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# *Varieties of Funds and Performance: The Case of Private Equity*

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## **Abstract**

Within the growing body of literature on private equity, there is intense debate as to whether, and by how much, the industry really adds value. However, much of the diversity in results can be ascribed to a tendency to combine very different fund types. This study explores variations in performance according to fourteen different types of fund, a much bigger range than preceding studies in the academic literature. We find that funds that focus on riskier areas of activity are not only associated with divergent outcomes, but generally underperform. In other words, there is variety in degree of underperformance, but in general, high risk is married with poor returns. We explore why such funds continue to attract significant investment. Since the wave of post-financial crisis quantitative easing, there has been a growing divergence between multiples of invested capital and internal rates of return, with the former doing significantly worse than the latter, suggesting possible changes in funds' holding period strategies and, possibly, that it has become harder to optimise returns other than through borrowing. However, there is much more to fund performance than potential risk and debt, and evaluate which specific types of fund do better or worse when, and why, as well as which types of fund are associated with greater unpredictability in returns. We apply agency theory to help understand general partner behavior in private equity partnerships, and draw on the literature on the economics of expectation and of systemic evolution to explain limited partner behavior, and draw out the implications for theory and practice.

## **Highlights**

- An analysis of the relationship between a much wider range of PE fund types than preceding studies, and performance.
- Explanatory application of agency, expectations and evolutionary theories.
- Funds that signal riskier status through their scope and focus often are associated with more diverse, but generally sub-optimal outcomes, yet seem persistently capable of attracting significant investor capital; we explore why this might be the case.
- We explore possible explanations behind mediocre or superior returns for specific fund types and why levels of return for some exhibit much more diversity than others.

JEL Codes D22; E22; G11; G23

**Keywords: Private Equity, Fund Types, Financial Crisis, Expectations, Agency and Investor Categories**

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## 1. Introduction

This is a study of private equity fund performance, focusing on differences according to the aims and scope of such funds. More specifically, it distinguishes between fourteen types of fund, ranging from balanced to mezzanine, comparing their relative size and performance, and, as such, represents the first such study we are aware of in the academic literature. There is intense debate as to the performance effect of private equity on firms. On the one hand, it has been argued that private equity investors may battle to resolve structural organizational problems (Olsson. and Tåg, 2017) to, on the other hand, ones that suggest firms are re-energised, with positive spill-over effects on industries at large (Jensen et al. 2006). However, much of the variation in results can be accounted for by differences in data sources, methodologies, time periods under review, and, above all, through combining very different types of fund (Wood and Wright, 2009; Phalippou, 2014): it can be argued that the most robust finding is that of considerable internal diversity, reflecting the heterogeneity of the industry and shifting external realities (Phalippou, 2014; Sensoy et al. 2014; Wood and Wright, 2009; Korteweg and Sorensen 2017).

A growing body of work has highlighted the fundamental differences between venture capital (VC), private equity funded MBOs (management buyouts), and institutional buyouts (IBOs) (Phalippou, 2014; Sensoy et al. 2014; Wood and Wright, 2009). What the funds have in common is that they are structured as partnerships, with the partnership providing the general partner (GP), and other investors limited partners. Through takeovers, funds seek to enhance performance and/or release value to a greater extent than was the case prior to the takeover (Braun et al. 2017; Sensoy et al. 2014). However, what has been relatively neglected in the literature has been a more detailed exploration of the performance consequences of different fund types, distinguishing funds

not only according to the nature of the firm and sector targeted, but also according to relationships with investors, and which of these the fund assigns primary strategic importance. Yet, as Sensoy et al. (2014) note, with the maturity of the private equity industry has come increasing specialisation, with funds focusing on areas such as property and infrastructure becoming widespread. In other words, we do not seek to add to the literature as to the relative performance consequences of private equity per se, but rather how the many different types of fund perform when compared to each other, taking account differences in sector and locale, and what may lie behind such a divergence in theoretical and applied terms. Based on Prequin data, we find that funds that signal riskier status through their scope and focus often are associated with more diverse, but generally sub-optimal outcomes, yet seem persistently capable of attracting significant investor capital; we explore why this might be the case. Since the wave of post-financial crisis quantitative easing, there has been a growing divergence between multiples of invested capital and internal rates of return, with the former doing significantly worse than the latter, suggesting possible changes in funds' holding period strategies and, possibly, that it has become harder to optimise returns other than through borrowing. However, there is much more to fund performance than potential risk and debt, and evaluate which specific types of fund do better or worse when, and why, making usage of agency, expectation and evolutionary theories.

## **1.1 Private Equity and Performance: Theoretical Insights**

Agency theory sees conflicting interests between owners of capital and those they entrust it with as the central concern of corporate governance (Jensen and Meckling, 1976). Later extensions of agency theory suggest that given they take an active hand in the running of the firm, private equity is well equipped to solve any agency problems (Jensen et al. 2006; Rosenbusch et al. 2013; Meuleman et al. 2009). However, other

accounts have argued that agency issues can potentially manifest in many forms, and that there has been a failing in much of the agency theory literature to take account of agency problems arising from the relationship between investors and fund managers (Allen, 2001), including between limited and general partners in private equity partnerships (Davidoff, 2008). The latter may benefit from handsome management fees that may not accurately incentivize them to optimize returns especially into the middle and long terms; owing to high levels of debt leverage and the investments of limited partners, a significant component of the risk is with ‘other people’s money’. Again, they may seek to maximize fund size to maximize their personal prestige, pursuing unnecessary empire building, that results in unnecessary complexity and the concerns of ordinary investors being neglected.

This raises the question as to why investors might – and indeed often do - put up with sub-optimal returns. It could be argued that in very complex areas of the investment ecosystem, investors often have at best incomplete information, with any shortfalls in information likely being filled with fill information and gaps with assumptions and aspirations (Shackle, 2012). In making their decisions, investors are likely to anticipate certain outcomes and may oscillate between extreme optimism and pessimism (Shackle, 2012). This may result in rushes into specific types of investment, for fear of being a latecomer that is left with proverbial crumbs and similar panics if disillusionment sets in. However, investors with high aspirations are likely to opt for greater risk, and it will take much to force them to desist from this path (Magron, 2014). Indeed, the disposition effect suggests that investors are reluctant to admit defeat and will persist with losers (Shapira and Venezia, 2001). They may also continue to invest with those who have performed poorly for them in the past, reflecting a reluctance to face up to their own past poor judgement. In contrast, when returns are good, there is evidence that investors are predisposed to cash in on their gains (Shapira and Venezia, 2001). This is not to suggest that private equity always performs badly. However, it may explain why there is much heterogeneity in the industry, and why good performers do not always drive out bad. For

the purposes of this paper, we use the term ‘riskier’ in terms of inputs, to denote funds that signal a riskier status to investors through concentrating their activities in certain areas where there is inherent uncertainty (e.g. organizations in the early and late stages of their life cycles), in asset classes (e.g. minerals) that are associated with volatility (Demaria, 2016), or have high usage of specific types of debt (e.g. mezzanine debt). No definition of how a fund signals riskiness is ever complete, and it is recognized that there are many other dimensions of fund risk, such as relative experience of partners, which fall beyond the scope of this paper. We compare and contrast this to actual outcomes according to fund type, highlighting those types of funds that are associated with both a greater volatility, and hence uncertainty, in returns, and mediocre returns. Whilst many investors may trade modest returns in return for greater predictability, funds that are both unpredictable and poorly performing could be considered particularly risky in terms of outcomes.

## **1.2 Private Equity and Performance: Existing Evidence**

### ***1.2.1 Combined Studies***

It is estimated that private equity activity represents some 20% of global M&As (Cao et al. 2015). Jensen et al. (2006) argues that private equity improves firm performance by reigning in managers, restricting spending through debt, and through more effective managerial financial incentives. Phalippou (2014) notes that there has been considerable divergence in the findings of studies of private equity performance based on publicly available data and that of private proprietary datasets. The latter tend to generate very much more optimistic results on industry performance against the S&P 500. Phalippou (2014) finds that, as a whole, using publicly available data, there is evidence of industry outperformance, but when benchmarked to a small value index, there is underperformance. Hence, the relative performance of the industry appears very sensitive

to the choice of benchmark (ibid.). Phalippou (2014) also finds a recent tendency to underperformance following on the financial crisis, ascribing this to trends in the S&P, rather than failings in the industry. This variation may help explain why investors are increasingly choosing to invest directly in PE transactions, rather than via intermediaries, to increase their bargaining power over funds (Phalippou, 2014).

Other work explores variations in the source of capital on performance, which may help explain the considerable gap between top performing partnerships and other players (Sensoy et al. 2014). To this end, Sensoy et al. (2014) found that the former seek to ration the access to their funds to preferred investors, such as endowments. However, private equity, on average, outperforms the market, with fund performance being closely related to size and the ability to raise subsequent capital (ibid.). Renneboog et al. (2007) find a premium is paid to firms with low debt leverage, which would reflect the potential to shoulder additional debt. Kaplan and Schoar (2005) note a learning effect, with more experienced general partners being associated with better performance (c.f. Braun et al. 2017).

### ***1.2.2 Comparative Studies***

Harris et al. (2014) update earlier work on private equity performance, through looking at evidence up to 2011. What is particularly welcome is they unpack venture capital from private equity, as is the case with this study. They find that private equity outperforms the S&P 500 net of fees and carried interest, but that venture capital has underperformed in recent years (ibid.). However, they find that performance is negatively related to aggregate capital commitments in the case of both (ibid.). In the case of private equity, they found no relationship between fund size and performance, but found that small venture funds tended to underperform. The results using the proprietary data set are markedly more positive for buyout funds than previously documented with commercial data sets (Harris et al. 2014). More recent work points to both persistent

variations in fund management capabilities, and that fund performance is often inconsistent over time (Korteweg and Sorensen 2017; Braun et al. 2017).

Average U.S. buyout fund returns have exceeded public markets for most vintages since 1984. PME against the S&P500 average 20% to 27% over the life of the fund and more than 3% per year. Buyout fund performance remains similar using other benchmarks such as Nasdaq and the small-cap Russell 2000, and is lower but also positive against the small-cap Russell 2000 value index and Fama-French size deciles. Both absolute performance and performance relative to public markets are negatively related to aggregate capital commitments for both buyout and venture capital funds. These results suggest that an influx of capital into buyout and venture funds is associated with lower subsequent performance (ibid.). The results for both buyout and venture capital funds are qualitatively similar when assuming higher levels of systematic risk (Harris et al. 2014). The authors find no significant relation between performance and fund size for buyout funds. For venture capital funds, funds in the bottom quartile of fund size underperform (Harris et al. 2014). Looking at the 1980-1997 period, Kaplan and Schoar (2005) found that fund performance was roughly equivalent to the S&P 500, with venture capital funds outperforming the index, while the converse was true for buyout funds. Variations in the performance of different funds did not seem to reflect differences in risk (ibid.). Furthermore, Kaplan and Schoar (2005) found no difference in outcomes on sectoral lines, or in terms of positive performance biases.

Kaplan and Schoar (2005) found a concave relationship with fund size, indicating diminishing returns beyond a certain scale. They also found that funds raised during times of economic boom battled to raise funds during downturns, which might suggest that such funds underperform. Overall, on an equal-weighted basis, private equity has returned somewhat less than an investment in S&P500 with a PME of 0.96, albeit on a capital-weighted basis, private equity has returned somewhat more than an investment in S&P500 with a PME of 1.05 (Kaplan and Schoar, 2005). Kaplan and Schoar (2005) also



found large differences in returns of individual funds (25<sup>th</sup> percentile – Internal Rate of Return (IRR) of 3%, 75<sup>th</sup> percentile – IRR of 22% per year), the uneven performance between funds potentially indicating variations in skills and expertise (ibid.). Furthermore, Kaplan and Schoar (2005) suggest that better performing funds may be better governed, but highlight this as an area for future research.

Using average IRR as a measure of performance appears to inflate apparent performance. Looking at mature funds, Phalippou and Gottschalg (2009) find that net of fees, private equity underperformed the S&P 500, even if gross of fees it outperformed it. Phalippou and Gottschalg (2009) note that there are some side benefits of investing in underperforming funds. These can include banks investing in venture capital activity as a means of building client relationships among early start-ups, and regional development authorities and certain institutional investors using such investments to help local economies.

Robinson and Sensoy (2013) argue that since the 1990s, there has been a decline in the performance of the venture capital industry, whilst private equity performance has flatlined. Diller and Kaserer (2009) found returns on funds differ according to skills, illiquidity and segmentation, with the latter being more pronounced in venture than buyout funds. They also found a negative correlation between private equity and venture capital performance on the one hand, and macro-economic growth on the other, with the authors conceding it was unclear why this was the case (ibid.).

### ***1.2.3. Size Effects***

Cumming and Dai (2011: 3) argue that the relationship between private equity and public equity valuations is fundamentally different, given the “lack of an efficient pricing mechanism in the case of the former”. There is much debate as to whether economies or diseconomies of scale exist in the case of financial intermediaries, but less so regarding private equity (ibid.).

As funds increase in size, human capital and expertise may not immediately follow suit (Cumming and Dai, 2011). It could be argued that with size, there comes a tendency to be over-optimistic, leading to failures to deliver expected returns to investors (Cumming and Dai, 2011). Indeed, it could be argued that fund managers have an incentive to increase fund size for reasons of prestige and to maximise the fixed fees and other pecuniary advantages (Cumming and Dai, 2011).

Again, Lerner and Schoar (2004) suggest that more sophisticated investors are better equipped to identify potential problems in fund performance, whilst in more mature funds, information asymmetries with investors are likely to be less serious. Lerner and Schoar (2004) argue that fund managers have an interest in identifying liquid investors, as these are less likely to face liquidity shocks. The latter may create uncertainties among potential investors, who may battle to distinguish between such liquidity shocks and decisions not to reinvest owing to concerns as to the way the fund is managed (ibid.). Lerner and Schoar (2004) conclude that restrictions on liquidity may allow private equity to impact on the composition of investors, and discourage those with liquidity constraints.

#### ***1.2.4. Industry Effects***

Phalippou and Gottschalg (2009) highlight the challenges of accurately gauging industry performance, which encompasses the choice of comparative indices, sample selection bias, and the NAVs of old funds. Funds may also be distinguished according to the stage in the organisational life cycle they invest in, the predominant sources of debt, and/or their sectoral orientation. Which of these factors constitutes the predominant feature of the fund that will impact on subsequent strategic choices and investment decisions represents a founding policy decision (Phalippou and Gottschalg, 2009).

Looking at information from 1690 buyout funds from 1982 to 2012, a practitioner orientated study found that buyouts and private equity generally outperform the market, with a tendency towards diversification (Preqin, 2015a). Across time, diversified funds

show higher median IRR until 2005, but the trend reverses afterwards, sector specific funds outperforming post-2005. Despite these performance results, there still exists a bias for diversified funds, diversified funds being larger in number and size. More specifically, 29% of sector-specific buyout funds have been top-quartile performers compared to only 24% of diversified funds (ibid.). Therefore, historically, sector-specific funds have been more capable of achieving top quartile returns. Approximately one third of Telecoms, Media & Communications solely industry focused and IT solely focused funds are top-quartile performers, while only 13% of IT focused funds are bottom quartile performers, significantly less than any other industry (Prequin, 2015a). Again, approximately one third of healthcare-focused funds are bottom quartile performers. Therefore, large discrepancies are noted between industries for sector-specific funds (ibid.).

## **2. Varieties of Funds**

### **2.1 *Mezzanine Funds***

Mezzanine buyout funds fill any shortfalls in capital between what can be raised via conventional debt and via equity to fund a firm being taken private, reducing the risk falling directly on private equity partners (Silbernagel and Vaitkunas, 2012). Although mezzanine debt provides both an equity component in the form of preferred equity and junior or subordinated debt, mezzanine investors are not primarily motivated by shareholding, but rather to secure a desired rate of return. As it is subordinated, the debt is only repaid after more senior creditors have been paid off. However, they have seniority over common equity holders, reducing their riskiness compared to pure equity holdings. They provide reserve sources of capital, and to more conventional lenders, their presence - as their debt rights are secondary - may reassure the latter that the deal is one likely to perform well. Mezzanine fund providers are often bought out by the original owners or via recapitalizations (Silbernagel and Vaitkunas, 2012). Mezzanine funds typically

provide support to plug capital shortfalls. Typically, they only take a minority of shareholding, with buyout terms being included in original deals (Vasilescu, 2010).

## **2.2 *Real Estate Funds***

Real estate funds have, as their name suggests, their focus restricted to a specific asset class: property (Tomperi, 2010). Private equity property funds are very under-investigated, especially with regards to how leverage may impact on performance (c.f. Driessen et al. 2012). Alcock et al. (2013) find, once more, that relative expertise in this area may strongly impact on performance. However, top performing funds do not seem to grow as much in proportionate terms than ones of average performance (Tomperi, 2010).

## **2.3 *Infrastructural Funds***

Again, there are many types of infrastructural funds, but these can include private equity style limited partnerships. However, the latter are profoundly different to private equity in that they are associated with lower, but more certain returns. Major infrastructural projects tend to be quite well planned, and there are often governmental guarantees of returns (Fraser-Sampson, 2011). However, it could be argued that this underestimates the extent to which private equity may have an interest in such assets owing to the potential for debt leverage, and, indeed, the establishment of debt trains based on relatively secure profits many years into the future (Goergen et al. 2014b).

## **2.4 *Growth Funds***

Growth funds represent a type of venture capital orientated towards more mature firms. The primary focus is on firms and sectors with potential for aggressive expansion (Grinblatt and Titman, 1989). Treynor and Mazuy (1996) found that growth funds were relatively homogenous in terms of focus and outcomes. It has been argued that when

growth stocks do well, growth funds will too (Malkiel, 1995). There is a focus on mature firms, often industry leaders, with investments being determined by concrete plans to secure growth (Stewart, 2012). Growth funds focus on firms with little debt, but also little free cash flow, but where an infusion of capital can fuel growth. Often growth funds focus on minority stakes (Stewart, 2012). Mason (2014) argues that there has been an increasing industry interest in growth funds on account of the extent to which they represent “a stable choice for investors”.

### **2.5 *Expansion/Late Stage Funds***

A variation on growth funds are expansion funds. Such funds are approached by firms that need more equity capital, but do not wish to hand over control. This is distinct from growth funds, where there may be a presumption that control will be relinquished (Stern School, 2017). In other words, if growth funds may force radical change at firm level, expansion funds seek to preserve continuity in managerial style. Late stage funds focus on firms that are mature, but again, may seek to help provide needed capital, rather than force through organizational changes (c.f. Diller and Kaserer, 2009). Reflecting this, late stage private equity managers may make a smaller contribution to maximising returns than is the case with firms earlier in the organizational life cycle (Cumming and Walz, 2010).

### **2.6 *Secondary Funds***

Secondary funds focus on takeovers of firms that are already owned by private equity (Lerner et al. 2011). On the one hand, it could be argued that such players tend to be particularly ruthless, looking to squeeze what remaining assets have not been liquidated and/or seeking to leverage fresh debt against them. On the other hand, it could be argued that as such firms are already likely to be heavily loaded with debt, secondary

buyers having to focus on the nuts and bolts of running the organisation, which may include having to pay off excessive debt burdens (Goergen et al. 2014b).

## **2.7 *Venture Capital***

Formally speaking, “venture-capital organizations raise money from individuals and institutions for investment in early-stage businesses that offer high potential but high risk” (Sahlman 1990: 273). Again, venture capital differs from private equity in that venture capital investment may be highly sought after by early stage firms, whilst managers of more mature firms may often fear hostile private equity takeovers for the right (organizational sustainability) or wrong (agency) reasons. Hence, whilst venture capital may work to build a favourable reputation to target firms - based on track record, expertise, reputation and size – private equity players may primarily be orientated towards raising capital, and will seek to build their reputation to investors and creditors, above all, in terms of capabilities for releasing value.

In looking at the case of venture capital, Cumming and Dai (2011) found a convex relationship between fund size on target firm valuations, and a concave relationship between fund size and venture performance. They conclude that this reflects a diseconomy of scale in the industry, due to limitations in human capital and capabilities as the fund upsizes. As fund sizes grow, the management fees accruing to VCs become proportionately more important (ibid.). This provides strong incentives to increase the fund size, but raises the question as to whether this comes at the expense of quality of management (Cumming and Dai, 2011).

## **2.8 *Early Stage Funds***

Early stage represents investments in the very earliest stages of the organisational life cycle, and hence can be considered a particularly focused form of venture capital (Berger and Udell, 1998). This can include firms that are in the initial phases of a start-

up, and who may not have made any sales yet. Early stage funds carry high risk, but provide an invaluable source of capital for organisations with potential; some of this may be considered business angel activity.

### **2.9 *Distressed and Turnaround Funds***

These funds invest in firms that are undergoing a serious crisis of competitiveness, but where it is hoped, new financing and a new direction may bring about a turnaround. These investments are relatively high risk, and will be particularly sensitive to trends in the market for credit. Typically, distressed funds purchase the debt securities of firms that are nearing bankruptcy for much less than face value; the aim may be either one of entering the firm into bankruptcy or seeking to turn the firm around in order to release longer term value; once more, they can be considered a risky fund type (Shadab, 2009).

### **2.10 *Co-Investment Funds***

This is a rapidly expanding asset class, as general partners vie for funding. The most common form of co-investment is syndicated co-investment, whereby general partners (GPs) sell to limited partners (LPs) a proportion of their equity once the deal has been closed (Preqin, 2015b). In other words, private equity co-investment funds typically involve a joint investment between GPs and LPs post takeover. The former gain greater control over the takeover process, can realize earlier returns, albeit at the cost of lower fees, whilst the latter benefit not having to engage with the initial fund-raising process (Preqin, 2015b). Co-investments seem to be more prevalent in smaller deals, as greater complexity can slow the buyout process in the case of larger ones (ibid.).

### **2.11 *General Private Equity Buyout Funds***

This category encompasses MBOs and IBOs, with much existing work on private equity being concentrated on this broad category. There is much debate as to the relative

effects of both, although it is generally considered that MBOs perform better than IBOs. There is an extensive body of work on the consequences of private equity funded MBOs, most notably associated with the Nottingham/Imperial Centre for Management Buyout Research (CMBOR) (Bacon et al. 2012; Bacon et al. 2013; Wright et al. 2009; Meuleman and Wright, 2011).

On the other hand, it has been argued that buyout funds in general do not outperform the market. Again, self-reported fund values tend to be over-optimistic (Driessen et al. 2012). On the other hand, CMBOR research highlights the beneficial consequences of MBOs. Not only do they resolve any agency issues, but they also free managers to make optimal usage of their insider knowledge to forge innovative strategies and adopt optimal HR policies for high performance (Bacon et al. 2013).

IBOs represent private equity takeovers that involve the replacement of the existing senior management team or the latter's subordination to the fresh strategic directions and practices imposed by the buyer. Although when conflated with MBOs, negative effects are less visible, there is an emerging body of research that suggests that the consequences of IBOs are much more negative. For example, based on companies' data, and using a matched sample with comparable firms not subject to an IBO, Goergen et al. (2014a) find that IBOs were associated with both job losses and inferior performance. They ascribe this to the extent to which it is more difficult for outsiders to accurately value the worth of a firm's human assets.

Unfortunately, our data combines both MBOs and IBOs that do not have any of the specific features that identify the other categories of funds encompassed in this article. However, as this is a very mature area of enquiry, our primary objective is to shed light on the other fund types whose specific performance is much less investigated.



### **2.12 *Balanced Funds***

Balanced funds are funds that invest in portfolio companies in various stages of their organisational life, and may encompass buyout financing in the pre-IPO phase (Diller and Kaserer, 2009). Industry sources would indicate increasing interest in this type of fund, motivated by a desire to hedge the specific risks that may come with investing in a firm at a particular evolutionary stage (Dopfer, 2005).

### **2.13 *Natural Resources Funds***

High and volatile minerals prices, and the opening up of large areas of land for agribusiness in a number of African states has led to the proliferation of natural resource orientated funds. The oil and gas industry has increasingly been characterised by the usage and ready availability of high levels of debt leverage (Frynas et al. 2017). Again, close ties have been built up between major development finance players and focused private equity funds, critics charging that this has fundamentally recast existing governance relations (Daniel, 2011). On the one hand, this may open up new sources of capital and enable the more efficient utilisation of resources. On the other hand, this may lead to political backlashes and raises a range of sustainability issues (Daniel, 2011).

### **2.14 *Fund of Funds***

Private equity fund of funds pool a group of investors to build a diversified portfolio of investments; as with conventional private equity, they are self-liquidating structures (Meyer and Mathonet, 2011). As with conventional private equity, fund of funds are often based on limited partnerships, with day to day management being entrusted into the hands of general partners. Fund of funds may make primary investments, co-investments with PE fund general partners, or become a secondary investor in an existing fund. Fund of funds gather capital from a number of different investors, deploying this capital in twenty or more PE funds (Weidig et al. 2005).

Fund of funds can mediate size challenges by bringing together a number of smaller investors, thus promoting diversification and reducing risks. However, running fund of funds requires higher levels of expertise than a single investment (Meyer and Mathonet, 2011). They can be considered wasteful or inefficient, in that they impose an extra layer of management fees, in addition to the fees normally imposed by a PE fund (Meyer and Mathonet, 2011). Hence, it could be argued that it would be more cost effective for a major institutional investor to develop their own private equity portfolio. Against this should be considered the extent to which fund of funds managers can bring superior expertise to bear (Meyer and Mathonet, 2011). In the case of fund-of-funds, the relative bargaining power of investors is accordingly diluted. This may lead to expectations of higher returns, which in turn, may lead to riskier investments, especially if risk is offset via portfolio diversification. However, in general terms, fund of funds are considered relatively low risk, with larger funds having relatively higher levels of risk (Meyer and Mathonet, 2011). There is very little published research on private equity fund of funds, but as the chances of capital loss are slight, they do hold diversification benefits. There is some evidence that fund-of-funds tend to underperform before fees (Driessen et al. 2012). Weidig et al (2005) argue that as earlier research shows highly uneven private equity and venture capital returns, funds of funds represent a safer vehicle in areas of limited expertise. However, Jenkinson et al. (2017) concluded that whilst fund of funds are quite successful in identifying which VC opportunities are likely to outperform public market indices, they seem less able to do so in the case of buyouts.

### 3. Method

#### 3.1 Data

Our fund data set is provided by Preqin. The fund sample starts in 1990, the first year with over 50 funds recorded, and ends in 2013.<sup>1</sup> Following Phalippou (2014), we include all funds classified as ‘closed’ or ‘liquidated’ by Preqin. Most data are reported as of 2015 while the latest reports are as of 31<sup>st</sup> March 2016.

#### 3.2 Fund type identification

Preqin classifies funds into twenty-seven fund types.<sup>2</sup> We further conflate these by using similarities with respect to investment stage and nature of investment between the different types of funds, reaching a total of fourteen *fund types*. **Table 1** presents the fourteen fund types used throughout the paper as well as information on how the original Preqin types have been conflated. Six fund types are deleted altogether from the sample due to insufficient amount of funds and lack of a clear route of conflation with the fund types presented in Table 1. These are: ‘real estate co-investment’, ‘real estate secondaries’, ‘real estate fund of funds’, ‘infrastructure fund of funds’, ‘infrastructure secondaries’, and ‘timber’. Together the funds classified by Preqin under these fund types add up to less than 2% of the total fund sample. After excluding funds with no reported IRR or fund value, one fund with no reported GP location, funds classified under the six deleted fund types and trimming the data by 1% of top and bottom performing funds in

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<sup>1</sup> We choose to begin our data set in 1990 to ensure that as many fund types as possible are represented within each vintage year, while still preserving a long enough time frame to analyse changes in performance throughout vintages. 1990 is the first year when at least 10 of the fund type classifications are represented. Moreover, the total number of funds recorded in our database with pre-1990 vintages is 335, representing just 5.8% compared to the post-1990 data set.

<sup>2</sup> The 27 fund types as originally classified by Preqin are: balanced, buyout, co-investment, co-investment multi-manager, direct secondaries, distressed debt, early stage, early stage: seed, early-stage: start-up, expansion/ late stage, fund of funds, growth, infrastructure, infrastructure fund of funds, infrastructure secondaries, mezzanine, natural resources, real estate, real estate co-investment, real estate fund of funds, real estate secondaries, secondaries, special situations, timber, turnaround, venture (general), venture (debt).

terms of IRR and multiples of invested capital, we obtain a total sample of 5522 funds. Since our dataset covers a wide range of fund types over a period of twenty-four years, rather than isolating buyouts and venture capital, our fund sample is much richer and diverse than in previous studies.<sup>3</sup>

In the empirical models, we identify fund types using dummy variables which are equal to ‘1’ when a fund is reported as being part of one of the fourteen classes of fund types previously described and ‘0’ otherwise. As benchmark, we use buyout funds, which are the most numerous funds in our sample and represent a good point of reference within the private equity universe.

### **3.3 *Fund performance measurement***

In line with Harris et al. (2014), we measure fund performance using two proxies: the net internal rate of return (IRR) and the multiples of invested capital. Our fund sample with reported multiples of invested capital values is slightly smaller than our base sample, counting 5268 funds. Fund performance can be analysed by employing several other variables such as: the total value over paid-in capital (TVPI), which is the ratio of the sum of distributions and most recent NAV to the sum of all takedowns, the distributed over paid-in capital (DPI), representing the ratio of the sum of distributions to the sum of all takedowns (Phalippou and Gottschalg, 2009) and the proportion of successful IPO exits (Cumming, Fleming, and Schwienbacher, 2009). Previous papers have also examined whether private equity outperforms the public market by employing several comparative measures such as the PME which relates a private equity investment to an investment in the relevant public market over the same time-frame (Kaplan and Schoar, 2005; Harris et

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<sup>3</sup> Previous papers investigating buyouts and venture capital use smaller data sets. Kaplan and Schoar (2005) investigate a total of 746 U.S. funds between 1980 and 2001, Phalippou and Gottschalg (2009) use a base sample of 852 funds raised between 1980 and 1993, Sensoy et al. (2014) examine 14380 investments in 1250 unique private equity funds, while Harris et al. (2014) use Burgiss data on 1373 U.S. private equity funds.

al. 2014; Phallipou, 2014) and the Long-Nickels excess return, which represents the difference between a fund's IRR and the annualised relevant public market IRR (Kocis et al. 2009; Harris et al. 2014). Since our focus is analysing performance differentials between fund types, we focus on absolute measures of fund performance and consider that the net IRR and the multiples of invested capital should reflect all relevant fund performance factors. In addition, Harris et al. (2014) show that multiples in invested capital and IRR explain at least 93% of the variation in the PME, validating our use of these absolute return measures.

### **3.4 *Size variables***

Fund size is measured using the total amount of capital a fund raises (i.e. fund value). This is obtained from Preqin. We adjust fund size for inflation by measuring fund values in 2013 dollars. In line with Cumming and Dai (2011), within the regression models, fund size is measured through the natural logarithm of the fund size. To compare fund performance across different fund sizes, we split funds into six size brackets and create indicator variables equal to '1' when a fund's size value lies within the respective bracket and '0' otherwise. The six size brackets constructed are: fund size less than \$100mn (*<\$100mn*), fund size between \$100mn and \$250mn (*\$100mn-\$250mn*), fund size between \$250mn and \$500mn (*\$250mn-\$500mn*), fund size between \$500mn and \$1bn (*\$500mn-\$1bn*), fund size between \$1bn and \$3bn (*\$1bn-\$3bn*) and fund size in excess of \$3bn (*>\$3bn*). The benchmark size bracket consists of the group including the smallest funds (*<\$100mn*).

### **3.5 *Vintage***

The models presented control for the year in which a fund was raised, by using a dummy variable equal to '1' when a fund is reported by Preqin as being raised in that specific vintage year and '0' otherwise. Moreover, to investigate separately fund

performance in the periods before, during and after the financial crisis, we create three vintage year brackets: the pre-crisis period (funds raised between 1990 and 2002), the crisis period (funds raised between 2003 and 2008) and the period including both the pre-crisis and the crisis period (funds raised between 1990 and 2008). Fund performance may vary from one period to another as performance factors could influence fund type returns differently within different subsamples.<sup>4</sup> As before, we create indicator functions which are equal to ‘1’ if a fund is raised in a vintage year or within one of the year brackets and ‘0’ otherwise. We use 2003 as benchmark year, as it sits chronologically towards the middle of our sample, while the aggregate fund performance recorded in 2003 lies approximately in the middle of our sample’s vintage performance using both performance measures.

### **3.6 *Region focus***

In terms of regional focus, our dataset includes funds operating in all geographical regions. Most funds operate in the U.S. (68% of the sample), while funds focusing on the European and Asian market comprise 19.4% and 7.3% of the sample, respectively. The other four regions, namely Africa, Americas (excluding U.S.), Middle East & Israel and multi-regional funds, amount to 5.4% of the sample. In the empirical models, we control for the region where the fund focuses its operations by including dummy variables equal to ‘1’ when a fund operates in a specific region and ‘0’ otherwise. The benchmark region is the U.S.

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<sup>4</sup> For instance, in their analysis of limited partners’ performance over time, Sensoy et al. (2014) document that endowments investors earn superior performance between 1991 and 1998, mostly due to their better access to the best performing venture capital funds. However, this outperformance is subsumed between 1999 and 2006, as endowment investors no longer outperform and do not exhibit the same access to the best funds.

### 3.7 *Fund sequence*

Cumming, Fleming and Schwienbacher (2009) evidence that later stage funds outperform the rest of the funds, as proxied by the number of successful IPO exits. Private equity houses may raise funds in a sequence. Therefore, in our models, we proxy fund sequence by the number within a sequence that a fund occupies within a private equity house. If a fund is the first fund to be raised by the private equity house, then the sequence proxy takes the value of '1', whereas if it is a follow-on fund, the proxy takes the value of how many funds were brought up before by the PE house, including the current fund.

## 4. Findings

### 4.1 *Descriptive statistics:*

To emphasize the diversity of our fund data, we present two descriptive statistics tables to illustrate both the variation across vintages (**Table 2**) as well as the variation across the 14 fund types identified (**Table 3**).

Examining the summary statistics by vintage year, we note that during the 1990s, the number of funds raised increases each year (except for vintage year 1991), the average fund performance is the highest within our entire sample (except for 1998 and 1999 vintages), while the funds raised are, on average, the smallest in terms of fund value. The beginning of the 2000s (2001 through to 2003) marks a decrease in private equity fundraising and an increase in performance relative to the end of the 1990s. However, the picture reverses between 2004 and 2008, the period with the most active fundraising, when performance falls sharply due to the negative shocks of the financial crisis. Moreover, funds raised during this period are on average the largest within our data set, with mean fund sizes of over USD \$1bn in 2006 and 2007. Fund raising decreases considerably in the years immediately following the financial crisis, while fund

performance rebounds to levels comparable to those of funds raised in the period between 2001 and 2003.

When investigating the summary statistics by fund type, we observe that buyout, real estate, fund of funds and venture funds are the most numerous in our sample, while expansion, balanced and co-investment funds are the least represented. The average fund performance as measured through the IRR is 12.45%, while the average fund multiple of invested capital is 1.56x.

We can separate the fourteen fund types into four groups in terms of their performance as measured by the IRR and multiples of invested capital when compared to the average fund in our sample. Firstly, the fund types which outperform the average fund using both performance measures are: buyouts, distressed & turnaround, growth, natural resources and secondaries. Secondly, co-investment funds outperform the average fund using the IRR, but slightly underperform when examining the multiples of invested capital. Thirdly, balanced funds underperform when measuring performance via the IRR, but outperform when investigating the multiples of invested capital. Lastly, early stage funds, expansion/late stage funds, fund of funds, infrastructure funds, mezzanine funds, real estate funds and venture funds perform worse than the average fund using both performance measures. The best performing fund type in terms of the IRR are secondaries (18.82%), whereas the worst performing are early stage funds (8.50%). In terms of multiples of invested capital, the best performing fund type are buyouts (1.73x), while the worst performing type is represented by real estate funds (1.43x).

In terms of average fund size, buyout funds, infrastructure funds, distressed & turnaround funds and balanced funds are the largest fund types in our sample, each with an average fund value of over USD 1bn, while early stage funds, expansion/late stage funds and venture funds have the smallest fund values.

The buyout IRR figures from our study are similar to those reported by Harris et al. (2014), using a sample spanning between 1984 and 2008, while venture capital



performance is lower. The returns are worse than those reported by Harris et al. (2014) mainly due to the very low fund performance, as measured by the multiples of invested capital, in the years following 2008 and until the end of our sample in 2013. Moreover, our results for both fund types are significantly lower than those found by Kaplan and Schoar (2005) using a sample between 1980 and 2001, mainly due to their sample not including the modest fund performance between 2003 and 2008.

#### **4.2 *Fund observations analysis***

To uncover more evidence related to the relative fundraising activity of different fund types over time, we investigate the ratio of fund observations of each of the fourteen fund types to the total number of fund observations using rolling five-year windows. **Figure 1** panels (a) - (c) present the results. Two broad fundraising patterns can be distinguished among the fund types identified. Firstly, funds for which the proportion of fund type observations to total fund observations increases over time include: fund of funds, real estate funds, growth funds, secondaries funds, infrastructure funds, distressed & turnaround funds and co-investment funds. Conversely, the fund types for which the proportion of fund observations decreases over time include: buyout funds, venture funds, early stage funds, expansion/ late stage funds, balanced funds, mezzanine funds and natural resources funds. Noteworthy, the diminishing proportion of buyout and venture funds out of the total number of funds raised reinforces the importance of studying closely the different aspects of other fund types to obtain a detailed picture of the private equity and venture capital universe.

#### **4.3 *The size-performance relationship***

In line with the previous findings of Lopez de Silanes et al. (2015), we document a negative relationship between fund size and performance. Moreover, the negative size-performance relationship holds for each fund type separately. To visualise this, we graph

the five-year simple moving average IRR, the five-year simple moving average multiple of invested capital and 5-year simple moving average fund size for the fourteen fund types over the entire sample period. Aggregating the results, we find evidence for a negative size-performance relationship when examining results for all funds combined. Results are presented in **Figure 2**. Panel (a) displays aggregate results while Panels (b)-(o) illustrate the relationship for the 14 fund types separately. On aggregate, fund performance peaked during the beginning of the 1990s and then fell consistently until the end of the financial crisis. Following the financial crisis, when measuring performance via the IRR, we find a small rebound in performance in the post-2008 period. However, this small rebound in performance is only captured when measuring IRRs, average multiples of invested capital continuing to decrease until the end of the sample. At the same time, fund sizes increased on aggregate from the start of our sample until the end of the financial crisis, followed by a decrease in fund values in the post-2008 period.

#### **4.4** *Empirical strategy*

To investigate whether performance differences exist between the various fund types in the private equity industry, a series of tests and models are employed. Firstly, we examine whether significant differences in terms of average performance, as measured by the IRR and multiples of invested capital, exist between the 14 fund types. Within **Table 4**, panel (a) presents the differences between the mean IRRs of the 14 fund types, while panel (b) presents differences between multiples of invested capital. When investigating the differences between mean IRRs, we note that secondaries funds significantly outperform all other fund types. Buyouts also significantly outperform all fund types except for co-investment, distressed & turnaround, natural resources and secondaries funds. At the opposite end of the spectrum, early stage funds, expansion / late stage funds and venture funds generally underperform. When evaluating the differences between fund type mean performance using the multiples of invested capital, we find that

buyout funds significantly outperform all fund types except natural resources and growth funds, while real estate funds generally underperform.

#### 4.5 *Fund type regressions*

To shed more evidence on the performance differences between the various fund types, we estimate a series of regressions focusing on the performance characteristics of the different fund types, while controlling for factors such as vintage, region focus, fund size and fund sequence. Each of the models is estimated twice, once using the IRR and once using the multiple of invested capital as dependent variables. Our baseline model (*Model 1*) investigates the differences in performance between the different fund types, when controlling for vintage year, fund size (natural log of), region focus and fund sequence. *Model 2* replaces the fund size variable from the baseline model with fund size brackets. *Models 3(a-c)* replace the vintage years from the baseline model with the three vintage year brackets. *Model 3(a)* presents results isolating the pre-crisis period (1990-2002), *Model 3(b)* presents results for the pre-crisis and crisis period together (1990-2008), while *Model 3(c)* presents results for the crisis period (2003-2008). *Models 4 (a-c)* replace both the fund size and the vintage year variables from the baseline model with fund size brackets and year brackets, respectively. In all models, the benchmark fund type is buyouts. The results for *Model 1* and *Model 2* are presented in **Table 5**, while results for *Models 3(a-c)* and *Model 4(a-c)* are presented in **Table 6**.

Evaluating the results displayed in Table 5, fund types can be separated in four categories corresponding to their performance measured via the IRR and multiples of invested capital, compared to the performance of buyout funds. Firstly, the fund types which significantly underperform irrespective of the performance measure chosen are: balanced funds, early stage funds, expansion/late stage funds, fund of funds, infrastructure funds, mezzanine funds, natural resources funds, real estate funds and venture funds. Growth funds significantly underperform in terms of IRR, but not

significantly in terms of multiples of invested capital, whereas co-investment funds and distressed & turnaround funds significantly underperform in terms of multiples of invested capital, while not having a significant relationship when investigating IRRs. Finally, secondaries funds significantly outperform when measuring IRRs and significantly underperform when evaluating multiples of invested capital.

In terms of vintage years, we observe significant overperformance during the beginning of our sample and significant underperformance during the 1999 and 2000 bubble period and between 2004 and 2008 due to the negative effects of the financial crisis. When evaluating funds via the multiple of invested capital, we also note that the significant underperformance of funds continues after 2008 until the end of our sample. With regards to region focus, we note that funds operating in the Americas and multi-regional funds significantly underperform when compared to U.S. focused funds. We also find compelling evidence that fund performance decreases with fund size and that the smallest funds (<\$100mn of fund value) are the best performers. Investigating standardized coefficients, we note that an increase of one standard deviation in the (natural log of) fund size would decrease IRRs by 10.8% and multiples of invested capital by 12.7%, respectively.

The fund type performance results presented in Table 6 echo the previous findings for the whole sample, with early stage funds, expansion/late stage funds, fund of funds, growth funds, infrastructure funds, mezzanine funds, natural resources funds, real estate funds and venture funds significantly underperforming compared to buyout funds in all subsamples when measuring performance by both the IRR and multiples of invested capital. Additionally, for all subsamples, co-investment funds and distressed & turnaround funds underperform when measuring multiples of invested capital, while balanced funds underperform when measuring IRRs. Lastly, in all subsamples, secondaries funds significantly outperform buyouts when measuring IRRs and significantly underperform when examining multiples of invested capital.

The vintage brackets highlight the high-performance vintages from the beginning of the sample, while also evidencing the sharp fall in performance during the crisis period. Interestingly, the fund performance picture for funds raised on or after 2009 is mixed; if fund performance is measured via the IRR the post-crisis period outperforms, while in terms of multiples of invested capital the most recent funds significantly underperform. Funds with a region focus on the Americas (excluding U.S.) and multi-regional funds significantly underperform in all vintage brackets, when benchmarked against the U.S. In terms of fund size, in line with previous studies such as Lopez de Silanes (2015), we find that fund performance drops as funds grow larger, the smallest funds (<\$100mn) performing the best in all subsamples. Interestingly, most notably during the financial crisis period, we find that higher sequence funds perform worse than low sequence funds.

#### **4.6 *Estimations including fund type and year bracket interactions***

*Models 5(a-b)* and *models 6 (a-b)* examine the performance of each fund type before and after the financial crisis by interacting the fund type and vintage bracket dummies. *Models 5 (a-b)* control for the level of fund size, while *models 6 (a-b)* control for the size brackets constructed. Results for the estimations using type and vintage bracket interaction terms are presented in **Table 7**. Most fund types perform better in the pre-crisis period (1990-2002) compared to the rest of the sample. Most notably, buyouts, distressed & turnaround funds, infrastructure funds, natural resources funds, real estate funds and secondaries funds perform significantly better pre-crisis using either of the two performance measures. Early stage funds are the only fund type to perform significantly worse in the pre-crisis period and only when measuring IRRs. However, the picture is more diverse when comparing the post-crisis period (2009-2013) with the rest of our sample (1990-2008). Buyout funds are the only fund type to perform better between 1990 and 2008 irrespective of the performance measure, while funds of funds, growth funds, infrastructure funds and mezzanine funds perform significantly worse in the post crisis

period when evaluating multiples of invested capital, but significantly better when evaluating IRRs. Interestingly, when evaluating multiples of invested capital, no fund type performs significantly better in the post-crisis period compared to the rest of the sample.

Once more, the fund size variable is significant and negative, while the best performing fund size bracket is the one consisting of the smallest funds. In terms of region focus, funds operating in the Americas (excluding U.S) region and multi-regional funds significantly underperform, when benchmarked against U.S. funds. We also note a surprising result relating to the fund sequence variable estimate being significant and negative indicating that later stage funds underperformed compared to first-time and lower-sequence funds.

#### ***4.7 Volatility in returns***

Our discussion of risk so far has been in terms of how a fund signals risk to investors according to its scope and domain of operations. However, riskiness is above all about relative certainty in returns. We therefore now explore volatility in returns, defined as the standard deviation of the two fund performance measures, for each fund type. Results are presented in Table 8. We find that some of the riskiest fund types in terms scope and domain – natural resources, early stages, and venture – are indeed associated with higher levels of volatility in returns as well as yielding inferior returns to investors. In contrast, fund of funds, and infrastructure funds, both were associated with stability; this would be expected, given that the former seeks a balance between different types of investment, whilst infrastructure funds can often count on the security of direct or indirect state subsidies. It is perhaps surprising that real estate funds were not associated with greater volatility given persistent bubbles in this area, but this may be due to the ability to offset risk through engaging in different types of property development and in different national and regional locales (in contrast, mineral prices are global). Mezzanine funds mean that

junior debt holders shoulder more risk; in turn, this may reduce the risk falling on general and limited partners. We observe accordingly a lower risk in terms of volatility in our sample of mezzanine funds.

## **5. The performance of U.S. funds**

Separately, to provide robustness to our results and given the existing literature's emphasis on U.S. based funds, we repeated our fund performance analysis on a subsample of funds having the General Partner (GP) located in the U.S. The U.S. fund results are displayed in tables A1 - A7 in the online appendix (available at ##). On aggregate, U.S. based funds accounted for approximately 70% of the funds in the main dataset. While this ratio does not fluctuate widely throughout the sample period, we note that the proportion of U.S. based funds is slightly larger in early vintages compared to later vintage years, indicating a relative increase in non-U.S. based fundraising.

All in all, performance results of U.S. based funds closely match fund performance within the main sample. We observe a slight underperformance of U.S. based funds using both performance measures, U.S. funds displaying an average IRR of 12.11% compared to 12.45% for the whole sample and average multiple of invested capital of 1.55x compared to 1.56x for the whole sample. Table A2 presents performance results by fund type; it can be seen that U.S. secondaries and expansion/late stage funds show a weaker performance compared to the whole sample results, while U.S. natural resources funds perform better, using both performance measures. Separately, growth funds perform worse in terms of IRRs, while balanced funds perform better in terms of multiples of invested capital. All the performance results for the remaining fund types identified are very similar to those of the whole sample.

Investigating Model 1 estimation results, presented in Table A4, we find that U.S. early stage funds, expansion/late stage funds, funds of funds, infrastructure funds,

mezzanine funds, real estate funds and venture funds significantly underperform using both performance measures compared to U.S. buyout funds. Growth funds underperform only in terms of internal rates of return, while co-investment and distressed & turnaround funds underperform only in terms of multiples of invested capital. These results echo previous findings for the main dataset. What is different from the whole sample results, is that U.S. balanced funds and natural resources funds do not significantly underperform U.S. buyout funds; again U.S. secondaries underperform in terms of multiples, but no longer significantly outperform buyout funds in terms of internal rates of return.

Investigating fund values, U.S. based funds are on average 7.6% larger compared to the main sample of funds. Fund size remains significantly negatively related to fund performance, with the smallest of funds, having fund values of less than \$100mn displaying the best performance. In terms of vintages, we observe a very similar picture to the main sample results, fund performance peaking in the early 1990s and dropping between 1998-2000 and 2004-2008. Interestingly, on aggregate, we again note that funds underperform in terms of multiples of invested capital, but not in terms of internal rates of return in the later vintages from the sample. In terms of region focus, funds focusing on the Americas and Australasia regions significantly underperform in terms of both performance measures, while multi-regional funds underperform in terms of internal rates of return and European-focused funds significantly underperform in terms of multiples of invested capital.

## **6. Discussion**

Our study revealed great heterogeneity in terms of fund performance. Although this echoes earlier work on the subject (Cumming and Dai 2011; Goergen et al. 2014a; Wood and Wright 2009) what our study adds is a very much more finely grained analysis of fund type; this is the first academic study we are aware of that encompasses so many



categories of funds. IRR is considered the most important benchmark for private equity performance, but it is a composite indicator that may be affected not only by the actual performance of the core business, but also by debt leverage (Goedhart et al. 2015) and holding period. Over a certain holding period, IRR includes in its measurement the baseline return (i.e. what the firm would have attained without any changes in managerial strategy), improvements to business performance (e.g. increasing margins), strategic repositioning (e.g. entering new markets, innovation, new products), and debt leverage (ibid.). As excessive leverage adds risk, it may jeopardise genuine value creation (Goedhart et al. 2015). Again, IRR may be boosted through the strategic timing of returns to investors: IRR rates may be significantly increased by the return of early gains to investors (BVCA, 2015). The time span that a fund holds on to a company influences IRR results as well, with longer holding periods decreasing IRRs. Given that the average holding period increased significantly in the financial crisis due to lack of available exit options, we see a greater discrepancy between IRR and multiples of invested capital in the later years of our sample. In disentangling the reasons behind any divergence between internal rates of return and multiples of invested capital, it should be noted that debt and holding period effects are hard to disentangle. Both are bound up with developments in the external market; at times it is easier to borrow and/or to sell on a firm with a specific debt profile than others. Multiples of invested capital represent the return on the overall investment over a particular time period. This provides a more accurate representation of funds in the later stages of their life, as there is a larger number of distributions to evaluate. As Barber and Yasuda (2017) note, GPs may have an incentive in maximising the former, as they can present particular peaks in IRRs as evidence of their capabilities to support a new round of fundraising.

We found that two types of funds performed poorly in terms of both IRRs and multiples of invested capital: early stage and expansion/late stage. There are inherent risks associated with investing in firms in the very earliest stage of organizational life (Nanda

et al. 2013). Expansion/late stage funds bring with them the risk that the firm may already be heavily over-borrowed, and hence, it is much more difficult to enhance returns through new efficiency savings and/or to engage in new rounds of debt and distribution. However, as it involves investing in mature enterprises, there is a greater predictability in terms of likely performance trajectories: hence, there was much less variation in returns than in the case of early stage funds. Predictably, mezzanine funds did poorly in terms of multiples of invested capital, but somewhat better in terms of IRRs. The *raison d'être* of such funds is to be able to unlock new forms of borrowing, and, it is likely that post takeover, a heavy focus will be on borrowing against the assets of the firm; mezzanine investors are typically more concerned with immediate returns than longer term value of equity, and will drive general partners to maximize IRRs even at the expense of multiples of invested capital. Real estate funds also show the weakest performance in terms of multiples of invested capital; this would again reflect a tendency for property price bubbles particularly in the developed common law countries and associated very high levels of debt leverage. IRRs may, in the short term, be quite good, but the underlying worth of assets once debt is accounted for (and hence, multiples of invested capital values) may be much more modest, especially given periodic property price downturns, such as those that took place in the post financial crisis USA. What is interesting is the recent upsurge in real estate fund performance, possibly on the back of reflating property bubbles (c.f. Smick, 2016). Again, poor fund returns might either reflect excessive risk taking or risk aversion, the latter a possible response by general partners in over compensating for the challenges posed through operating in specific areas of activity and/or through the usage of junior debt. In case of the latter, General Partners may wish to demonstrate that they are 'safe pairs of hands', opening the way to more conventional debt financing in future.

Secondaries, and distressed and turnaround funds, did quite well in terms of IRRs, but much less well in terms of multiples of invested capital. This may reflect the fact that

renewed rounds of borrowing are likely to take place against the assets of a firm that is likely to have – as a consequence of the initial buyout – already taken on significant debt (Goergen et al. 2014b). In other words, distributing the money released by new borrowing may boost IRRs, but this will not be reflected in multiples of invested capital performance. It has been argued that in the case of such funds, there are limited opportunities for private equity investors to make gains (Goergen et al. 2014b). Not only may debt leverage already be quite high, but other expedient measures to enhance return, such as sale and leaseback agreements with premises, cutting back on long term staff development and/or R&D, may already have been implemented. Whilst fresh insights from a new managerial team may identify new opportunities for value maximization and release, it can be argued that the range of these of these opportunities is likely to be limited, and that any ‘fresh insight gains’ may be transitory. Hence, whilst such funds may initially yield good IRRs, over a longer period of time, they may diminish; the effects of early gains are more likely to dissipate, and any costs associated with earlier rounds of restructuring, such as leaseback agreements of premises or higher debt, have to be shouldered. There is some debate as to whether secondaries, and distressed and turnaround funds, are primarily concerned with new opportunities for debt leverage, or on concentrating on enhancing core business activities, given that the most easily fungible assets may have been released at the first stage or at the onset of distress (Altman and Hotchkiss, 2010). This study suggests that the former is more likely to be the case.

The superior performance of co-investment funds in terms of IRRs, but not multiples of invested capital might suggest that such funds may, again, be particularly focused on leverage and the release of value. This may be the one area where it is easiest to forge consensus between the co-investors; agreement around the adoption of a mutually supportive set of new managerial strategies may be much more difficult to secure (Daily et al. 2013). Balanced, growth and natural resource funds do well against multiples of invested capital. Balanced funds seek to offset risks through investing in different types

of firm; this may mean that such funds are not able to adopt a single recipe for value release, and hence, this may make for a less intense focus on debt leverage as a mechanism for value release. As growth funds seek to aggressively expand the target organization, debt is more likely to be channelled to fund this than simply to return value to investors. Meanwhile, minerals prices have boomed in recent years; even if debt may be relatively high, it may be driven higher on the anticipation of an increase in value of underlying assets (c.f. Stuermer, 2018). Buyouts do best against both measures: buyout funds are not necessarily committed to imposing a single type of managerial team, but may vary the recipe according to the target organization (e.g. supporting existing managers to buy the firm vs an MBI or IBO). This may lead to the adoption of managerial directions most appropriate to the specific circumstances of the organization.

We found that since 2009 (i.e. the post-crisis period), all funds except buyouts, distressed & turnaround, secondaries and natural resources did better in terms of IRRs than before the financial crisis. Although this might be explained by a natural selection process, with weaker players abandoning the industry, a look at multiples of invested capital revealed the converse. Effects of quantitative easing have been the renewed availability of capital and a commensurate increase in levels of borrowing (Kapatnios et al. 2012); these may enable new waves of debt and distribution, but without generating real new value.

## **7. Conclusions**

There is quite an extensive body of literature on the relative performance of the private equity industry, and the consequences of private equity investment (Wood and Wright, 2009; Cumming and Dai, 2011; Goergen et al. 2014a). This literature reveals a great deal of heterogeneity in fund performance, which may reflect a much greater internal diversity in the sector than is captured by studies that amalgamate many different

fund types. This is the first study to explore in depth performance variations across such a wide range of fund types. Our study revealed that performance outcomes – and diversity in performance - varied greatly according to fund type. This may explain the contradictory results of studies that review performance, yet conflate very different fund types. In general, some of the riskier funds performed the worst, with early and late stage funds doing particularly badly; the former being also associated with higher levels of diversity in actual returns. Reflecting differences in the extent to which funds may enhance their reported IRR through borrowing and distribution, there was some divergence in fund performance between IRRs and multiples of invested capital. This divergence might be caused by possible increases in holding periods due to the financial crises and the difficulty to exit portfolio companies during this time as well as the strategic timing of returns to investors, and the capacity of the acquired firm to take on further debt. Clearly, this relationship is a complex one, and would merit a focused study in its own right. Conventional buyout funds did the best, and this may reflect the diversity of approaches that may be adopted within this category towards managing target firms (i.e. the lack of a standardized recipe irrespective of organizational circumstances). The general boom in IRRs, but poor performance in terms of multiples of invested capital in the post crisis period could reflect the ease of borrowing following quantitative easing, allowing funds to load target firms with new debt, and to return money to investors without necessarily improving, or even sustaining, organizational fundamentals. This is not to suggest that it is all about risk and debt; as can be seen from the preceding section, there also lie some very specific reasons contributing to why specific funds under- or over- perform.

We found a negative relationship between fund size and performance. This would reflect the extent to which smaller players may lack the necessary resources to buffer external and unexpected shocks, which may present them – and the firms they invest in – with existential challenges. However, with size does not necessarily go superior knowledge (Cumming and Dai, 2011); indeed, we found that some of the largest funds

operated in relatively under-performing areas. This raises the issue as to why under-performing types of fund – and those where there are high levels of diversity in actual returns - continue to attract investment and why large funds – who have potentially the greatest resources available to secure top level expertise – are found in such areas. There are three broad theoretical explanations for this. The first represent agency failures. Although the bulk of the literature on agency failings concentrates on the firm, as Allen (2001) notes, it is possible that agency failings may similarly manifest themselves within the alternative investor ecosystem. General partners are rewarded not only through returns, but also through management fees, they may seek the personal prestige of running as large a fund as possible, whilst risking in proportionate terms, relatively little of their own money. In turn, this may result in them stepping outside of their envelope of expertise, and as suggested by Cumming and Dai (2011) end up battling to manage increasingly complex deals; bought in expertise may be a poor substitute for insider knowledge.

The second can be found in expectations literature: given the complexity of the private equity sector, significant numbers of investors fill information gaps with assumptions and aspirations. As optimistic narratives gain traction, a ‘gold rush’ atmosphere prevails, with the assumption that funds that signal riskier status are likely to seek to compensate investors with higher returns (Delevande et al. 2011; Shackle, 2012). The third is that evolutionary processes in the fund ecosystem operate in a non-linear fashion; if agents may learn from each other, the patterns of their interactions may make for both continuity and ruptures (Dopfer, 2005; c.f. Hollingsworth, 2006), with certain types of fund (e.g. larger ones) proliferating not because they perform any better, but rather owing to external developments. The latter would include the impact of the recession (smaller players, who are less able to raise large war chests, are similarly less well equipped to withstand shocks), and quantitative easing (the release of large amounts

of new capital for investment, from which larger players might be particularly likely to benefit).

The findings of the study indicate that flows of investment capital often follow sub-optimal paths, and this, in turn, would highlight imbalances in expertise and knowledge in an undeniably complex area of the investment ecosystem. However, it should similarly be acknowledged that we only review performance outcomes over a limited time period, and that larger players, who have the resources to take a longer-term view, may be counting on gains much further into the future. Although it is often argued that time horizons in the sector are quite short (Harford and Kolasinski, 2013), this is clearly an area for future research. Again, a closer look at regional effects, and the impact of differing national corporate governance regimes on fund size and performance may yield further insights on why some types of fund seemingly do much better than others. Again, an evaluation of the relationship between the relative experience of GPs, type of funds and performance might yield interesting results; it is possible that more experienced general partners might concentrate their efforts on specific types of fund which they have found to have the most potential. Finally, there are many ways funds may be categorized in terms of riskiness (e.g. ease of raising capital, locale of operation, sector, etc.), and the development of a more nuanced taxonomy of riskiness might in turn, yield further insights on the variability of fund performance. Given that the study indicates that investing in private equity has become riskier, it can be argued that the need for such a taxonomy has become more pressing.

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**Table 1: Fund types conflation**

**Table 1** presents the grouping of the Preqin-defined fund classes into the fourteen fund types analysed throughout the paper. The first column presents the fourteen fund types investigated. The Preqin-defined fund types are presented in the second column. The route towards conflation of the Preqin-defined fund classes into the fourteen fund types examined is presented in each row.

Fund Types		Conflation of Preqin-defined fund classes		
1	Balanced	Balanced		
2	Buyout	Buyout		
3	Co-investment	Co-investment	Co-investment Multi-Manager	
4	Secondaries	Secondaries	Direct Secondaries	
5	Distressed & Turnaround	Distressed Debt	Special Situations	Turnaround
6	Fund of Funds	Fund of Funds		
7	Growth	Growth		
8	Infrastructure	Infrastructure		
9	Mezzanine	Mezzanine		
10	Natural Resources	Natural Resources		
11	Real Estate	Real Estate		
12	Venture	Venture (General)	Venture Debt	
13	Expansion/Late Stage	Expansion/Late Stage		
14	Early Stage	Early Stage	Early Stage Start-up	Early Stage: Seed

**Table 2: Descriptive statistics by vintage**

**Table 2** presents summary statistics for the sample of funds for each vintage year. The first column presents the vintage year. The second column presents the number of funds raised in each of the vintages. The third and fourth columns present the average performance per vintage year across the sample of funds, as measured by the mean internal rates of return and mean multiples of invested capital, respectively. The last column presents the average fund size per vintage year, calculated in 2013 U.S. dollars. The net internal rates of return (%) and multiples of invested capital (x) for each fund are obtained from Preqin. Data span is between 1990 and 2013.

<b>Vintage</b>	<b>Fund observations</b>	<b>Fund mean IRR (%)</b>	<b>Fund mean multiple (X)</b>	<b>Fund mean size (USD mns)</b>
1990	52	20.579	2.375	376.676
1991	31	25.235	2.339	277.740
1992	62	24.163	2.302	398.841
1993	66	24.600	2.442	280.612
1994	86	20.476	2.079	620.300
1995	102	18.238	1.889	408.891
1996	118	14.945	1.740	358.009
1997	155	15.035	1.735	553.174
1998	207	10.354	1.564	680.039
1999	217	8.334	1.526	671.494
2000	326	10.220	1.585	721.003
2001	235	14.456	1.753	603.423
2002	182	14.695	1.667	558.430
2003	182	15.068	1.704	621.775
2004	244	10.034	1.535	534.408
2005	399	7.720	1.454	776.681
2006	467	6.501	1.430	1075.650
2007	510	9.332	1.495	1094.045
2008	451	11.664	1.524	979.212
2009	204	14.761	1.554	591.645
2010	286	15.243	1.531	590.283
2011	362	15.325	1.407	686.857
2012	309	16.177	1.295	870.904
2013	269	12.807	1.162	911.925
<b>Grand Total</b>	<b>5522</b>	<b>12.447</b>	<b>1.556</b>	<b>754.690</b>

**Table 3: Descriptive statistics by fund type**

**Table 3** presents summary statistics for each of the fourteen fund types identified. Panel A presents the number of funds with reported net internal rates of return (*Obs*) as well as the average (*Mean*), standard deviation (*Std. Dev.*), minimum (*Min*) and maximum (*Max*) performance as measured by the net IRR (%). Panel B presents the number of observations with reported multiples of invested capital (*Obs*), as well as the average (*Mean*), standard deviation (*Std. Dev.*), minimum (*Min*) and maximum (*Max*) performance as measured by the multiples of invested capital (x). Panel C presents the number of observations with reported fund size (*Obs*), as well as the average (*Mean*), standard deviation (*Std. Dev.*), minimum (*Min*) and maximum (*Max*) fund size as measured by fund values (in 2013 USD millions). All statistics are presented separately for each fund type as well as on aggregate for all funds in the sample. The net IRR (%) and multiples of invested capital (x) for each fund are obtained from Preqin. Data span is between 1990 and 2013.

Fund Type	Panel A: Net IRR (%)					Panel B: Multiple (X)					Panel C: Fund Size (USD mns)				
	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
Balanced	93	12.29	15.27	-19.00	63.70	92	1.65	0.81	0.56	5.20	93	1106.93	2515.27	1.46	16816.88
Buyout	1335	15.32	13.82	-20.70	66.10	1293	1.73	0.69	0.25	5.56	1335	1335.85	2380.15	3.91	23360.93
Co-investment	95	14.23	14.76	-17.60	66.90	93	1.55	0.58	0.36	3.42	95	345.39	414.39	2.13	2294.22
Distressed & Turnaround	246	14.36	12.92	-15.60	70.00	227	1.58	0.62	0.54	5.07	246	1207.24	1480.76	11.94	11583.46
Early Stage	342	8.50	15.28	-19.40	66.00	325	1.46	0.83	0.24	5.59	342	224.37	313.57	2.07	3099.73
Expansion / Late Stage	84	9.09	13.32	-16.90	55.00	79	1.45	0.68	0.38	3.48	84	301.44	380.23	14.26	2624.00
Fund of Funds	741	10.50	8.43	-14.40	69.00	719	1.50	0.46	0.36	5.29	741	413.94	512.11	1.68	5864.10
Growth	262	13.28	13.21	-19.90	67.00	258	1.64	0.77	0.32	5.49	262	488.91	658.44	10.38	4820.84
Infrastructure	115	11.54	11.26	-14.20	46.80	107	1.48	0.55	0.60	3.58	115	1304.13	1487.60	5.47	8404.33
Mezzanine	218	10.57	7.26	-13.00	56.30	200	1.45	0.40	0.47	3.40	218	666.00	1231.57	13.54	14574.63
Natural Resources	143	13.24	16.44	-20.00	67.10	136	1.61	0.79	0.40	4.86	143	996.45	1565.44	2.01	9374.10
Real Estate	1040	11.76	12.28	-19.50	71.30	954	1.43	0.49	0.28	4.93	1040	600.17	954.78	1.46	12220.27
Secondaries	188	18.82	12.47	-6.30	66.00	185	1.58	0.43	0.81	3.81	188	846.43	1237.47	11.47	7487.16
Venture	620	9.72	16.39	-19.80	69.50	600	1.50	0.83	0.23	5.59	620	312.03	378.09	1.02	2982.49
<b>All Funds</b>	<b>5522</b>	<b>12.45</b>	<b>13.33</b>	<b>-20.70</b>	<b>71.30</b>	<b>5268</b>	<b>1.56</b>	<b>0.65</b>	<b>0.23</b>	<b>5.59</b>	<b>5522</b>	<b>754.69</b>	<b>1488.72</b>	<b>1.02</b>	<b>23360.93</b>

**Table 4: Differences between fund type mean performance**

**Table 4** presents pairwise differences in mean performance between the fourteen identified fund types. *Panel (a)* presents pairwise differences between average internal rates of return (%). *Panel (b)* presents pairwise differences between mean multiples of invested capital (x). Statistical significance is measured through Satterthwaite-Welch t-statistics. \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% level, respectively. The net IRR (%) and multiples of invested capital (x) for each fund are obtained from Preqin. Data span is between 1990 and 2013.

												<i>Panel (a)</i>					
<b>Buyout</b>	3.032*																
<b>Co-investment</b>	1.938	-1.094															
<b>Distressed &amp; Turnaround</b>	2.076	-0.956	0.138														
<b>Early Stage</b>	-3.790**	-6.822***	-5.728***	-5.866***													
<b>Expansion / Late Stage</b>	-3.194	-6.227***	-5.132***	-5.271***	0.595												
<b>Fund of Funds</b>	-1.790	-4.822***	-3.728***	-3.866***	2.000**	1.404											
<b>Growth</b>	0.988	-2.044**	-0.950	-1.088	4.778***	4.183***	2.779***										
<b>Infrastructure</b>	-0.744	-3.776***	-2.682	-2.820**	3.046**	2.451	1.046	-1.732									
<b>Mezzanine</b>	-1.714	-4.746***	-3.652***	-3.790***	2.076**	1.481	0.076	-2.702***	-0.970								
<b>Natural Resources</b>	0.955	-2.077	-0.983	-1.121	4.745***	4.149**	2.745**	-0.034	1.698	2.669*							
<b>Real Estate</b>	-0.523	-3.555***	-2.461	-2.599***	3.267***	2.672*	1.267***	-1.511*	0.221	1.191*	-1.478						
<b>Secondaries</b>	6.537***	3.505***	4.599***	4.461***	10.327***	9.731***	8.327***	5.548***	7.280***	8.251***	5.582***	7.060***					
<b>Venture</b>	-2.564	-5.596***	-4.502***	-4.641***	1.226	0.630	-0.774	-3.553***	-1.821	-0.850	-3.519**	-2.042***	-9.101***				
	<b>Balanced</b>	<b>Buyout</b>	<b>Co-investment</b>	<b>Distressed &amp; Turnaround</b>	<b>Early Stage</b>	<b>Expansion /Late Stage</b>	<b>Fund of Funds</b>	<b>Growth</b>	<b>Infrastructure</b>	<b>Mezzanine</b>	<b>Natural Resources</b>	<b>Real Estate</b>	<b>Secondaries</b>				

**Table 4: Differences between fund type mean performance (cont'd)**

	Balanced	Buyout	Co-investment	Distressed & Turnaround	Early Stage	Expansion / Late Stage	Fund of Funds	Growth	Infrastructure	Mezzanine	Natural Resources	Real Estate	Secondaries
<b>Buyout</b>	0.071												
<b>Co-investment</b>	-0.101	-0.172**											
<b>Distressed &amp; Turnaround</b>	-0.080	-0.150***	0.022										
<b>Early Stage</b>	-0.191*	-0.261***	-0.089	-0.111									
<b>Expansion / Late Stage</b>	-0.204	-0.275***	-0.103	-0.124	-0.013								
<b>Fund of Funds</b>	-0.157	-0.228***	-0.056	-0.078	0.033	0.047							
<b>Growth</b>	-0.016	-0.087	0.086	0.064	0.175**	0.188*	0.142**						
<b>Infrastructure</b>	-0.176	-0.247***	-0.074	-0.096	0.015	0.028	-0.019	-0.160*					
<b>Mezzanine</b>	-0.204*	-0.274***	-0.102	-0.124*	-0.013	0.000	-0.046	-0.188***	-0.028				
<b>Natural Resources</b>	-0.042	-0.113	0.059	0.037	0.148	0.162	0.115	-0.026	0.134	0.161*			
<b>Real Estate</b>	-0.225**	-0.295***	-0.123	-0.145***	-0.034	-0.021	-0.067*	-0.209***	-0.049	-0.021	-0.183**		
<b>Secondaries</b>	-0.078	-0.149***	0.023	0.002	0.113	0.126	0.079	-0.062	0.098	0.126*	-0.036	0.147***	
<b>Venture</b>	-0.155	-0.226***	-0.054	-0.076	0.035	0.049	0.002	-0.140**	0.020	0.048	-0.113	0.069	-0.078

*Panel (b)*



**Table 5: Fund type performance including vintage years**

Table 5 investigates the relationship between fund type and fund performance. The dependent variable in all regressions is the measure of fund performance (net IRR or multiples of invested capital). In Model 1, fund performance is regressed on a constant, dummy variables identifying fund type (except for that capturing buyout funds which is kept as benchmark), dummies identifying vintage years (except for the one identifying vintage year 2003 which is kept as benchmark), dummy variables highlighting the region focus of the funds (except for the one identifying a focus on the U.S. region, which is kept as benchmark), the natural logarithm of fund size in 2013 USD mns ( $LN(Fund\ Size)$ ) and the number within a sequence that a fund occupies within a private equity house ( $Fund\ Sequence$ ). Model 2 is constructed in the same way as Model 1, with the difference that the fund size variable is replaced by dummy variables representing fund size brackets (except for the dummy capturing the smallest of funds, with fund values below USD 100 million, which is kept as benchmark). \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% level, respectively. Estimations use HAC standard errors.

Dependent Variable	Model 1		Model 2	
	IRR (%)	Multiple	IRR (%)	Multiple
<b>Fund Types (benchmark: Buyout)</b>				
Balanced	-4.133 ***	-0.179 **	-4.190 ***	-0.181 **
Co-Investment	-1.346	-0.129 **	-1.121	-0.115 *
Distressed & Turnaround	-1.319	-0.112 ***	-1.236	-0.105 ***
Early Stage	-8.537 ***	-0.367 ***	-8.442 ***	-0.361 ***
Expansion / Late Stage	-8.009 ***	-0.386 ***	-7.906 ***	-0.382 ***
Fund of Funds	-5.102 ***	-0.240 ***	-4.896 ***	-0.232 ***
Growth	-2.593 ***	-0.057	-2.451 ***	-0.050
Infrastructure	-3.573 ***	-0.135 ***	-3.526 ***	-0.129 **
Mezzanine	-5.500 ***	-0.317 ***	-5.302 ***	-0.311 ***
Natural Resources	-2.724 **	-0.125 *	-2.620 *	-0.118 *
Real Estate	-4.039 ***	-0.271 ***	-3.875 ***	-0.262 ***
Secondaries	2.608 ***	-0.147 ***	2.708 ***	-0.141 ***
Venture	-7.393 ***	-0.366 ***	-7.248 ***	-0.359 ***
<b>Vintage (Benchmark: 2003)</b>				
1990	5.523 ***	0.658 ***	5.473 ***	0.652 ***
1991	9.831 ***	0.614 ***	9.952 ***	0.613 ***
1992	8.490 ***	0.548 ***	8.489 ***	0.551 ***
1993	9.390 ***	0.713 ***	9.606 ***	0.723 ***
1994	4.621 ***	0.322 **	4.637 **	0.320 **
1995	2.604	0.152	2.619	0.151
1996	-0.367	0.016	-0.230	0.019
1997	0.027	0.018	0.124	0.018
1998	-4.595 ***	-0.147 **	-4.513 ***	-0.144 **
1999	-6.121 ***	-0.156 **	-5.974 ***	-0.151 **
2000	-4.054 ***	-0.098	-3.903 ***	-0.094
2001	0.130	0.075	0.251	0.081
2002	-0.179	-0.028	0.003	-0.021
2004	-4.865 ***	-0.165 **	-4.772 ***	-0.162 **
2005	-7.138 ***	-0.243 ***	-6.971 ***	-0.239 ***
2006	-8.100 ***	-0.254 ***	-8.040 ***	-0.254 ***
2007	-5.209 ***	-0.189 ***	-5.122 ***	-0.189 ***
2008	-2.992 **	-0.166 ***	-2.931 **	-0.165 ***
2009	-0.261	-0.155 **	-0.168	-0.153 **
2010	0.082	-0.176 ***	0.269	-0.171 ***
2011	0.521	-0.295 ***	0.663	-0.291 ***
2012	1.191	-0.404 ***	1.317	-0.402 ***
2013	-2.428 *	-0.539 ***	-2.316	-0.536 ***
<b>Region (benchmark: U.S.)</b>				
Africa	-1.145	-0.048	-1.293	-0.046
Americas	-4.327 ***	-0.122 *	-4.183 ***	-0.112
Asia	0.223	-0.024	0.215	-0.024
Australasia	1.771	-0.058	1.662	-0.066
Diversified Multi-Region	-4.597 **	-0.136 **	-4.56 **	-0.131 *
Europe	-0.363	-0.045 **	-0.406	-0.047 **
Middle East & Israel	4.852 *	0.124	4.850 *	0.119
<b>Size Variable</b>				
$LN(Fund\ Size)$	-1.047 ***	-0.06 ***		
<b>Size Brackets (benchmark: &lt;\$100mn)</b>				
\$100mn_ \$250mn			-2.394 ***	-0.079 ***
\$250mn_ \$500mn			-3.046 ***	-0.150 ***
\$500mn_ \$1bn			-4.162 ***	-0.212 ***
\$1bn_ \$3bn			-4.722 ***	-0.259 ***
>\$3bn			-3.700 ***	-0.198 ***
Constant	24.456 ***	2.243 ***	21.042 ***	2.024 ***
Fund sequence	-0.015	0.001	-0.023	0.000
F-stat	19.796***	22.731***	18.523***	21.176***
Adj. R-squared	13.29%	15.66%	13.46%	15.80%
Observations	5522	5268	5522	5268



**Table 7: Estimations using fund type and vintage bracket interaction terms**

Table 7 examines the relationship between fund type and fund performance during different time periods by interacting the fund type and vintage bracket dummy variables. The dependent variable is the measure of fund performance (net IRR and multiples of invested capital). In Model 5(a) the independent variables are: a constant, fourteen interaction terms between the dummy variable capturing funds raised between 1990 and 2002 and, in turn, the fourteen dummies capturing fund type, dummy variables capturing funds' region focus, the natural logarithm of fund size ( $LN(Fund\ Size)$ ), and the sequence of a fund in a private equity house ( $Fund\ sequence$ ). Model 5(b) is constructed similarly to Model 5(a), with the difference that the fund type dummy variables are now interacted with the dummy variable capturing funds raised between 1990 and 2008. Model 6(a) and 6(b) are constructed as Models 5(a) and 5(b), respectively, but investigate fund size as captured by fund size brackets. \*\*\*, \*\* and \* denote significance at the 1%, 5% and 10% level, respectively. All estimations use HAC standard errors.

Dependent Variable	Model 5(a)		Model 5(b)		Model 6(a)		Model 6(b)	
	IRR (%)	Multiple	IRR (%)	Multiple	IRR (%)	Multiple	IRR (%)	Multiple
<b>Fund Type* Vintage Bracket</b>								
Balanced_1990_2002	3.498	0.435 ***			3.213	0.421 ***		
Buyout_1990_2002	6.200 ***	0.490 ***			6.161 ***	0.489 ***		
Co-Investment_1990_2002	5.582	0.442 **			5.613	0.439 **		
Dist & Turn_1990_2002	7.340 ***	0.466 ***			7.565 ***	0.478 ***		
Early Stage_1990_2002	-6.525 ***	-0.089			-6.708 ***	-0.097		
Expansion/LS_1990_2002	-2.136	0.081			-2.096	0.08		
Fund of Funds_1990_2002	-0.376	0.225 ***			-0.381	0.223 ***		
Growth_1990_2002	1.630	0.409 ***			1.722	0.411 ***		
Infrastructure_1990_2002	5.779 *	0.674 ***			6.145 **	0.685 ***		
Mezzanine_1990_2002	0.110	0.074			0.278	0.082		
Nat.Res._1990_2002	10.201 ***	0.669 ***			10.249 ***	0.671 ***		
Real Estate_1990_2002	4.095 ***	0.262 ***			4.107 ***	0.266 ***		
Secondaries_1990_2002	8.229 ***	0.212 ***			8.262 ***	0.217 ***		
Venture_1990_2002	-2.117	0.072			-2.077 *	0.073		
Balanced_1990_2008			-2.557	0.325 ***			-2.791 *	0.315 ***
Buyout_1990_2008			1.036 *	0.471 ***			0.858	0.463 ***
Co-Investment_1990_2008			-5.447 ***	0.124			-5.373 ***	0.128
Dist & Turn_1990_2008			0.639	0.378 ***			0.574	0.377 ***
Early Stage_1990_2008			-9.928 ***	-0.005			-10.017 ***	-0.007
Expansion/LS_1990_2008			-8.965 ***	-0.016			-8.966 ***	-0.018
Fund of Funds_1990_2008			-5.343 ***	0.172 ***			-5.310 ***	0.172 ***
Growth_1990_2008			-3.128 ***	0.381 ***			-3.132 ***	0.380 ***
Infrastructure_1990_2008			-2.750 **	0.273 ***			-2.847 **	0.270 ***
Mezzanine_1990_2008			-4.846 ***	0.097 ***			-4.814 ***	0.097 ***
Nat.Res._1990_2008			1.081	0.381 ***			1.011	0.380 ***
Real Estate_1990_2008			-5.676 ***	0.032			-5.674 ***	0.034
Secondaries_1990_2008			1.746	0.233 ***			1.710	0.234 ***
Venture_1990_2008			-7.549 ***	0.061			-7.561 ***	0.061
<b>Region (benchmark: U.S.)</b>								
Africa	-0.677	0.004	-2.732	-0.119	-0.893	0.000	-2.89	-0.117
Americas	-3.527 ***	-0.086	-4.806 ***	-0.132 *	-3.389 **	-0.078	-4.626 ***	-0.120
Asia	0.279	-0.022	-0.34	-0.054 *	0.242	-0.023	-0.353	-0.054 *
Australasia	2.256	-0.005	1.068	-0.086	2.09	-0.017	0.922	-0.095
Diversified Multi-Region	-3.614 *	-0.107	-5.269 ***	-0.164 **	-3.563 *	-0.101	-5.255 ***	-0.160 **
Europe	0.219	-0.011	-0.568	-0.060 ***	0.125	-0.015	-0.617	-0.062 ***
Middle East & Israel	3.645	0.112	3.279	0.015	3.643	0.108	3.264	0.010
<b>Size Variable</b>								
LN(Fund Size)	-0.991 ***	-0.053 ***	-1.387 ***	-0.078 ***				
<b>Size Brackets (benchmark: &lt;\$100mn)</b>								
\$100mn_250mn					-2.653 ***	-0.096 ***	-2.958 ***	-0.108 ***
\$250mn_500mn					-3.337 ***	-0.162 ***	-3.870 ***	-0.194 ***
\$500mn_1bn					-4.529 ***	-0.217 ***	-5.273 ***	-0.259 ***
\$1bn_3bn					-4.803 ***	-0.259 ***	-5.993 ***	-0.324 ***
>\$3bn					-2.908 ***	-0.149 ***	-5.509 ***	-0.298 ***
Constant	17.270 ***	1.788 ***	23.544 ***	1.871 ***	14.557 ***	1.620 ***	19.205 ***	1.600 ***
Fund sequence	0.007	-0.003 ***	-0.064 **	-0.003 ***	0.003	-0.003 ***	-0.071 **	-0.004 ***
F-stat	13.129 ***	22.570 ***	20.221 ***	23.478 ***	12.182 ***	20.238 ***	17.867 ***	20.420 ***
Adj. R-squared	4.81%	8.61%	7.41%	8.94%	5.18%	8.98%	7.62%	9.05%
Observations	5522	5268	5522	5268	5522	5268	5522	5268

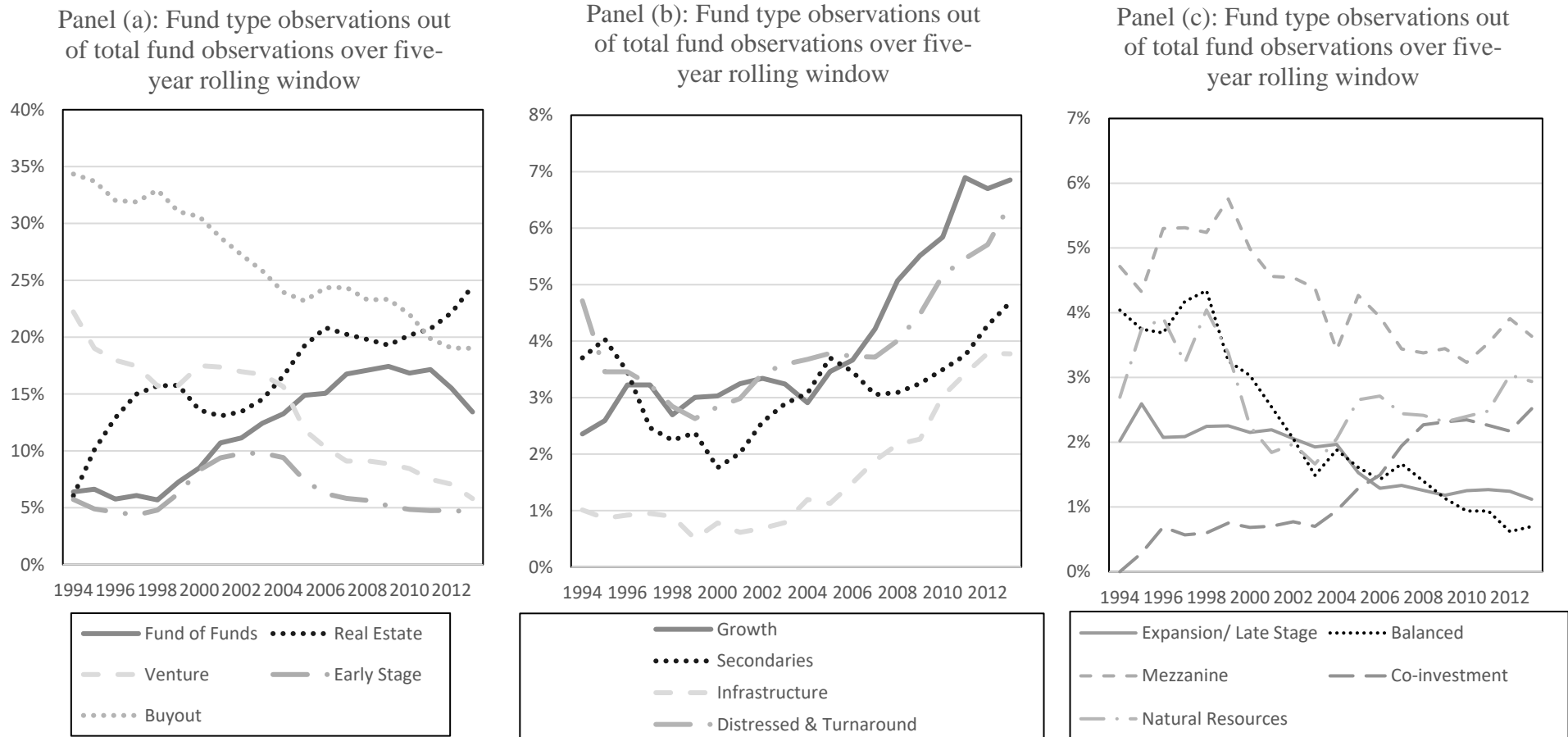
**Table 8: Mean fund performance and variability in performance**

Table 8 illustrates average fund performance (as measured by the mean internal rate of return and mean multiple of invested capital) and variability in performance (as measured by the standard deviation of the internal rate of return and multiple of invested capital per fund type) in decreasing order (from the largest values to the lowest) per fund type. The table displays an ordering of fund types according to the four selected criteria. Numerical values for each criterion for each of the fourteen fund types are presented in Table 3. Data span is between 1990 and 2013.

<b>Criteria (Large to Small)</b>	<b>Mean IRR</b>	<b>Mean Multiple</b>	<b>Standard Deviation IRR</b>	<b>Standard Deviation Multiple</b>
1	Secondaries	Buyout	Natural Resources	Venture
2	Buyout	Balanced	Venture	Early Stage
3	Distressed & Turnaround	Growth	Early Stage	Balanced
4	Co-investment	Natural Resources	Balanced	Natural Resources
5	Growth	Secondaries	Co-investment	Growth
6	Natural Resources	Distressed & Turnaround	Buyout	Buyout
7	Balanced	Co-investment	Expansion / Late Stage	Expansion / Late Stage
8	Real Estate	Venture	Growth	Distressed & Turnaround
9	Infrastructure	Fund of Funds	Distressed & Turnaround	Co-investment
10	Mezzanine	Infrastructure	Secondaries	Infrastructure
11	Fund of Funds	Early Stage	Real Estate	Real Estate
12	Venture	Mezzanine	Infrastructure	Fund of Funds
13	Expansion / Late Stage	Expansion / Late Stage	Fund of Funds	Secondaries
14	Early Stage	Real Estate	Mezzanine	Mezzanine

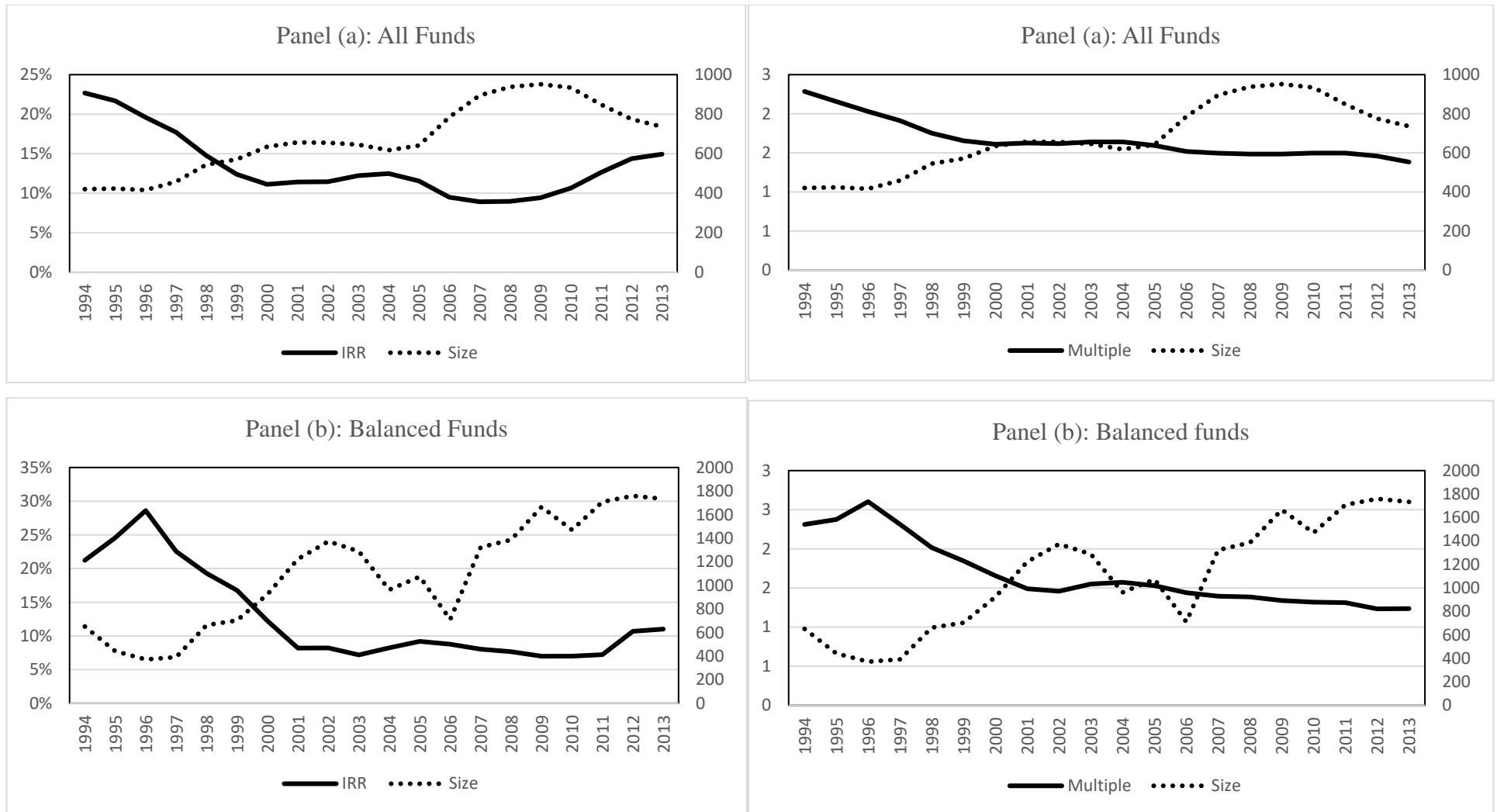
**Figure 1: Fund observations graphs**

Figure 1 panels (a), (b) and (c) present the ratio of fund observations of each fund type to the total number of fund observations using 5-year rolling windows. Panel (a) presents results for buyout funds, real estate funds, venture funds, early stage funds and fund of funds – the most represented fund types in the sample. Panel (b) presents results for distressed & turnaround funds, infrastructure funds, growth funds and secondaries funds. Panel (c) presents results for expansion/late stage funds, natural resources funds, balanced funds, mezzanine funds and co-investment funds.

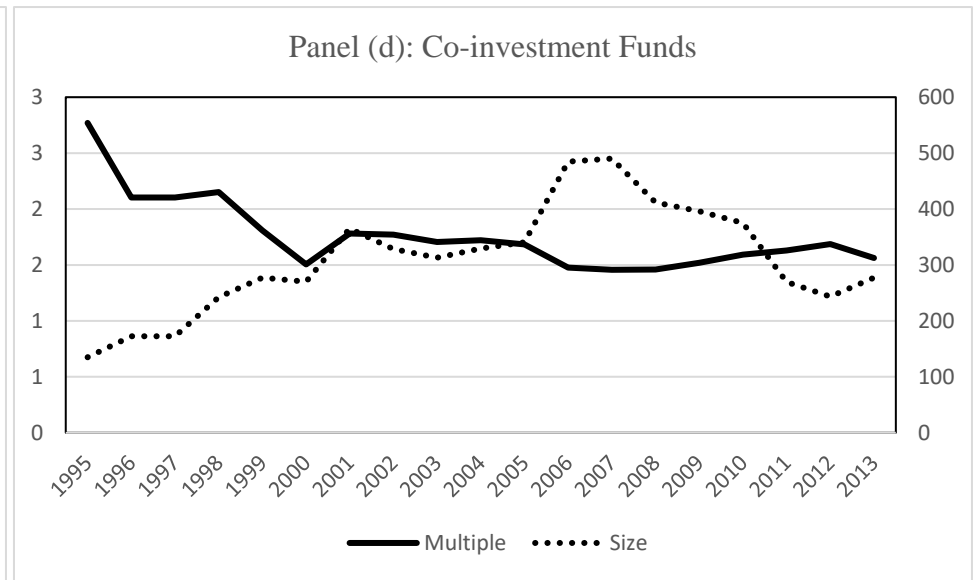
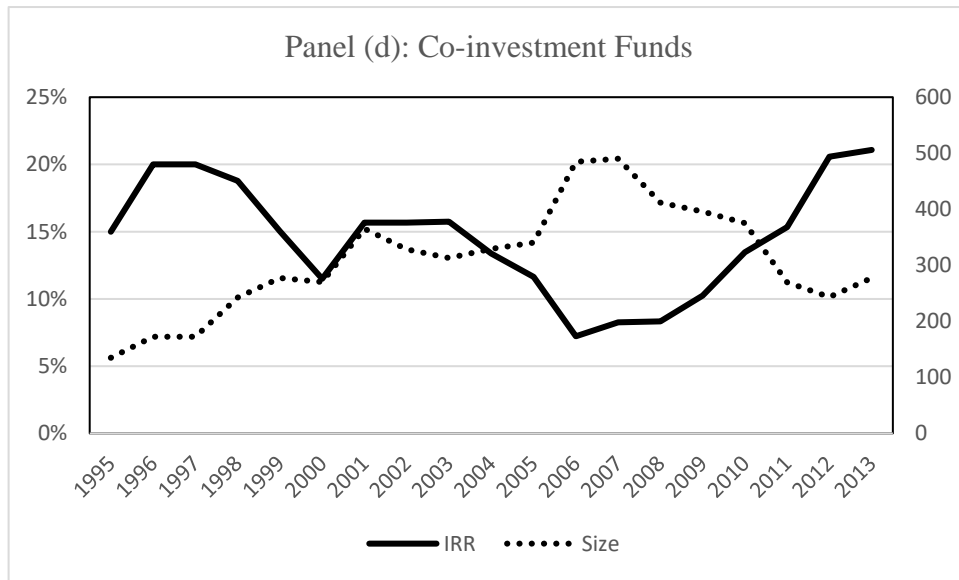
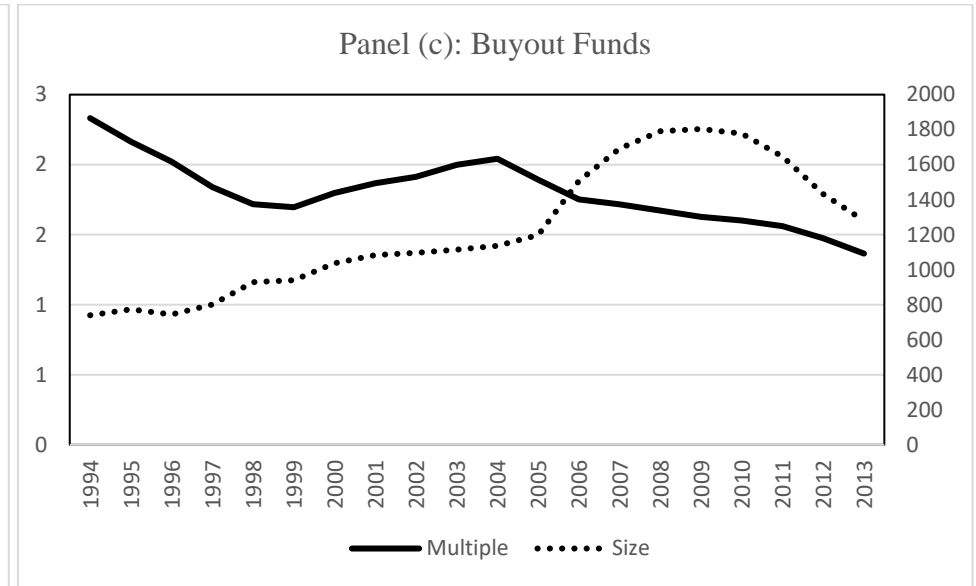
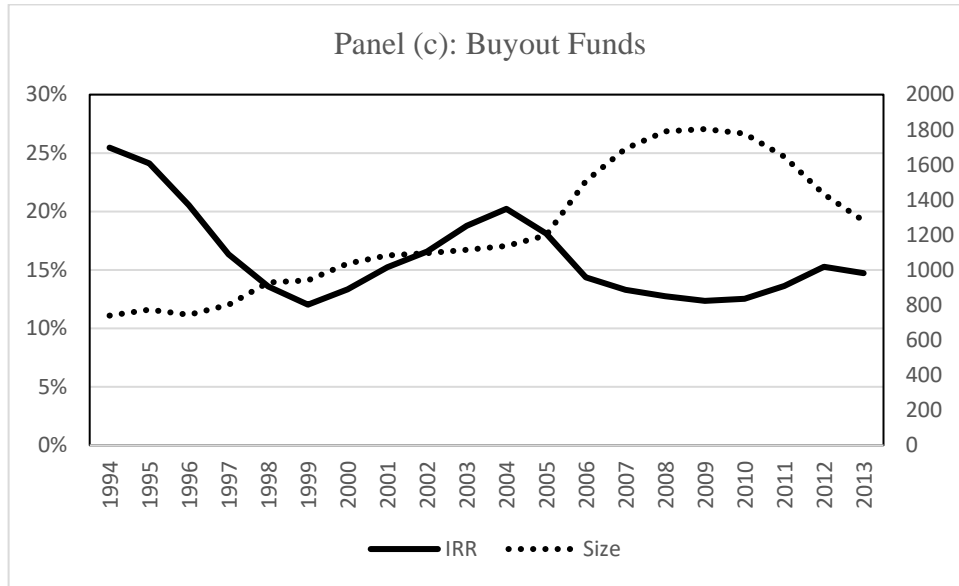


**Figure 2: Size-Performance Relationship**

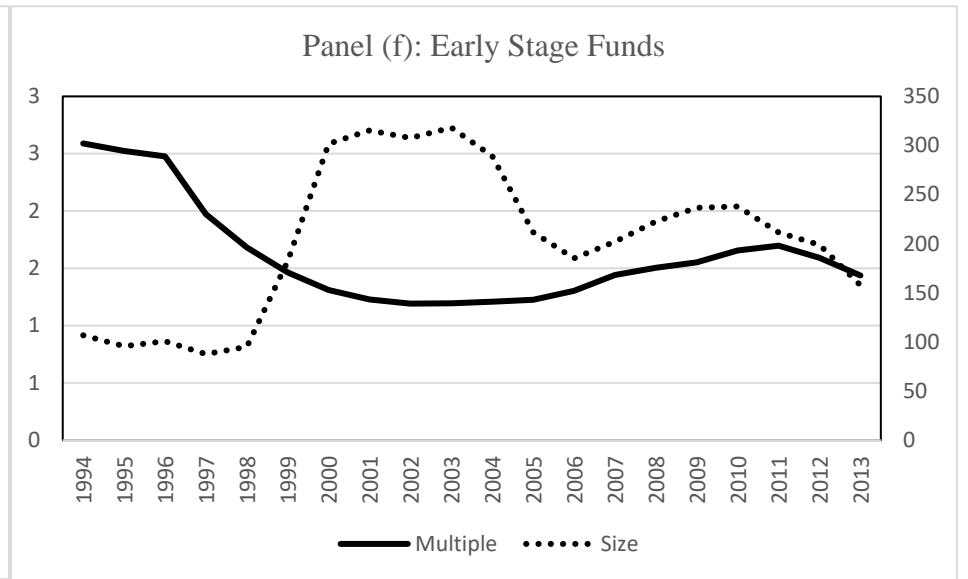
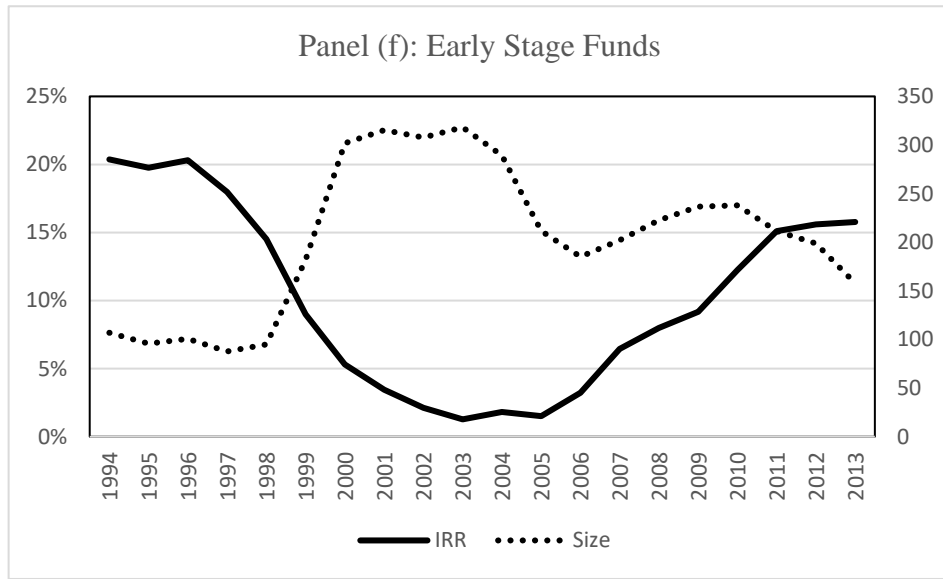
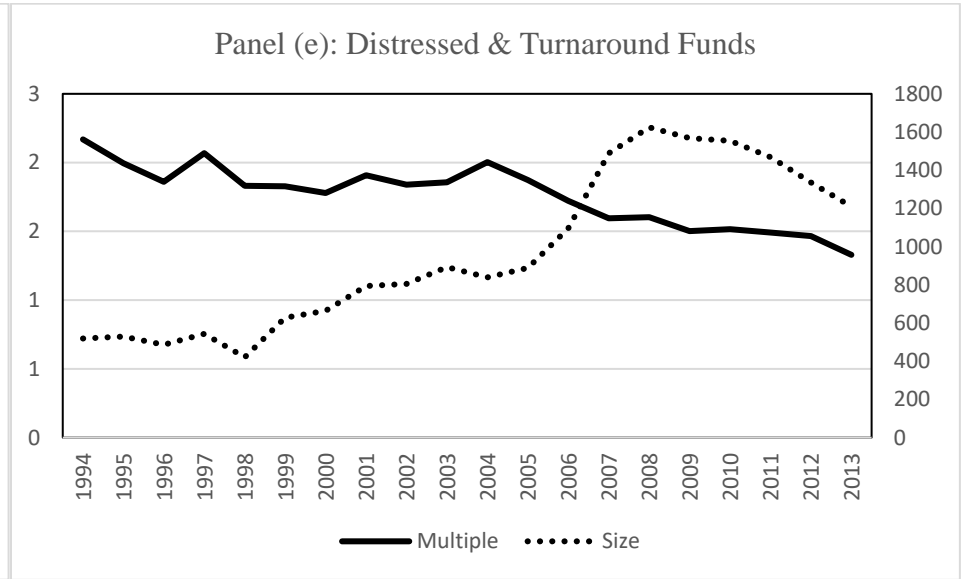
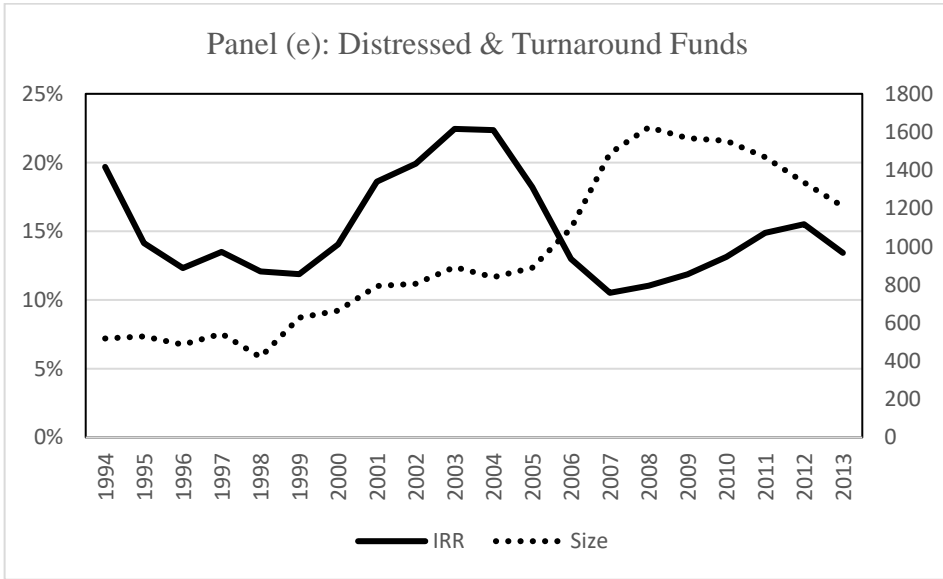
Figure 2 presents the relationship between the 5- year simple moving average (SMA) fund size and 5- year simple moving average fund performance as measured by the IRR and multiples of invested capital. Panel (a) presents aggregated results for all funds, while panels (b) – (o) present results for the 14 fund types separately.



**Figure 2: Size-Performance Relationship (cont'd)**

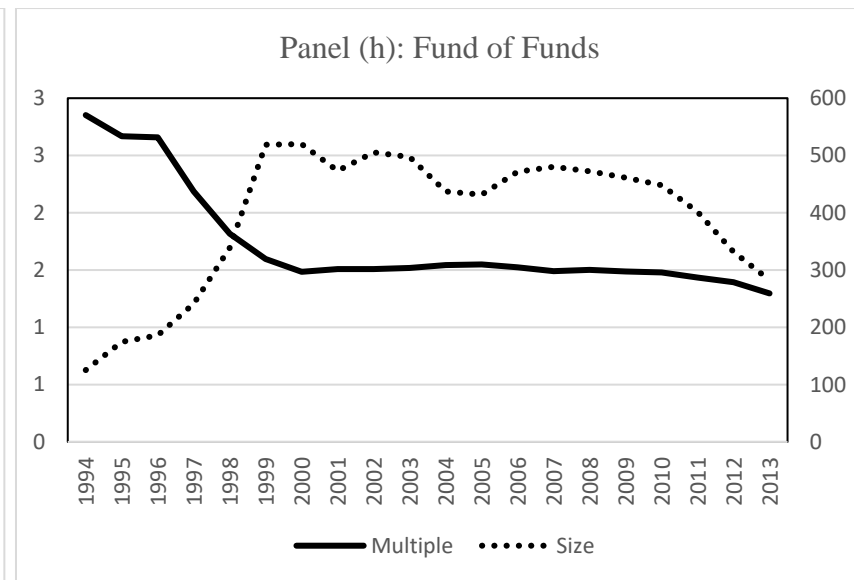
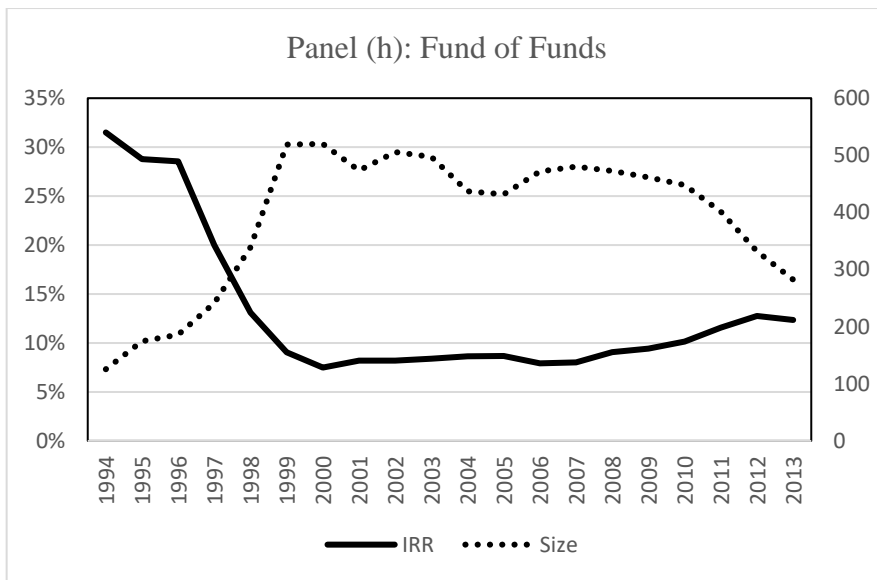
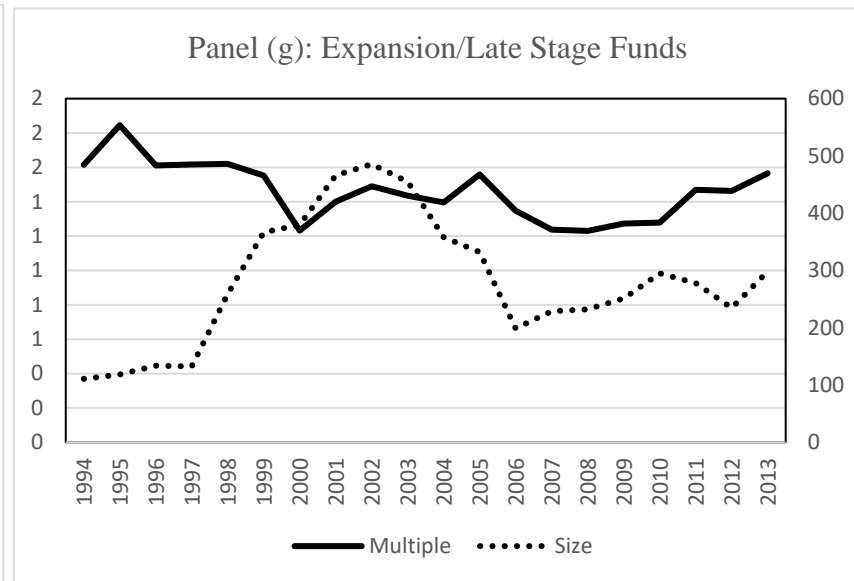
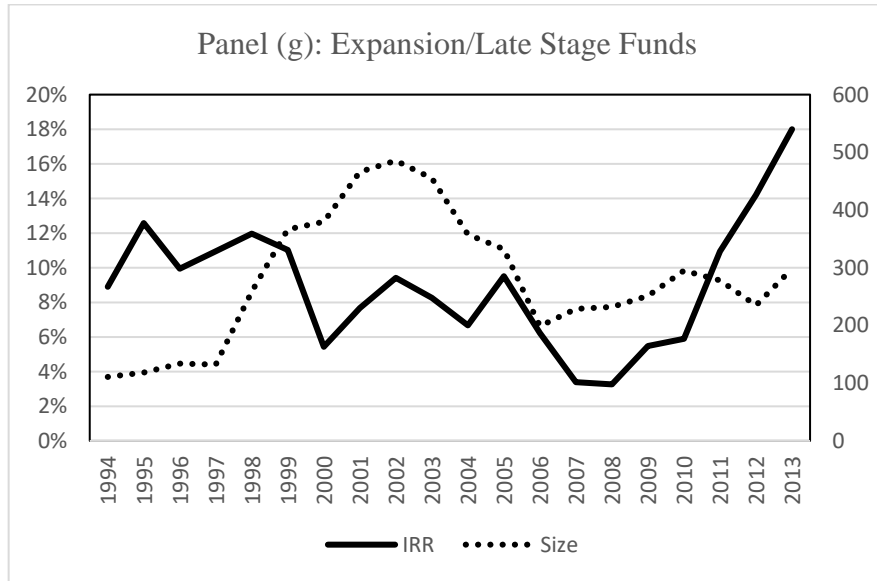


**Figure 2: Size-Performance Relationship (cont'd)**



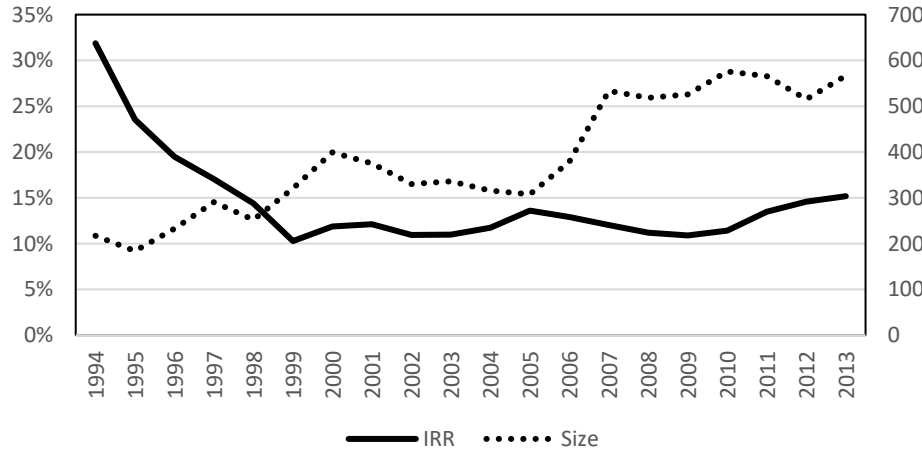


**Figure 2: Size-Performance Relationship (cont'd)**

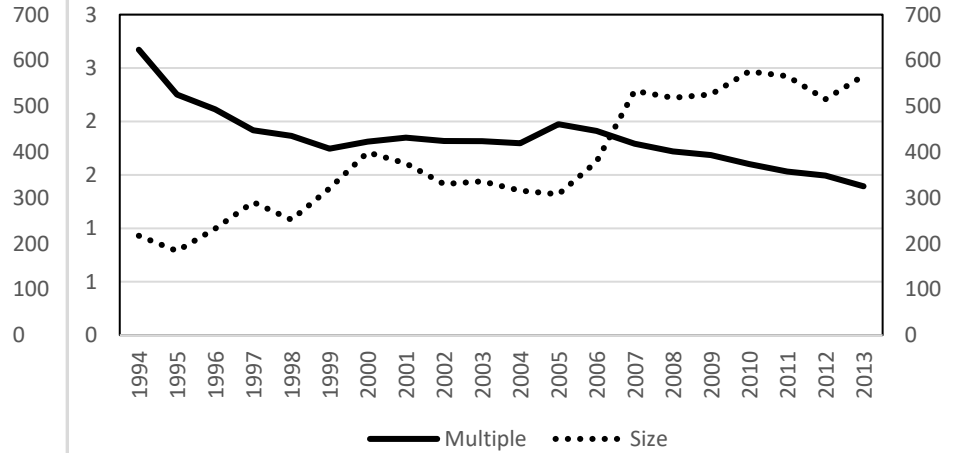


**Figure 2: Size-Performance Relationship (cont'd)**

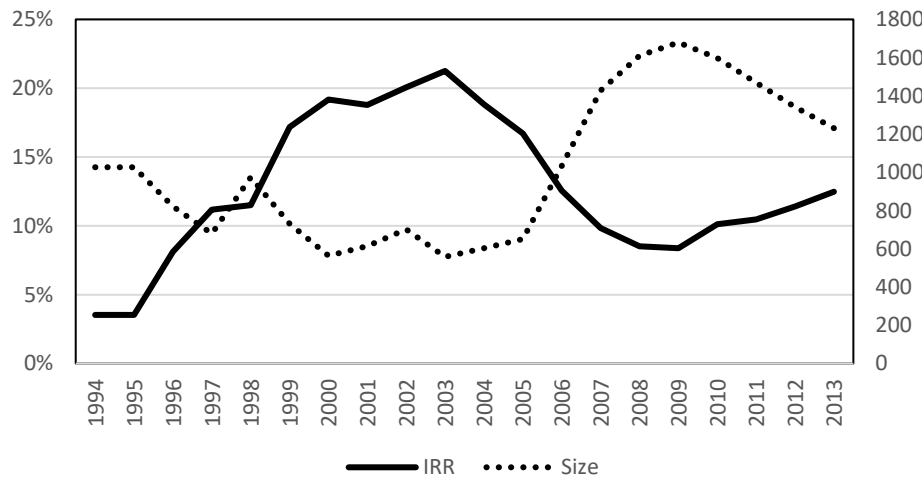
Panel (i): Growth Funds



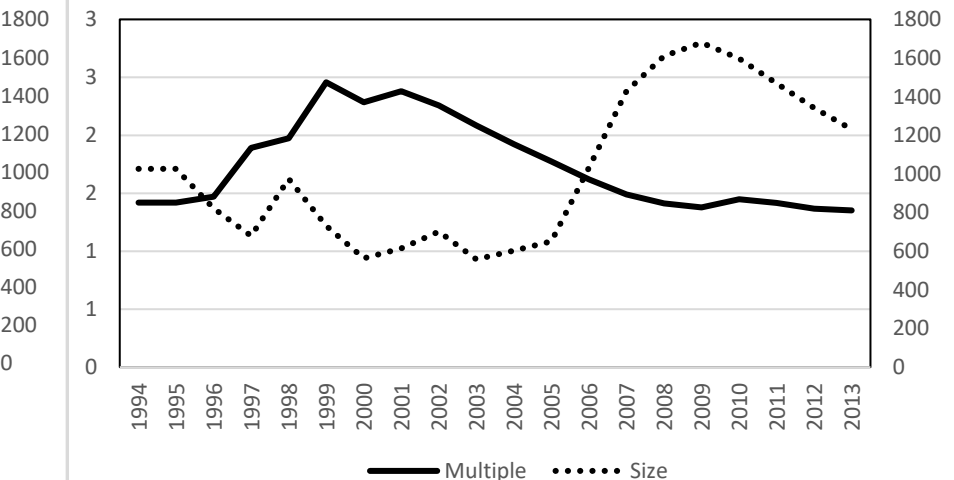
Panel (i): Growth Funds



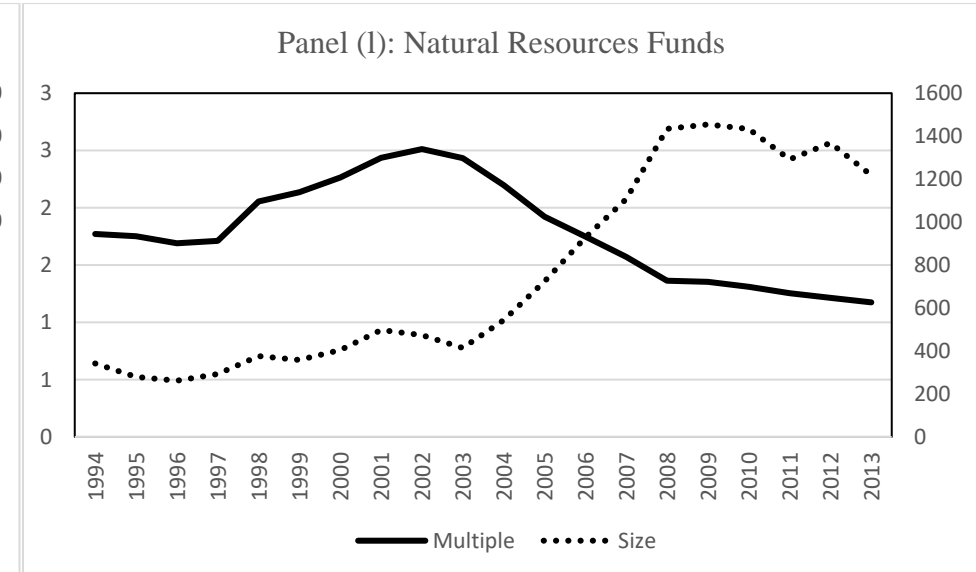
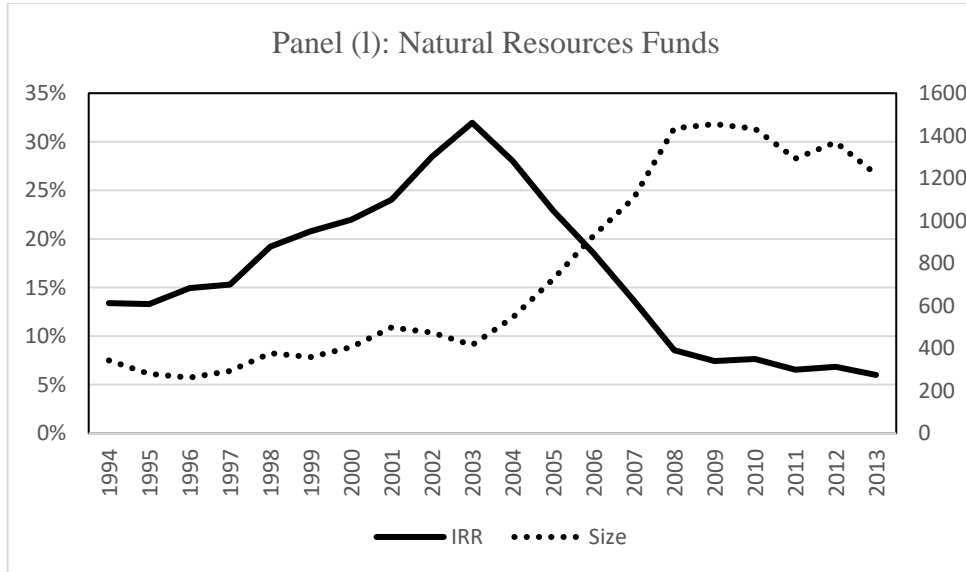
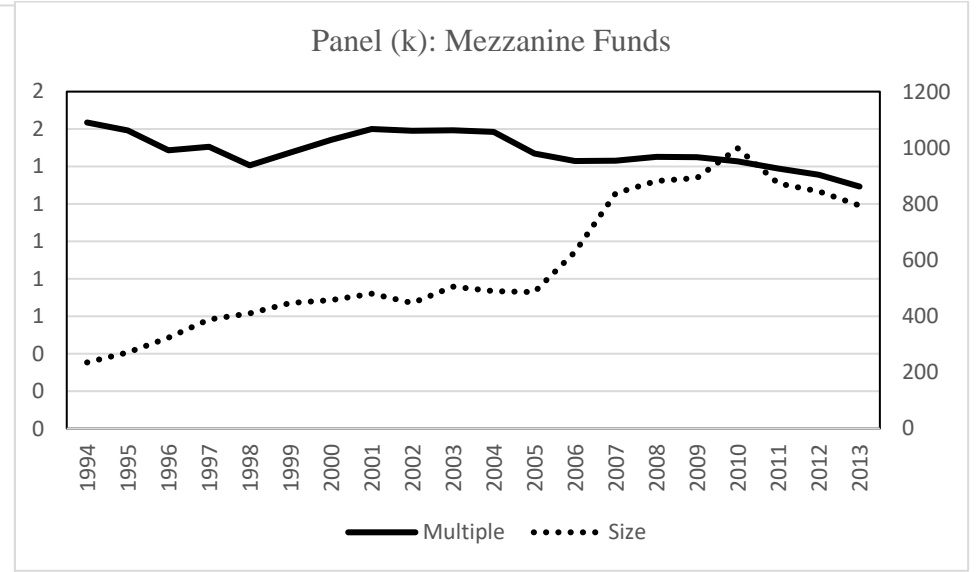
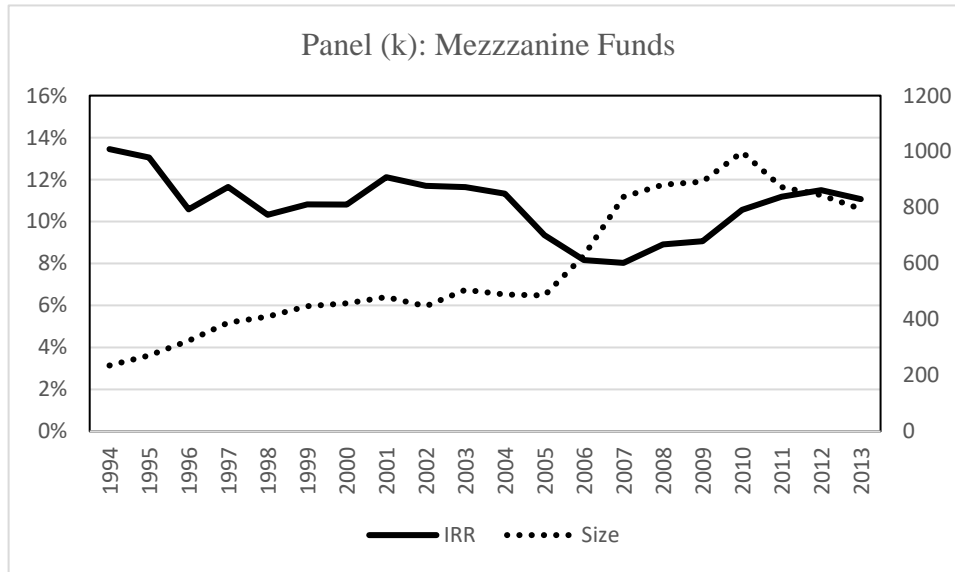
Panel (j): Infrastructure funds



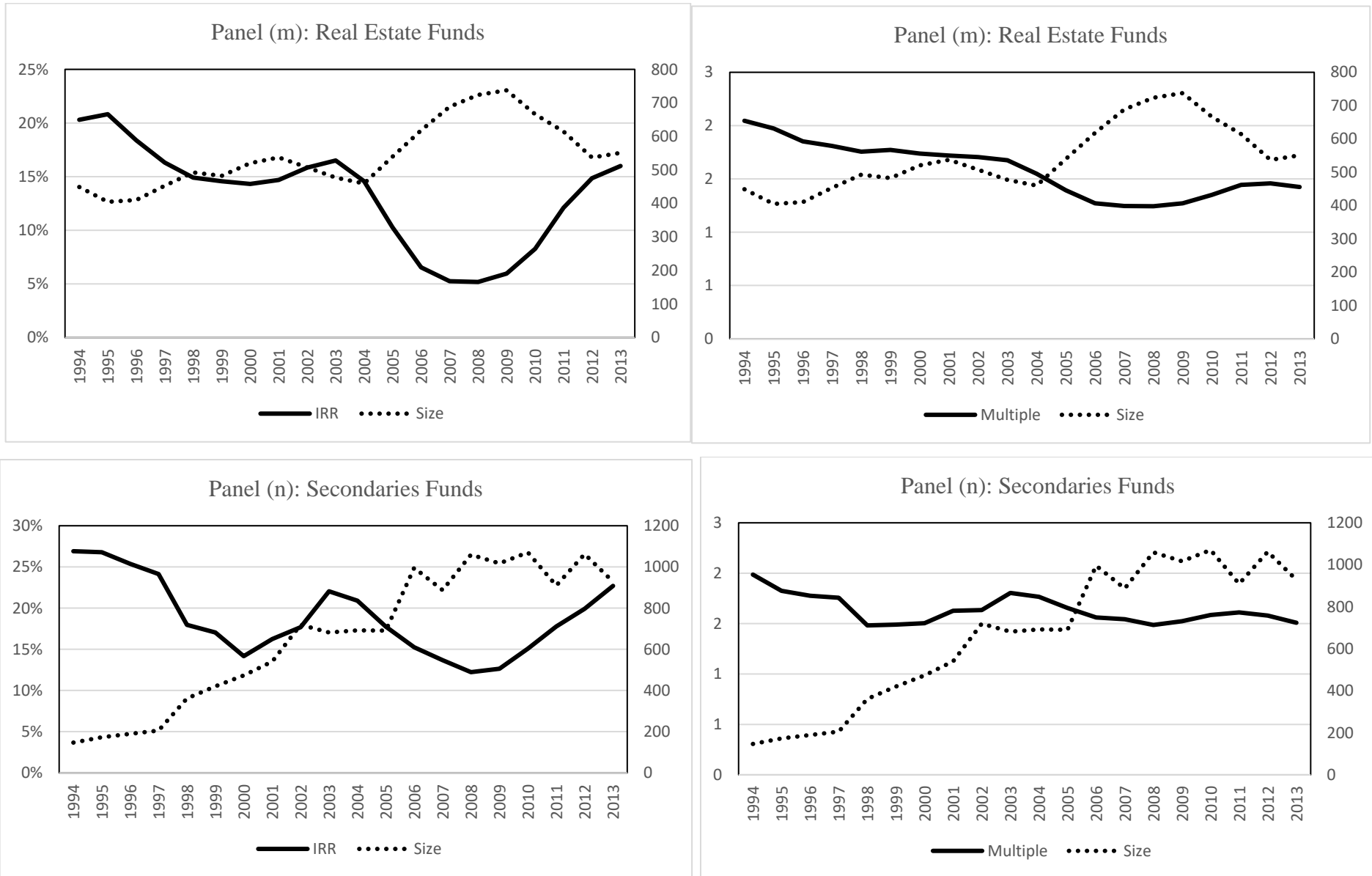
Panel (j): Infrastructure Funds



**Figure 2: Size-Performance Relationship (cont'd)**



**Figure 2: Size-Performance Relationship (cont'd)**



**Figure 2: Size-Performance Relationship (cont'd)**

