Investing Outside the Box:

Evidence from Alternative Vehicles in Private Equity

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May 2, 2020

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[1] Harvard University; State Street Global Exchange; Massachusetts Institute of Technology; and State Street Global Exchange. Lerner and Schoar are affiliates of the National Bureau of Economic Research. We received helpful comments from participants at the American Finance Association meetings, the Fiduciary Investments Symposium, the London Business School Private Equity Symposium, the National Bureau of Economic Research Summer Institute, the Q Group Meetings, the Southern California Private Equity Conference, the Stanford Finance of Infrastructure Symposium and Financing of Innovation Summit, and seminars at various schools, as well as Sabrina Howell, Niklas Hüther (discussant), Steve Kaplan, Mark Kritzman, Filippo Mezzanotti, Adair Morse (discussant), Marcus Opp, Andrea Rossi (discussant), and Berk Sensoy. We thank Arnold May and Robin Painter of Proskauer Rose for helpful conversations about fund structuring. We thank Will Kinlaw and J.R. Lowry for their support of this research. Harvard Business School's Division of Research, the Private Capital Research Institute, and the Smith-Richardson Foundation provided financial support for this project. Lerner and Schoar have advised institutional investors in private equity funds, private equity groups, and/or governments designing policies relevant to private equity (including State Street Global Exchange in Lerner's case). State Street provides a variety of custodial and financial services for limited and general partners in private equity funds, as well as offering private equity financial products. The views expressed in this material are the views of the authors. They do not necessarily represent the official views of State Street Global Exchange or State Street Corporation and its affiliates. All errors and omissions are our own.

Introduction

The last two decades have seen a significant transformation of the structure of the private equity (PE) industry. Not only has the amount of capital under management by buyout, venture, and private debt funds grown dramatically, but at the same time, general partnerships (GPs) have increasingly offered alternatives to their traditional monolithic large funds, such as co-investment vehicles, parallel funds, feeder funds, and more. Using novel data from State Street, we document for the first time several stylized facts about the growth of these alternative vehicles (AVs) over the last four decades. We show that by 2017, alternative vehicles constituted almost 40% of all capital raised in private equity, and were especially prevalent for buyout firms.

Our analysis suggests that the rapid rise of alternative vehicles answers some of the most enduring puzzles in private capital. First, earlier research has shown that in the 1980s and 1990s, some funds persistently produced positive alphas for their investors, yet did not sharply increase their capital under management despite being highly oversubscribed (e.g., Kaplan and Schoar, 2005; Brown et al., 2015). Similarly, compensation of fund managers was highly bunched and seemingly independent of fund performance, with annual management fees between 1.5% and 2% of committed capital and carried interest (profit share) of around 20% (Gompers and Lerner, 1999; Metrick and Yasuda, 2010). This behavior runs counter to the intuition of the typical neoclassical investment model, where managers with scarce human capital appropriate the residual rents from their funds either by charging higher fees or by capitalizing on their reputation and growing their assets under management more rapidly, as laid out in Berk and Green (2004).

We examine these questions using a data set covering all investment vehicles organized by private equity funds—whether groups specializing in buyouts (including growth capital), venture, or private debt—invested in by 108 asset owners with PE holdings and for whom State Street

Corporation acts as a custodian. The data capture all cash flows between the LPs and the PE managers in their portfolios, representing one half-trillion dollars of commitments and twenty thousand investments. We highlight four sets of findings.

First, we show that over the last two decades, more established and better performing partnerships (as measured by higher past PMEs) set up more AVs and raised more capital in both their main funds and in AVs relative to GPs with lower PMEs. The average AVs offered by high-PME partnerships outperformed that of the average fund in the market. In contrast, alternative vehicles offered by low-PME partnerships performed more poorly. But when looking at the relative performance of AVs benchmarked against the main funds of the associated partnership, we see that AVs significantly underperform their main funds, which we argue is in line with the predictions of Berk and Green (2004).

Second, we show that the returns investors can achieve in alternative vehicles reflect the bargaining process between a set of heterogeneous GPs and LPs in the private equity market. Earlier papers have questioned why net-of-fee returns (and fees themselves) in private equity have been so uniform across LPs, even when there is large heterogeneity in the attractiveness and bargaining power among LPs. For example, LPs may be more attractive to GPs if they have abundant financial resources, greater value added, or an ability to provide GPs with "liquidity insurance" in bad times (Lerner and Schoar (2004), a view also consistent with Pastor, Stambaugh, and Taylor (2015) and Gerakos, Linnainmaa, and Morse (2016)). A key prediction of the bargaining hypothesis is that GPs should match the return of the AVs they offer to the outside options of the LPs.

To test this hypothesis, we classify GPs and LPs by the average performance of their portfolios across all PE investments. We find that LPs with better past performance invest in

alternative vehicles that had above-average market performance and often even outperform the main fund of the GP sponsoring them. LPs with worse past performance invest in AVs with lower PMEs. In line with a bargaining story between LPs and GPs, we show that the access to AVs and their performance varies significantly with the match between LP and GP, e.g., a top-tier LP investing in a top-performing GP versus a lower tier-LP investing in the same GP, and so on. Access to AVs in top-tier GPs is almost three times as likely for top LPs than lower tier LPs. Even conditioning on having access to AVs in a given partnership, we find that better LPs have slightly better performance than LPs with worse past performance. But this result is less significant than the differential access. In contrast, access to AVs in lower-tier GPs is slightly more balanced between top-tier and lower-tier LPs. But the performance of these vehicles is significantly worse than for top GPs. Even when we condition on the GPs in this group, top LPs receive better returns than lower tier-LPs. These results support the idea that GPs tailor the alternative vehicles they offer their LPs to the outside options of the LP. We see that access to the AVs of top GPs is a major differentiating factor for LP returns.

We can rule out that this heterogeneity or match-specific performance is driven solely by the inability of some LPs to understand the investment opportunities: the investments that lower-performance LPs make in top GPs still outperform the rest of these LPs' portfolios in PE. It appears that LPs realistically assess the relative performance between different opportunities presented to them. In addition, we show that the match-specific differences in performance are not explained by some LPs and GPs having prior relationships that could reduce information asymmetries. Instead, we find that the results are unchanged even when controlling for any prior investment relationships between LPs and GPs.

In addition, we find that the types of LPs that have the highest performance in their alternative vehicle investments are those that are typically seen as high-prestige LPs, such as endowments and foundations, private pension funds, and insurance companies. The poorest performance in alternative vehicles is seen for fund-of-funds. This results is in line with earlier research, see for example Lerner et al (2007) or Cavagnaro et al (2019). We also find that larger LPs and North American LPs are less likely to resort to alternative vehicles, while European LPs are more likely to invest in these vehicles, even controlling for other LP characteristics. This again might suggest that LPs whose access to the top funds is more limited—i.e., those whose bargaining power is lower—are more likely to invest in alternative vehicles.

Third, we classify AVs into two broad sub-groups: discretionary vehicles and GP-directed vehicles. Discretionary vehicles include co-investment opportunities that are provided by a GP but in which the LP maintains discretion over which deals to invest in. Here the LP's sophistication and understanding of the investment process significantly affect the quality of the decision. In contrast, GP-directed vehicles typically are funds that invest in similar deals as the main funds, where the GP retains all key decision-making powers. Practitioner accounts also suggest that certain large high-profile investors receive more co-investment opportunities and chances to access investments in other favored ways.[2] We document that the biggest difference in access between top versus lower-tier LPs is in discretionary vehicles, which on average tend to perform the best.

Finally, we ask what drives the match-specific difference in the AV returns for top-tier versus lower-tier GPs. Do these GPs change the deal terms for the AVs compared to the main funds or do they tailor the underlying deals differentially? We show that AVs on average are

[2] See, for instance, the discussion of the investment strategies of the Canadian Pension Plan Investment Board and the Teachers Retirement System of Texas in Lerner, Rhodes-Kropf, and Burbank (2013) and Rhodes-Kropf et al. (2014).

smaller than main funds and thus have more idiosyncratic risk. But we do not find that the idiosyncratic risk varies with AV returns in a meaningful way.

We then analyze how much overlap there is in the underlying investments between the AVs and the main funds. In our data, we cannot see the exact deals that GPs invest in, but we have the exact time stamp of cash inflows and outflows of funds. The correlation of cashflows between AVs and the main fund allows us to create a proxy of the overlap in investment between these vehicles. We find stark differences between top-tier and lower-tier GPs:

- For top GPs, we find that the overlap in investments between AVs and the main funds are small, and there is no difference in the performance of AVs that either have high or low overlap with the main funds. This result suggests that top-tier LPs typically use AVs to expand their set of investments, and their deal flow seems to be sufficiently good that the performance does not vary much with the deal mix.
- In contrast, lower-tier GPs tend to have a higher investment overlap between the AVs and the main funds. But here we see a major difference: AVs with higher overlap perform better than those with low overlap. The results suggest that lower-tier GPs allow their top LPs to double up on the deals in the main fund, but offer their lower-tier LPs a different portfolio which performs below the average.

In addition to contributing to the more general literature on private equity compensation and performance, this paper adds to the growing literature on co-investments and other alternative transactions. Fang, Ivashina, and Lerner (2015) analyzed co-investments and solo investments using information from seven large limited partners, and showed that the net returns from these investments are little different than those from contemporaneous funds. Because the "haircuts" associated with fees and carry are much lower than direct transactions, these findings suggest that

there might be adverse selection in the transactions offered to these partners. Our results suggest that this finding depends on the quality of the LPs making the co-investments. Braun, Jenkinson, and Schemmerl (2019) looked at co-investments recorded in the CapitalIQ database and found no evidence of difference in gross returns, a pattern that holds across virtually all classes of investor.

The rest of this paper is structured as follows. Section 2 describes the creation of the data set. Section 3 presents the usage of and analyzes the performance of alternative vehicles in general. Section 4 presents analyses across different classes of general partners and limited partners. The final section concludes the paper.

2. **Constructing the Sample**

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The data in this paper consist of cash flows from the records of State Street Corporation's custodial unit, which provides services for asset owners, including pensions, sovereign wealth funds, and endowments. As of mid-2018, State Street's custody business was the world's largest, with over $30 trillion dollars in assets.[3] State Street also provides custodial services to fund managers and other clients, as well as engaging in asset management, securities trading, and securities finance. State Street's PE index covers around three thousand funds over a thirty-year period and is used by some of the world's largest investors to benchmark their portfolios.

[3] Joe Parsons, "State Street leapfrogs BNY Mellon as world's largest custodian," *K-+I3-& O,"2+0#3$*, July 20, 2018, https://www.globalcustodian.com/state-street-leapfrogs-bny-mellon-worlds-largest-custodian/.

Among the custodial services that State Street (and other custodial banks) provide to their asset owner clients are keeping track of the securities held, monitoring cash flows between the investors and fund managers, executing the sales of securities and other transactions, assisting with foreign currency conversions, and documenting the investors' activities, including for tax purposes. (For an industry overview, see Clearing House, 2016.) Thus, in their role as a custodian, State Street has a comprehensive picture of the investments made by the asset owners that they work for. All cash flows are recorded net of management fees and carried interest charged by the general partners.

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State Street's custodial division has a rich array of data on its clients. We use information on 108 large asset owners with PE exposure, which collectively had made over seventy thousand investments into private financial vehicles of various types, including private equity, real estate, hedge funds, securitizations, and many other assets. For the purposes of this paper, we focus exclusively on PE, including buyout and growth capital, private debt, and venture capital.

Identifying and classifying the vehicles associated with these PE groups may sound straightforward, but is actually challenging. For example, TPG Global Advisors' July 2017 filing of Form ADV with the U.S. Securities and Exchange Commission identified in Section 7B nearly 100 affiliated entities.[4] While some of these were clearly identifiable from their titles (e.g., TPG

[4] TPG Global Advisors, "Form ADV: Uniform Application for Investment Adviser Registration and Report by Exempt Reporting Advisers," July 19, 2017, https://adviserinfo.sec.gov/IAPD/content/ViewForm/crd_iapd_stream_pdf.aspx?ORG_PK=159732.

Parallel III), many had far less obvious names (e.g., Arrow Ridge Capital Master Fund, FoF Partners III-B, and MLS (B&C) AIV 1-B).

Moreover, there is not a clear mapping between the titles of these instruments and their characteristics. Labels like special purpose vehicle (SPV) and affiliated investment vehicle (AIV) are used by GPs in a seemingly random fashion. Thus, classifications could not be done on the basis of fund name, but required manual review. To illustrate the difficulty, AIVs frequently fell into two categories. The first type, often referred to as a "subsidiary AIV," was owned directly by the fund (either in whole or in part with other LPs). Subsidiary AIVs typically held a set of investments that mirrored the fund with which it is paired. The second kind of AIV, usually called a "side AIV," was not owned by the fund, but rather by a subset of the fund's partners, including the GP. This type of AIV typically co-invested in selected portfolio companies (or a portfolio company) alongside the fund.

Using State Street's internal classification scheme for investment vehicles in its State Street Global Exchange (GX) Private Equity Index (PEI) database, we identify twenty-two thousand of the seventy thousand transactions that appear to be private equity-related. Thus, we exclude many investments made by asset owners into vehicles organized by hedge and real estate groups without private equity funds.

Using State Street's "standardized name convention" process, we identified 6,068 unique investment vehicles with associated LP and GP names. (In many cases, multiple LPs in the database invested in the same vehicle.) We also included in this total a number of vehicles that did

not have a GP affiliation due to the nature of vehicle, especially what Fang, Ivashina and Lerner (2015) termed "solo" investments by LPs. We then filtered out 746 of these vehicles, including real estate funds, hedge funds, traditional funds-of-funds and secondary funds, and other non-PE vehicles (which are not the focus of this research paper).

We examine the remaining 5,322 vehicles. We associated them with general partners and classified them into three main categories, based on various sources. The key resources we used were:

- The GXPEI database, which contained data on the characteristics of the vehicles and links between the vehicles and PE groups. Even when the identifier field was blank, often a text note or other field indicated which PE group and/or fund the vehicle was associated with and its features.
- A list of vehicles associated with all private equity groups that we assembled from outside sources. We used the list to identify the unmatched vehicles listed in the database, as well as to determine their characteristics. The sources used to create the list included:
    - SEC Exhibit 21s for publicly traded entities, which lists the names of affiliate and subsidiary entities. As SEC regulations note: "A list of subsidiaries must be disclosed to the SEC as Exhibit 21 to registration statements filed on Forms S-1, S-4, S-11, F-1, F-4, 10, and the annual report filed on Form 10-K."[5]
    - All Form ADVs filed between 2001 and 2016. Since the passage of the Dodd-Frank Act, these forms must be filled out by all non-venture private equity with more than

[5] U.S. Securities and Exchange Commission, Office of Investor Advocacy and Education, "Researching Public Companies through EDGAR: A Guide for Investors," no date, https://www.sec.gov/oiea/Article/edgarguide.html.

$150 million in assets under management in the United States. Section 7B of Form ADV includes the names of all affiliated entities.

- Searches of the SEC EDGAR database for keywords, "Affiliated Fund," "Co-invest," "Special Purpose Vehicle," "Special Investment Vehicle," "SPV," and "AIV." These searches generated a wide variety of documents filed by private equity groups listing affiliate structures, such as Form 400-APP/A, "Applications under the Investment Company Act other than those reviewed by Office of Insurance Products" and Form D.
- We finally undertook extensive research on the remaining unmatched entities to understand their properties and affiliations. The resources we used included fund web sites, media accounts, and the records in Preqin and Thomson Reuters (which sometime list a variety of alternative vehicles in addition to main funds).

Among the 5,322 investments, we were able to identify 3,620 "main funds." The majority of those in the database are contained in the State Street Global Exchange Index. Most main funds have a traditional eight- to ten-year horizon, but a few have less common structures, such as the long-duration funds that a number of private equity groups have raised in recent years.

Of the remaining entities, they were split between what we term 819 GP-directed vehicles and 883 discretionary vehicles. The underlying principle for our classification is whether the LPs had any input or control over the selection of the underlying investments or if the investment decision stayed entirely in the hands of the GPs. We define these as follows:

- GP-directed parallel vehicles (henceforth GP-directed) typically invest in similar securities as the main funds and the GP retains key decision-making powers. These vehicles contain special features to cater to certain classes of limited partners. For instance, they may be tailored to:
    - have more favorable economics for a limited partner that is making a sizeable capital commitment,
    - avoid domestic tax obligations for non-domestic investors, such as blocker funds and offshore vehicles,
    - allow the GP to continue to finance firms when they are running out of capital in the main fund,
    - not use capital call lines to address investors' concerns about risk, or
    - address many other limited partner concerns.
- Discretionary vehicles allow the limited partner to invest in one or more transactions that a general partner may offer them. Under this category, we include a number of vehicles. These include co-investments into individual companies by one or more LPs; solo investments by LPs in previously PE-financed companies; pledge fund structures where transactions are funded by the LP on a deal-by-deal basis (sometimes raised by groups that have encountered poor performance who have found raising a traditional fund difficult); co-investment or overage funds that are raised alongside a main fund; and co-sponsored transactions between LPs and GPs. We also include co-investment funds raised by funds-of-funds and other intermediaries (though not the traditional funds-of-funds or secondary

funds that they raise).[6] Many intermediaries have aggressively expanded into this area, especially after the widespread disillusionment with traditional funds-of-funds engendered by the Global Financial Crisis and the collapse of Bernard Madoff's hedge funds.

A natural question is the extent to which the State Street clients are representative of the industry. For instance, State Street could have gained or lost customers for its custodial business that might have led to dramatic fluctuations in the comprehensiveness of coverage over time. One way to evaluate this concern is to examine the commitments to main funds in the sample. We compute the ratio of these capital commitments over time to total capital commitments to PE funds. To estimate the overall commitments, we use the total global PE fundraising as estimated by Preqin from 1995 onward (2017 and earlier years). For the years before 1995, we use estimates from a variety of sources, including annual compilations in *?,.+,2"*, the *F(#*32)&G=,#2.&:$3-."2*, and the *;)$2,()&O3'#23-&Q+,($3-* for the U.S., the various *R)3(I++H"* of the European Venture Capital Association for Europe, the *:"#3$&;)$2,()&O3'#23-&Q+,($3-&* for Asia, various publications and reports of the Latin American Venture Capital Association, and the reports of McDonald & Associates for Canada. Not all these sources go back to 1980; when they do not, we supplement the data series with estimates based on news stories, case studies, and trade journals.

This analysis suggests that State Street's clients have made a reasonably consistent share of the commitments to the main funds of PE firms. The asset owners committed 2.4% of the capital to the funds in the 1980s (of course, the total committed capital of the main funds in which they

[6] These co-investment funds run by funds-of-funds and other intermediaries may not allow that underlying asset owner to opt into individual investments. Thus, while the intermediary has discretion where to invest, the underlying LP may not.

invested was a much larger share of the industry). In the subsequent three decades, the shares were 4.8%, 6.3%, and 4.3%. This broad look does not suggest dramatic fluctuations in coverage, though the coverage was clearly at a lower level during the 1980s than in subsequent decades.

3. **Alternative Vehicles: An Aggregate Look**

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We first look at the use of different vehicles in general. Table 1 provides an overview of the data set. Of the 108 asset owners active in PE, fully 87 invest in GP-directed vehicles and 69 in discretionary ones. Looking at the number of distinct investments and the dollar size of the commitments, main funds represent 68% of the distinct vehicles and 83% of the capital committed. GP-directed and discretionary vehicles are roughly equal in number, but the former represent 50 billion dollars in capital to the latter's 38 billion.

Figure 1 depicts the temporal distribution of the number of investments in and the dollar commitments to main funds and alternative vehicles, by the year of the vehicles' formation (vintage year in industry parlance) and decade. In the annual charts, the ebbs-and-flows of fundraising—with the peaks of fundraising in 2000 and 2007-08, the crashes of 2001-02 and 2009, and the recovery in recent years—are apparent. The seeming downturn in activity in 2017 is driven by the fact that the total represents only part of the year's activity. While the volume of activity in alternative vehicles follows the pattern of the main funds, the increased share in recent years is apparent.

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We then analyze the performance of these instruments. We employ certain standard methodologies throughout the paper. First, we exclusively focus on the Kaplan-Schoar (2005) PME computed relative to the Russell 3000, as this is a standard performance measure in the academic literature. Second, we compute performance as of the first quarter of 2019. Third, because of a few extreme outliers, we winsorized the excess PMEs at the 0.5% and 99.5% level and raw PMEs at the 99th percentile.[7] Finally, we dropped a few older observations from the analysis due to questions about the performance data.

The first way to examine performance is to simply look at the returns from each class of vehicle: main funds, discretionary vehicles, and GP-directed vehicles. We also look specifically the subset of main funds with an associated alternative vehicle. Table 2 presents their performance measured three ways: our baseline measure (the top panel), as well as two measures often used by practitioners, the internal rate of return (IRR) and the ratio of total value to paid-in capital (TVPI). In this table, we present several performance metrics. First, we use each vehicle as an observation: there is no added weight if multiple asset owners invested, or if the committed capital was relatively larger. We present in each case the 25th and 75th percentiles of performance, as well as the median returns. Second, we compute the weighted average performance, where the weights are the total capital commitments by all the LPs in the State Street population who invested in the same vehicle.

[7] The exceptions are when we (a) present IRRs and TVPIs in Figure 2 and Table 2 and (b) replicate the calculations of Harris et al. (2016) in Appendix B.

Table 2 shows that there are generally modest differences in the performance of the three classes of vehicles when we look a medians and simple averages. The median discretionary and median GP-directed vehicle performed about the same than the median main fund in terms of PME. The patterns in the other median and simple average performance measures are also mixed.

A more consistent pattern appears, however, when we examine weighted average performance. When comparing the weighted mean performance of main funds with an associated alternative vehicle to the alternative vehicles, we see that the alternative vehicles consistently underperform. Using PMEs, the difference is 1.09 for main funds vs. 1.05 for the discretionary vehicles and 1.03 for the GP-directed vehicles. Patterns using weighted average IRRs and TVPIs are similar: the alternative vehicles underperform the main funds associated with such a vehicle.

One natural question relates to the seeming deviation between the relatively low PMEs generated by our portfolio of main funds and those reported in canonical studies such as Harris, et al. (2016). These differences spring from five differences in our approaches: we (a) calculate performance through the first quarter of 2019, (b) include private debt funds in addition to venture and buyout ones, (c) look at funds based both within and outside the U.S., (d) use the Russell 3000 rather than the S&P 500 as the public market benchmark, and, most importantly, and (e) include vintage years through mid-2017. If we repeat the calculations in Exhibit II of Harris, et al.—that is, only using U.S. funds in vintage years through 2010 and comparing performance against the S&P 500 through mid-2017—we obtain very similar numbers to theirs. For instance, our average PME for buyout funds across all vintage years (calculated using 936 funds, to their 781) is 1.21as compared to their 1.20. Our average PME for venture funds (computed using 669 funds, to their

1095) is 1.44, as compared to their 1.35.[8] We present the computations for main funds with these adjustments in Appendix B.

Figure 2 looks at the temporal patterns in performance, calculating performance through the first quarter of 2019. Focusing on Panel A, which presents the PME-based measures, we see that the return series of the various vehicles tend to track each other by-and-large. The returns of alternative vehicles are more volatile than the others, which may reflect their less diversified nature. In Panel B, we present the median TVPI. Here, the main funds have an initial performance advantage over the alternative vehicles, a pattern that disappears by the 2000s.

The comparisons in Table 2 may be misleading, however, because not all PE groups raised alternative vehicles, and not all investors can invest in all vehicles separately from the main fund. In particular, one might anticipate that asset owners might be disinterested in undertaking discounted arrangements with poorly performing fund managers, while top-tier PE groups might be unwilling to make such concessions.

Tables 3 and 4 presents what we believe to be a more reasonable comparison. We look at the performance of the alternative vehicles against the main fund that investors presumably could have (or did) also invested in. We compute the difference in the PME between the performance of each alternative vehicle (again computing PMEs using the Russell 3000) and that of the main fund raised by the same group of the same type (e.g., U.S. buyout) immediately prior to the launch of

[8] The difference reflects the improved performance of venture funds in recent years (including that of older vintages). This improvement is documented in Kaplan (2018).

the alternative vehicle. Fifty-eight percent of the alternative vehicles are matched to a main fund begun in the same year as the vehicle; 86% to one in the year of the fund or in the two years prior. If there are no main funds raised in the previous five years, we do not use the alternative vehicle in the analysis. (Thus, the sample size shrinks to 749 for the discretionary vehicles, and to 708 for the GP-directed vehicles.)

One consequence of this methodology is that the alternative vehicles will be raised on average in later years than the main fund to which they are paired. As Harris and co-authors (2016) documented, PMEs have been generally falling over time. This pattern may lead to the seeming underperformance of the alternative vehicles, simply because they were often raised in later vintage years than their paired main funds. While this correction may be excessively conservative (e.g., it may be appropriate to pair a co-investment made in 2007 with the 2004 fund which invested alongside the LP), we correct for the changing investment climate across the various vintage years. To do this, we compute what we term the Adjusted Excess PME Performance of the alternative vehicles. This measure is defined as follows:

(PME(AV) – Mean PME(MFs, VYAV)) – (PME(PMF) – Mean PME(MFs, VYPMF))

where PME(AV) is the PME of the alternative vehicle, Mean PME(MFs, VYAV) is the mean PME of all main funds of the same vintage year as the alternative vehicle, PME(PMF) is the PME of the paired main fund, and Mean PME(MFs, VYPMF) is the mean PME of all main funds of the same vintage year as the main fund that is paired to the alternative vehicle. If the alternative vehicle and the paired main fund are contemporaneous, the second and fourth terms will cancel out. In other cases, this adjustment will correct for the differences in investment climate between the two years.

The results are robust to the use of alternative methodologies. Another approach is to skip the adjustment for the later vintage years (i.e., delete the second and fourth terms from the equation above). Results using this Unadjusted Excess PME Performance measure (unreported) are little different. Second, we limit the matches to funds formed in the year of the transaction or the three years prior, which only eliminates 7% of the observations and has little impact on the results. A third approach is that if there are multiple main funds during the five years after the observation, we average the performance of the main funds and use this in the comparison. This methodology tends to depress the performance of the alternative vehicles to a certain degree.

We again look at the simple mean and median of returns across vehicles (counting each vehicle as a single observation), and then at the average returns when weighting each by the size of the State Street LPs' capital commitments to that vehicle. The results in Panel A of Table 3 suggest some underperformance by the alternative vehicles relative to their main funds. When using what we regard as the best approach, the weighted average, the alternative vehicles underperform their paired main funds, with PMEs that are 0.058 lower. These results suggest again that underperformance is more significant among the larger transactions. The patterns are depicted graphically in Figure 3, which depicts the distribution of the adjusted excess performance of the alternative vehicles of the two types relative to main funds.

We also see a strong secular trend in performance, which was hinted at already in Figure 2, Panel B. Alternative vehicles formed in the years after the financial crisis performed significantly better, as Panel B of Table 3 reports. This pattern is particularly true when we look at mature vehicles formed in this period: Panel C focuses on vehicles established between 2009

and 2014. Whether these differences reflect a secular shift in the skill of LPs in selecting transactions or special circumstances associated with post-financial crisis environment is an issue we return to in the conclusion.

We look at the robustness of the results reported in Tables 2 and 3 in Appendix C and D. In these supplemental tables, we exclude private debt funds (which are often not considered in the private equity literature) and blocker and offshore funds (whose performance might be affected by tax considerations). (In an unreported analysis, we also exclude funds formed after 2011.) We find in an unreported analyses that these exclusions have little impact on the alternative vehicles' relative performance.

4. Who Uses Alternative Vehicles?

We now turn to examining the differences in the use and performance of alternative vehicles across the general partners in the sample. We ask which types of partnerships rely more heavily on such alternative vehicles and what returns they offer to their investors.

The average GP in the sample was established in 2003, while the mean LP was somewhat older (1998). (Note that in calculating LP age we use the date of the asset owner's first PE commitment, not the date of the organization's formation.) The total capital commitments garnered over their existence by the GPs from the custodial LPs vary widely, with a mean of just over six hundred million. The mean LP has committed $4.7 billion to private equity.[9]

[9] In addition to the 108 LPs used in the analysis, there were four asset owners in the sample had made no private equity commitments as of mid-2017.

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We first look at the prevalence of alternative vehicles across different classes of GPs. Of course, their usage is likely to be a function of both their willingness to offer these alternatives, and the interest of asset owners in undertaking these investments.

Table 1 looks at the differences across PE groups with various strategies (each group is assigned to only one strategy, based on where the bulk of its investment activity is focused). Following State Street's typology, we divide the groups into those focused on buyout (including growth capital), private debt, and venture capital transactions. We find a substantial disparity between venture capital-focused groups and the other classes. The amount of capital raised by the venture-focused groups was much more concentrated in main funds, representing 90% of the total raised, as opposed to 82% and 83% for buyout- and private debt-focused groups. Similar patterns appear when we divide funds by size, using data from Preqin to determine the cut-offs. In an unreported table,[10] the smallest tercile of firms represented raised only 2% of its capital through alternative vehicles, while the corresponding number for the largest tercile was 18%.

In Table 1, a similarly dramatic pattern appeared when we examined differences in the geography of the GPs. In each case, we assign the group to the region in which its headquarters is located. North American GPs are far more likely to employ alternative vehicles: 17% of the capital raised were of this nature. Meanwhile, for groups outside of Europe and North America, alternative vehicles represented only 5% of the capital raised.

[10] All unreported tables are available on request.

We then examine the performance across different classes of GPs. We again examine adjusted excess PME performance, comparing the alternative vehicle and the paired main fund. Focusing on weighted average returns, we see in Panel A of Table 4 that alternative vehicles of buyout-focused GPs had consistent negative returns compared to their paired main funds, regardless of the method of adjustment used. Other strategies had more mixed results.

Panels B and C look at the relationship of excess performance on the one hand and GP size and geography on the other. Again, focusing on the results using weighted-average returns, we find that the performance was poor, frequently at statistically significant levels, for vehicles raised by the largest tercile of firms (with adjusted PME differences of about -0.06) and managers based in North America (about -0.09). The effects are similar for GP-directed and discretionary vehicles.

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Table 5 looks at the differences in the use of alternative vehicles across GPs of different types in regression analyses. (The definition of all independent variables is in Appendix A.) We use as observations each private equity group that raised funds in a given five-year period (from 1980 to 1984, 1985 to 1989, and so forth). If the PE group raised capital in multiple five-year periods, there are multiple observations; if the group raised no capital in a five-year period, the period is not used as an observation. In each table, we present the results weighted and unweighted by the size of the capital raised by the private equity group in the given five-year period. We also include the performance of earlier funds raised by the GP in the previous five-year period as an independent variable.

The dependent variable in the odd columns is the ratio of the total amount of discretionary and GP-directed vehicle commitments (together in the first four columns and then separately) to total fundraising in that period in each five-year period for each general partner. In the even columns, it is the logarithm of alternative vehicle fundraising in each five-year period for each general partner. We regress the alternative vehicle ratio and amount on GP characteristics; in particular, the region the GP operates in, fund strategy, fund size, the performance of the partnership in the prior five years, and time period dummies.

The regressions show that the use of alternative vehicles is unevenly distributed across GPs. The utilization outside of Europe and the U.S. is less frequent, as is their use by venture capital-focused organizations. We find a strong negative relationship between the ratio of fundraising via alternative vehicles and a partnership's past performance. However, when we look at the absolute volume of funds raised via alternative vehicles in the even regressions, the effect of performance is insignificant. Better performing partnerships do not appreciably change their fundraising for alternative vehicles, but because they are able to raise main funds more readily, the alternative share falls. The unreported time dummies suggest that (consistent with the earlier figures) alternative vehicle fundraising (both in absolute volume and as a share of total fundraising) has increased over time.

Table 6 looks at the performance of funds, using each alternative vehicle as an observation. We look at the raw PME of each alternative vehicle. There are few differences across vehicle type,

geography, and fund strategy. But we find that top-performing groups are more likely to have high-performing alternative vehicles.

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We then look at the patterns across different classes of limited partners in their usage of alternative vehicles and the performance of these investments. As has been documented in the finance literature (Lerner, Schoar, and Wongsunwai, 2007; Sensoy, Wang, and Weisbach, 2014), PE investment decisions and performance differ across classes of LPs (though in ways that may have varied over time). These considerations may also have affected the interest in alternative vehicles by different classes of limited partners. Of course, their usage of alternative vehicles was also likely to be a function of the willingness of GPs to offer them such investment opportunities.

In Table 7, we present cross-tabs, where each investment by an individual LP in an alternative vehicle is an observation. The performance variables are the vehicle's PME; its adjusted excess PME; and its PME less the weighted average PME of main funds that it has invested in during the prior five years. We characterize the performance of the LP and the GP in four ways: (1) both the LP and GP performed above median over the five years prior to the investment, (2) LP and GP below median, (3) LP above median and GP above, and (4) **#1)&*)("3*. Weighted averages are computed for each cell using commitment size.

Panel A of Table 7 reveals that the strongest performance is associated with LPs with successful track records investing in GPs with above-average performance. For discretionary funds, the weighted average PME is 1.20 and for GP-directed ones, it is 1.14. Meanwhile,

investments made by LPs in the bottom half of the performance distribution into GPs with poor performance have the lowest PMEs, around 1.00 and 0.95 in discretionary and GP-directed funds, respectively.

The effect is largely driven by the performance of the GP, not the LP. Controlling for GP quality, the difference between the performance of vehicles across high- and low-performing LPs is quite modest. But as Panel D—which presents the number of observations in each cell—reveals, the distribution of investments is uneven. 56% of the alternative vehicle investments of above median LPs are with above median GPs, while only 38% of those by below median LPs are. The effects are even more dramatic when it comes to discretionary investments.

When we examine adjusted excess PME in Panel B of Table 7, we see that above-average LPs are offered alternative vehicles by their GPs that perform about the same as or slightly above these LPs' corresponding main funds. For example, columns (1) and (2) in Panel B show that above-average LPs have a premium in PME relative to the associated main fund when investing in alternative vehicles of a top GP of -0.01 and 0.06. The mirror image emerges for below-average LPs. In columns (3) and (4) of Panel B, we see that alternative vehicles that below-average LPs invest in have significantly lower performance than the associated main funds, -0.12 and -0.13. Lower-performing limited partners appear to be offered opportunities that perform poorly than the associated main funds.

In Panel C, we take another perspective on the investment quality question. In particular, we compare the average performance of alternative vehicles against the performance of all the

other main funds that a given LP invested in over the same time period. This exercise allows us to test how GPs use alternative vehicles to differentiate between LPs and their investment opportunities: For top LPs investing in top GPs, alternative vehicles (especially discretionary vehicles) beat the rest of the LP's portfolio, outperforming the main funds they chose. This result suggests that top GPs use these vehicles to provide improved opportunities for their best investors. Similarly, the performance of alternative vehicles of top GPs invested in by lower-tier LPs beat the other main funds in which these LPs invest. This pattern holds even though, as we saw in Panel B, the performance of low-performing LPs investing in top GPs is much lower than the main fund of the same partnerships. This asymmetry suggests that top GPs differentiate between their more and less preferred investors. But even for low-performing LPs, these investments are still better than the rest of the opportunities they have access to. Finally, while Panel B showed that top LPs have relatively better performance than lower-performing LPs when investing in alternative vehicles of bad GPs, the overall level of performance is much poorer than the average main funds in which they invest.

In sum, these results suggest that GPs recognize the outside options of their investors. This effect is especially strong for GP-directed funds where LPs do not have much ability to select deals. Therefore, we believe that the results are not just an expression of poor selection by LPs, but reflect the differentiation of deals that are offered to different types of LPs.

Table 8 looks at the first of the cross-tabs reported in Table 7 in greater depth, using regression analyses which allow us to control for fund characteristics and time effects. Each investment by an individual LP in an alternative vehicle is an observation. The dependent variable

is the vehicle's raw PME. We regress the performance of the alternative vehicle on a measure of the LP's and GP's lagged performance. We use the average volume-weighted PME for the LPs and GPs over the five years prior to the inception of the alternative vehicle. We then classify LPs and GPs into above-median versus below-median performers. We form four dummies to characterize the match between the LP and the GP: (1) LP and GP above median, (2) LP and GP below median, (3) LP above and GP below median, and (4) *#1)⁄*)("3*.

One might worry that established LPs with known track records might get into better alternative vehicles because they have longstanding relationships with many GPs. Younger or less well-performing LPs might not have access to these same relationships. In that case, the match could proxy for prior relationships or reduced information asymmetries on the side of some LPs, rather than their outside options. For that reason, we add to the even specifications a dummy variable that denotes whether the LP had invested in any of a GP's main funds before investing in the alternative vehicle with the GP.

The results show that the PME of an alternative vehicle where the LP and the GP are above-median performers is 0.16 points higher than the base category of a below-median GP–LP pair. The dummies on the matches between below-median LPs and above-median GPs also have statistically significant higher performance, of about 0.14. The performance of above-median LPs and below-median GPs, however, is economically and statistically indistinguishable from the baseline case of below-median GPs and LPs. When breaking the results out by type of alternative vehicles, we find that the results are larger in magnitude and consistently significant for the discretionary vehicles. The differences for the GP-directed vehicles are directionally similar, but

smaller and insignificant. As discussed above, these results are in line with a bargaining explanation, where the top LPs receive better returns.

The next two tables look at the performance of the alternative vehicle investments by limited partner type. In Table 9, we see that funds-of-funds had consistently negative relative performance across all three measures, with weighted average adjusted PME differences of -0.144 and -0.106 for discretionary and GP-managed vehicles, respectively (both statistically significant). Continuing to focus on weighted average relative returns, the alternative investments of public pensions were also consistent underperformers (-0.083 and -0.065 respectively), though they look better when we examine medians.[11] Insurance and finance institutions, in contrast, did quite well in their alternative investments, with adjusted excess PMEs of 0.177 and 0.013 for discretionary and GP-directed vehicles, respectively; lesser but also attractive performance was seen for private pensions and endowments and foundations. Finally, SWFs did quite poorly on GP-directed investments (-0.213) but moderately well on the discretionary vehicles (0.082). (When we look across LPs of different sizes in unreported analyses, we find that the top largest tercile—likely to be dominated by sovereigns and public pensions—had much lower relative performance of GP-directed vehicles, consistent with the results in Table 9.)

[11] While their $31 billion of commitments to alternative vehicles was the largest of any class of investor, public pensions had so much committed to traditional funds that their 12% share of commitments was considerably smaller than every other class of investor, such as sovereign wealth funds, endowments and foundations, and private pensions. LPs based outside of Europe and the North America (22% of total capital), and especially European ones (28%), made far more use of alternative vehicles than the North American asset owners (14%).

In Table 10, we examine the differences across LPs with different geographic bases. We see a disparity, with asset owners based in North America consistently underperforming in their alternative vehicle investments: their weighted average adjusted PME difference is -0.13 for discretionary and 0.0002 for GP-Directed vehicles. European LPs did better in alternative vehicle investing (0.17 and -0.01 respectively).

5. Underlying Asset Composition of Alternative Vehicles

We now look at the nature of cash flows into and out of alternative vehicles to shed more light on the investment strategies pursued by the partnerships. GPs might use AVs to allow some LPs to increase their exposure to investments made by the main fund, such as in parallel funds or side vehicles. Alternatively, fund managers might use AVs to give LPs access to additional deals or more tailored investments that are different from the investments in the GPs' main fund.

To analyze these strategic decisions, we would ideally observe the underlying deal-level investments that the main funds and AVs of a given partnership undertake. While these data are not available, we do observe all the cash flows in and out of a fund. By looking at the number, size, and exact timing of cash flows, we can proxy for the amount of overlap there is in the underlying investments between the main fund and the AVs.

We first document that the number of cash flows into—which are typically a proxy for the number of investments the fund makes—and out of alternative vehicles is much smaller than for the main funds. This is not surprising, since alternative vehicles typically make fewer investments and are smaller than the main funds. Table 11, Column (1) shows the breakdown of contributions

for different funds. We see that more than 50% of GP-directed funds have less than 15 separate inflows into the fund. This number is even smaller for discretionary funds, where more 50% of funds have ten or less total cash inflows and outflows. In comparison, the average main funds in our sample have more than 60 cash flows and a quarter have more than 100. The results are qualitatively very similar for the outflows from the funds; the data can be obtained from the authors.

As a result, AVs are less diversified and might have more idiosyncratic risk than the typical main fund. Indeed, Table 11 shows that the standard deviation of AV returns decreases slightly with the number of cashflows these vehicles have. In Panel A of Table 11, we find that for the GP-directed funds the cross-sectional standard deviation of fund returns decreases for funds that have a larger number of cash flows. For example, GP-directed funds with one-to-five cash flows have a cross sectional standard deviation of the realized PMEs of 0.92, while the set of vehicles with more than 20 cash flows has standard deviation of PMEs of 0.39. This relationship also holds for discretionary funds, but is less steep. However, when looking at the associated average performance of the alternative vehicles in each of these bins, we do not see a consistent relationship between the number of cashflows into and out of the funds and performance, whether measured using PMEs or IRRs. This result suggests greater idiosyncratic volatility is not related to average performance.

In a second step, we analyze the overlaps in the cash flows of the main fund and the AVs. We can proxy for investment overlaps by looking at the precise time-stamp and size of cash flows in and out of the fund. We classify an outflow as +*)(-3''#$‰with the main fund, if the cash

outflow occurred within five days of a cash outflow from the main fund. We look only at the 70% largest in and outflows of each fund: that is, we drop any small cash flows or regular fee payments that happen on preset dates but might not be materially important. We then calculate the fraction of cash flows that overlap between an AV and its associated main fund. We also repeat these calculations only for the cash out-flows, since in many cases cash drawdowns are predetermined. But the results are quantitatively very similar.

In Figure 4, Panels A and B, we show the distribution of cash flow overlaps between AVs and main funds for discretionary funds and GP-directed funds. Panel A shows that discretionary funds have very low overlap with main funds; 60 percent of the funds have less than 20% overlap. This is in line with our prior that these vehicles are used to access new investments (or to intensify access to a single investment), and not create more exposure to existing deals. GP-directed funds in Panel B show a bi-modal distribution. More than 75 percent of funds either have less than 20% overlap or more than 80% overlap. It seems that GP-directed funds follow one of two strategies; they either allow investors to double down on existing investments (high overlap), or to get access to additional deals that are not in the main fund (low overlap).

We then look at the excess performance of AVs, conditional on their level of overlap with the main fund. We use the excess PME of an AV relative to the main fund here (weighted and unweighted), since we want to account for the partnership's baseline level of performance. The average performance of AVs with higher overlap does not differ significantly from those with lower overlap. Even for GP-directed funds, which show a clear bi-modal distribution in the amount of overlap, there are no significant performance differences for AVs with low or high overlap. This

result suggests that while AVs differ in how much they allow LPs to double down on the deals made by the main funds, on average the degree of overlap does not create a significant performance advantage.

But we see a different pattern when separating out the top-performing GPs versus the below-median GPs. In Panel A of Table 12, we sort AVs by whether they have high versus low overlap with their main fund, and whether the GPs had below- versus above-median past performance. As before, we also break out the AVs by whether they are GP-directed versus discretionary. When looking at discretionary funds, we see that top GPs are more likely to have very low levels of overlap with the main fund. Lower performance GPs tend to have a higher fraction of discretionary investments with high overlap. In contrast, for GP-directed funds, both types of GPs tend offer a mix of high- and low overlap funds.

Interestingly, when looking at the excess adjusted performance of AVs in unreported analyses, we see that for top GPs, the performance difference between high- versus low-overlap AVs is not large. For both GP-directed and discretionary AVs, the performance PME difference is 0.03 or smaller. However, for below average GPs, AVs with higher overlap do much better: The difference in excess PME for discretionary funds is 0.15, and for GP-directed funds it is above 0.30.

Overall, these results suggest that top GPs are using discretionary funds to allow their LPs to access a more diverse set of underlying deals, but maintain high performance regardless of the

degree of overlap. Lower-performance GPs are more likely to set up AVs that have high overlap with their main fund, thus allowing investors to double down on the deals in the main fund.

Finally, we can ask how the composition of AVs differs with the status of the LPs. For this we break out the results in Panel A of Table 12 by the type of LP (high versus low past performance) investing in the fund. In Panel B, we analyze how the overlap between AVs and main funds varies with the match of high- versus low-performing LPs crossed with high- versus low -performing GPs. The results in rows (1) and (2) show that top LPs have similar excess PMEs in high- and low-overlap AVs when investing with a top GP. In comparison, the performance of AVs with low-performance LPs is slightly lower, but this difference is not driven by the amount of overlap: see rows versus (5) and (6). This suggest that top GPs do not offer their lower-tier LPs a much worse asset mix. The same is true when looking at GP-directed funds. However, there is a striking difference in the likelihood that a lower-tier LP invests with a top-tier GP. Top-tier LPs are more than four times as likely to invest in the AV of a top fund.

The picture is not much different when looking at the lower-performing GPs. In rows (3) and (4), we see that there is a difference in excess PME between high-overlap versus low-overlap vehicles offered to top LPs. But the same does not consistently hold for funds offered to lower-tier LPs by these same GPs. And similar to discrepancy between top and bottom LPs, we see that lower-tier GPs make up less than 22% of the AV investments of the LPs in our sample. In sum, it seems that lower-tier GPs have worse deal flow and probably much less demand from LPs to set up AVs.

6. **Conclusions**

Using hitherto-unexplored custodial data, we take a broad look at the changing structure of the private equity, using investments by 108 large asset owners, including transactions involving assets outside the traditional fund structure. We show that alternative vehicles have been a major—and rapidly growing—portion of these investors' portfolios over the past four decades. We also document the disparity in the performance across the limited and general partners participating in such vehicles, as well as across the two broad classes of alternative vehicles. Differential access to top-performing alternative vehicles seem to explain much of these trends. The results suggest that the previously established puzzles of private equity performance might be disappearing. Partnerships seem to be using alternative vehicles to tailor investment returns based on the outside opportunities of different investors. Our results also suggest that the sophistication of an LP within the private equity space becomes more important as partnerships offer a gamut of different vehicles.

Several avenues for future research follow naturally from this paper. One of these relates to the contractual terms in these "outside-the-box" investments. While the partnership agreements between GPs and LPs in main funds have been well scrutinized, we know very little about the nature of these alternative vehicle arrangements. In this analysis, as in the earlier literature on co-investments, we only observe the net cash flows to the LPs, not the payments that went to the GPs. Second, the dramatic upswing in co-investment performance since the financial crisis documented in Table 3 is intriguing. To what extent does this reflect an increase in sophistication on the part of LPs? Or is this positive performance simply a reflection of the anomalous market conditions in the post-crisis years? A third intriguing question is whether the patterns seen here are replicated

in other asset classes. One natural arena to investigate is real estate, where “blind pool” funds were far later in arriving than in PE. Understanding how the use of such “outside the box” investments varies across asset classes, and the performance of such transactions, are important and interesting open questions.

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Figure 1: Vehicle Numbers by Vintage Year.

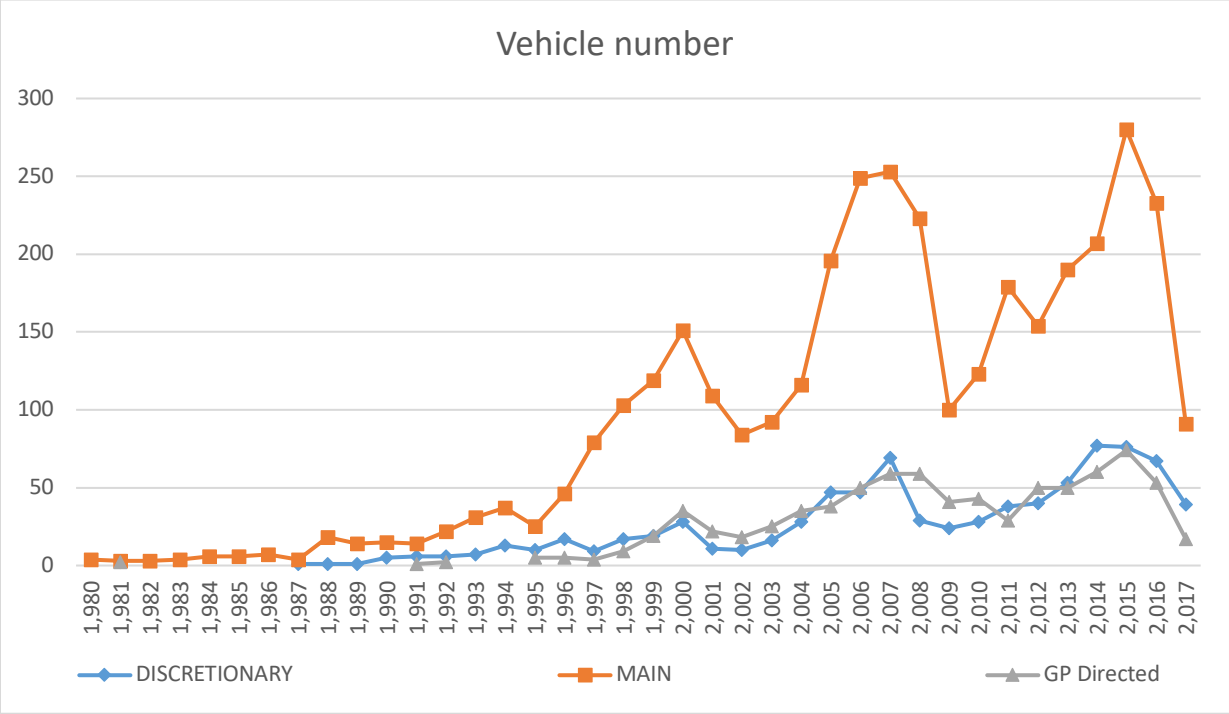
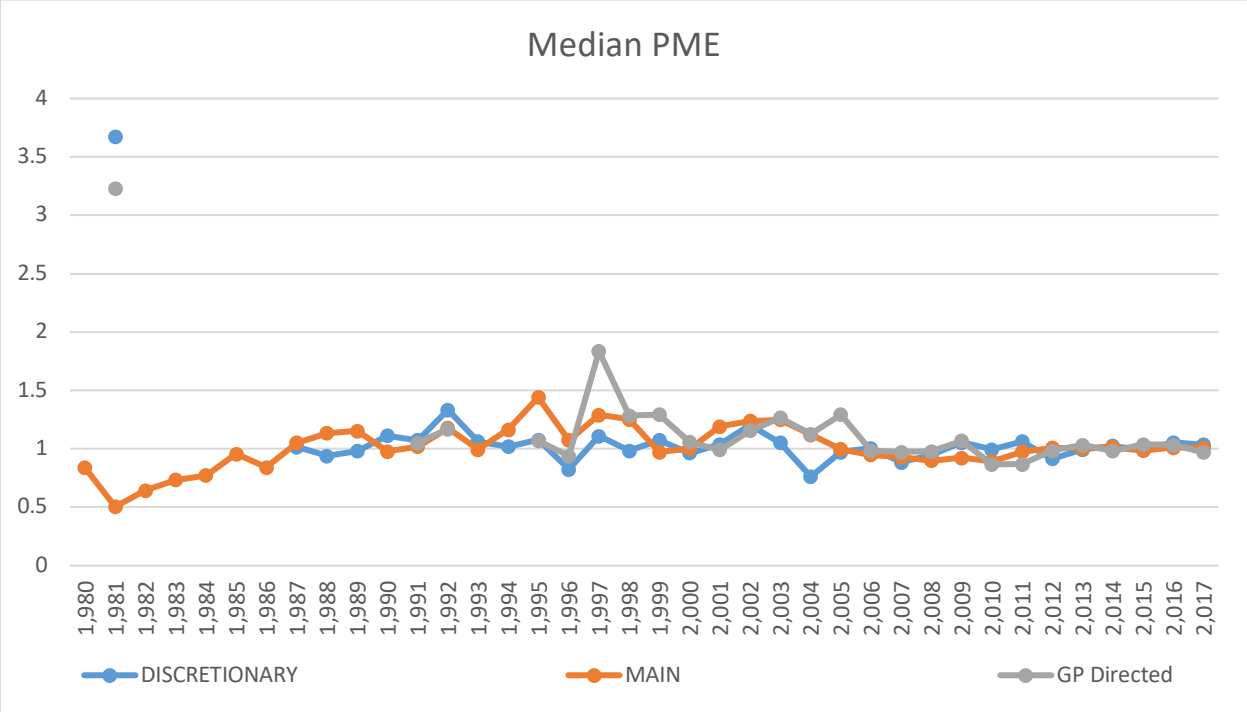


Figure 2: Performance by Vehicle Type and Vintage Year.

Panel A. Median PME (relative to the Russell 3000) by fund type and vintage year.



Panel B. Median TVPI by fund type and vintage year.

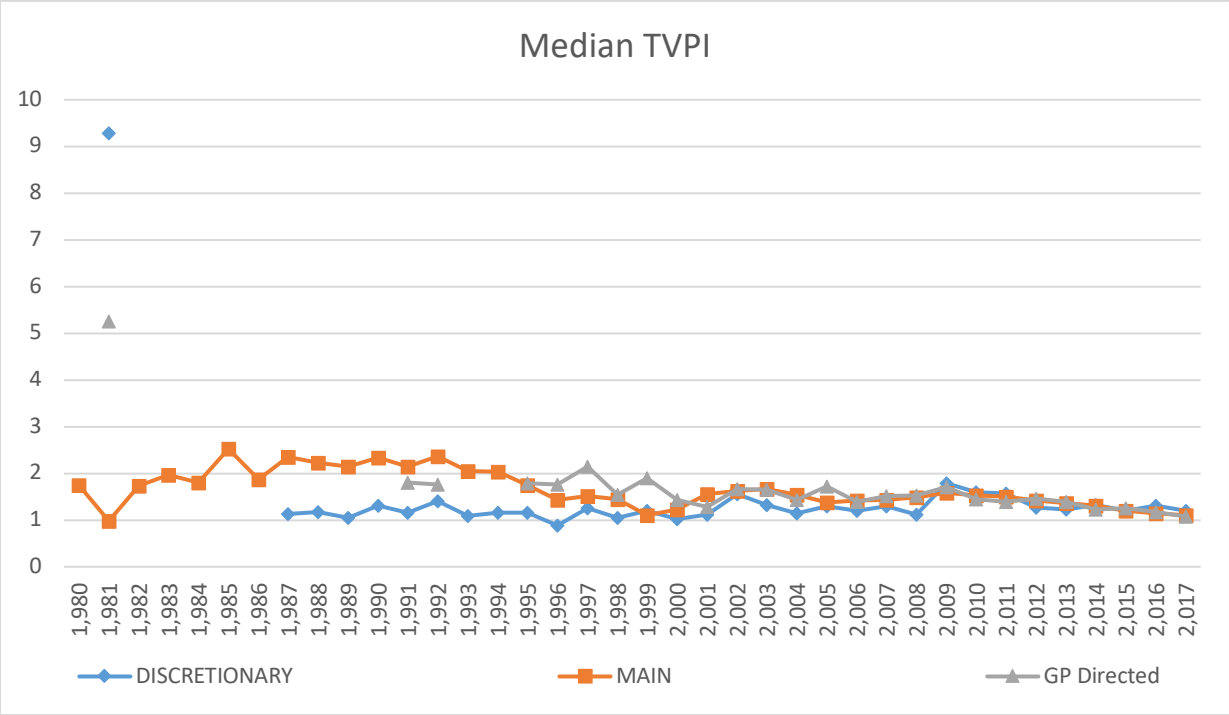
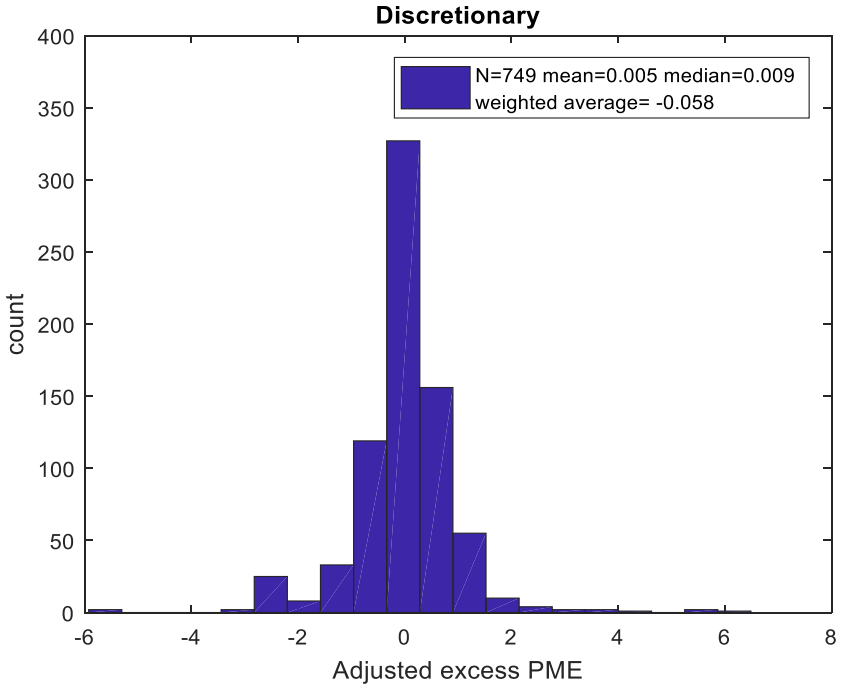


Figure 3: Adjusted Excess Performance of Alternative Vehicles, by Vehicle Type. Excess PMEs are winsorized at the 0.5th and 99.5th percentiles.

Panel A. Histogram of adjusted excess PME of discretionary vehicles.



Panel B. Histogram of adjusted excess PME performance of GP-directed vehicles.

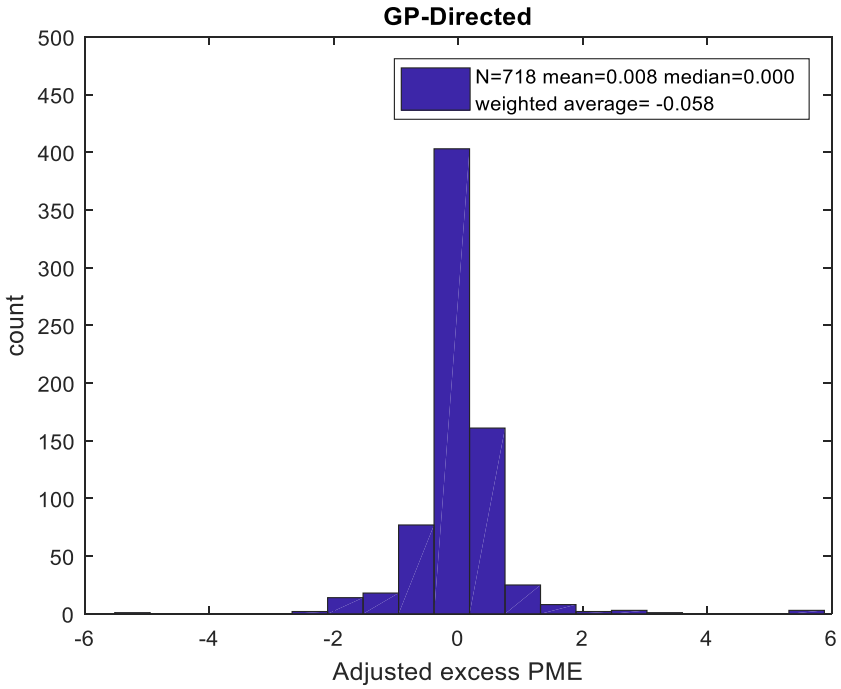


Figure 4: Distribution of Alternative Vehicles sorted by Overlap with Main Fund. The x-axis plots the fraction of fund distributions to investors that occurred in the same week as a distribution to the main fund. The first panel plots the cash flows of GP-directed vehicles versus the main fund. The second panel plots the cash flows of discretionary vehicles versus the main fund.

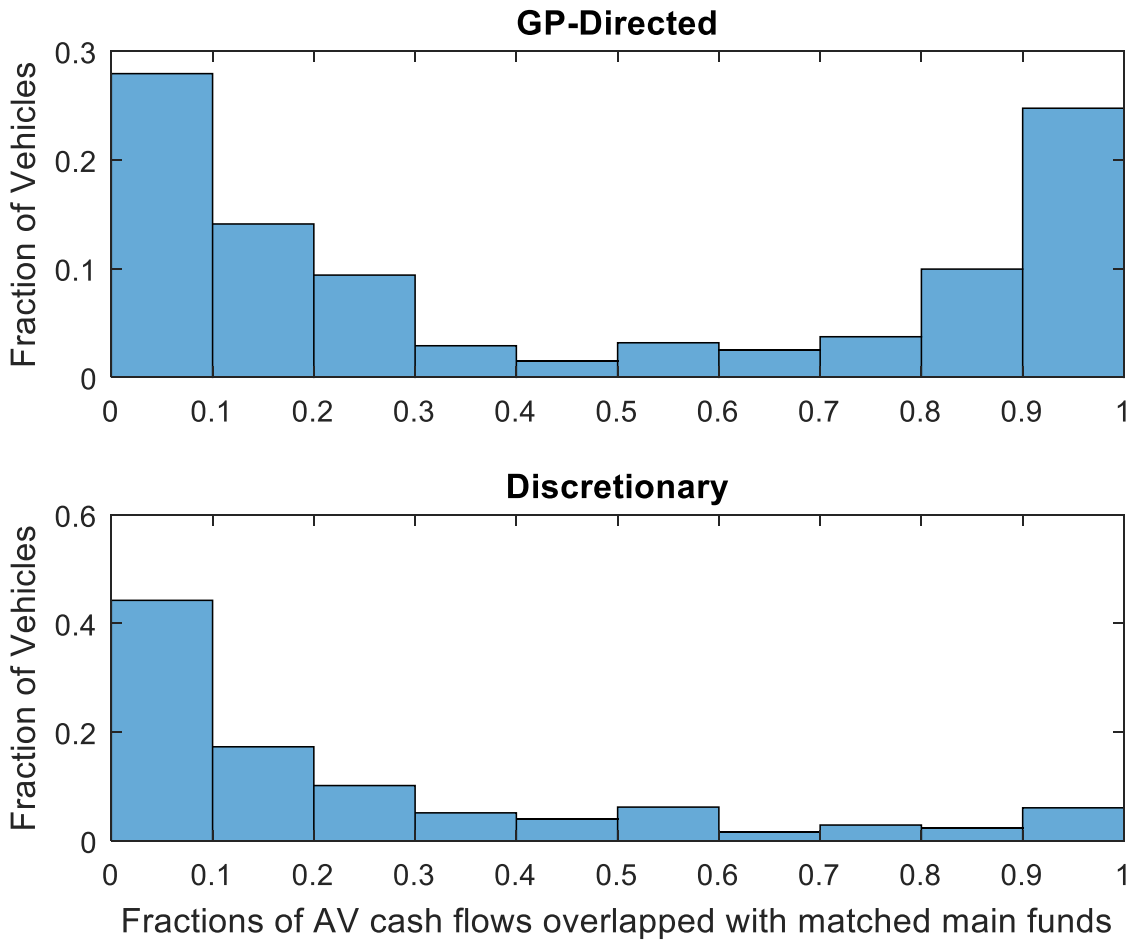


Table 1: Vehicle Count, Vehicle Investment Count, GP Count, LP Count, and Total and Average USD LP Commitment (USD MM), by Vehicle Type, as well as Breakdown by Fund Type.

Vehicle type	**Main**		**Discretionary**		**GP-Directed**	
Vehicle count	3620	68.0%	883	16.6%	819	15.4%
Investment count	15553	78.7%	1800	9.1%	2411	12.2%
GP count	868		197		261	
LP count	108		69		87	
Total LP Commitment	444190	83.5%	37874	7.1%	49848	9.4%
Average LP commitment	29		21		21	
Total Commitment to Buyout	333084	62.6%	30140	5.7%	40379	7.6%
Total Commitment to Private Debt	57231	10.8%	5657	1.1%	5669	1.1%
Total Commitment to Venture Capital	53875	10.1%	2077	0.4%	3800	0.7%
Total Commitment to European GPs	58238	10.9%	4067	0.8%	7825	1.5%
Total Commitment to North American GPs	367828	69.1%	33167	6.2%	41267	7.8%
Total Commitment to Rest of World GPs	18125	3.4%	640	0.1%	756	0.1%

Table 2: Performance by Vehicle Type. The performance metrics reported are Kaplan-Schoar Public Market Equivalent versus the Russell 3000, Internal Rate of Return, and Total Value divided by Paid-In Capital. The calculations are presented for all main funds in the sample, all main funds with an associated alternative vehicle, and the two classes of alternative vehicles. Weighted averages are by vehicle's total commitment by limited partners in the sample. PME, IRR, and TVPI are winsorized at 99th percentile.

			Russell 3000 KS PME		
Vehicle type	**N**	**25%**	**50%**	**75%**	**Weighted Average**
Main	3596	1.28	1.00	0.78	1.05
Main AV-Associated	696	1.25	1.02	0.81	1.09
Discretionary	846	1.28	1.01	0.74	1.05
GP-Directed	807	1.27	1.02	0.80	1.03

			IRR (%)		
Vehicle type	**N**	**25%**	**50%**	**75%**	**Weighted Average**
Main	3596	18.35	9.94	2.84	11.34
Main AV-Associated	696	18.46	10.03	3.19	14.15
Discretionary	846	25.85	11.33	-0.01	12.87
GP-Directed	807	22.15	11.71	3.70	11.91

			TVPI		
Vehicle type	**N**	**25%**	**50%**	**75%**	**Weighted Average**
Main	3596	1.83	1.38	1.09	1.47
Main AV-Associated	696	1.78	1.35	1.10	1.50
Discretionary	846	1.77	1.23	0.96	1.42
GP-Directed	807	1.79	1.40	1.13	1.41

Table 3: Adjusted Excess PME Performance of Alternative Vehicles. The performance metric used is the Kaplan-Schoar Public Market Equivalent versus the Russell 3000. The performance of each alternative vehicle is compared to that of the most recent main fund raised by the same group of the same type within the past five years, with an adjustment for the mean PME for main funds in the vintage of the vehicles' formation. (See text of the paper for precise definition.) Weighted averages are computed using commitment size. Excess PMEs are winsorized at the 0.5th and 99.5th percentiles.

Panel A: All alternative vehicles

Vehicle type	N	Weighted average	p-value	Average	p-value	median
All	1467	-0.0582	0.010	0.007	0.763	0.002
Discretionary	749	-0.0580	0.148	0.005	0.881	0.009
GP-Directed	718	-0.0584	0.015	0.008	0.758	0.000

Panel B: Alternative vehicles formed between 2009 and 2017

Vehicle type	N	Weighted average	p-value	Average	p-value	median
All	791	0.005	0.794	0.051	0.040	0.003
Discretionary	418	0.119	0.000	0.114	0.001	0.029
GP-Directed	373	-0.083	0.004	-0.018	0.611	-0.002

Panel C: Alternative vehicles formed between 2009 and 2014

Vehicle type	N	Weighted average	p-value	Average	p-value	median
All	486	0.058	0.009	0.111	0.001	0.005
Discretionary	246	0.133	0.000	0.163	0.000	0.031
GP-Directed	240	0.016	0.552	0.057	0.214	0.000

Table 4: Adjusted Excess Performance of Alternative Vehicles by GP Strategy, Size, and Geography. The performance metric used is the Kaplan-Schoar Public Market Equivalent versus the Russell 3000. The performance of each alternative vehicle is compared to that of the most recent main fund raised by the same group of the same type within the past five years, with an adjustment for the mean PME for main funds in the vintage of the vehicles' formation. (See text of the paper for precise definition.) Weighted averages are computed using commitment size. Excess PMEs are winsorized at the 0.5th and 99.5th percentiles.

Panel A: GP strategy.

GP Strategy	Vehicle type	N	Weighted average	p-Value	Average	p-Value	Median
Buyout	Discretionary	579	-0.090	0.066	-0.013	0.759	0.013
Buyout	GP-Directed	505	-0.065	0.018	0.012	0.673	0.005
Private Debt	Discretionary	55	0.157	0.030	0.221	0.010	0.193
Private Debt	GP-Directed	80	-0.053	0.360	0.045	0.435	0.000
Venture Capital	Discretionary	115	0.003	0.953	-0.007	0.940	-0.001
Venture Capital	GP-Directed	133	0.053	0.583	-0.030	0.730	-0.018

Panel B: GP size.

GP Size	Vehicle type	N	Weighted average	p-Value	Average	p-Value	Median
Bottom	Discretionary	9	0.317	0.452	-0.203	0.768	0.341
Bottom	GP-Directed	8	-0.090	0.455	-0.100	0.551	-0.087
Middle	Discretionary	57	0.122	0.294	0.328	0.056	0.031
Middle	GP-Directed	97	0.051	0.188	-0.035	0.532	0.005
Top	Discretionary	683	-0.062	0.139	-0.019	0.594	0.000
Top	GP-Directed	613	-0.061	0.020	0.016	0.581	0.000

Panel C: GP geography.

GP Region	Vehicle type	N	Weighted average	p-Value	Average	p-Value	Median
NA	Discretionary	657	-0.094	0.041	-0.012	0.745	0.000
NA	GP-Directed	555	-0.090	0.001	-0.055	0.043	-0.002
Europe	Discretionary	79	0.198	0.000	0.142	0.212	0.117
Europe	GP-Directed	129	0.061	0.114	0.174	0.003	0.015
RoW	Discretionary	13	-0.122	0.277	0.073	0.529	0.044
RoW	GP-Directed	34	0.627	0.065	0.406	0.128	0.173

Table 5. Analysis of Alternative Vehicle Activity by GP Characteristics. The dependent variable in the odd columns is the ratio of discretionary and GP-directed vehicle commitments to total capital commitments in each five-year period for each GP. The dependent variable in even columns is the log10 of 1 + the dollar commitment to alternative vehicles in each five-year period for each GP. Weighted regressions use the sum of the GPs capital commitments in the current five-year period as weights. GP prior five-year mean PME is an average over the previous five-year period, weighted by vehicle commitments. The reference categories are North America (US & Canada) for GP region, buyout for GP strategy, and bottom tercile for GP size. Standard errors are clustered by GP and shown in parentheses. *, ** and *** denote statistical significance at the 10%, 5% and 1% level, respectively.

	All alternative vehicles				**Discretionary**		**GP-Directed**	
Variables	**Unweighted ratio**	**Unweighted level**	**Weighted ratio**	**Weighted level**	**Weighted ratio**	**Weighted level**	**Weighted ratio**	**Weighted level**
GP_region_{Europe}	0.023	0.501	0.003	-0.249	-0.018	-2.412	0.020	-0.323
	(0.027)	(0.342)	(0.046)	(0.576)	(0.027)	(0.764)***	(0.031)	(0.752)
GP_region_{RoW}	-0.096	-0.842	-0.164	-1.906	-0.062	-2.196	-0.102	-2.490
	(0.034)***	(0.456)*	(0.037)***	(0.848)**	(0.024)***	(0.995)**	(0.025)***	(0.797)***
$GP\_strategy_{VC}$	-0.026	-0.704	-0.082	-1.945	-0.035	-1.638	-0.047	-2.426
	(0.021)	(0.278)**	(0.028)***	(0.512)***	(0.015)**	(0.626)***	(0.022)**	(0.648)***
$GP\_strategy_{Debt}$	-0.022	-0.672	-0.052	-1.556	-0.014	-1.902	-0.039	-1.150
	(0.038)	(0.499)	(0.063)	(0.762)**	(0.037)	(0.865)**	(0.035)	(1.036)
GP_size_{Middle}	0.067	1.048	0.024	1.000	0.017	0.063	0.007	0.554
	(0.026)**	(0.266)***	(0.024)	(0.419)**	(0.012)	(0.376)	(0.018)	(0.400)
GP_size_{Top}	0.112	3.155	0.109	4.659	0.056	3.264	0.053	3.321
	(0.025)***	(0.276)***	(0.024)***	(0.399)***	(0.012)***	(0.412)***	(0.017)***	(0.418)***
$GP\_prior\_5yr\_PME$	-0.029	-0.108	-0.056	0.462	-0.038	0.169	-0.018	0.330
	(0.013)**	(0.133)	(0.025)**	(0.304)	(0.012)***	(0.364)	(0.019)	(0.442)
$Five\ year\ series\ fixed\ effect$	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1165	1165	1165	1165	1165	1165	1165	1165
Adjusted R-squared	0.061	0.148	0.143	0.145	0.099	0.139	0.079	0.099

Table 6. Regression Analyses of Alternative Vehicle Performance by GP Characteristics. Each alternative vehicle is an observation; the dependent variable is the raw PME performance in Panel B. (See text for definitions.) Weighted regressions use the sum of the vehicles capital commitments as weights. GP prior five-year mean PME is an average over the previous five years, weighted by vehicle commitments. The reference categories are vintage years 1980-1999, North America (US & Canada) for GP region, buyout for GP strategy, and bottom tercile for GP size. *, ** and *** denote statistical significance at the 10%, 5% and 1% level, respectively. PMEs are winsorized at the 99th percentile.

	All Alternative vehicles				**Discretionary**	**GP-Directed**
Variables	**Unweighted**	**Weighted**	**Unweighted**	**Weighted**	**Weighted**	**Weighted**
$Vehicle\_type_{Discretionary}$	-0.464	-0.238	-0.335	-0.184		
	(0.277)*	(0.342)	(0.288)	(0.350)		
GP_region_{Europe}	0.061	0.089	0.074	0.085	0.010	0.127
	(0.079)	(0.058)	(0.087)	(0.055)	(0.063)	(0.084)
GP_region_{RoW}	0.197	0.154	0.230	0.176	-0.184	0.626
	(0.202)	(0.313)	(0.251)	(0.345)	(0.167)	(0.675)
$GP\_strategy_{VC}$	-0.084	0.043	-0.047	0.029	-0.054	0.113
	(0.077)	(0.113)	(0.078)	(0.112)	(0.127)	(0.164)
$GP\_strategy_{Debt}$	-0.097	-0.056	-0.074	-0.055	0.001	-0.073
	(0.048)**	(0.070)	(0.051)	(0.074)	(0.138)	(0.059)
GP_size_{Middle}	0.061	0.160	0.043	0.255	-0.164	0.413
	(0.155)	(0.200)	(0.145)	(0.190)	(0.334)	(0.126)***
GP_size_{Top}	0.077	0.229	0.056	0.261	-0.318	0.540
	(0.133)	(0.193)	(0.112)	(0.183)	(0.323)	(0.105)***
$GP\_prior\_5yr\_PME$			0.355	0.309	0.637	0.213
			(0.076)***	(0.079)***	(0.182)***	(0.075)***
$Five\ year\ series\ fixed\ effect$	Yes	Yes	Yes	Yes	Yes	Yes
$Five\ year\ series\ fixed\ effect * Vehicle\_type_{Discretionary}$	Yes	Yes	Yes	Yes	No	No
Observations	1467	1467	1393	1393	726	667
Adjusted R-squared	0.010	0.031	0.038	0.062	0.059	0.099

Table 7: LP and GP Matching in Alternative Vehicles. Each investment by an individual LP in an alternative vehicle is an observation; the performance variables are the vehicles PME; its adjusted excess PME; and its PME less the weighted average PME of main funds that it has invested in the whole history. We characterize the match between the LP and the GP using their 5-year PMEs prior to the investment: (1) LP and GP above median, (2) LP and GP below median, (3) LP above median and GP above, and (4) vice versa. Weighted averages are computed for each cell using commitment size. PMEs are winsorized at the 0.5th and 99.5th percentiles.

Panel A: Alternative vehicle PME.

	LP+GP+	LP+GP-	LP-GP+	LP-GP-
All	1.16	0.99	1.12	0.97
Discretionary	1.20	0.98	1.22	1.00
GP-Directed	1.14	0.99	1.06	0.95

Panel B: Alternative vehicle adjusted excess PME.

	LP+GP+	LP+GP-	LP-GP+	LP-GP-
All	-0.01	0.06	-0.12	-0.13
Discretionary	0.04	0.07	0.20	-0.26
GP-Directed	-0.04	0.05	-0.30	-0.01

Panel C: Alternative vehicle PME less the weighted average PME of main funds that it has invested in the entire sample period.

	LP+GP+	LP+GP-	LP-GP+	LP-GP-
All	0.10	-0.05	0.09	-0.05
Discretionary	0.14	-0.06	0.19	-0.03
GP-Directed	0.09	-0.05	0.04	-0.08

Panel D: Count of investments

	LP+GP+	LP+GP-	LP-GP+	LP-GP-
All	1189	923	494	813
Discretionary	567	353	182	412
GP-Directed	622	570	312	401

Table 8: Analysis of LP and GP Matching in Alternative Vehicles. Each investment by an individual LP in an alternative vehicle is an observation; the dependent variable is its PME performance. Weighted regressions use the individual capital commitments as weights. The reference categories are buyout for GP strategy and bottom tercile for GP size. We classify LPs and GPs into above-median versus below-median performers, using the average volume-weighted PME in the five years prior to the inception of the alternative vehicle as the performance measure. We form four dummies to characterize the match between the LP and the GP: (1) LP and GP above median, (2) LP and GP below median, (3) LP above median and GP above, and (4) vice versa. but Dummy $HasPriorRelationshp$ indicates if the LP had invested in any of GPs main funds before investing in the alternative vehicle with the GP. Standard errors are shown in parentheses. *, ** and *** denote statistical significance at the 10%, 5% and 1% level, respectively. PMEs are winsorized at the 99th percentile.

Variables	All alternative vehicles		Discretionary		GP-Directed	
GP_size_{Middle}	0.315	0.325	-0.052	-0.051	0.463	0.472
	(0.132)**	(0.136)**	(0.297)	(0.300)	(0.109)***	(0.120)***
GP_size_{Top}	0.310	0.316	-0.107	-0.109	0.542	0.549
	(0.138)**	(0.142)**	(0.286)	(0.290)	(0.149)***	(0.157)***
$GP\_strategy_{VC}$	0.021	0.024	-0.115	-0.111	0.104	0.106
	(0.127)	(0.126)	(0.137)	(0.132)	(0.202)	(0.201)
$GP\_strategy_{Debt}$	-0.044	-0.040	0.004	0.009	-0.071	-0.070
	(0.081)	(0.083)	(0.164)	(0.169)	(0.059)	(0.058)
$HasPriorRelationshp$		0.035		0.030		0.017
		(0.033)		(0.083)		(0.055)
$LP\_PME(+)GP\_PME(-)$	0.009	0.005	-0.001	-0.000	0.060	0.056
	(0.064)	(0.066)	(0.106)	(0.107)	(0.087)	(0.099)
$LP\_PME(-)GP\_PME(+)$	0.145	0.144	0.241	0.241	0.114	0.112
	(0.070)**	(0.070)**	(0.136)*	(0.136)*	(0.088)	(0.091)
$LP\_PME(+)GP\_PME(+)$	0.160	0.159	0.259	0.261	0.129	0.126
	(0.059)***	(0.060)***	(0.072)***	(0.072)***	(0.100)	(0.108)
$Five\ year\ series\ fixed\ effect$	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3419	3419	1514	1514	1905	1905
Adjusted R-squared	0.037	0.038	0.052	0.052	0.080	0.080

Table 9: Adjusted Excess Performance of Alternative Vehicles by LP Type. The performance metric used is the Kaplan-Schoar Public Market Equivalent versus the Russell 3000. The performance of each alternative vehicle is compared to that of the most recent main fund raised by the same group of the same type within the past five years, with an adjustment for the mean PME for main funds in the vintage of the vehicles' formation. (See text of the paper for precise definition.) Weighted averages are computed using commitment size. Excess PMEs are winsorized at the 0.5th and 99.5th percentiles. One vehicle may have more than one LP.

LP type	Vehicle type	N	Weighted Average	p-Value	Average	p-Value	Median
Fund-of-Funds	Discretionary	35	-0.113	0.048	-0.191	0.255	-0.078
	GP-Directed	89	-0.074	0.231	-0.049	0.579	-0.011
Foundation & Endowment	Discretionary	60	0.367	0.000	0.053	0.517	-0.003
	GP-Directed	75	-0.058	0.115	-0.004	0.921	0.001
Insurance & Financial institution	Discretionary	168	0.150	0.011	0.228	0.000	0.060
	GP-Directed	392	-0.011	0.736	0.032	0.398	0.005
Private Pension	Discretionary	30	0.103	0.230	0.049	0.683	0.193
	GP-Directed	56	-0.015	0.783	-0.051	0.462	-0.011
Public Pension	Discretionary	397	-0.256	0.001	-0.049	0.368	0.033
	GP-Directed	121	0.043	0.352	0.045	0.339	0.008
Sovereign Wealth Fund	Discretionary	108	0.040	0.228	-0.031	0.577	-0.136
	GP-Directed	104	-0.185	0.011	-0.204	0.014	-0.075

Table 10: Adjusted Excess Performance of Alternative Vehicles by LP Geography. The performance metric used is the Kaplan-Schoar Public Market Equivalent versus the Russell 3000. The performance of each alternative vehicle is compared to that of the most recent main fund raised by the same group of the same type within the past five years, with an adjustment for the mean PME for main funds in the vintage of the vehicles' formation. (See text of the paper for precise definition.) Weighted averages are computed using commitment size. NA (i.e. North America) includes US and Canada. Excess PMEs are winsorized at the 0.5th and 99.5th percentiles. One vehicle may have more than one LP.

LP region	Vehicle type	N	Weighted Average	p-Value	Average	p-Value	Median
NA	Discretionary	602	-0.130	0.015	0.013	0.757	0.017
NA	GP-Directed	528	0.000	0.993	0.015	0.589	0.005
Europe	Discretionary	81	0.172	0.000	0.195	0.002	0.117
Europe	GP-Directed	140	-0.012	0.772	0.016	0.795	-0.018
RoW	Discretionary	112	0.037	0.263	-0.058	0.300	-0.139
RoW	GP-Directed	119	-0.176	0.007	-0.168	0.017	-0.030

Table 11: Average PME and IRR by Number of Contributions to the Fund. The table tabulates the number of contributions LPs make over the lifetime of the fund for discretionary vehicles and GP-directed vehicles, as well as the average and standard deviation of the IRRs and PMEs of these vehicles.

	Number of contributions	**Count**	**Average IRR**	**STD (IRR)**	**Average PME**	**STD (PME)**
Discretionary	1-5	504	14.52	41.11	1.08	0.81
	6-10	135	17.21	41.32	1.15	0.71
	11-15	48	16.65	25.01	1.13	0.57
	16-20	31	13.52	15.16	1.10	0.40
	>=25	46	13.35	23.60	1.10	0.89
GP-Directed	1-5	149	14.51	45.56	1.07	0.92
	6-10	162	18.06	32.65	1.13	0.77
	11-15	90	18.19	20.82	1.17	0.74
	16-20	94	15.29	19.38	1.09	0.45
	>=25	233	14.12	18.67	1.08	0.39

Table 12: Average PME and Adjusted Excess PME by overlap within LP and GP performance groups. LP+(-) denotes cases where the LP weighted average PME in main funds is > (<=) than the median LP. GP+(-) denotes cases where the GP weighted average PME is > (<=) than the median. High overlap are those where >=30% of the investments overlap for discretionary investments, and >=50% for GP-directed investments. Overlap ratios are based on all cash flows. N denoted the count of LP-GP investments in each class of AV.

Fund Structure	GP performance	Overlap group	N	Average AV Overlap with Main	Average PME	Weighted Avg PME
Discretionary	GP+	High	201	61.95%	1.301	1.124
Discretionary	GP+	Low	495	7.86%	1.083	1.062
Discretionary	GP-	High	55	66.80%	0.878	0.676
Discretionary	GP-	Low	89	6.06%	0.926	0.989
GP-Directed	GP+	High	291	87.56%	1.224	1.176
GP-Directed	GP+	Low	413	13.06%	1.132	1.036
GP-Directed	GP-	High	102	86.18%	0.879	0.715
GP-Directed	GP-	Low	110	13.20%	0.837	0.888

Fund Structure	LP&GP performance	Overlap group	N	Average AV overlap with Main	Average PME	Weighted Avg PME
Discretionary	LP+GP+	High	413	68.42%	1.271	1.154
Discretionary	LP+GP+	Low	657	8.75%	1.207	1.087
Discretionary	LP+GP-	High	76	70.20%	0.950	0.729
Discretionary	LP+GP-	Low	96	6.04%	0.771	0.735
Discretionary	LP-GP+	High	70	60.66%	1.325	1.184
Discretionary	LP-GP+	Low	175	9.37%	1.139	1.042
Discretionary	LP-GP-	High	52	68.76%	0.636	0.744
Discretionary	LP-GP-	Low	53	7.41%	0.853	1.214
GP-Directed	LP+GP+	High	620	84.01%	1.229	1.128
GP-Directed	LP+GP+	Low	582	12.52%	1.344	1.100
GP-Directed	LP+GP-	High	256	83.98%	0.897	0.860
GP-Directed	LP+GP-	Low	190	11.03%	0.751	0.879
GP-Directed	LP-GP+	High	95	85.16%	1.187	1.152
GP-Directed	LP-GP+	Low	281	12.84%	1.022	0.959
GP-Directed	LP-GP-	High	32	89.61%	0.712	0.686
GP-Directed	LP-GP-	Low	54	12.08%	0.822	0.906

Appendix A: Variable Definitions

Variables	Definition
GP_strategy_{xxx}	Dummy variable for GP main strategy: Venture Capital, Debt Related, Buy out
GP_size_{xxx}	Dummy variable for GP size tercile: Bottom, Middle and Top.
GP_prior_5yr_PME	weighted average of the GP's prior 5-year PME
$GP\_fixed\_effects$	Dummy variable for individual GP
type_{xxx}	Dummy for LP types: Funds-of-Funds (reference group): Foundations and Endowments, Insurance and Financial Institutions, Private Pension, Public Pension, Sovereign Wealth Funds
LP_region_{xxx}	Dummy for LP region: US (reference group), Europe and RoW
LP_size_{xxx}	Dummy for LP size tercile: Bottom (reference group), Middle and Top
$LP\_prior\_5yr\_PME$	weighted average of the LP's prior 5-year PME
$LP\_prior\_5yr\_PME \times GP\_prior\_5yr\_PME$	Interaction between weighted average of the LP's prior 5-year PME and weighted average of the GP's prior 5-year PME
T (five-year series)	Time trend variable indicating the five-year period of the dependent variable. We start with 0 for 1980-1984, 1 for 1985-1989 and so on.
T (Vintage year – 1980)	Time trend variable defined as the vintage year of the alternative vehicle minus 1980
$\text{T} \times \text{GP\_region}_{xxx}$	Interaction between GP region and time trend variable
$\text{T} \times \text{GP\_strategy}_{xxx}$	Interaction between GP strategy and time trend variable
$\text{T} \times \text{GP\_size}_{xxx}$	Interaction between GP size tercile and time trend variable
$\text{T} \times \text{Vehicle\_type}_{xxx}$	Interaction between vehicle type and time trend variable
$\text{Vehicle\_type}_{xxx}$	Dummy for vehicle type: Discretionary or GP-directed (reference group)
$LP\_PME(+)GP\_PME(+)$	Dummy for LP performance above median and GP performance above median

Appendix B: Replicating the main fund performance calculations of Harris, et al. (2016). PME calculations use the S&P 500, North American GPs only, and just buyout and venture capital main funds (updated to 2019 as other tables).

	Buyout				Venture Capital			
Vintage year	N	Median	Mean	Weighted average	N	Median	Mean	Weighted average
1985	1	0.93	0.93	0.93				
1986					1	1.58	1.58	1.58
1987	1	0.98	0.98	0.98				
1988	7	1.01	1.22	1.00	8	1.28	1.13	1.35
1989	3	1.17	1.29	1.69	8	1.12	1.24	1.20
1990	6	0.90	0.87	0.86	7	1.14	1.55	1.79
1991	6	1.09	1.16	1.23	5	0.88	0.72	0.61
1992	8	1.24	1.21	1.13	9	1.19	1.66	1.50
1993	10	1.14	1.37	1.12	13	1.13	1.34	1.49
1994	17	1.07	1.18	1.48	16	1.47	2.36	1.37
1995	13	0.98	1.22	1.16	9	1.67	2.05	2.69
1996	19	1.28	1.33	1.34	12	1.52	2.35	1.49
1997	37	1.44	1.46	1.38	21	1.27	1.69	1.13
1998	52	1.33	1.43	1.39	30	1.29	2.22	1.10
1999	45	1.39	1.26	1.24	56	0.67	0.77	0.61
2000	49	1.29	1.43	1.43	74	0.74	0.98	0.82
2001	47	1.47	1.39	1.55	36	0.96	0.95	0.87
2002	40	1.34	1.41	1.33	21	0.67	0.73	0.69
2003	42	1.48	1.56	1.54	15	0.83	3.03	0.85
2004	58	1.29	1.27	1.39	29	0.79	1.44	0.96
2005	85	1.00	1.05	1.09	52	0.86	1.22	1.15
2006	97	1.06	1.19	1.00	67	0.87	1.09	0.98
2007	113	0.99	1.23	1.02	63	0.97	1.05	0.98
2008	97	0.91	0.93	0.91	52	0.94	1.14	1.09
2009	39	0.98	1.02	1.01	30	1.08	1.18	1.03
2010	44	0.97	0.94	0.77	35	1.12	1.19	1.30
Average	936	1.15	1.21	1.20	669	1.09	1.44	1.19
Average 2000s	711	1.16	1.22	1.19	474	0.89	1.27	0.97
Average 1990s	213	1.19	1.25	1.23	178	1.22	1.67	1.38
Average 1980s	12	1.02	1.11	1.15	17	1.33	1.31	1.38

Appendix C: Tables 2 and 3, without private debt GPs.

Table 2 without private debt GPs

Russell 3000 KS PME

Vehicle type	N	25%	50%	75%	Weighted Average PME
MAIN	3157	1.29	1.01	0.77	1.06
Main AV-Associated	619	1.29	1.04	0.82	1.12
DISCRETIONARY	773	1.30	1.01	0.74	1.06
GP-DIRECTED	709	1.31	1.03	0.81	1.04

IRR

Vehicle type	N	25%	50%	75%	Weighted Average IRR
MAIN	3157	18.89	10.34	2.64	11.58
Main AV-Associated	619	19.40	10.89	3.39	13.45
DISCRETIONARY	773	27.27	11.38	-0.69	13.35
GP-DIRECTED	709	23.03	12.21	3.74	12.23

TVPI

Vehicle type	N	25%	50%	75%	Weighted Average TVPI
MAIN	3157	1.87	1.40	1.08	1.49
Main AV-Associated	619	1.81	1.37	1.10	1.52
DISCRETIONARY	773	1.78	1.22	0.96	1.43
GP-DIRECTED	709	1.84	1.41	1.13	1.43

Table 3 without private debt GPs

Vehicle type	N	Weighted average	p-value	Average	p-value	median
All	1332	-0.069	0.005	-0.004	0.855	0.000
Discretionary	694	-0.084	0.054	-0.012	0.756	0.000
GP-Directed	638	-0.059	0.023	0.004	0.902	0.000

Appendix D: Tables 2 and 3, without blocker and off-shore funds.

Table 2 without blocker and off-shore funds

Russell 3000 KS PME

Vehicle type	N	25%	50%	75%	Weighted Average PME
MAIN	3590	1.28	1.00	0.78	1.05
Main AV-Associated	696	1.25	1.02	0.81	1.09
DISCRETIONARY	835	1.28	1.00	0.74	1.05
GP-DIRECTED	695	1.29	1.03	0.79	1.03

IRR

Vehicle type	N	25%	50%	75%	Weighted Average IRR
MAIN	3590	18.36	9.96	2.84	11.37
Main AV-Associated	696	18.46	10.03	3.19	14.15
DISCRETIONARY	835	25.85	11.27	0.00	12.87
GP-DIRECTED	695	23.26	12.03	3.39	12.16

TVPI

Vehicle type	N	25%	50%	75%	Weighted Average TVPI
MAIN	3590	1.83	1.38	1.09	1.47
Main AV-Associated	696	1.78	1.35	1.10	1.50
DISCRETIONARY	835	1.76	1.23	0.96	1.42
GP-DIRECTED	695	1.82	1.38	1.10	1.42

Table 3 without blocker and off-shore funds

Vehicle type	N	Weighted average	p-value	Average	p-value	median
All	1356	-0.065	0.007	0.010	0.678	0.005
Discretionary	738	-0.062	0.124	0.004	0.915	0.008
GP-Directed	618	-0.068	0.012	0.017	0.565	0.004