by 32 listed PE vehicles between 1996 and 2011 that meet the following criteria: the acquisition is completed; the deal value is at least one percent of the listed PE firm's market capitalization measured on the eleventh trading

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[23] Identifying listed PE firms in this manner ensures that the listed PE entities in the sample are reasonably liquid, thereby avoiding issues associated with the analyses of illiquid stocks.

day prior to the announcement date; only one (seller) buyer is named in the case of (exits) investments;[24] no other exit or investment announcements occur on the same day; and the listed PE firm has stock return and liquidity information available from Datastream.

Our sample includes listed PE firms from 12 different countries: UK, US, Canada, France, Germany, Greece, Japan, Sweden, Switzerland, Spain, Italy and Belgium. The overwhelming majority of our firms are listed on the stock exchanges of the UK and the US. In the case of investment (exit) announcements, 20 percent (28 percent) are listed on the London Stock Exchange and 47 percent (38 percent) are listed in the US (on either the New York Stock Exchange or the NASDAQ). Appendix A displays the listed PE firms in the sample.

Table 4.1 reports the distribution of the sample during the period. Few investment announcements occur prior to 1999, and the number of exit announcements does not become sizeable until 2002. This is not surprising, as PE firms make investments during the early stages of a fund's life (from year one to year five), and they usually only begin to make exits from year four onwards. There are no investment announcements in 1998, but this is likely due to our inclusion criteria. The largest number of investment announcements is made in 2007 (63 announcements), which is consistent with the unlisted PE boom. Most investments were exited in 2009 (28 announcements), but this number is not dissimilar from the number of exits that occurred from 2007 to 2010.

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[24] We do this to ensure that any announcement effects are directly attributable to the party buying (in the case of investments) or selling (in the case of exits) an investment. Notwithstanding, we include transactions sold by a seller syndicate for investment announcements, and we include transactions sold to a buyer syndicate for exit announcements.

Table 4.1 Summary Distribution by Announcement Year

The sample consists of 423 investment announcements and 231 exit announcements made between 1996 and 2011.

Year	Number of Investment Announcements	Numbers of Exit Announcements
1996	1	1
1997	2	5
1998	0	4
1999	11	8
2000	19	8
2001	22	9
2002	18	11
2003	25	20
2004	42	13
2005	32	21
2006	47	19
2007	63	22
2008	30	21
2009	27	28
2010	39	22
2011	45	19
Total	423	231

Each variable used in this study is defined in Table 4.2 and explained in more detail as follows.

4.3.2 Listed PE Firm Characteristics

We classify listed PE firms along three dimensions:

(i) The PE asset class encompasses management buyouts/buy-ins, expansion capital, and venture capital. Managers may invest in one stage or diversify across stages. We identify firms where the majority of their investments are at the venture stage. *Venture Investor* equals one where a listed PE firm predominantly invests in venture deals, and zero otherwise.[25]

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[25] We classify the dominant investment focus of the listed PE entity and assume that all investments made by the manager are in this stage, as we are unable to classify the stage of the investment. In practice, firms may make other types of PE investments outside of their area of expertise; for example, a buyout- or expansion-focused manager may occasionally invest in a venture deal.

(ii)   PE funds may invest via equity or private debt (e.g., leveraged loans or mezzanine). *Equity Investor* equals one if the listed PE firm predominantly invests via equity financing, and zero otherwise.

(iii)   Listed PE entities have different organizational forms (see Herschke and Lahr 2009). A listed PE firm may focus solely on managing one fund or may opt to manage multiple products. The latter provides investors with diversification of both investment-specific and fund-specific risk. In some cases, shareholders may also be given the opportunity to participate in the management fees and carried interest received by these firms for managing funds. *Asset Manager* equals one if the listed PE firm manages money in addition to the listed vehicle, and zero otherwise.

We identify the investment stage, financing style, and organizational forms of the listed PE firms in our sample by examining the websites, quarterly reports, and annual reports of the firms. We also engage a listed PE fund manager[26] to cross-check our classifications to ensure their accuracy.

4.3.3 Listed PE Announcement Returns

We obtain stock returns and market returns from Datastream. Following the methodology proposed by Brown and Warner (1985), we measure the market reaction to a listed PE firm's announcement by market model adjusted stock returns. We use an ordinary least squares estimation of the model parameters over day -210 to day -11 (as per Masulis et al. 2007) using the S&P broad market index (BMI) of the country in which the listed PE vehicle is traded as the market return. Abnormal returns for each security are computed as the difference between observed returns and predicted returns,

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[26] We thank Barwon Investment Partners for their assistance.

where predicted returns are based on the market model. Average daily abnormal returns are then computed over the sample of announcements. We compute three-day cumulative abnormal returns (CARs) from day -1 to day 1, where day 0 is the date of the announcement, as well as five-day CARs (from day -2 to day 2).

4.3.4 Other Independent Variables for the Abnormal Return Analysis

To control for the industry sector in which the target operates, we calculate the *Sector Return*, which is measured as the announcement day return measured from the prior day of the relevant sector indices. Targets are classified into sectors based on industry/sector classifications provided by SDC and Capital IQ. In a few instances where this information was missing, we establish the industry of the target by analyzing the company description provided by the databases. We classify sectors into Technology, Consumer Services, Industrials, Consumer Goods, Telecommunications, Financials, Oil and Gas, Healthcare, and Basic Materials, and we use the relevant Datastream global sector index to measure the sector return.

We control for both stock run-up and market run-up to account for prior performance. Müller and Vasconcelos (2012) find that stock run-up and, in some cases, market run-up, are inversely related to announcement returns. We measure *Stock Run-up* as the listed PE firm's buy-and-hold abnormal return over the period 210 days to 11 days before the announcement using the S&P BMI of the country in which the listed PE firm is traded as the benchmark. We define *Market Run-up* as the sum of the market returns of the benchmark indices over the period 210 days to 11 days before the investment or exit announcement.

To capture the location of the target relative to the listed PE firm, we introduce an indicator variable, *Cross Border Transaction*, which equals one if the location of the

listed PE firm and the location of the target are in different regions, and zero otherwise. We define the following as regions: Canada and North America, Europe, and Asia.

We use *Private* as an indicator variable that denotes one when the target is a private company or subsidiary, and zero when it is a public company. Fuller et al. (2002) and Moeller et al. (2004) find that firms experience positive abnormal returns when acquiring private companies, and vice versa in the case of public firms.

Moeller et al. (2004) find that larger firms experience lower announcement returns. To control for firm size, we use *ln(Assets)*, which is measured as the natural log of the listed PE firm's total assets in US dollars one year prior to the announcement. We also include the *Relative Deal Size* of the investment made or sold, which we define as deal size over the listed PE firm's market capitalization measured on the eleventh trading day prior to the announcement date. We anticipate a positive relationship between the size of the deal and returns (Moeller et al. 2004). We also control for the *Age* of the listed PE firm, which is calculated as the difference between the year of the announcement and the year the firm was founded.

We include three additional control variables in the exit announcement analysis. We create the indicator variable *IPO* to denote investments that were exited via an IPO. Other exit mechanisms include trade sales and stock deals. Müller and Vasconcelos (2012) find that IPOs achieve more positive abnormal returns around exit announcements relative to trade sales, secondary sales, and stock deals. We also create the indicator variable *Buyer Syndicate*, which equals one if the asset is sold to a syndicate of investors, and zero otherwise. Further, *Majority Sold* is an indicator variable where one denotes cases where more than 50 percent of the company has been sold.

4.3.5 Liquidity Measures

We use two liquidity proxies based on daily data because our study includes firms in multiple countries. Goyenko et al. (2009) find that liquidity proxies using daily data generally do well in capturing the spread cost and price impact that are estimated using intra-day data. Data for the liquidity measures are taken from Datastream.

We calculate abnormal volume as the difference between actual volume and predicted volume, where predicted volume is based on an ordinary least squares estimation of a turnover-based market model with parameters computed over day -210 to day -11 (similar to Campbell and Wasley 1996). *Stock Volume* is defined as the natural log of the value traded of the stock (defined as price multiplied by number of shares traded) divided by the market capitalization of the stock (defined as price multiplied by number of shares of the company). *Market Volume* is defined as the natural log of the value traded of the Datastream Index of the country in which the listed PE firm is traded divided by the market capitalization of the respective index. Cumulative abnormal trading volume (CAV) is calculated for the three days surrounding the announcement (days -1 to 1), as well as five days (days -2 to 2).

The *Amihud Illiquidity Ratio* (Amihud 2002) captures the absolute percentage price change per dollar of the daily trading volume. Goyenko et al. (2009) find that, when using daily data, the Amihud ratio is a good proxy for price impact. Fong et al. (2011) identify that it is one of the best cost-per-volume proxies. It is computed as follows (for ease of interpretation, we multiply the ratio by 10^6):

$$\textbf{Amihud Illiquidity Ratio}_{jp} = \frac{\textbf{1}}{D_{jp}} \times \sum_{t=1}^{D_{jp}} \frac{|r_{jt}|}{Vol_{jt}}$$

Where r_{jt} = stock returns of firm j on day t

Vol_{jt} = US dollar trading volume for firm j on day t

D_{jp} = number of trading days for firm j in period p.

As a robustness test, following studies by Florackis (2011) and others, we also calculate a turnover-based measure of the Amihud illiquidity ratio using turnover rather than US dollar trading volume in the denominator. This accounts for size effects and eliminates currency issues that may arise from our international study context where our sample of firms has differing currencies.

We construct daily means of the Amihud illiquidity ratio across our sample. For our control sample, we calculate a pre-announcement period average by computing the mean of the Amihud ratio across all observations over day -210 to day -11. To test for significant changes in the Amihud illiquidity ratio around announcements, we compare the daily average to the pre-announcement period average (similar to Morse and Ushman 1983). For our multivariate regressions, to alleviate skewness, we take the log of the Amihud illiquidity ratio. We subtract the log of the average of the Amihud illiquidity ratio during the 200 days of the pre-announcement period from the log of the average of the Amihud illiquidity ratio during the three-day announcement period.

4.3.6 Other Independent Variables for the Liquidity Analysis

As in our abnormal return analysis, our regressions of liquidity control for firm size (Llorente et al. 2002), the relevant sector index return, and whether the investment being made/exited is a private company. Additionally, we control for *Volatility*, which

is defined as the standard deviation of daily returns during the pre-announcement period (day -210 to day -11). In our trading volume analysis, we also include the *Absolute Price Change*, which is the absolute value of cumulative returns from day -1 to day 0, where day 0 is the day of the announcement (Chen and Sami 2013).

Table 4.2 Variable Definitions

Variable	Definition
I(Venture Investor)	An indicator variable that equals one where a listed PE firm predominantly invests in venture deals, and zero otherwise
I(Equity Investor)	An indicator variable that equals one if the listed PE firm predominantly invests via equity financing, and zero otherwise
I(Manage Multiple Funds)	An indicator variable that equals one if the listed PE firm manages money in addition to the listed vehicle
Age	The difference between the year of the announcement and the year of listing of the PE entity
I(Cross Border Transaction)	An indicator variable that equals one if the location of the listed PE firm and the location of the target are in different regions
I(Private)	An indicator variable that equals one where the target is a private company or subsidiary, and zero if it is a public company
Relative Deal Size	Deal size over the listed PE firm's market capitalization measured on the eleventh trading day prior to the announcement date
Market Cap	Price multiplied by number of shares of the company
ln(Assets)	Natural log of the listed PE firm's total assets in US dollars one year prior to the announcement
Sector Return	Announcement day return measured from the prior day of the relevant sector indices
Stock Run-up	The buy-and-hold abnormal return over the period 210 days to 11 days before the announcement using the S&P BMI of the country in which the listed PE firm is traded as the benchmark
Market Run-up	The sum of the market returns of the benchmark indices over the period 210 days to 11 days before the investment or exit announcement
I(Buyer Syndicate)	An indicator variable that equals one if the asset is sold to a syndicate of investors, and zero otherwise
I(Majority Stake)	An indicator variable that equals one in cases where more than 50 percent of the company has been sold, and zero otherwise
I(IPO)	An indicator variable that equals one if an investments is exited via an IPO, and zero otherwise
CAR	Cumulative abnormal returns calculated using market model adjusted stock returns with parameters computed over the period 11 days to 210 days before the announcement (Masulis et al. 2007)
CAV	Cumulative abnormal trading volume calculated using a turnover-based market model with parameters computed over the period 11 days to 210 days before the announcement (Campbell and Wasley 1996)
Amihud Illiquidity Ratio	Daily ratio of absolute stock return to its dollar volume multiplied by 10^6
Absolute Price Change	Absolute value of cumulative returns from day -1 to day 0, where day 0 is the day of the announcement
Volatility	Standard deviation of daily returns during the preannouncement period (day -210 to day -11)

4.3.7 Descriptive Statistics

Table 4.3 presents descriptive statistics for the sample. A large majority (more than 85 percent) of investment and exit announcements relate to private targets. Investments tend to be significantly smaller in size compared to exits, and they are announced by listed PE entities that are not as large in terms of market cap and total assets. Of the listed PE entities that announce investments, 15 percent are venture investors and around half invest via equity and manage multiple products. In terms of exits, 10 percent are exited by venture investors, 78 percent by listed PE entities providing equity financing, and 62 percent by asset managers.

4.4. Univariate Results

4.4.1 Abnormal Returns around Investment and Exit Announcements

We first examine the market reaction to investment and exit announcements made by listed PE firms. Table 4.4 displays the event study results. Based on CARs, both types of announcements result in wealth gains to shareholders. We find that the market reacts positively to exit announcements. Average abnormal returns are significant and positive on the day of, and one day following, the realization announcement. Listed PE shareholders experience significant positive returns of 1.88 percent around the three-day event window and 1.61 percent around the five-day event window. In the case of investment announcements, the three-day and five-day CARs are marginally significant and of a smaller magnitude than exit announcements (0.52 percent and 0.65 percent for a three-day and five-day event window, respectively).

Table 4.3 Summary Statistics

This table contains summary statistics for the sample. Table 4.2 contains the variable definitions. We compare the means and medians of the investment and exit announcements for the continuous variables. To test the significance of differences between means (medians), we use t-tests (Mann–Whitney tests) as displayed in parentheses. ***, ** and * denote significance at the 1, 5 and 10 percent levels, respectively.

Variable	Investments			Exits			Diff. of Means	Diff. of Medians
	Mean	Std Dev.	Median	Mean	Std Dev.	Median		
I(Venture Investor)	0.151	0.359	0.000	0.100	0.300	0.000	n.a.	n.a.
I(Equity Investor)	0.525	0.500	1.000	0.775	0.419	1.000	n.a.	n.a.
I(Manage Multiple Funds)	0.473	0.500	0.000	0.619	0.487	1.000	n.a.	n.a.
Age (Years)	9.059	6.903	7.000	12.043	6.333	12.000	n.a.	n.a.
I(Cross Border Transaction)	0.076	0.265	0.000	0.013	0.113	0.000	n.a.	n.a.
I(Private)	0.856	0.352	1.000	0.874	0.332	1.000	n.a.	n.a.
Deal Size (US$ mill)	184.005	431.527	42.400	258.894	435.305	118.550	-74.889** *(-2.115)*	-76.150*** *(-6.993)*
Market Cap (US$ mill)	2,170	2,800	992	3,200	3,510	1,500	-1,030*** *(-4.076)*	-508*** *(-3.453)*
Total Assets (US$ mill)	3,870	5,790	1,210	5,630	5,480	4,460	-1,760*** *(-3.791)*	-3,250*** *(-5.367)*
Sector Return (%)	-0.000	1.115	0.060	0.074	0.967	0.062	-0.075 *(-0.855)*	-0.002 *(-0.636)*
Stock Run-up (%)	-0.049	0.065	-0.028	-0.124	0.459	-0.024	0.076*** *(3.329)*	-0.004 *(-1.371)*
Market Run-up (%)	7.441	16.787	9.823	5.670	17.492	9.178	1.771 *(1.271)*	0.645 *(1.064)*
I(Buyer Syndicate)	n.a.	n.a.	n.a.	0.286	0.453	0.000	n.a.	n.a.
I(Majority Stake)	n.a.	n.a.	n.a.	0.823	0.383	1.000	n.a.	n.a.
I(IPO)	n.a.	n.a.	n.a.	0.069	0.254	0.000	n.a.	n.a.

Table 4.4 Announcement Abnormal Returns

This table contains the average daily abnormal returns and CARs for investment and exit announcements. Abnormal returns are calculated based on the market model. Cumulative average abnormal returns are reported for various event windows relative to the event day (day 0). Table 4.2 contains the variable definitions. T-statistics are displayed in parentheses. ***, ** and * denote significance at the 1, 5 and 10 percent levels, respectively.

Day	Average Daily AR for Investments	Average Daily AR for Exits
-5	-0.105	-0.083
	(-0.924)	(-0.488)
-4	0.164	0.351
	(1.534)	(1.425)
-3	0.089	0.030
	(0.777)	(0.239)
-2	0.061	-0.295*
	(0.693)	(-1.876)
-1	0.113	0.292
	(0.758)	(1.325)
0	0.204	0.866***
	(1.390)	(3.042)
1	0.205	0.717***
	(1.580)	(3.124)
2	0.066	0.031
	(0.669)	(0.183)
3	0.094	0.017
	(0.880)	(0.067)
4	0.063	-0.315
	(0.517)	(-1.385)
5	-0.170*	-0.287
	(-1.722)	(-1.226)
CAR (-1,1)	0.522*	1.875***
	(1.734)	(4.029)
CAR (-2,2)	0.649*	1.610***
	(1.901)	(3.237)
Observations	423	231

4.4.2 Liquidity Effects of Investment and Exit Announcements

This section examines the changes in liquidity measures around exit and investment announcements using trading volume and the Amihud illiquidity ratio as proxies.

The results for trading volume in relation to both investment and exit announcements are shown Table 4.5. The three-day CAV is positive and significant for both investments and (marginally) exits. On day 0, there is a significant increase in trading volume for only exit announcements. In the case of investments, there are significant increases in trading volume for the two days following the announcement.

Table 4.5 Announcement Abnormal Volume

This table contains the average daily abnormal volume and cumulative abnormal volume for investment and exit announcements. Abnormal volumes are calculated based on a volume-based market model. Cumulative average abnormal volumes are reported for various event windows relative to the event day (day 0). Table 4.2 contains the variable definitions. T-statistics are displayed in parentheses. ***, ** and * denote significance at the 1, 5 and 10 percent levels, respectively.

Day	Average Daily Abnormal Turnover for Investments	Average Daily Abnormal Turnover for Exits
-5	-0.076*	-0.048
	(-1.950)	(-0.925)
-4	-0.005	-0.027
	(-0.134)	(-0.637)
-3	-0.010	-0.048
	(-0.258)	(-0.871)
-2	0.016	-0.104*
	(0.410)	(-1.777)
-1	0.047	0.000
	(1.138)	(0.996)
0	0.062	0.141**
	(1.547)	(2.374)
1	0.117***	0.074
	(2.824)	(1.420)
2	0.109***	0.047
	(2.725)	(0.388)
3	0.042	0.074
	(1.074)	(1.306)
4	0.072*	0.006
	(1.737)	(0.096)
5	0.044	0.013
	(1.090)	(0.812)
CAV (-1,1)	0.226**	0.215*
	(2.337)	(1.700)
CAV (-2,2)	0.351**	0.159
	(2.349)	(0.826)
Observations	385	221

We examine the Amihud illiquidity ratio surrounding investment and exit announcements in Table 4.6. In relation to investment announcements, we find that liquidity does not significantly improve at day 0, but it improves on several other days around the investment announcement. Our results around exit announcements are much stronger than investment announcements in demonstrating an improvement in liquidity. Our mean measures for the Amihud ratio over the three-day (day -1 to day 1) and five-day (day -2 to day 2) exit announcement windows are significant and show that our average Amihud ratio over these periods is significantly less than during the control samples. Additionally, the Amihud illiquidity ratio declines on the day of the exit announcement and on most days around the announcement.

As a robustness test, following Florackis et al. (2011), we re-estimate the analysis in Table 4.6 using a turnover-based measure of the Amihud illiquidity ratio. This should reduce any size effects and remove any currency effects that may be affecting our results (as all our sample firms do not trade with the same currency). Table 4.7 presents the results of the changes in the Amihud turnover-based measure around the announcement day. The results are similar to those using the standard Amihud illiquidity ratio in Table 4.6.

Table 4.6 Amihud Illiquidity Ratio surrounding Investment and Exit Announcements

This table contains Amihud ratios around investment and exit announcements. We provide the daily mean of the Amihud ratio as well as the difference between the mean and the control period average. The control period is over day -210 to day -11. Table 4.2 contains the variable definitions. T-statistics are displayed in parentheses and compare each daily mean with the respective mean for day -11 to day -210. ***, ** and * denote significance at the 1, 5 and 10 percent levels, respectively.

Day	Investments		Exits	
	Mean of Amihud Illiquidity Ratio	Difference between Mean and Control Period	Mean of Amihud Illiquidity Ratio	Difference between Mean and Control Period
-5	2.041	-0.832	12.009	6.725
		(-1.175)		(0.968)
-4	1.705	-1.168*	1.952	-3.332*
		(-1.689)		(-1.878)
-3	2.335	-0.538	4.698	-0.585
		(-0.767)		(0.358)
-2	1.519	-1.354**	3.515	-1.768**
		(-2.065)		(-2.039)
-1	1.863	-1.010	2.980	-2.303**
		(-1.480)		(-2.392)
0	2.158	-0.715	2.135	-3.148**
		(-0.836)		(-2.035)
1	1.688	-1.186*	2.120	-3.164**
		(-1.769)		(-2.158)
2	4.689	1.816	7.668	2.384
		(0.572)		(0.496)
3	2.083	-0.790	1.755	-3.529**
		(-1.320)		(-2.046)
4	1.209	-1.664**	3.243	-2.041*
		(-2.395)		(-1.764)
5	3.037	0.163	2.651	-2.633**
		(0.115)		(2.574)
Days (-1,1)	1.903	-0.970	2.412	-2.872**
		(-1.406)		(-2.214)
Days (-2,2)	2.384	-2.384	3.684	-1.600**
		(-0.494)		(-2.011)
Observations	388	388	221	221

Table 4.7 Robustness Test: Amihud Turnover-based Ratio surrounding Announcements

This table contains estimates of the turnover-based Amihud illiquidity ratio around investment and exit announcements. We provide the daily mean for the turnover-based Amihud illiquidity ratio as well as the difference between the mean and the control period average. The control period is over day -210 to day -11. Table 4.2 contains the variable definitions. T-statistics are displayed in parentheses and compare each daily mean with the respective mean for day -11 to day -210. ***, ** and * denote significance at the 1, 5 and 10 percent levels, respectively.

	Investments		Exits	
Day	Mean of Amihud Turnover Ratio	Difference between Mean and Control Period	Mean of Amihud Turnover Ratio	Difference between Mean and Control Period
-5	6.901	-2.223**	21.113	8.903
		(-2.005)		(0.891)
-4	6.646	-2.478*	5.854	-6.355***
		(-1.949)		(-2.626)
-3	9.006	-0.118	15.817	3.607
		(-0.062)		(0.510)
-2	5.727	-3.396**	7.671	-4.539**
		(-2.575)		(-2.333)
-1	13.037	3.914	9.517	-2.693
		(0.555)		(-1.560)
0	8.833	-0.291	6.335	-5.875**
		(-0.088)		(-2.423)
1	8.743	-0.381	6.733	-5.477***
		(-0.129)		(-2.625)
2	6.368	-2.756*	13.826	1.616
		(-1.963)		(0.216)
3	9.875	0.751	6.476	-5.734**
		(0.202)		(-2.198)
4	15.015	5.891	8.054	-4.156**
		(0.608)		(-2.463)
5	9.994	0.870	6.469	-5.741***
		(0.236)		(-2.777)
Days (-1,1)	10.205	1.081	7.528	-4.682***
		(0.247)		(-2.645)
Days (-2,2)	8.542	-0.582	8.882	-3.394*
		(-0.208)		(-1.905)
Observations	388	388	221	221

4.5. Multivariate Regression Results

4.5.1 Listed PE Characteristics and Abnormal Returns

This section investigates whether the characteristics of listed PE entities influence the market reaction. We study the effect of listed PE firm characteristics on CARs by controlling for the announcer traits and deal-level variables described in Section 4.3. The results are presented in Table 4.8. T-statistics are adjusted for heteroskedasticity and listed PE firm clustering.

The dependent variable is the three-day CAR surrounding the investment announcement (Column 1) or the exit announcement (Column 2). The key explanatory variables are the three listed PE firm characteristics: Venture Investor, Equity Investor and Asset Manager. In the case of investment announcements, we control for the age of the listed PE firm, whether the deal was a cross-border transaction, relative deal size, log of total assets of the announcer, whether the target is a private firm, sector return, stock run-up, and market run-up. For exit announcements, we include three additional controls: whether the asset was purchased by a syndicate of buyers, whether a majority stake was sold, and whether the method of exit was an IPO.

In relation to investment announcements, we find that an investment made by a venture investor has a significant and positive effect, supporting the hypothesis that venture managers invest in companies that are associated with more information asymmetries. The coefficient of Total Assets is positive and significant, suggesting that larger PE firms experience higher abnormal returns around investment announcements. This result is in contrast to the prior mergers and acquisitions (M&A) literature, which has found an inverse relationship between acquirer size and returns (Moeller et al.

2004). However, in the case of PE firms, the size of total assets could be viewed as a proxy for reputation, as better performing firms are expected to raise larger funds.

The exit announcement results differ from investment announcements. Exit announcements made by equity investors and asset managers have a negative effect on returns. This result does not support Hypothesis 2, which predicts an opposite relationship. A limitation of our dataset is that we are unable to calculate a measure of performance for exits and do not have last reported valuations to be able to calculate the valuation uplift for an investment upon exit. The negative coefficient on equity financiers may indicate that equity-financed deals perform more poorly than mezzanine deals, or it may signal that listed PE firms investing via equity are more active in valuing their investments, and the most recent valuation accurately reflects the exit price. The less positive market reaction achieved by asset managers may be for similar reasons, or it may be a reflection of the superior investing ability of sole-focused managers. A common critique of asset managers is that their core focus is on increasing funds under management rather that managing investments, which is supported by our results. In contrast to investment announcements, the type of investment (venture) does not have a significant effect on exit announcements. This could reflect the inability of venture managers to deliver on promised returns, which is consistent with the performance of unlisted venture managers. Harris et al. (forthcoming) find that post-1998 unlisted US venture funds have delivered lower average returns and under-performed public markets. In an analysis of the Kauffman Foundation's portfolio, Bradley et al. (2012) observe that only 16% of funds generate a return of greater than two times invested capital, thereby demonstrating that even though some venture investments generate 'home runs, in aggregate they tend to underperform. Additionally,

Hege et al (2012) find that venture capital investments in Europe (where a large part of our sample is located) deliver significantly less value than their US counterparts.

In addition, surprisingly, we find that deals sold to a syndicate of buyers have a significantly negative effect on listed PE returns. However, there are many instances of deals with multiple buyers where an investment is sold to the incumbent management team (which has backing from another financial sponsor). Typically, when this occurs, the PE manager does not yield a good return on the investment. Thus, our buyer syndicate variable may be acting as a proxy for poor performing deals. Moreover, larger firms are associated with higher abnormal returns around exit announcements.

To check the robustness of our results, we undertake several sensitivity tests. In the cross-sectional analysis of announcement returns in Table 4.8, two firms account for a significant percentage of observations. In the case of investments, American Capital accounts for 20 percent of announcements, and in the case of exits, 3i accounts for 28 percent of announcements. In Table 4.9, we re-estimate the announcement return regressions in Table 4.8, excluding observations for American Capital in the case of investments (Column 1) and for 3i in the case of exits (Column 2) to ensure that these two firms are not driving our results. We find that the significance and sign of our key explanatory variables are largely unchanged. Additionally, the Total Assets variable remains positive and significant for both investment and exit announcements.

Table 4.8 Three-day CARs Regression Results

This table contains ordinary least squares estimates. The dependent variable is the three-day market model CAR. Table 4.2 contains the variable definitions. In parentheses are t-statistics based on standard errors adjusted for heteroskedasticity and firm clustering. All regressions control for year fixed effects, whose coefficient estimates are suppressed. ***, ** and * denote significance at the 1, 5 and 10 percent levels, respectively.

	Investments	Exits
	Dependent Variable: CAR	
Venture Investor	1.901**	0.453
	(2.597)	*(0.380)*
Equity Investor	0.358	-2.437***
	(0.641)	*(-3.523)*
Asset Manager	-1.085*	-2.298**
	(-1.682)	*(-2.717)*
Age	-0.031	-0.028
	(-1.342)	*(-1.552)*
Cross Border	-2.632	-2.265
	(-1.542)	*(-0.654)*
Relative Deal Size	0.001	0.009
	(1.244)	*(0.630)*
ln(Total Assets)	0.612*	0.925**
	(1.843)	*(2.214)*
Private	1.466*	0.088
	(1.706)	*(0.039)*
Sector Return	0.398*	-0.312
	(1.741)	*(-0.694)*
Stock Run-up	-6.677	-0.285
	(-0.842)	*(-0.209)*
Market Run-up	-0.006	-0.041
	(-0.240)	*(-1.308)*
Buyer Syndicate		-1.623*
		(-1.757)
Majority Stake		-0.810
		(-0.442)
IPO		2.287
		(1.047)
Constant	-7.954	-13.252
	(-1.169)	*(-1.463)*
Observations	423	231
Number of Firms	45	32
Adjusted R Squared	3.63%	8.29%

Table 4.9 Robustness Test: Three-day CAR Regression Results excluding American Capital and 3i

This table excludes investments made by American Capital and realizations made by 3i. In 20 percent of the observations where a listed PE firm acquires an investment, the acquirer is American Capital. In 28 percent of observations where a listed PE firm realizes an investment, the seller is 3i. The dependent variable is the three-day market model CAR. Table 4.2 contains the variable definitions. In parentheses are t-statistics based on standard errors adjusted for heteroskedasticity and firm clustering. All regressions control for year fixed effects, whose coefficient estimates are suppressed. ***, ** and * denote significance at the 1, 5 and 10 percent levels, respectively.

	Investments	Exits
	Dependent Variable: CAR	
Venture Investor	1.957**	1.060
	(2.616)	(0.795)
Equity Investor	-0.345	-2.580***
	(-0.506)	(-3.249)
Asset Manager	-0.640	-2.512**
	(-0.828)	(-2.716)
Age	-0.044*	0.007
	(-1.854)	(0.210)
Cross Border	-1.044	2.842
	(-1.202)	(1.332)
Relative Deal Size	0.002*	0.013
	(1.797)	(0.885)
ln(Total Assets)	0.701**	1.135**
	(2.096)	(2.526)
Private	1.888*	0.245
	(1.957)	(0.095)
Sector Return	0.399	-0.638
	(1.602)	(-1.315)
Stock Run-up	-7.393	0.123
	(-0.918)	(0.087)
Market Run-up	-0.015	-0.053
	(-0.690)	(-1.262)
Buyer Syndicate		-2.198
		(-1.446)
Majority Stake		-2.877*
		(-1.835)
IPO		4.420
		(1.600)
Constant	-15.890**	-11.125
	(-2.342)	(-1.132)
Observations	338	166
Number of Firms	44	31
Adjusted R Squared	3.54%	8.93%

In unreported results, we also account for technology investments. We re-estimate the announcement return regressions in Table 4.8 and Table 4.9, including an indicator variable *Technology*, which equals one if the company being sold, or invested in, by the listed PE firm operates in the technology space. We define technology companies as per Loughran and Ritter (2004).[27] The results are largely unchanged and Technology is not significant.

4.5.2 Listed PE Characteristics and Liquidity

We next examine whether characteristics of the listed PE vehicle influence the liquidity of a listed PE entity's stock. We undertake several regressions using our two proxies for liquidity as the dependent variables. We include the three variables used to characterize listed PE vehicles: Venture Investor, Equity Investor and Asset Manager.

Table 4.10 presents our results, where the dependent variable is the three-day CAV surrounding the investment announcement (Column 1) or the exit announcement (Column 2). We control for firm size (proxied by the log of total assets), the age of the listed PE vehicle, whether the announcement relates to a private company, the absolute price change, and volatility. In the case of investment announcements, we find that the features of a listed PE manager do not explain trading volume. For exit announcements, the positive and significant Venture Investor coefficient demonstrates that realization announcements made by venture investors generate increased trading volume. While this finding may seem to conflict with Hypothesis 4, it is consistent with the findings of Kim and Verrecchia (1991) and Lee et al. (1993). Kim and Verrecchia's (1991) model

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[27] We define technology companies as those with one of the following SIC codes: 3571, 3572, 3575, 3577, 3578 (computer hardware), 3661, 3663, 3669 (communications equipment), 3671, 3672, 3674, 3675, 3677, 3678, 3679 (electronics), 3812 (navigation equipment), 3823, 3825, 3826, 3827, 3829 (measuring and controlling devices), 3841, 3845 (medical instruments), 4812, 4813 (telephone equipment), 4899 (communications services), and 7371, 7372, 7373, 7374, 7375, 7378, 7379 (software).

suggests that certain announcements can induce trading volume but reduce liquidity. They suggest that increased volume may be the result of informed trading. This is a highly plausible explanation in the context of venture deals, which usually include investments in early-stage companies with short cash flow histories that are difficult to value.

In the regression of investment announcements, we find that acquisitions of private investments are marginally associated with lower trading volume, possibly indicating that more information is released prior to an investment announcement regarding a private target rather than a public target (which may be subject to certain news embargoes). For exit announcements, the magnitude of the stock price reaction is associated with greater trading volume (consistent with Atiase and Bamber 1994), and announcements made by larger firms lead to lower trading activity, potentially reflecting the greater volume of pre-announcement information surrounding larger firms (supported by Atiase 1987). Additionally, the coefficient of Volatility is negative and marginally significant when examining exit announcements.

Table 4.10 CAV Regression Results

This table contains ordinary least squares estimates. The dependent variable is the three-day market model CAV. Table 4.2 contains the variable definitions. In parentheses are t-statistics based on standard errors adjusted for heteroskedasticity and firm clustering. All regressions control for year fixed effects whose coefficient estimates are suppressed. ***, ** and * denote significance at the 1, 5 and 10 percent levels, respectively.

	Investments	Exits
	Dependent Variable: CAV	
Venture Investor	-0.256	0.873**
	(-0.824)	(2.277)
Equity Investor	0.167	0.453
	(0.854)	(1.266)
Asset Manager	0.101	0.481
	(0.329)	(1.493)
Private	-0.920*	-0.384
	(-1.883)	(-0.719)
ln(Total Assets)	-0.092	-0.237*
	(-1.194)	(-1.768)
Absolute Price Change	-1.910	9.066***
	(-0.306)	(3.186)
Volatility	-5.122	-12.807*
	(-0.321)	(-1.849)
Sector Return	-0.063	-0.010
	(-0.780)	(-0.079)
Age	0.004	-0.012
	(0.863)	(-1.463)
Constant	3.755**	2.843
	(2.352)	(0.956)
Observations	388	221
Number of Firms	42	32
Adjusted R Squared	4.16%	10.99%

The analysis of log changes in the Amihud illiquidity ratio is presented in Table 4.11. As stated earlier, changes are estimated by subtracting the log of the Amihud ratio average during the 200 days of the pre-announcement period from the log of the Amihud ratio average during the three-day announcement period. We control for firm size and age, whether the investment is a private transaction, volatility, and industry sector return. Columns 1 and 2 examine investment and exit announcements, respectively.

In support of Hypothesis 4, we find that investment announcements made by venture investors are positively and significantly associated with the change in the Amihud ratio. This is consistent with Gopalan et al. (2012), who link asset liquidity and stock liquidity. In this context, venture deals are arguably less liquid than their buyout counterparts. However, in contrast to Hypothesis 4, we find that investment announcements by equity investors reduce the Amihud ratio. In terms of exit announcements, unlike our trading volume results, we observe an insignificant relationship between exit announcements made by venture investors and the change in the Amihud ratio. However, we find that exit announcements made by asset managers are associated with an increase in liquidity. Investors may be concerned with the intentions of asset managers (who are often perceived as asset gatherers), and exit announcements may signal their positive investment intentions to the market. In relation to our control variables, we find that larger firms experience larger changes in the Amihud illiquidity ratio for both investment and exit announcements.

As a robustness test, following Florackis et al. (2011), in Table 4.12, we re-estimate our liquidity analysis using a turnover-based measure of the Amihud illiquidity ratio to reduce any size effects and remove any currency effects that may be affecting our results (as all of our sample firms do not trade with the same currency). The results are similar to those using the standard Amihud illiquidity ratio.

Table 4.11 Amihud Illiquidity Ratio Regression Results

This table contains ordinary least squares estimates. The dependent variable is the log change in the Amihud illiquidity ratio. Column 1 pertains to investment announcements and Column 2 pertains to exit announcements. Table 4.2 contains the variable definitions. In parentheses are t-statistics based on standard errors adjusted for heteroskedasticity and firm clustering. All regressions control for year fixed effects whose coefficient estimates are suppressed. ***, ** and * denote significance at the 1, 5 and 10 percent levels, respectively.

	Investments	Exits
	Dependent Variable: Change in Amihud Illiquidity Ratio	
Venture Investor	0.524*	0.022
	(1.972)	*(0.114)*
Equity Investor	-0.241**	-0.065
	(-2.446)	*(-0.589)*
Asset Manager	0.063	-0.254**
	(0.549)	*(-2.413)*
ln(Total Assets)	0.104*	0.232***
	(1.817)	*(4.622)*
Private	0.317	0.228
	(1.521)	*(0.754)*
Volatility	-4.831	-1.212
	(-0.351)	*(-0.377)*
Sector Return	0.016	0.006
	(0.419)	*(0.095)*
Age	0.007**	-0.001
	(2.634)	*(-0.201)*
Constant	-3.321***	-4.018***
	(-2.796)	*(-3.621)*
Observations	388	221
Number of Firms	43	32
Adjusted R Squared	9.41%	16.30%

Table 4.12 Robustness Test: Turnover Based Amihud Illiquidity Ratio Regression Results

This table contains ordinary least squares estimates. The dependent variable in Column 1 is the log change in Amihud turnover ratio around investment announcements. The dependent variable in Column 2 is the log change in the Amihud turnover ratio around exit announcements. Table 4.2 contains the variable definitions. In parentheses are t-statistics based on standard errors adjusted for heteroskedasticity and firm clustering. All regressions control for year fixed effects whose coefficient estimates are suppressed. ***, ** and * denote significance at the 1, 5 and 10 percent levels, respectively.

	Investments	Exits
	Change in Amihud Turnover-based Ratio	**Change in Amihud Turnover-based Ratio**
Venture Investor	0.464**	-0.022
	(2.199)	*(-0.146)*
Equity Investor	-0.275***	-0.090
	(-3.032)	*(-0.863)*
Asset Manager	0.101	-0.238**
	(0.958)	*(-2.083)*
ln(Total Assets)	0.090*	0.195***
	(1.750)	*(3.803)*
Private	0.290	0.183
	(1.502)	*(0.665)*
Volatility	-7.752	-0.125
	(-0.720)	*(-0.044)*
Sector Return	0.026	0.027
	(0.766)	*(0.511)*
Age	0.004	-0.000
	(1.638)	*(-0.057)*
Constant	-2.851**	-3.216***
	(-2.644)	*(-2.928)*
Observations	388	221
Number of Firms	43	32
Adjusted R Squared	7.69%	7.89%

4.6. Conclusion

Manager selection is critical in PE investing due to a large dispersion of returns among PE funds. Despite the typically intensive and arduous due diligence process undertaken when committing to a PE fund, an investor remains uncertain of the manager's ability until they deliver on their objective. In listed PE, this large degree of information asymmetry between investors and managers is alleviated by investment-

related announcements, which reveal the ability of managers to make quality investments and realize those assets. By examining listed PE, relative to unlisted PE, we are able to better measure the value perceived by shareholders when a PE firm sources and realizes investments.

This paper empirically examines shareholder reactions to investment and exit announcements made by listed PE companies, as well as the liquidity effects of these announcements. Additionally, we examine whether listed PE company characteristics influence stock returns and liquidity.

We find that the market reacts positively to investment and exit announcements. In addition, we find that liquidity increases around announcements using trading volume and the Amihud illiquidity ratio as measures for liquidity. We also observe that venture investors make more value-creating acquisitions. Exits undertaken by listed PE companies that provide equity financing and firms that manage multiple products reduce shareholder value. With respect to trading volume, we find that exit announcements made by PE firms focused on venture transactions generate increased trading volume. Further, announcements of investments by non-venture-focused entities and equity investors increase liquidity by reducing the Amihud illiquidity ratio.

Listed PE is a relatively new asset class, and investors are still in the process of understanding its inherent risk and return properties. Our findings can assist investors in their PE allocation decisions, as we provide insights into the anticipated market reaction around investment-related announcements and identify a positive change in liquidity around these events.

Further research could incorporate performance measures and valuation changes for exited investments when examining market reaction and liquidity. Listed PE firms

intermittently value the investments in their portfolios. These unrealized valuations may accurately reflect exit prices, or they may deviate considerably. An examination of these valuation changes would provide fruitful research.

Chapter 5. Conclusion

The exponential growth of PE over the past decade has resulted in institutional investors deploying significant amounts of capital into the asset class.[28] This dissertation provides an analysis of PE from the perspective of investors, with specific consideration for the implications of information asymmetries.

The first chapter of this dissertation examines the determinants of investor demand for a PE fund and the relation between demand and future fund performance. We find that venture capital funds raised in environments of high GDP growth are more likely to be oversubscribed. Similarly, demand for buyout funds is heightened when credit conditions are favorable. Further, we show that investors exhibit skill in the selection of buyout funds, with evidence of a positive, albeit concave, relationship between oversubscription and fund performance. However, we do not find this to be the case in the venture sector, where information asymmetries are more severe. Chapter 1 makes an important contribution to the literature on the performance of PE funds and to studies on the investment skills of investors more generally. A potential extension to this study would be an analysis of the relationship between fund performance and the time taken by a PE fund to reach a first and final close. Additionally, pending data availability, research could examine the relationship between oversubscription, fundraising duration, and investor attributes at a more granular level.

Using a new dataset, Chapter 2 examines the decisions and performance of local and foreign investors investing in China-focused PE funds. The results show a clear

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[28] PE assets under management grew from US$720 billion in 2000 to US$3.5 trillion in 2013 (Preqin 2014b).

division between the investment attitudes of domestic and offshore investors, with the latter preferring funds that reduce their information asymmetries. Additionally, we find that PE funds backed by domestic investors have greater ability in exiting portfolio companies and in securing higher multiples of cost on exit. This chapter adds to the literature on the biases and informational advantages of local investors across asset classes. Future research is warranted on the preferences and performance of PE investors in different geographic locations and in markets other than China.

Chapter 3 analyzes investment and exit announcements made by listed PE vehicles and examines the impact of these announcements on their stock price and liquidity. The results show that there are wealth effects and improved liquidity resulting from investment-related announcements, and that these are affected by certain characteristics of the listed PE entity. This chapter fills an important gap in the literature by focusing on the under-researched listed PE market and ascertaining the broader effects of investment-related announcements. Further research could examine the market reaction and liquidity effect of the valuation changes of investments held by listed PE firms.

The findings of this dissertation have implications for PE fund investors and PE fund managers. Our results can assist investors in constructing PE portfolios and selecting PE fund investments. Additionally, we offer insights for PE fund managers on the drivers of fund performance as well as the preferences of their incumbent and potential investors.

Appendix

Appendix A. Sample Listed PE Entities

Table A Sample Listed PE Entities

Name	Ticker	Exchange	Year Listed
Aberdeen Development Capital	AVC LN	London	1986
Absolute Private Equity	ABSP SW	Swiss	2001
Allied Capital Corp	ALD US	New York	1993
Altamir et Amboise	LTA FP	Euronext Paris	1996
American Capital Strategies	ACAS US	Nasdaq	1997
Apollo Investment Corp	AINV US	Nasdaq	2004
Ares Capital Corp	ARCC US	Nasdaq	2004
Blackrock Kelso Capital Corp	BKCC US	Nasdaq	2007
Blackstone	BX US	New York	2007
Bure Equity	BURE SS	Stockholm	1993
Candover Investments	CDI LN	London	1984
Compass Diversified Holdings	CODI US	Nasdaq	2006
Dea Capital	DEA IM	Milan	2000
Deutsche Beteiligungs	DBA GR	Frankfurt	1985
Dinamia Capital Privado	DIN SM	Madrid	1997
Dunedin Enterprise	DNE LN	London	1987
East Capital Explorer	ECEX SS	Stockholm	2007
Electra Private Equity	ELTA LN	London	1976
Eurazeo	RF FP	Euronext Paris	2001
Fortress	FIG US	New York	2007
Gimv	GIMB BB	Euronext Brussels	1997
Gladstone Capital Corp	GLAD US	Nasdaq	1981
Graphite Enterprise Trust	GPE LN	London	2001
Hakon Invest	HAKN SS	Stockholm	2005
Harris & Harris Group	TINY US	Nasdaq	1983
Hercules Technology Growth	HTGC US	Nasdaq	2005
Hgcapital Trust	HGT LN	London	1989
Internet Capital Group	ICGE US	Nasdaq	1999
Intermediate Capital Group	ICP LN	London	1994
Jafco Co Ltd	8595 JP	Tokyo	1989
JZ Capital Partners	JZCP LN	London	1986
KKR & Company	KKR NA	Euronext Amsterdam	2010
LMS Capital	LMS LN	London	2006
Mainstreet Capital Corp	MAIN US	New York	2007
Marfin Investment Group	MIG GA	Athens	2007
MCG Capital Corporation	MCGC US	Nasdaq	2001
MVC Capital	MVC US	New York	2000
NGP Capital Resources	NGPC US	Nasdaq	2004
Onex Corporation	OCX CN	Toronto	1987
Prospect Energy Corporation	PSEC US	Euronext	2004
Ratos	RATOB SS	Stockholm	1999
Safeguard Scientifics	SFE US	New York	1981
3i Group	III LN	London	1994
TICC Capital Corp	TICC US	Nasdaq	2003
Triangle Capital Corp	TCAP US	Nasdaq	2007
Wendel Investissement	MF FP	Euronext Paris	2002

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