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ARE LPS FUNDS OF FUNDS? RELATIONSHIP BUILDING IN THE PRIVATE EQUITY INDUSTRY[†]

Abstract

We investigate an informal yet important mechanism in the private equity industry that helps to reduce uncertainty: relationship building. Based on a large sample of private equity funds over the 1980-2010 period, we find that the general partners strategically allocate good funds to loyal investors, who in turn commit to invest also in new funds that are not ex-ante promising. In addition, this effect is stronger for venture capital (VC) funds and more popular among certain types of investors. The bargaining power of the relationship concentrates in the hand of GPs.

JEL Classification: G20 and L10
Keywords: performance, private equity and relationship

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Introduction

Private equity (PE) is an industry characterized by a high degree of opacity and the absence of flexibility for the investors to liquidate their positions before maturity. These properties create severe uncertainty to both the investors (i.e., the limited partners or LPs) and the managers (i.e., the general partners or GPs, to whom the investment is delegated to) of the funds. For instance, LPs face the investment uncertainty of fund payoff, with scarce information and inability to close the position before maturity (Sorensen, Wang and Yang, 2013; Lerner, Schoar and Wongsunwai, 2007). GPs face the capital uncertainty on the placement of new funds, especially in the presence of performance-chasing investors (Kaplan and Schoar, 2005; Chung et al., 2012) and when the underlying investment, such as innovation, requires not only pay-for-performance incentives but also tolerance to failure (Manso, 2011; Tian and Wang, 2012).[1] Moreover, opacity and illiquidity make the explicit contracting between the investor (i.e., the limited partner or LP) and the manager (i.e., the general partner or GP, to whom the investment is delegated to) incomplete (e.g., Kaplan and Strömberg, 2003, 2004; Sorensen, Wang, and Yang 2013), if not suboptimal (e.g., Phalippou, 2009; Phalippou and Gottschalg, 2009).[2] One interesting question is therefore how the industry has come around these issues associated with such opacity and illiquidity.

We postulate that "relationship building" may provide the answer. The main feature of long-term relationship – i.e., repeated interactions between two business parties – is known to overcome the problem of asymmetric information and to be valuable when transparency is low in the banking industry (e.g., Boot, 2000, Bharath et al. 2007, 2011, Repullo and Suarez, 2013; MacLeod 2007 and Malcomson, 2013 provide discussions on relationship contracts). The PE industry could benefit from a similar informal arrangement: a long-term relationship in which GPs allocate the best funds to the "loyal" LPs and the latter promise to reciprocate by investing also in the "cold" vintages of the GPs – i.e., the new funds that are not ex-ante promising – can help reduce both the capital uncertainty of the GPs and the investment uncertainty of the LPs. This mechanism effectively provides insurance to GP's capital raising in exchange for a more predictable performance from LP's perspective.

We consider two alternative hypotheses that differ in terms of the relative bargaining power of the long-term relations. The "supply-driven hypothesis" (or supply-side view) posits that the bargaining power in the PE industry mostly rests with the GPs and that the GPs use it to ensure demand at the

[1] The private equity industry is known to play the important economic role of promoting innovation. See, for instance, Kortum and Lerner (2000) and Hellmann and Puri (2000) on the role of venture capital funds and Lerner, Sorensen, and Strömberg (2011) for the case of buyout funds.

[2] Lerner and Schoar (2004, 2005) discuss the impact of liquidity and legal enforcement on optimal contracting. Kaplan and Strömberg (2009) and Chung et al. (2012) discuss the incentive pay. Cumming (2008) examines the contract between VC and entrepreneurial firm. More institutional features of the PE industry can be found in Gompers and Lerner (2002) and Metrick and Yasuda (2010, 2011).

offering of the new funds. Therefore, they allocate their best funds to LPs who are also willing to invest in cold funds. The bargaining power of the GPs arises from one important feature of PE investment: limited scalability (e.g., Kaplan and Schoar, 2005; Metrick and Yasuda, 2010). Due to this feature, GPs with superior performance choose to keep their new funds of a limited size even when these funds are oversubscribed by the investors. The mismatch between the excess demand (i.e., oversubscription from investors) and the limited supply (due to limited scalability) provides the GPs with bargaining power and makes relationship building – i.e., a favorable allocation of hot deals in exchange for insurance of cold deals – not only possible but also optimal from GPs' point of view.

The alternative "demand-driven hypothesis" (or demand-side view) posits that the bargaining power in the PE industry mostly rests with the LPs. The LPs do not tie their ends with few GPs, but cherry pick the best funds on the basis of LPs' selection skills. This behavior is similar to what "funds of funds" typically do in the hedge fund industry (e.g., Ang et al., 2008; Brown et al., 2004). A long-term relationship between LPs and GPs reflects the efforts of capable LPs to make long-term investments in truly skilled GPs.[3]

We test these hypotheses using a sample of 1,868 PE funds over the 1980-2010 period. Our main finding can be graphically depicted in Figure 1. There, we first proxy for the relationship between a GP and an LP in a given year as the number of years of partnership between the two in the prior five years.[4] For each PE fund, we then consider both the *existing* relationship between its GP and LPs (weighted by LPs' commitment in investment) and that between the GP and its "leading" LP (the LP that commits the maximum capital) prior to the vintage year of the fund. We then sort PE funds into ten deciles according to their performance, proxied by the realized internal rate of return (hereafter, IRR), and plot the average LP-GP relationship within each decile in Panel A and that for the leading LPs in Panel B.

Two patterns emerge from the graphs. First, the LP-GP relationship positively correlates with fund performance. This correlation, by itself, can imply either that GPs allocate better funds to more "closely related" investors or that LPs are able to identify skilled GPs to make long-term investments. Second, the LP-GP relationship displays a hump around zero fund performance. This casts some doubt on the latter interpretation. Indeed, the hump implies that LPs also stay longer with "bad" funds, a feature that would be difficult to explain on the basis of LPs' selection skills. In contrast, this feature is precisely what the supply-side view would predict: in exchange for the favorable allocation of good funds, related LPs are also called on when GPs create new fund that are *ex ante* "cold". These findings, therefore, sketch a

[3] LPs may also use their information indirectly. For instance, Hochberg, Ljungqvist, and Vissing-Jørgensen (2014) develop a model that VC investors have informational hold-up power over the GPs. In this case some long-term relationship between GPs and (informed) LPs is also expected.

[4] We define partnership-year as the product between the total number of funds of the same GP that the LP has invested and the average number of year that the LP have invested in these funds.

preliminary supply-side vision on relationship building as an informal mechanism to reduce risk in the PE industry.

We then provide a formal econometric analysis. We take three steps to differentiate the two hypotheses as well as to explore their implications. In the first step, we investigate the impact of LP-GP relationship on fund performance. In the literature, the track record (i.e., past performance) of the GPs is known to signal their investment skills and to predict the future returns of the new funds they launch (e.g., Kaplan and Schoar, 2005). The demand-side view posits that, in addition to this known relationship, the LP's track record should improve predictability over and above the GPs' track record.

By contrast, the supply-side view posits the GP decides to allocate its best funds to the "loyal" LPs. This allocation incentive implies that the public signal is less precise than the GP's own private knowledge. In this context, the *interaction* between GP's track record and LP-GP relationship can help predict fund performance. To see the intuition, consider a PE fund with a good track record. The information contained is such track record is less precise than the GP's own private knowledge. The action to allocate funds provides additional information. This implies that, according to the supply-side view, given that the GP will allocate his best funds to the more related LPs, the *interaction* between the track record and the LP-GP relationship of the fund provides an additional signal.

We design two tests to verify these performance-related predictions. We first examine whether past LPs selection skills can help predict fund return above and beyond GPs' track record. We find that, individually used both the LPs and GPs' track record help forecast future fund performance. However, the LP's predictive power is largely absorbed by GP's track record, suggesting that GP is the dominant economic source for performance and that LPs have scarce ability of their own. In the second test, we explore whether fund performance increases in the *interaction* between GPs' track record and the LP-GP relationship of the fund as the supply-side view would predict. The results confirm this prediction. A one-standard-deviation increase in both GPs' track record and the LP-GP relationship can increase annual fund performance by as high as 9.0%.[5] The results of the two tests, therefore, are in general in favor of the supply-side view rather than the demand-side vision.

In the second step, we focus on the way LP-GP relationship affects capital flows. Capital flows are known to be increasing and concave with respect to performance due to the restrictions on investments imposed by GPs concerned with the limited scalability of their investment opportunities. However, this

[5] Notably, the LP-GP relation itself does not enhance performance in our test. This insignificance is consistent with the supply-driven view, in which LPs invest in not only good funds but also cold funds. In other words, LPs benefit from reduced investment uncertainty for each fund they invest, not necessarily from enhanced average return. By contrast, the demand-side view would posit that relationship itself, as a proxy for long-term investments made by skilled LPs, should be associated with performance, which is unsupported by the data.

should change in the presence of GPs' strategic allocation. A favorable allocation of hot deals to related LPs effectively relaxes the restrictions that related LPs face in investing in better performing funds, reducing concavity. Insurance for cold deals, on the other hand, requires related LPs not to walk away from "bad" vintages of funds, which reduces the first-order sensitivity of capital flow to (poor) performance. In other words, the supply-side view posits that both the capital the capital-performance sensitivity as well as its concavity can be reduced by relationship building, because more related LPs face a less constrained (concave) capital flow-performance relation for outperforming funds in exchange of a less performance-sensitive supply of capital in the case of poor-performing funds.

By contrast, the demand-side view posits that relationship enhances the capital-performance sensitivity, because the demand of the LPs more capable of making long-term investment by cherry picking skilled funds to should be more associated with fund performance. Furthermore, GPs, concerned by the enhanced capital uncertainty arising from bad performance, may further constrain fund size to stay clearly away from the potential damage that may arise from limited scalability. In this case, capital-performance concavity also gets enhanced. Empirically, the introduction of LP-GP relationship in the traditional flow-performance analysis reduces both the sensitivity and the concavity of capital flows with respect to performance, which is consistent with the supply-side view of relationship building.

We provide two more tests to verify the flow implication. First, given that VC funds are more subject to limited scalability than Buyout funds (Metrick and Yasuda, 2010), we expect relationship-building to more significantly affect the flows for VC funds according to the supply-side view. And indeed, we find that the LP-GP relationship offsets the flow concavity for VC funds more than for Buyout funds. Second, if the LP-GP relationship provides informal insurance for capital flows, it should be in general helpful at the launch of new funds and particularly valuable in the launching of cold funds. And indeed, we find that the stronger the relationship between a GP and its existing LPs, the higher is the probability that the GP can offer new funds and, in particularly, new cold funds. For instance, a one-standard-deviation increase in the relationship the GP has with its existing LPs is related to a 19.3% higher relative probability of launching a new "cold" fund. These additional results are more difficult to explain by the demand-side view, as the selection ability of LPs should not differ between VC and Buyout funds, and will only hurt, rather than help, the likelihood of launching a cold fund. Hence, relationship building is mainly driven by GPs' allocation strategy.

In the third and last step of our analysis, we extend our economic intuition and check the robustness of our results. First, investigate how the existing relationship affects the likelihood of getting a new partner – i.e., to start a new relationship. Unlike the previous tests which are conducted at the fund level, here we pair up LPs and GPs and test the likelihood for new LP-GP pairs to be formed as a function of

their existing relationship with respect to all possible GPs and LPs. Interestingly, we find that the GPs' existing relationship helps them to get a new partner, but that the LPs' existing relationship hurts, if anything, the LPs' chance of pairing up with a new GP. This asymmetry further illustrates that the bargaining power between the GPs and LPs tilts toward the former, as the LP-GP relationship seems to impose an obligation rather than offering an option to the LP. Second, we show that investing in cold funds benefits LPs in receiving more hot funds from GPs in the future. This effect is especially significant for LPs with low existing relationship with GPs, suggesting that investing in cold funds is one explicit channel to build up relationship. Finally, we also investigate how the LP-GP relationship affects the capital flows for different types of LPs. We find that the LP-GP relationship is stronger for endowments and pension funds, and weaker for advisors, insurance, and banks. A set of robustness checks show that our results are robust to alternative proxies for the LP-GP relationship.

Our main contribution is to focus on the relationship building aspect of the private equity industry. Most of the literature on private equity has concentrated on the analysis of performance (e.g., Ljungqvist and Richardson, 2003; Cochrane, 2005; Kaplan and Schoar, 2005; Sorensen, 2007; Lerner, Schoar, and Wongsunwai, 2007; Phalippou and Gottschalg, 2009; Hochberg, Ljungqvist, and Lu, 2007; Korteweg and Sorensen, 2010; Franzoni, Nowak and Phalippou, 2012; Robinson and Sensoy, 2012). Various factors that may affect PE investments and performance, such as diversification (Lossen, 2006), fund and investor type (Ljungqvist and Richardson, 2003; Phalippou, 2010), capital flows (Gompers and Lerner, 2000; Ljungqvist, Richardson and Wolfenzon, 2007; Diller and Kaserer, 2009), and market conditions (Gompers, Kovner, Lerner and D. Scharfstein. 2008), are also extensively examined in the literature. In the process it has also identified a "concave" flow performance relationship that has been explained in terms of capacity to provide performance and deliberate choice of the GPs to restrict investment in the fund to too many LPs. None of the studies, however, considers the case that fund performance may be strategically allocated to investors in exchange for capital insurance, which is the focus of our paper.

By doing so, we also contribute to the literature examining the economic role of connections and relationships. In the banking industry, relationship building is known to be one important element to reduce information asymmetry and to boost banking business (Boot 2000; Bharath et al., 2007, 2011; Repullo and Suarez, 2013), which also benefits the banking services in the private equity industry (Hellmann, Lindsey and Puri, 2008; Fang, Ivashina and Lerner, 2013). Meanwhile, networking itself could be helpful to venture capitalists by reducing the entry of new competitors in a local market (Hochberg, Ljungqvist and Lu, 2007, 2010). We extend these studies by directly examining the long-term relationship between the investors and managers in the private equity industry.

Our results also have important normative implications. Since formal contracts in the private equity industry are essentially incomplete, uncertainty in the PE business could be especially harmful to innovation, whose success requires not only pay-for-performance incentives but also tolerance to failure (Manso, 2011; Tian and Wang, 2012). Relationship building, by providing an informal mechanism to reduce uncertainty, may help to reduce "short-termism" and contribute to the success of the industry, as documented in the literature (e.g., Kortum and Lerner, 2000; Hellmann and Puri, 2000; Lerner, Sorensen, and Strömberg, 2011), in promoting innovation.

The rest of the paper is structured as follows. In Section II, we provide the intuition for the main hypotheses, while in Section III, we describe the data and the construction of the main variables. In Section IV, we provide evidence on the link between the LP-GP relationship and fund performance. In Section V and VI, we investigate how the LP-GP relationship is related to fund flows and the offering of new funds, respectively. Section VII provides additional tests and robustness checks. A brief conclusion follows.

II. Main Hypotheses

We consider two alternative hypotheses on relationship building. The first ("supply-side view") posits that the bargaining power in the PE industry mostly rests with the GPs. GPs use their power to ensure demand at the offering of the new funds. They allocate hot funds to "loyal" LPs in exchange for their willingness to invest also in cold funds.

More specifically, a PE fund with a good track record is expected by the public to deliver superior performance. This information contained in the track record of the GP, however, is less precise than the GPs' own knowledge (i.e., the GPs' private information about the investment opportunity as well as their own ability). Using such private information, the GP will allocate more of its best funds the the related LPs in an effort to build and maintain relationships. In this case, funds with good track record and low LP-GP relationship will deliver lower performance than funds with good track record and high LP-GP relationship. In other words, fund performance increases in the *interaction* between the track record of the GP and the LP-GP relationship of the fund, as the private information implied by a high LP-GP relationship reinforces the prediction of a good public signal.

It is worthwhile to point out, however, that a high LP-GP relationship alone may not predict superior fund performance. This is because GPs also allocate cold funds to the related LP. In this case, funds with high LP-GP relationship and *bad* GP's track record, should deliver lower performance than funds with high LP-GP relationship and *good* GP's track record. Hence, the predictability of fund performance relies

on the *interaction* between the track record of the GP and the LP-GP relationship of the fund, rather than on the LP-GP relationship itself.

The alternative hypothesis ("demand-side view") posits that the bargaining power in the PE industry mostly rests with the LPs. The LPs do not tie their hands with few GPs, but cherry pick the best funds. In other words, LPs act as sorts of "funds of funds", screening performance. In this case, the most important predictor of fund performance is LP's selection skills: a fund invested by LPs with superior track records should deliver superior return over and above the one predicted by GPs' track record. The above predictions from the supply- and demand-side views of relationship building allow us to differentiate the predictions about fund performance from the two competing hypotheses as follows.

H1 (supply-side view): LPs prior track record does not predict future fund performance over and above the track record of the GPs. Fund performance is positively associated with the interaction between the track record and the LP-GP relationship of the fund.

A1 (demand-side view): LPs prior track record helps to predict future fund performance over and above the track record of the GPs.

The two hypotheses have different implications in terms of the flow-performance relationship. It has been shown that the flow-performance relationship in the PE industry is concave – very high performance does not generate flows at the same speed and very low performance loses quite a lot of flows. The concavity has been explained in terms of limited scalability that induces GPs to stay small even when vintages of funds with expected superior performance are typically oversubscribed.

The supply-side view posits that the GPs allocate their best funds to "loyal" LPs in exchange for their willingness to invest also in not very good funds. This implies that the LP-GP relationship "smooths" the concavity of flow performance relationship. A stronger LP-GP relationship trades off better demand on the low performance side with higher allocation and fewer restrictions on the high performance side. In this case, both the capital flow-performance sensitivity and its concavity are reduced by the LP-GP relationship.

The demand-side view, instead, predicts the very opposite. The ability of the LPs to cherry pick the best funds increases the concavity of the flow-performance relationship. Indeed, LPs who are able to select good funds to make long-term investments will be more sensitive to fund performance, as they will try to avoid "cold" funds for their long-term investments. In this regard, the capital-performance sensitivity should increase among the LPs characterized by long-term relationship. Regarding the concavity of the capital-performance relationship, we first notice that LP's investment skills should be

uncorrelated with the level of scalability of the underlining investment opportunity of the PE funds in which they invest. However, the GPs may want to constrain the size of the funds they offer in order to avoid the potential negative effects of bigger fund size. In this case, the GP's action will increase capital-performance concavity. Hence, both capital-performance sensitivity and its concavity are likely to increase under the demand-side hypothesis. These considerations allow us to lay out the predictions regarding the capital-performance relationship from the two hypotheses as follows.

H2 (supply-side view): The LP-GP relationship reduces the capital-performance sensitivity as well as its concavity.

A2 (demand-side view): The LP-GP relationship increases the capital-performance sensitivity as well as its concavity.

In this context, the critical factor to affect the allocation of performance in the PE industry is the bargaining power between GPs and LPs. According to the supply-side view, the higher the GP's bargaining power, the greater is its ability to offer new funds using the connected LPs as investors. This "allocation power" will be especially helpful to the vintages of "cold" funds that are not ex ante promising. In contrast, the demand-side view posits that the LPs cherry pick among the best funds. Therefore, the ability to offer a new fund, especially a new cold fund, will not increase in the existing relationship, because LPs' demand is largely determined by the expected performance of the fund. This allows us to lay out the last prediction made by the two competing hypotheses.

H3 (supply-side view): The ability of a GP to offer new (cold) funds increases in the GP's relationship with its existing LPs.

A3 (demand-side view): The ability of the GP to offer new funds is not related to the GP's existing relationship.

Before we proceed to test these predictions, we describe the data and the main variables.

III. Data Description and Main Variables

A. Data Source

Our main source of data is Preqin. Preqin provides the historical investment information of LPs, including LP's name, LP's address, LP's commitment on each fund. This dataset contains 8,453 funds that have

vintage years from 1969 to 2010, excluding funds with missing fund name, missing vintage year, missing GP, missing LPs. These funds are managed by 3,246 GPs and invested in by 3,202 LPs.

Based on available disclosure, Preqin also reports fund-level information including net internal rate of return (IRR), multiplex, residual value to paid-in (value rvpi), and called up. If we focus on this subset of funds that appear in the LP's investment portfolios and exclude the funds whose vintage years are before 1980, we have available a sample of 2,055 PE funds that have available fund-level information. Within this sample, 1,868 funds have the LP investment information we need for our analysis.

Table 1 provides details of the sample broken down by years. The left panel reports the number of *existing* PE funds in a given year, as well as the total market capitalization of the industry (in billions of USD), the total number of LP's and GP's in the industry, and the average number of PE funds in an LP's portfolio. When we cannot pin down the exact liquidation year of a PE fund, we apply a ten-year duration to it. The right panel reports the number of new funds "vintages" in each year as well as their average size (in millions of USD), and the number of new GPs enter the industry. To save space we only tabulate the information for every two years.

The most striking feature of the PE industry we can see from this table is the remarkable growth of the industry during the last three decades. It had started with less than 50 funds and less than $2 billion of assets under management in the early 1980s and has grown to more than 5,000 funds and around $2 trillion of capital by the end of year 2010. The biggest increase in the number of funds and total net assets (TNA) actually takes place in the first decade of this century, suggesting that the recent decade is essential for the development of the PE industry. In the last a few years of the decade, partially due to the global financial crisis, the industry stabilizes at about five to six thousands of funds.

Likewise, the number of service providers (the "GPs") and that of the investors (the "LPs") of the industry has also grown by more than ten times during the same period. Noticeably, the increase in the number of LPs and GPs is less than that of the funds, suggesting a repeated "matching" between same LPs and GPs.

B. Main Variables

The most important fund-level information for our analysis is fund performance, which is processed in the following way. First, consistent with the existing literature (e.g., Chung, Sensoy, Stern, and Weisbach, 2012; Hochberg, Ljungqvist, and Vissing-Jørgensen, 2014; Lerner, Schoar, and Wongsunwai, 2007), we rely on fund IRR as our main performance measure.

Preqin provides two types of information on fund IRR (see Chung, Sensoy, Stern, and Weisbach, 2012, Hochberg, Ljungqvist, and Vissing-Jørgensen, 2014). The first type is realized IRR, which can be regarded as the *ex post* return of a fund from its inception year to its liquidation year. Each fund, when applicable, has only one realized IRR. The second type is the "interim" IRRs for each year between the inception year and the liquidation year (or year 2010, the end of the sample period, whichever comes first) of a fund. Interim IRRs are reported by PE funds to their LPs. They combine the objective cash-on-cash returns and unrealized capital gains the PE fund expects to realize in the future.[6]

We follow the literature and rely on realized IRR as the main fund performance measure. We also follow Lerner, Schoar, and Wongsunwai, (2007) and include funds that are un-liquidated yet but have a minimum of 5 years of cash flows by the end of our sample period (year 2010). For these funds, we use the interim IRR reported for the year of 2010 as a proxy for fund performance. When the liquidation horizon of a fund is longer than ten years, we follow Hochberg, Ljungqvist, and Vissing-Jørgensen (2014) and use the realized IRR by the end of its tenth year as fund performance to rule out data problems. It is important to point out, however, that our results are robust whether we add or remove these un-liquidated funds. Based on fund performance, we also compute the performance of the GPs and LPs as commitment value-weighted average performance of all valid funds in their existing portfolio.

Our main proxy for the relationship between a GP and an LP is built following the spirit of the "bank relationship" used in the banking literature (e.g., Bharath et al., 2007, 2011). Specifically, the relationship between a GP and an LP in a given year is defined as the logarithm of the number of partnership-year between the two in the previous five years, where partnership-year is the maximum number of years that the LP has invested in any fund of the GP.[7] We denote this variable as *Rel_PartnerYear*. In addition, we also consider two alternative measures on LP-GP relationship based on either the fraction of funds of a GP that the LP had invested in the prior 5 years (*Rel_Intensity*), or the logarithm of the maximum number of years that the LP has invested in the GP in our sample (*Rel_LongTerm*). The Appendix provides more detailed definition of these variables.

In our later fund-level tests involving performance and capital flows, we also aggregate the LP-GP relationship at the fund level. In terms of our main variable, for instance, we can compute for any given fund the average value of *Rel_PartnerYear* between its GP and all its LPs, weighted by the capital commitment of the latter. This variable describes the average *existing* relationship between the GP and the LPs of the fund prior to the vintage of the fund. Alternatively, we also use the value of *Rel_PartnerYear*

[6]Hochberg, Ljungqvist, and Vissing-Jørgensen (2014) and Chung, Sensoy, Stern, and Weisbach (2012) provide more detailed descriptions.

[7]Hence, if an LP has invested in two funds of a GP for 2 and 4 years in the previous 5 years, respectively, then the partnership-year between the LP and the GP is 4. Note that although we cap the period in computing the LP-GP partnership by 5 years, extending the ceiling will not change our main results.

between its GP and its leading LP – i.e., the LP that commits the largest amount of capital – to describe the most important LP-GP relationship of the fund. We exclude funds that do not have data to compute valid relationship values.

Our final sample includes 1,868 PE funds with 1,520 LPs as investors. Given that there are fewer funds and LP investment records before 1980, our main testing period is between 1980 and 2010.[8] The average and median sizes of the funds are $350 million and $155 million (in 1990 USD), respectively. The average (median) fund IRR is 11.7% (8.7%). Our sample has very similar properties to what has been reported in the literature. For instance, the average (median) realized fund IRR is 16.6% (14.2%) for buyout funds and 15.6% (11.4%) for the combination of buyout, VC, and real estate funds – these numbers are very close to what have been reported by Chung, Sensoy, Stern, and Weisbach (2012).[9]

In Table 2, we provide some descriptive statistics. Panel A reports the summary statistics of our proxies of LP-GP relationship, including *Rel_PartnerYear*, *Rel_Intensity*, and *Rel_LongTerm*, for all the LP-GP pairs that have *none-zero* relationship in a given year. Since *Rel_PartnerYear* and *Rel_LongTerm* are defined as the logarithm of the numbers of partnership-year in the past (five years and entire history, respectively), we also report the distribution of their corresponding numbers of partnership-year before we take the logarithm, which we referred to as *PartnerYear* and *LongTerm*, in order to better describe the un-scale length of partnership-year between LPs and GPs in the industry. The first two Models report the mean and variance of the pooled sample of none-zero LP-GP relationship. The next five Models report the 10%, 20%, 50%, 80%, and 90% quantile values of the sample. The last Model reports the number of observations of the sample. The average partnership-year between related LPs and GPs is 3.2 years out of the most recent five years. The long-term partnership-year could be as high as 9 years for the 90 percentile of related LP-GP pairs. These numbers suggest that long-term relationship is quite common in the industry.

Panel B reports the distribution of a list of characteristics for PE funds, including performance (*Fund_Perf*), size (*Fund_Size*, in millions of USD), vintage sequence of a fund in a year (*Fund_Sequence*), as well as the relationship between its GP and all LPs that invests in the fund. The LP-GP relationship of *a fund* is computed either as the commitment value-weighted average relationship between its GP and all its LPs (the *VW LP-GP Relationship*), or as the relationship between its GP and its leading LP in terms of commitment (the *Leading LP-GP Relationship*) *before* the vintage of the fund.

[8] We allow GPs' and LPs' track records to be dated before 1980 to maximize the sample size of our analyses. Our main conclusions are robust when we include the pre-1980 period.

[9] In Chung, Sensoy, Stern, and Weisbach (2012), the average (median) fund IRRis 16.5% (14.3%) for buyout funds and 15.1% (10.6%) for the combination of buyout, VC, and real estate funds. In addition, the median fund size is 312 and 216 millions of USD for buyout funds and the combination of the three types of funds in our sample, compared with 380 and 210 in Chung, Sensoy, Stern, and Weisbach (2012).

Note that these variables can take a value of zero, if the LPs of the specific fund have never invested in previous funds of the GP. For instance, if we focus on the existing *Rel_PartnerYear* between a fund's LPs and GP, the average number of partnership-years between the two in the prior five years could be anywhere between zero – if the LPs and GP start a new relationship based on the fund – and five – if the LPs and GP have always been related. Empirically, at least 20% of the funds have zero existing partnership-year to begin with. In other words, they are invested by new LPs. At the same time, the existing number of partnership-year could be as high as 5 years at the 90% quantile level, suggesting that more than 10% of PE funds are invested entirely by the LPs that are always related with the GP. Overall, there is a huge variation in terms of *existing* relationship between a fund's LPs and GP. This feature allows us to test the implications of relationship building in the PE industry in later sections.

Panel B also reports the distribution for a list of characteristics of the LPs and GPs of PE funds, including age (*LP_Age and GP_Age*), performance (*LP_Perf and GP Perf*), and the cumulative commitment of an LP in the PE industry. Since one PE fund may be invested by many LPs, for a given PE fund, we report either the commitment-weighted average of the characteristics of all the LPs that have invested in the fund or the characteristics of the leading LP of the fund. All the GP and LP characteristics are lagged – i.e., they are computed prior to the vintage of the specific fund. The Appendix provides the detailed definition of each variable. We see that all these characteristics have reasonable distributions.

Finally, Panel C reports the correlation among the main variables and these characteristics. We observe that fund performance is positively correlated with relationship. However, the magnitude of the correlation is much smaller compared to the correlation between fund performance and (lagged) LP performance, suggesting that long-term relationship is not a direct consequence of LP's long-term investments. Furthermore, GP performance is more correlated with fund performance than LP performance, implying that LP's track record may not predict superior return over and above that predicted by GPs' track record. These correlations shed some first light on the major determinant of fund performance in the PE industry, which we will examine in more details in the next section.

IV. Fund Performance and LP-GP Relationship

We now focus on the first testable restriction and investigate the performance of the PE Funds. To examine whether LPs' track record can be used to select good PE funds over and above GPs' track record, we extend the specification of Kaplan and Schoar (2005) and estimate the following Panel regression:

$$Fund\_Perf_{f,t} = \alpha_0 + \beta_1 \times GP\_Perf_{f,t-1} + \beta_2 \times LP\_Perf_{f,t-1} + c \times M_{f,t-1} + e_{f,t}, \qquad (1)$$

where $Fund\_Perf_{f,t}$ is the performance of fund f that is vintage in year t, $GP\_Perf_{f,t-1}$ and $LP\_Perf_{f,t-1}$ refer to the performance of the GP and LP of the fund prior to the vintage year of the fund, respectively, and $M_{f,t-1}$ stacks a list of control variables, including the logarithm of GP's age (*GP_Age*), the logarithm of the size of GP (*GP_Size*), the logarithm of LP's total historical investments in the PE industry (*LP_TotalCommit*), as well as the logarithm of the size and sequence of the fund. We follow the standard literature (e.g., Kaplan and Schoar, 2005; Lerner, Schoar, and Wongsunwai, 2007) and cluster the standard errors at the GP level and include fixed year and fund-style effects. All GP and LP control variables are lagged by one year.

We report the results in Table 3. Models 5 to 10 use the performance and other characteristics of the funds value-weighted according to the commitment value of all the LPs investing in the fund, while in Models 11 to 16, performance and the other characteristics of the funds are those of the leading LPs of the PE funds. The results show that, used alone, both lagged GP and LP predict fund performance. A fund managed by a good GP is likely to have a superior performance. Also, a fund invested by LPs which had a previous track record in selecting good funds is likely to perform better. A one-standard-deviation increase in the past performance of GP (LP) is related to a 8.8% (7.8%)[10] higher performance of the fund. In this case, LPs seem to have some selection skills, though their performance impact is less than that of the GPs. However, if we consider jointly both GP and LP (Models 9, 10, 15 and 16), the impact of the LP is largely absorbed by GP's performance. By contrast, the impact of GP remains significant and of a similar economic magnitude, suggesting that GP is the ultimate important economic source to predict performance. Overall, these findings suggest that GP determines fund return. Hence, GP has better information and could use this information strategically.

Next, we investigate whether fund performance increases in the *interaction* between GPs' track record and the LP-GP relationship of the fund. We therefore estimate the following Panel specification:

$$Fund\_Perf_{f,t} = \alpha_0 + \beta_1 GP\_Perf_{f,t-1} + \beta_2 Relation_{i,f,t-1} + \beta_3 GP\_Perf_{f,t-1} \times Relation_{i,f,t-1} + c \times M_{f,t} + e_{f,t}, \quad (2)$$

where $Relation_{i,f,t-1}$ refers to the fund-level LP-GP relationship prior to the vintage year, and other variables/conditions are as specified before. We report the results in Table 4. Models 1 to 5 use the commitment-weighted average value of *Rel_PartnerYear* between the GP of a fund and all its LPs. All LP characteristics, accordingly, are computed as the commitment-weighted average of the characteristics from all LPs. More specifically, Model 1 relates fund performance to the LP-GP relationship. Models 2 to

[10] We estimate the performance impact of the regression model $y = \beta \times x$ as $\Delta y = \beta \times \Delta x$, where Δx refers to the one standard deviation change in the independent variable x. This allows us to estimate the impact of GP performance for Model 4 as $0.408 \times 0.215 = 8.8\%$ and the impact of LP performance for Model 7 as $0.446 \times 0.172 = 7.8\%$.

4 include the interaction term between the LP-GP relationship and GP's lagged performance, and employ different fixed effects and clustering specifications to illustrate the robustness of the results. In Model 5, we further interact relationship with fund size in order to examine the potential impact of fund size. In contrast, Models 6 to 10 use the *Rel_PartnerYear* value between the GP of a fund and its leading LP, as well as characteristics of the latter.

The results show that, in general, the LP-GP relation does not help to predict performance – i.e., related LPs are likely to get good deals as well as bad deals. Instead, fund performance increases in the *interaction* between the LP-GP relationship and lagged GP performance. A one-standard-deviation increase in both GPs' track record and the LP-GP relationship can increase fund performance by as high as 9.0% in model 5.[11] The magnitude of the impact is similar in Models 2 to 4, and is highly relevant. This observation directly verifies the supply-driven view that GPs allocate more hot deals according to their private information to their related LPs. In contrast, the demand-side hypothesis implies that relationship itself, as a proxy for long-term investments made by skilled LPs, should be associated with performance.

As we argued, the economic power for GPs to adopt strategic allocation comes from limited scalability, in which case not all subscriptions of good funds by investors can be filled. Given that the constraint of limited scalability is less binding for bigger funds, we expect fund size to negatively affect the degree of favorable allocation. That is, a larger fund size, by reducing the gap between demand and supply for hot funds, reduces the degree of over-subscription and thus the incentive or power of the GP to strategically allocate the deal. Consistently, Model 5 shows that fund performance decreases in the interaction between fund size and LP-GP relationship, suggesting a negative conditional impact of fund size strategic allocation. Nonetheless, the main result that funds of skilled GPs that are invested by highly related LPs deliver superior performance remains unchanged even when we further control for the potential impact of fund size on allocation.

Taken together, these results suggest that LP's ability to select good funds depends on their relationship with the GPs.

V. Investor Flows and LP-GP Relationship

[11]For the interaction term$y = \gamma \times xz$, the impact of changes in independent variables is estimated as follows: $\Delta y = \gamma \times (x \Delta z + \Delta xz + \Delta x \Delta z)$. The mean and the standard deviation are 0.112 and 0.215 for GPs' track record and 0.814 and 0.630 for LP-GP relationship, respectively. The regression coefficient is $\gamma = 0.237$. In this case, the total performance impact can amount to $0.237 \times (0.112 \times 0.630 + 0.215 \times 0.814 + 0.215 \times 0.630) = 0.237 \times (0.071 + 0.175 + 0.135) = 9.0\%$, among which the $\Delta x \Delta z$ term alone can contribute 3.2% of return.

We now focus on the second testable restriction and explore the way the LP-GP relationship affects capital flows. We estimate the following discrete choice specification:

$$D_{i,f,t} = \alpha_0 + \beta_1 GP\_Perf_{f,t-1} + \beta_2 Relation_{i,f,t-1} + \beta_3 GP\_Perf_{f,t-1} \times Relation_{i,f,t-1} + C \times M_{f,t} + e_{i,f,t}, \quad (3)$$

where $D_{i,f,t}$ is a dummy variable that takes the value of 1 if LP i had invested in $Fund_{f,t}$ newly launched in period t, and other variables are as explained before. Again, we focus on fund-level *Rel_PartnerYear* as the main relationship proxy. In the main specifications, the standard errors are clustered at the LP-GP level with fixed year effects. Clustering at the LP-GP level means we cluster at the *intersections* between GP and LP.

We report the results in Table 5. We estimate a Logistic specification in Models 1 to 4 and a Probit specification in Models 6 to 10. As a robustness check, we also include fixed fund-style and LP-style effects in Models 5, and 10. Models 1, 2 and 5, 6 illustrate that the investment of LPs' in new funds is positively related to prior performance and negatively related to its square, suggesting that flow is an increasing but concave function of performance. This concavity, as illustrated by the previous literature, reflects the feature of limited scalability of investment opportunities in the PE industry.

When the LP-GP relationship is introduced into the regression (in Models 3-5 and 8-10), this variable offsets the increasing and concave relation between capital flow and fund performance. More specifically, we notice that capital flows increase in the interaction term between the LP-GP relationship and the squared GP performance, suggesting that a good relationship offsets flow concavity. This result is consistent with the supply-side rather than the demand-side view of relationship building, as it suggests that related LPs are less subject to limited scalability for good funds, which is exactly the outcome of GPs' favorable allocation of good funds to more related LPs.

Next, we see that the LP-GP relationship reduces the sensitivity of capital flows to past performance though the interaction term between relationship and GP performance. As we argued, this reduction of the first-order flow sensitivity comes from the implicit insurance role played by related LPs for funds with low performance. As we have seen in Figure 1, related LPs face the implicit constraint to insure capitals. Their commitment makes the total demand less sensitive to past performance. Overall, the results in Table 5 are consistent with the supply-side rather than the demand-side view of relationship building.

Next, we look more in detail at the different classes of PE funds. Given that VC funds are more subject to limited scalability than buyout funds (Metrick and Yasuda, 2010), we expect the LP-GP relationship to more significantly affect the flows for VC funds. We therefore re-estimate our main specification with the full list of controls of Table 5 separately for buyout funds and VC funds. We report

the results in Table 6. More specifically, Models 1 to 4 in Table 6 re-estimate the Models 4, 5 (for Logistic regressions), 9 and 10 (for Probit regressions) of Table 5 but only for buyout funds, while Models 5-8 estimate similar specifications for VC funds. Unreported results for other tests reported in Table 5 lead to similar conclusions. The results show that the LP-GP relationship is more important for VC funds than for Buyout funds, which further confirms the intuition behind the supply-side view of relationship building.

VI. New Vintages of Funds and LP-GP Relationship

We now turn to the third testable restriction. The previous results suggest that the existence of a LP-GP relationship provides the GP with the possibility of "smoothing" the flow-performance relationship by compensating the "loyalty" of the LPs investing in not so high quality or cold funds by offering them better funds. This suggests that the existence of a LP-GP relationship provides a sort of "buffer" for the GP. One of the instances in which this will be used more is at the moment of launching new funds. As we argued, GPs with a more diffused network of LPs are better able to launch new funds. We test this hypothesis by focusing on the launching of new PE funds. We look at the Likelihood for GPs to Launch a New Fund or a New "Cold" Fund and estimate a logistic regression of the type:

$$D(NewFund)_{j,t} = \alpha_0 + \beta_1 GP\_Perf_{j,t-1} + \beta_2 GP\_Relation_{j,t-1} + C \times M_{j,t} + e_{j,t}, \qquad (4)$$

where $D(New\ Fund)_{j,t}$is a dummy variable that takes the value ofone if j^{th} GP successfully launched a fund in year t and zero if no fund is launched, $GP\_Perf_{j,t-1}$ refers to lagged GP performance, $GP_Relation_{j,t-1}$refers to GP's relation with its existing LPs (either the value-weighted relationship with all its LPs or the one with its leading LP) prior to the vintage year, and $M_{f,t}$ stacks a list of control variables which are similar to previous tables, except that we further control for LP's relationship with its existing GPs (either the value-weighted relationship with all its GPs or the one with its leading GP). The standard errors are clustered at the GP level with fixed year effects. All GP and LP control variables are lagged.

We report the results in Table 7. In Panel A, we focus on *Rel_PartnerYear* as the main relationship proxy. In Panel B, we examine the likelihood of launching a cold fund by replacing $D(New\ Fund)_{j,t}$with the dummy of launching a new cold fund, which takes a value of one if a GP j successfully launched a cold fund in year t, and zero if no fund is launched. A cold fund is defined as a fund whose ex post performance is below the median performance of all funds. In Panel C, we explore an alternative definition of cold funds as funds lunched in cold years—years in which the equity market return (proxied by S&P 500 index) is negative or the total number of private equity fund vintages is below its general

trend.[12] In other words, we examine whether relationship allows GPs to vintage funds even in periods more difficult for the PE industry as a whole to raise new capitals.

The results show that the higher the magnitude of relationships a GP has with its existing LPs, the higher is the probability it will be offering new funds. One standard deviation higher relationship of a GP with its existing LPs is related to a 30.9% higher relative probability of launching a new fund in the case we consider the relationship of the GP with all its existing partners (Model 3) and to a 21.2% higher probability in the case in which we consider the relationship of the GP with just the leading LP partner (Model 7).[13] Interestingly, if the related LPs of a particular GP are themselves well connected, – the ability of the particular GP to offer new funds is reduced – though this impact is less robust compared to that from GP's existing relationship.[14] This suggests that the bargaining power of the GPs vis-à-vis their LPs is more limited in the case in which the LPs have many alternative available relationships.

If we focus on new yet cold PE funds in Panel B, we see that again the relation of the GP with its existing LPs increases the probability of a new launch. More specifically, a one-standard-deviation increase in the GP's relationship with its existing LPs is related to a 19.3% higher probability of launching a new fund (Model 3), and a one-standard-deviation increase in the GP's relationship with its leading LP is related to a to a 8.2% higher probability (Model 7).[15] However, in this case, whether the related LPs of a particular GP are themselves well connected or not has little impact on new launches. This suggests that in the case of cold funds the bargaining power of the GPs has to be very strong for them to be able to impose them, so the other relationships of the LPs play a smaller role. Similar patterns are also observed for the ability of GPs to raise funds in cold years in Panel C.

Among the other variables the number of funds launched is also a good predicator of new launches, suggesting a link between reputation (number of funds launched) and new launches. It is worth noticing

[12] The general trend is estimated based on an AR(1) regression on the number of private equity fund vintages as follows: $\ln(n_t) = \gamma \times \ln(n_{t-1}) + \epsilon_t$, where n_t refers to the total number of PE fund vintages in year t. Cold years are periods in which ϵ_t from the above AR(1) regression is smaller than zero. The adjustment for trend captures the general growth rate witnessed in the PE industry.

[13]The probability for a new fund to be launched is $\pi(x) = \frac{1}{1+e^{-\beta x}}$ in the logit regression, where x is the independent variable and β is the regression parameter. When we omit high order terms of π, an increase in x, denoted as Δx, affects π as follows: $\Delta \ln(\pi) \approx \frac{\Delta\pi}{\pi} = \beta \times \Delta x$, where $\frac{\Delta\pi}{\pi}$ represents the relative increase in the probability. According to Models 3 and 7 in Panel A of Table 7, the relative impacts are $0.831 \times 0.372 = 30.9\%$ and $0.548 \times 0.387 = 21.2\%$, respectively.

[14] For instance, a one-standard-deviation increase in the existing relationship of the leading LP of jth GP reduces the relative probability for the GP to launch new funds by 13.6% as reported in Model 7 of Panel A ($-0.461 \times 0.295 = -13.6\%$). Note that here the leading LP's existing relationship is defined with respect to all GPs, including j^{th} GP. The positive impact of GP's existing relationship on the launch of new funds, as well as the negative impact of LP's relationship, remains the same if we instead compute LP's existing relationship based on all other GPs (i.e., excluding j^{th} GP in equation 4).

[15] According to Models 3 and 7 in Panel B, the relative impacts for the two cases are $0.519 \times 0.372 = 19.3\%$ and $0.359 \times 0.229 = 8.2\%$, respectively.

that all these findings are not spuriously related to GP's and LP's size, performance, age and number of funds, as we explicitly control for these characteristics.

VII. Extensions

This section provides additional tests to extend our economic intuition as well as to check the robustness of our results. We first investigate how the existing LP-GP relationship affects the likelihood of getting a new partner – i.e. to start a new relationship. Next, we explore the consequence of investing in cold funds by LPs, especially LPs with low existing relationship. We then further extend our capital flow tests to different types of LPs. Finally, we conduct robustness checks based on alternative proxies for the LP-GP relationship, alternative performance measures and different econometric specifications.

A. The Likelihood of Getting a New Partner

We start by investigating the likelihood of getting a new partner by estimating the following discrete choice specification:

$$D_{i,j,t} = \alpha_0 + \beta_1 GP\_Perf_{j,t-1} + \beta_2 GP\_Relation_{j,t-1} + \beta_3 LP\_Perf_{i,t-1} + \beta_4 LP\_Relation_{i,t-1} + C \times M_{i,j,t} + e_{i,j,t}, \quad (5)$$

where $D_{i,j,t}$ is a dummy variable that takes the value of one when an *unrelated* LP i invests in a fund newly launched by a GP j in year t and the value of zero if the *unrelated* LP does not invest in the new fund.[16] It is worth stressing that we have subscripts for both LPs and GPs in equation (5) because, unlike in the previous tests, the regression is estimated at the LP-GP pair level. Accordingly, $GP_Perf_{j,t-1}$and $LP_Perf_{i,t-1}$refer to lagged performance of the GP and LP, respectively. Also, $M_{i,j,t}$ contains a list of control variables related to the characteristics of the LP, the GP, as well as to the fund. We aggregate, for each LP (GP), its relationships with all existing GPs (LPs) as the main independent variable. We define the existing relationship of LP i with respect to all GPs in the industry, labeled$LP_Relation_{i,t-1}$ in equation (5), as the commitment-weighted average relationship between LP i and all its *existing* GPs prior to year t. Similarly, the existing relationship of GP *j*, labelled $GP\_Relation_{j,t-1}$, is defined as the commitment-weighted average relationship between the GP *j* and all its *existing* LPs prior to year t.

We report the results in Table 8. We report the results of the Logistic specification in Models 1 to 5 and those of the Probit specification in Models 6 to 10. In Panel A, the LP-GP's existing relation refers to the commitment-weighted average (VW) relationship between the LP and all its existing GPs and the VW relationship between the GP and all its existing LPs, respectively. In Panel B, the relations are between

[16] In other words, we do exclude all investments made by related LPs.

the LP/GP and its leading partner (in terms of invested value). The standard errors are clustered at the LP-GP level with fixed year effects.

The results show that GP's existing relationship helps to get a new partner. The more related the GP is with respect to all its existing LPs or to its leading LP, the higher is the probability that the GP can find a new partner. If we consider the logistic specification, for instance, a one-standard-deviation increase in a GP's existing relationship with respect to all its LPs and its leading LP is associated with a 6.83% and 5.62% higher probability of getting a new LP partner, respectively.[17]

In contrast, the existing relationship of a particular LP, with respect to all its GPs or to its leading GP, plays a negative role for the LP to obtain a new partner. A one-standard-deviation increase in the existing relationship of an LP with respect to all its GPs and to its leading GP is associated with a 55.8% and 25.7% lower probability of getting a new partner, respectively.[18] This asymmetry further confirms that the bargaining power of the GPs is stronger. More specifically, the possibility of getting a new partner when its existing relationship is strong suggests that the bargaining power concentrates on the GP side. In contrast, when the existing relationship hurts the chance of getting a new partner, relationship building imposes a constraint on LPs' actions.

It is interesting to note that the lagged performance of both LP and GP help recruit new partners, reflecting a possible reputation effect. The opposite impacts of GP's existing relationship and LP's existing relationship suggest that relationship building could be very different from reputation. Especially, unlike reputation from which both LPs and GPs could benefit, GP has the advantage of extending to new relation as well as of retaining the existing relations.

B. Investing in Cold Funds by LPs

If GPs dominate the relationship in the PE industry, we should expect GPs to reward LPs when the latter help the GPs to raise capital. In other words, the relationship may start with the decision of an LP to invest in cold funds, followed by the a favorable allocation of hot funds as "compensation" from the GPs.

To test this specific dynamic, we estimate the following Logistic (models 1, 2, 5, and 6) and Probit (models 3, 4, 7, and 8) regression models:

$$D_{i,j,t} = \alpha_0 + \beta_1 Cold\_Investment_{i,j,t-1} + \beta_2 Cold\_Investment\ with\ Low\ Relation_{i,j,t-1} + C \times M_{i,j,t} + e_{i,j,t}, \qquad (6)$$

[17] In model 6 of Panel A and Panel B, the relative probability increase can be computed as $0.216 \times 0.316 = 6.83\%$ and $0.154 \times 0.365 = 5.62\%$, respectively.

[18] In model 6 of Panel A and Panel B, the relative probability decrease can be computed as -1.481×0.377=-55.8% and -0.638×0.403=-25.7%, respectively.

where $D_{i,f,t}$ is a dummy variable that takes the value of one when LP i invests in a hot fund launched by a GP j in year t and the value of zero if LP i invests in a cold fund launched by a GP j in year t. The variable $Cold\_Investment_{i,j,t-1}$ describes the historical investment of LP i in cold funds launched by GP j in the previous five years. The variable $Cold\_Investment\ with\ Low\ Relation_{i,j,t-1}$ describes the investment in cold funds made by new LPs—i.e., LPs that have low relationship with GPs. We will explain the details of the two variables shortly. Equation (6) helps us to pin down the consequence of LPs' previous investments in cold funds.

The results are reported in Table 9. In Models 1 to 4, the variable $Cold\_Investment_{i,j,t-1}$ is a dummy variable that takes the value of 1 if LP i had invested in the cold funds launched by GP j in the past five years, and 0 otherwise. In Models 5-8, $Cold\_Investment_{i,j,t-1}$ refers to the logarithm of the number of cold funds launched by GP j (plus one) that LP i had invested in the past five years. From Models 1, 3, 5, and 7, we see that the GP-LP relationship is in general positively associated with the allocation of hot funds. Furthermore, even after controlling for the general effect of the relationship, hot funds are allocated more to LPs who have made cold investments.

Models 2, 4, 6, and 8 introduce the variable $Cold\_Investment\ with\ Low\ Relation_{i,j,t-1}$, which differentiates LPs that have already built up relationship with GPs from those who have not. Specifically, we construct this variable as the interaction between $Cold\_Investment_{i,j,t-1}$ and a dummy variable that takes value of one when the existing relationship between LP i and GP j' belongs to the bottom half of all none-zero GP-LP relationships. We find that the dynamics of allocating more hot funds to LPs who made cold investments is especially important for LPs with low existing relationship. This pattern is reasonable because, from GPs' perspective, it remains unclear of whether new LPs can be relied on to supply capital insurance or not. Investing in cold funds signals the willingness of LPs to do so—and GPs reward this behavior consequently. In this regard, investing in cold funds provides one explicit way for LPs to build up relationships with GPs. Once the relationship is established, LPs are anyway expected to insure GPs' capital risk ex ante. In this case LPs may receive the allocation of hot funds mostly according to their long-term relationships with GPs. These patterns, especially the need for new LPs to investing in cold funds first in order to receive the allocation of hot funds in the future, are again consistent with the supply-side view that GPs could dominate their relationships with LPs.

C. Relationship Building for Different Types of LPs

Next, we look at the relationship building and LP Categories. We apply the same flow-relationship analysis as specified in Equation (3) to different type of LPs.

We report the results in Table 10. We find that the relationship effects we have identified are stronger when LPs are endowments, pension funds and others (which include Corporate Investor, Family Office, Government Agency, Hybrid Fund of Funds Manager, Private Equity Firm (Investor), Private Equity Fund of Funds Manager, Secondary Fund of Funds Manager, Sovereign Wealth Fund, and Superannuation Scheme), while they are weaker in the case of advisors, insurance funds, or banks. [19]

While the degree of heterogeneity across LPs may appear high, it is consistent with the findings of Lerner, Schoar, and Wongsunwai (2007) that PE investors vary in their sophistication and investment objectives. Interestingly, endowments and pension funds, among all the LPs, are the main relationship players – they are also the types of LP that delivers relatively high performance in Lerner, Schoar, and Wongsunwai (2007).

D. Robustness Checks

We now provide some robustness checks for the previous results. We consider either alternative proxies for the LP-GP relationship or alternative performance measures.

We first verify that our main results are robust to alternative proxies of the LP-GP relationship. We therefore re-estimate Equation 2 for the two alternative proxies of the value-weighted relationship between the LP and the GP of the fund prior to the vintage year (i.e., *Rel_Intensity* and *Rel_LongTerm*) and report the coefficients of interest in Panel A of Table 10: *Rel_Intensity* in Models 1 and 2 and *Rel_LongTerm* in Models 3 and 4. To save space, coefficients for GP, LP and fund characteristics are omitted. These tests confirm the conclusion of Table 4 that the interaction between the existing LP-GP relationship and GP performance predicts future performance. While not reported, using the alternative relationship proxies between GPs and leading LPs lead to similar results.

Finally, we also apply Models 5 and 11 in Table 5 to existing *Rel_Intensity* and *Rel_LongTerm* of funds, and report the results in Panel B of Table 10. We find that the impact of the LP-GP relationship on curbing the concave flow-performance relationship due to limited scalability is robust to the alternative proxy specifications. Overall, the main intuition of the supply-side view of relationship building is robust to alternative relationship measures and performance measures.

[19] When the commitment data for Bank are missing, we estimate the commitment size as follows. First, we compute the "average" size of the missing commitment data for each fund as the unfilled fund size (i.e., fund size minus reported commitments) divided by the number of LPs whose commitments are missing. Second, among the reported LP commitments of the same fund, we identify the smallest value (i.e. the minimum known commitment). Finally, when the average size of the missing commitment is smaller than the minimum known commitment, we replace the missing bank commitment data by the average size of the missing commitment. The main observation that Bank-LP does not focus on relationship building is robust to the way we backfill the missing commitment size.

Conclusion

Formal contracts in the private equity industry are essentially incomplete. We argue that, in this case, GPs and LPs can build long-term relationships that help to reduce the uncertainty for both. The supply-side view of relationship building posits that GP and LPs enter long-term relationships in which GPs allocate the best funds to the "loyal" LPs and the latter promise to invest also in the less good funds of the GPs, effectively providing capital insurance. The demand-side view, by contrast, states that long-term relationship may emerge as skillful LPs cherry-pick superior GPs for long-term investment.

We document evidence consistent with the supply-side view. First, while the tracking records of both GPs and LPs predict fund performance on their own, the impact of LPs is largely absorbed by GPs when the two are simultaneously used. In addition, a good LP-GP relation predicts good fund performance when GPs are skilled, relaxes the concave flow-performance relationship created by limited scalability, and boosts the launch of new cold funds. These results suggest that skilled GPs allocate good funds to loyal LPs and that LPs cover more "cold" deals in return. Finally, we find that relationship building is robust to alternative relationship and performance measures but is heterogeneous across different types of PE investors.

Overall, relationship building seems to provide helpful complements to formal contracting in the PE industry when the latter is incomplete. Our study, therefore, calls for more attention and academic research on "informal" contracting as a helpful extension to formal contracting.

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Appendix: Variable Definitions

Variable Names	Definitions
A: LP-GP Relationship	
We use $Relation_{i,j,t}$ to denote the relationship between LP i and GP j in a given year t. We only consider the relationship for active GPs who have launched at least one PE fund in the previous five years (from $t-4$ to t).	
Rel_PartnerYear (Main Proxy)	The log-year of relationship between an LP and a GP, defined as Ln (1+Total partnership-year between an LP and GP in the previous 5 years). We first define an LP's partnership-year in a particular fund as the number of years that the LP has invested in the fund in the previous 5 years, which takes value from 0 (no investments) to 5 (investing in every year). Next, we compare the LP's partnership-years in all the funds managed by a same GP and pick up the longest as the partnership-year between the LP and the GP.
Rel_LongTerm	ln(number of years since the LP invested on the GP + 1). If the LP did not invest on the GP in the previous five years, then this variable is 0.
Rel_Intensity	Number of funds that the LP invest on the GP in the past five years / Number of funds that the GP launched in the previous five years.
B: Fund Characteristics	
Fund_Perf (Fund IRR)	The performance of a fund. The main proxy is Internal Rate of Return (IRR). IRR is typically computed based on the period from the inception date of a fund to its liquidation date. We make two extensions. First, if a fund has an age of more than ten years, we use its IRR by the end of its tenth year to measure performance. Second, we also include funds that are not liquidated in 2010(the end of the sample period) yet have at least five years of operation by 2010. In this case we use their 2010 IRR to measure their performance.
Fund_Size (in Millions of Dollars)	The size of a fund, reported in millions of Dollars.
Fund_Sequence	The order in which a fund was raised in the PE firm's family of a fund
Leading LP of a Fund	The LP whose committed capital is the largest among all the LP's at the inception of a PE fund.
Leading LP-GP Relationship of a Fund	The relationship between the leading LP and the GP of a fund in its vintage year t.
VW LP-GP Relationship of a Fund	The commitment value-weighted average of the relationship (i.e., Rel_PartnerYear, Rel_Intensity, and Rel_LongTerm) between the GP and all LPs of a fund in its vintage year t.
C: LP Characteristics	
LP_Age	Number of years since LP first invested in PE funds in the data
LP_Commit (in Millions of Dollars)	The initial commitment of an LP to invest in a fund when the fund is launched.
LP_TotalCommit (in Millions of Dollars)	The summation of LP's historical commitments (in Millions of Dollars) in all PE funds .
LP_Perf	Commitment-weighted average performance of all valid funds in an LP's portfolio.
D: GP Characteristics	
GP_Age	Number of years since GP first launched a PE fund as reported in Preqin.
GP_NumFunds	Number of existing PE funds (not liquidated) of GP in year t.
GP_Size (in Millions of Dollars)	Summation of the size for all existing PE funds of a GP in year t.
GP_Perf	Fund size-weighted average of fund performance for all existing funds in a GP's portfolio.

Table 1: Snapshots of the Private Equity Industry from 1980 to 2010

This table reports the snapshots of the PE industry over the period from 1980to 2010. The left side of the table reports the number of existing PE funds in a given year, as well as the total market capitalization of the industry (in billions of USD), the total number of LP's and GP's in the industry, and the average number of PE funds in an LP's portfolio. The right side of the table reports the number of new funds vintaged in each year as well as their average size (in millions of USD), and the number of new GPs enter the industry. To save space we only tabulate the information for every two years.

	Existing Valid PE Funds (Assuming a 10-year Horizon)				New PE Funds Launched in Each Year		
Years	Tot Num of Funds	Tot Market Cap (Billions of USDs)	Tot Num of LPs	Tot Num of GPs	Tot Num of New PE Funds	Average Size (Millions of USDs)	Tot Num of New GPs
1980	17	1.49	17	12	9	129.7	9
1982	28	3.42	31	17	8	109.5	7
1984	72	8.88	61	45	27	129.9	27
1986	121	15.2	102	76	27	175.9	26
1988	201	43.0	164	123	39	365.8	37
1990	313	63.7	267	196	64	191.1	61
1992	405	75.5	329	252	68	126.3	65
1994	586	119	488	376	133	257.4	127
1996	883	182	654	552	209	203.9	198
1998	1458	333	976	823	373	290.5	334
2000	2347	607	1491	1232	595	298.6	546
2002	3123	809	1808	1561	411	229.4	376
2004	3752	980	2106	1868	503	267.6	448
2006	4967	1526	2546	2319	817	464.2	714
2008	5911	2087	2850	2697	692	467	598
2010	5377	1991	2713	2577	188	457.7	167

Table 2: Summary Statistics

Panel A reports the summary statistics of relation-building proxies, including Rel_PartnerYear, Rel_Intensity, Rel_Dummy, and Rel_LongTerm, for all LP-GP pairs that have *none-zero* relationship in a given year. We refer to the Appendix for the detailed definitions of the variables. The first two columns report the mean and variance of the pooled sample of none-zero LP-GP relationship. The next five columns report the 10%, 20%, 50%, 80%, and 90% quantile values of the sample. The last column reports the number of observations of the sample. Panel B reports the distribution of a list of characteristics for PE funds, including performance (Fund_Perf), size (Fund_Size, in millions of USD), vintage sequence of a fund in a year (Fund_Sequence), as well as the relationship between its GP and all LPs that invests in the fund. The LP-GP relationship of a fund is computed either as the commitment value-weighted average relationship between its GP and all its LPs (the VW LP-GP Relationship), or as the relationship between its GP and its leading LP in terms of commitment (the Leading LP-GP Relationship of a Fund). The same panel also reports the distribution of lagged GP and LP characteristics of the fund, including age (LP_Age and GP_Age), performance (LP_Perf and GP Perf), and the cumulative commitment of an LP in the PE industry. Panel C reports the correlation among the main variables and these characteristics. The Appendix provides the detailed definition of each variable.

Panel A: Quantile Values for the (non-zero) LP-GP Relationship for all LP-GP Pairs							
	Mean	Stdev	10%	20%	50%	80%	90%
Rel_PartnerYear	1.368	0.360	0.693	1.099	1.386	1.792	1.792
PartnerYear before taking the log	3.168	1.344	1	2	3	5	5
Rel_Intensity	0.574	0.350	0.125	0.2	0.5	1	1
Rel_LongTerm	1.572	0.564	0.693	1.099	1.609	2.079	2.303
LongTerm before taking the log	4.717	3.930	1	2	4	7	9
Panel B: Distribution of PE Funds and GP/LP Characteristics (fund-level)							
	Mean	Stdev	10%	20%	50%	80%	90%
1. Fund Characteristics							
Fund_Perf	0.117	0.274	-0.102	-0.0362	0.0870	0.224	0.326
Fund_Size ($mn)	432	644	50.27	101.2	218.4	469.7	1004
Fund_Sequence	2.708	1.998	1	1	2	4	6
2. Commitment Value-Weighted Relationships Between the GP and all LPs of a Fund							
Rel_PartnerYear	0.814	0.630	0	0	0.936	1.394	1.609
PartnerYear before taking the log	1.719	1.571	0	0	1.550	3.032	4
Rel_Intensity	0.420	0.380	0	0	0.350	0.905	1
Rel_LongTerm	0.966	0.797	0	0	1.043	1.696	2.040
LongTerm before taking the log	2.618	3.137	0	0	1.837	4.451	6.690
3. Relationships between the GP and the Leading LP of a Fund							
Rel_PartnerYear	0.820	0.731	0	0	1.099	1.609	1.792
PartnerYear before taking the log	1.906	1.877	0	0	2	4	5
Rel_Intensity	0.475	0.453	0	0	0.444	1	1
Rel_LongTerm	0.953	0.906	0	0	1.099	1.792	2.197
LongTerm before taking the log	2.946	3.993	0	0	2	5	8
4. Characteristics of the GP of a Fund Prior to Its Vintage							
GP_Perf	0.158	0.241	-0.075	0.0237	0.12	0.227	0.401
GP_Age	5.908	6.224	0	0	4	10	15
GP_Size ($mn)	1165	2395	50.49	129.4	352.5	971.4	2912
5. VW (commitment-weighted average) Characteristics of All LPs of a Fund Prior to Its Vintage							
LP_Perf	0.132	0.0967	0.0258	0.0635	0.126	0.186	0.253
LP_Age	17.75	6.436	9.131	13.5	18.25	22.4	25.76
LP_TotalCommit ($mn)	3356	3541	249.5	786.2	2135	4740	8326
6. Characteristics of the Leading LP of a Fund Prior to Its Vintage							
LP_Perf	0.13	0.107	0.021	0.0584	0.124	0.182	0.26
LP_Age	17.75	7.89	7	12	18	24	28
LP_TotalCommit ($mn)	4014	4555	180.2	740.1	2191	5784	10907

Panel C: Correlation Matrix																		
Fund Characteristics																		
Fund_Perf	1																	
Fund_Size ($mn)	0.011	1																
Fund_Sequence	0.044	0.171	1															
VW (Commitment Value-Weighted Average) Relationships Between the GP and all LPs of a Fund																		
Rel_PartnerYear	0.084	0.167	0.21	1														
Rel_Intensity	0.068	0.031	0.162	0.762	1													
Rel_LongTerm	0.116	0.197	0.291	0.901	0.685	1												
Leading LP-GP Relationship of a Fund																		
Rel_PartnerYear	0.068	0.19	0.179	0.851	0.68	0.759	1											
Rel_Intensity	0.063	0.084	0.158	0.669	0.857	0.6	0.828	1										
Rel_LongTerm	0.092	0.211	0.255	0.791	0.647	0.849	0.921	0.771	1									
Characteristics of the GP of a Fund Prior to Its Vintage																		
GP_Perf	0.346	0.013	0.108	0.067	0.102	0.126	0.065	0.075	0.132	1								
GP_Age	0.07	0.275	0.5	0.283	0.003	0.509	0.193	-0.02	0.353	0.105	1							
GP_Size ($mn)	-0.02	0.443	-0.06	0.164	-0.09	0.221	0.145	-0.07	0.189	-0.02	0.333	1						
VW (commitment-weighted average) Characteristics of All LPs of a Fund Prior to Its Vintage																		
LP_Perf	0.207	-0.05	0.033	0.086	0.075	0.086	0.068	0.06	0.074	0.311	0.021	-0.04	1					
LP_Age	-0.08	0.154	0.155	0.14	0.145	0.138	0.122	0.131	0.121	-0.02	0.141	0.097	-0.11	1				
LP_TotalCommit ($mn)	-0.11	0.129	-0.02	0.092	0.079	0.073	0.102	0.085	0.078	-0.09	0.007	0.155	-0.05	0.196	1			
Characteristics of the Leading LP of a Fund Prior to Its Vintage																		
LP_Perf	0.147	-0.02	0.036	0.086	0.043	0.074	0.069	0.039	0.064	0.202	0.037	0.001	0.882	-0.06	-0.01	1		
LP_Age	-0.07	0.138	0.147	0.117	0.118	0.117	0.121	0.1	0.136	0.002	0.128	0.072	-0.08	0.897	0.164	-0.0372	1	
LP_TotalCommit ($mn)	-0.1	0.205	0.035	0.099	0.058	0.091	0.139	0.113	0.119	-0.06	0.062	0.173	-0.04	0.186	0.891	0.0113	0.131	1

Table 3: Performance of PE Funds

This table presents the results of the following Panel regression,

$$Fund\_Perf_{f,t} = \alpha_0 + \beta_1 \times GP\_Perf_{f,t-1} + \beta_2 \times LP\_Perf_{f,t-1} + c \times M_{f,t} + e_{f,t},$$

where $Fund\_Perf_{f,t}$ is the performance of fund f that is vintage in year t, $GP\_Perf_{f,t-1}$ and $LP\_Perf_{f,t-1}$ refer to the performance of GP and LP of the fund prior to the vintage year of the fund, respectively, and $M_{f,t}$ stacks a list of control variables, including the logarithm of GP's age (GP_Age), the logarithm of the size of GP (GP_Size), the logarithm of LP's total historical investments in the PE industry (LP_TotalCommit), as well as the logarithm of the size and sequence of the fund. The standard errors are clustered at the GP level with fixed year and fund-style effects. This follows Kaplan and Schoar (2005). All GP and LP control variables are lagged. Models 5 to 10use the performance and other characteristics of value weighted according to the commitment value of all the LPs of a fund, while in Models 11 to 16these variables are of the leading LP of PE funds. The Appendix provides the detailed definitions. The numbers with "*", "**" and "***" are significant at the 10%, 5% and 1% level, respectively.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14	Model 15	Model 16
					Commitment Value-Weighted Average for All LPs of a Fund						The Leading LP of a Fund					
A. GP Characteristics																
GP_perf, t-1	0.416***	0.408***	0.415***	0.408***				0.399***	0.390***	0.390***				0.420***	0.411***	0.408***
	(3.58)	(3.55)	(3.59)	(3.56)				(3.61)	(3.57)	(3.59)				(3.45)	(3.42)	(3.39)
Ln(GP_Age)		0.0367***		0.0327***					0.0384***	0.0322**					0.0354***	0.0348***
		(3.52)		(2.64)					(3.73)	(2.49)					(3.41)	(2.59)
Ln(GP_Size, t-1)			0.0127**	0.00467						0.00653						0.00620
			(2.00)	(0.63)						(0.78)						(0.75)
B. LP Characteristics																
LP_Perf, t-1					0.431***	0.430***	0.446***	0.332	0.306	0.351	0.172**	0.170**	0.170*	0.0134	-0.000920	-0.0189
					(2.81)	(2.79)	(2.67)	(1.26)	(1.17)	(1.20)	(2.03)	(2.03)	(1.92)	(0.10)	(-0.01)	(-0.14)
Ln(LP_Age)						-0.00414	0.0209		0.00975	0.0351		0.0121	0.0369*		0.0144	0.0300
						(-0.21)	(0.86)		(0.32)	(0.91)		(0.74)	(1.90)		(0.61)	(1.15)
Ln(LP_TotalCommit, t-1)							-0.0139**			-0.0144			-0.00776*			-0.000684
							(-2.52)			(-1.62)			(-1.70)			(-0.12)
C. Fund Characteristics																
Ln(Fund_Size)	-0.000867	-0.00384	-0.0116	-0.00779	0.00610	0.00630	0.0107*	0.00270	-0.000727	-0.00239	0.00249	0.00199	0.00899	0.00253	-0.000943	-0.00405
	(-0.11)	(-0.46)	(-1.01)	(-0.67)	(1.05)	(1.04)	(1.70)	(0.28)	(-0.07)	(-0.18)	(0.42)	(0.33)	(1.41)	(0.28)	(-0.10)	(-0.30)
Ln(Fund_Sequence)	0.0186	0.00856	0.0199*	0.00991	0.0223*	0.0225**	0.0203*	0.0166	0.00527	0.00465	0.0224*	0.0219*	0.0194	0.0184	0.00712	0.00806
	(1.60)	(0.73)	(1.71)	(0.81)	(1.91)	(1.97)	(1.80)	(1.27)	(0.40)	(0.33)	(1.85)	(1.84)	(1.63)	(1.55)	(0.59)	(0.62)
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund type fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. observations	847	847	846	846	1573	1573	1560	799	799	794	1530	1530	1501	779	779	768
R-squared	0.228	0.233	0.230	0.233	0.118	0.118	0.120	0.230	0.235	0.238	0.106	0.107	0.108	0.223	0.228	0.230

Table 4: The Impact of Relationship Building on Fund performance

This table presents the results of the following Panel regression,

$$Fund\_Perf_{f,t} = \alpha_0 + \beta_1 GP\_Perf_{f,t-1} + \beta_2 LP\_Perf_{f,t-1} + \beta_2 Relation_{i,f,t-1} + \beta_3 GP\_Perf_{f,t-1} \times Relation_{i,f,t-1} + c \times M_{f,t} + e_{f,t},$$

where $Fund\_Perf_{f,t}$ is the performance of fund f that is vintage in year t, $GP\_Perf_{f,t-1}$, $LP\_Perf_{f,t-1}$ refer to the performance of GP and LP of the fund prior to the vintage year of the fund, respectively, $Relation_{i,f,t-1}$ refers to the relationship between LPi and the GP of the fund prior to the vintage year, and $M_{f,t}$ stacks a list of control variables, including the logarithm of GP's age (GP_Age), the logarithm of the size of GP (GP_Size), the logarithm of LP's total historical investments in the PE industry (LP_TotalCommit), as well as the logarithm of the size and sequence of the fund. All GP and LP control variables are lagged. The standard errors are clustered at the GP level with fixed year and fund-style effects. Models 1 to 4use the performance and other characteristics of value weighted according to the commitment value of all the LPs of a fund, while in Models 5 to 8 these variables are of the leading LP of PE funds. This table focuses on Rel_PartnerYear as the main relationship proxy, and the Appendix provides the detailed definitions. The numbers with "*", "**" and "***" are significant at the 10%, 5% and 1% level, respectively.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
	VW Relation with All Partners					Relation with the Leading Partner				
A. LP-GP Relationship										
Relation (t-1)	0.00807	-0.0261	-0.0299	-0.0299	0.188*	0.0133	-0.00836	-0.0103	-0.0103	0.192***
	(0.50)	(-1.33)	(-1.55)	(-1.13)	(1.73)	(1.22)	(-0.59)	(-0.74)	(-0.54)	(2.67)
GP_Perf (t-1)*Relation (t-1)		0.221*	0.230**	0.230***	0.237**		0.152*	0.159*	0.159**	0.162*
		(1.91)	(2.00)	(2.61)	(2.07)		(1.70)	(1.78)	(2.36)	(1.83)
Ln(Fund_Size)*Relation (t-1)					-0.0385*					-0.0349***
					(-1.97)					(-2.73)
B. GP characteristics										
GP_Perf (t-1)	0.396***	0.158	0.142	0.142	0.132	0.412***	0.242***	0.231***	0.231***	0.224***
	(3.61)	(1.61)	(1.51)	(1.35)	(1.44)	(3.43)	(2.65)	(2.65)	(2.63)	(2.66)
Ln(GP_Age)	0.0301**	0.0290**	0.0300**	0.0300	0.0342***	0.0300**	0.0281**	0.0306**	0.0306	0.0344***
	(2.04)	(2.07)	(2.37)	(1.43)	(2.65)	(2.00)	(1.98)	(2.36)	(1.47)	(2.64)
Ln(GP_ Size, t-1)	0.00702	0.00688	0.00615	0.00615	0.00505	0.00692	0.00732	0.00582	0.00582	0.00465
	(0.89)	(0.89)	(0.73)	(0.56)	(0.59)	(0.89)	(0.95)	(0.72)	(0.53)	(0.56)
C. LP characteristics										
LP_Perf (t-1)	0.334	0.299	0.341	0.341*	0.359	-0.0117	-0.0272	-0.00974	-0.00974	0.00313
	(1.17)	(1.06)	(1.16)	(1.96)	(1.20)	(-0.09)	(-0.20)	(-0.07)	(-0.07)	(0.02)
Ln(LP_Age)	0.0199	0.0216	0.0295	0.0295	0.0231	0.0239	0.0253	0.0279	0.0279	0.0222
	(0.57)	(0.63)	(0.76)	(0.76)	(0.61)	(1.07)	(1.13)	(1.07)	(0.97)	(0.88)
Ln(LP_TotalCommit, t-1)	-0.0107	-0.00982	-0.0129	-0.0129	-0.0127	0.000802	0.00108	-0.000815	-0.000815	-0.000175
	(-1.40)	(-1.29)	(-1.45)	(-1.29)	(-1.42)	(0.15)	(0.20)	(-0.14)	(-0.09)	(-0.03)
D. Fund characteristics										
Ln(Fund_Size)	0.00344	0.00414	-0.00150	-0.00150	0.0393**	0.00136	0.00170	-0.00344	-0.00344	0.0363**
	(0.25)	(0.32)	(-0.11)	(-0.11)	(2.01)	(0.10)	(0.13)	(-0.25)	(-0.25)	(2.26)
Ln(Fund_Sequence)	0.00617	0.00579	0.00410	0.00410	0.00437	0.00709	0.00590	0.00560	0.00560	0.00503
	(0.45)	(0.43)	(0.28)	(0.22)	(0.30)	(0.58)	(0.49)	(0.42)	(0.31)	(0.38)
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund type fixed effect	No	No	Yes	Yes	Yes	No	No	Yes	Yes	Yes
Cluster at GP	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	No	Yes
No. observations	766	766	766	766	766	741	741	741	741	741
R-squared	0.227	0.233	0.249	0.249	0.252	0.220	0.226	0.240	0.240	0.246

Table 5: Relationship and LP's Capital Commitments

We estimate the following Logistic (Models 1 to 5) and Probit (Models 6 to 10) regression models:

$$D_{i,f,t} = \alpha_0 + \beta_1 GP\_Perf_{f,t-1} + \beta_2 Relation_{i,f,t-1} + \beta_3 GP\_Perf_{f,t-1} \times Relation_{i,f,t-1} + C \times M_{f,t} + e_{i,f,t},$$

where$D_{i,f,t}$ is a dummy variable that takes the value of 1 if LPi had invested in $Fund_{f,t}$ newly launchedin period t, $GP\_Perf_{f,t-1}$ refers the performance of the GP of the fund prior to the vintage of the fund, $Relation_{i,f,t-1}$ refers to the relationship between the LP and the GP of the fund prior to the vintage year, and $M_{f,t}$stacks a list of control variables, including the logarithm of GP's age (GP_Age), the logarithm of the size of GP (GP_Size), the logarithm of LP's total historical investments in the PE industry (LP_TotalCommit)as well as the logarithm of the size and sequence of the fund. All GP and LP control variables are lagged. This table focuses on Rel_PartnerYear as the main relationship proxies, and the Appendix provides the detailed definition. In the main specifications, the standard errors are clustered at the GP-LP level with fixed year effects. As a robustness check, we also include fixed fund-style and LP-style effects in models 4, and 8.Numbers with "*", "**" and "***" are significant at the 10%, 5% and 1% level, respectively.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
	Logistic Regressions					Probit Regressions				
A. GP Characteristics										
GP_Perf (t-1)	0.412***	0.423***	0.687***	0.764***	1.057***	0.117***	0.121***	0.174***	0.261***	0.394***
	(4.83)	(4.93)	(6.88)	(4.41)	(5.70)	(3.96)	(4.06)	(5.06)	(3.62)	(5.06)
GP_Perf (t-1)^2	-0.345***	-0.458***	-1.079***	-1.137***	-1.673***	-0.0934**	-0.131***	-0.321***	-0.433***	-0.667***
	(-2.63)	(-3.45)	(-7.09)	(-4.34)	(-5.99)	(-2.01)	(-2.79)	(-6.08)	(-3.94)	(-5.66)
Ln(GP_Age)		0.239***	0.112***	0.0859**	0.0409		0.0881***	0.0649***	0.0670***	0.0491***
		(10.86)	(5.20)	(2.40)	(1.10)		(11.44)	(8.50)	(4.33)	(3.02)
Ln(GP_Size)		-0.121***	-0.328***	-0.352***	-0.318***		-0.0420***	-0.121***	-0.158***	-0.146***
		(-13.88)	(-39.72)	(-23.49)	(-20.18)		(-13.51)	(-37.06)	(-22.48)	(-19.90)
B. LP-GP Relationship										
Relation (t-1)			3.420***	2.427***	2.426***			1.569***	1.261***	1.261***
			(152.79)	(61.63)	(61.14)			(142.10)	(65.00)	(64.94)
GP_Perf (t-1)*Relation (t-1)			-1.905***	-2.227***	-2.207***			-0.801***	-1.082***	-1.081***
			(-13.07)	(-8.51)	(-8.40)			(-10.77)	(-8.23)	(-8.21)
GP_perf (t-1)^2*Relation (t-1)			3.770***	3.921***	3.890***			1.741***	1.980***	1.978***
			(13.93)	(8.45)	(8.43)			(13.17)	(8.83)	(8.86)
C. LP characteristics										
LP_Perf (t-1)				0.580***	0.465***				0.252***	0.197***
				(4.79)	(3.80)				(4.75)	(3.67)
Concentration of GP				-0.887***	-0.799***				-0.363***	-0.321***
in the LP Port (t-1)				(-9.53)	(-8.77)				(-9.83)	(-8.76)
Ln(LP_TotalCommit, t-1)				0.256***	0.284***				0.115***	0.128***
				(19.94)	(21.39)				(20.85)	(22.16)
Ln(LP_Age)				-0.175***	-0.133***				-0.0797***	-0.0597***
				(-4.47)	(-3.09)				(-4.92)	(-3.38)
D. Fund characteristics										
Ln(Fund_Size)	0.575***	0.657***	0.798***	0.843***	0.855***	0.200***	0.229***	0.295***	0.381***	0.388***
	(53.87)	(50.04)	(60.76)	(37.95)	(35.94)	(51.58)	(49.13)	(58.57)	(37.08)	(35.34)
Ln(Fund_Sequence)	0.448***	0.323***	0.329***	0.458***	0.377***	0.152***	0.107***	0.110***	0.188***	0.156***
	(18.82)	(12.91)	(14.14)	(11.70)	(9.15)	(18.09)	(12.26)	(12.92)	(10.95)	(8.54)
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund type fixed effect	No	No	No	No	Yes	No	No	No	No	Yes
LP type fixed effect	No	No	No	No	Yes	No	No	No	No	Yes
No. observations	3290211	3290211	2951110	229631	229117	3290211	3290211	2951110	229631	229117

Table 6: Relationship Building and Fund Types (Buyout vs. Venture Capital)

We estimate the following Logistic (Panel A) and Probit (Panel B) regression models:

$$D_{i,f,t} = \alpha_0 + \beta_1 GP\_Perf_{f,t-1} + \beta_2 Relation_{i,f,t-1} + \beta_3 GP\_Perf_{f,t-1} \times Relation_{i,f,t-1} + C \times M_{f,t} + e_{i,f,t},$$

where $D_{i,f,t}$ is a dummy variable that takes the value of 1 if LPi had invested in $Fund_{f,t}$ newly launchedin period t, $GP\_Perf_{f,t-1}$ refers the alternative performance measure of the GP of the fund prior to the vintage of the fund, $Relation_{i,f,t-1}$ refers to the alternative proxies of the relationship between the LP and the GP of the fund prior to the vintage year, and $M_{f,t}$stacks a list of control variables, including the logarithm of GP's age (GP_Age), the logarithm of the size of GP (GP_Size), the logarithm of LP's total historical investments in the PE industry (LP_TotalCommit), as well as the logarithm of the size and sequence of the fund. Standard errors are clustered at the GP-LP level with fixed year and LP-style effects. All GP and LP control variables are lagged. In each Panel, Models 1 to 4 focus on the sample of Buyout funds, while Models 5 to 8 focus on the sample of Venture Capital funds. Numbers with "*", "**" and "***" are significant at the 10%, 5% and 1% level, respectively.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
	Buyout Funds				Venture Capital Funds			
	Logistic Regressions		Probit Regressions		Logistic Regressions		Probit Regressions	
A. GP Characteristics								
GP_Perf (t-1)	1.311***	1.350***	0.520***	0.549***	1.318***	1.311***	0.521***	0.525***
	(3.43)	(3.51)	(3.05)	(3.19)	(3.29)	(3.26)	(2.93)	(2.92)
GP_Perf (t-1)^2	-1.812***	-1.854***	-0.731***	-0.774***	-1.476***	-1.470***	-0.607***	-0.609***
	(-3.09)	(-3.16)	(-2.77)	(-2.91)	(-2.91)	(-2.89)	(-2.71)	(-2.69)
Ln (GP_Age)	0.245***	0.252***	0.120***	0.124***	0.00985	0.000387	0.0132	0.0110
	(3.95)	(4.03)	(4.22)	(4.31)	(0.10)	(0.00)	(0.32)	(0.26)
Ln(GP_Size)	-0.515***	-0.518***	-0.227***	-0.228***	-0.307***	-0.304***	-0.127***	-0.127***
	(-9.91)	(-9.99)	(-9.93)	(-9.89)	(-7.31)	(-7.19)	(-6.94)	(-6.82)
B. LP-GP Relationship								
Relation (t-1)	2.264***	2.262***	1.219***	1.219***	2.529***	2.499***	1.315***	1.304***
	(29.76)	(29.56)	(31.75)	(31.45)	(31.34)	(30.64)	(34.78)	(34.07)
GP_Perf (t-1)*Relation (t-1)	-0.659	-0.773	-0.176	-0.253	-2.531***	-2.529***	-1.339***	-1.341***
	(-1.13)	(-1.33)	(-0.62)	(-0.89)	(-5.02)	(-4.94)	(-5.34)	(-5.27)
GP_perf (t-1)^2*Relation (t-1)	1.990*	2.091*	0.848	0.927*	3.752***	3.764***	2.068***	2.071***
	(1.71)	(1.80)	(1.58)	(1.76)	(4.81)	(4.74)	(5.49)	(5.43)
C. LP characteristics								
LP_Perf (t-1)	0.683***	0.544***	0.320***	0.245***	1.004***	0.883***	0.419***	0.367***
	(3.78)	(2.94)	(3.92)	(2.88)	(3.41)	(2.97)	(3.33)	(2.86)
Concentration of GP	-0.979***	-0.835***	-0.416***	-0.351***	-1.126***	-0.985***	-0.469***	-0.406***
in the LP Port (t-1)	(-7.38)	(-6.42)	(-7.36)	(-6.27)	(-4.71)	(-4.26)	(-4.97)	(-4.38)
Ln(LP_TotalCommit, t-1)	0.282***	0.331***	0.127***	0.153***	0.325***	0.375***	0.143***	0.168***
	(14.79)	(16.46)	(14.59)	(16.61)	(10.87)	(11.79)	(10.99)	(12.00)
Ln(LP_Age)	-0.185***	-0.0835	-0.0828***	-0.0361	-0.492***	-0.377***	-0.213***	-0.162***
	(-3.26)	(-1.30)	(-3.39)	(-1.30)	(-5.26)	(-3.66)	(-5.42)	(-3.77)
D. Fund characteristics								
Ln(Fund_Size)	1.092***	1.095***	0.494***	0.498***	0.786***	0.781***	0.348***	0.349***
	(18.39)	(18.43)	(19.01)	(18.99)	(10.16)	(10.11)	(10.01)	(10.08)
Ln(Fund_Sequence)	0.447***	0.451***	0.191***	0.194***	0.405***	0.430***	0.160***	0.171***
	(6.76)	(6.75)	(6.29)	(6.32)	(3.04)	(3.21)	(2.62)	(2.78)
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LP type fixed effect	No	Yes	No	Yes	No	Yes	No	Yes
No. observations	59075	59075	59075	59075	38916	38796	38916	38796

Table7: The Likelihood for GPs to Launch a New Fund or a New "Cold" Fund

Panel A estimates the following logistic regression model: $D(NewFund)_{j,t} = \alpha_0 + \beta_1 GP\_Perf_{j,t-1} + \beta_2 GP\_Relation_{j,t-1} + C \times M_{j,t} + e_{j,t}$,where$D(New\ Fund)_{j,t}$is a dummy variable that takes the value of one if a GPj successfully launched a fund in year$t$and zero if no fund is launched, $GP\_Perf_{j,t-1}$ refers to lagged GP performance, $GP_Relation_{j,t-1}$refers to GP's relation with its existing LPs (either the VW relationship with all its LPs or the one with its leading LP) prior to the vintage year, and $M_{f,t}$stacks a list of control variables which are similar to previous tables except LP's relationship with its existing GPs (either the VW relationship with all its GPs or the one with its leading GP). The standard errors are clustered at the GP level with fixed year effects. As a robustness check, we also include fixed GP-style effects in models 4, and 8.All GP and LP control variables are lagged. This table focuses on Rel_PartnerYear as the main relationship proxy, and the Appendix provides the detailed definition. Panel B examines the likelihood of launching a cold fund by replacing $D(New\ Fund)_{j,t}$with the dummy of launching a new cold fund, which takes a value of one if a GPj successfully launched a cold fund (defined as a fund whose ex post performance is below the median performance of all funds)in year$t$, and zero if no fund is launched. Panel C examines the likelihood of launching a fund in cold years as an alternative definition of cold funds, focusing on GP's VW relation with all its existing LPs. In models 1-4, a cold year is defined as a year with negative stock market return (i.e., when the S&P 500 index delivers negative return). In models 5-8, a cold year is defined as the year in which the total number of PE vintages is below the trend predicted by an AR(1) regression of year-by-year PE vintages over the entire sample period. Numbers with "*", "**" and "***" are significant at the 10%, 5% and 1% level, respectively.

Panel A: The Likelihood for a GP to Launch a New PE Fund

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
	VW Relation with All Partners				Relation with the Leading Partner			
A. Relationship								
GP's Relation with its Existing LP (t-1)	0.780***	0.748***	0.831***	0.849***	0.546***	0.480***	0.548***	0.591***
	(6.54)	(6.12)	(6.31)	(6.34)	(5.59)	(4.70)	(5.14)	(5.47)
LP's Relation with its Existing GP (t-1)			-0.730**	-0.408			-0.461**	-0.338
			(-2.24)	(-1.20)			(-2.06)	(-1.46)
GP_Perf*GP's Relation with its Existing LP			1.987*	1.627			1.111	0.898
			(1.91)	(1.50)			(1.57)	(1.28)
B. GP characteristics								
GP_Perf (t-1)	1.217***	1.216***	-1.432	-0.957	1.198***	1.181***	-0.287	0.00663
	(7.29)	(6.26)	(-1.02)	(-0.66)	(7.65)	(6.38)	(-0.30)	(0.01)
Ln(GP_Age)	-0.0893	-0.111	-0.102	0.118	-0.0238	-0.0510	-0.0457	0.174*
	(-1.10)	(-1.34)	(-1.23)	(1.27)	(-0.31)	(-0.63)	(-0.56)	(1.91)
Ln(GP_Size, t-1)	0.0590**	0.0643**	0.0611**	0.0840**	0.0475*	0.0509*	0.0486	0.0662*
	(2.23)	(2.16)	(2.05)	(2.48)	(1.88)	(1.70)	(1.61)	(1.94)
Ln(GP_NumFunds)	1.152***	1.183***	1.177***	0.747***	1.101***	1.154***	1.164***	0.736***
	(8.86)	(8.81)	(8.84)	(4.39)	(8.34)	(8.13)	(8.23)	(4.20)
C. LP characteristics								
LP_Perf (t-1)		-0.781	-0.580	-0.397		-0.499	-0.414	-0.197
		(-1.61)	(-1.18)	(-0.79)		(-1.22)	(-0.98)	(-0.45)
Ln(LP_Age)		0.142	0.145	-0.0406		0.146	0.141	0.0264
		(1.10)	(1.15)	(-0.29)		(1.55)	(1.50)	(0.27)
Ln(LP_TotalCommit, t-1)		-0.0572*	-0.0360	0.00302		-0.0459	-0.0288	0.0129
		(-1.70)	(-1.02)	(0.08)		(-1.62)	(-0.96)	(0.41)
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
GP type fixed effect	No	No	No	Yes	No	No	No	Yes
No. observations	5148	4503	4503	4449	5430	4418	4330	4320

Panel B: The Likelihood for GP to Launch a New yet Cold PE Fund								
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
	VW Relation with All Partners				Relation with the Leading Partner			
A. Relationship								
GP's Relation with its Existing LP (t-1)	0.529***	0.524***	0.519***	0.588***	0.378**	0.372**	0.359**	0.397**
	(2.90)	(2.91)	(2.67)	(2.89)	(2.40)	(2.39)	(2.25)	(2.35)
LP's Relation with its Existing GP (t-1)			-0.0836	0.0620			-0.237	-0.145
			(-0.17)	(0.13)			(-0.74)	(-0.45)
GP_Perf*GP's Relation with its Existing LP			1.353	1.931			1.286	1.290
			(0.84)	(1.23)			(1.31)	(1.33)
B. GP characteristics								
GP_Perf (t-1)	-0.0789	-0.00838	-1.819	-2.423	-0.155	-0.0932	-1.838	-1.669
	(-0.31)	(-0.03)	(-0.83)	(-1.13)	(-0.64)	(-0.35)	(-1.35)	(-1.25)
Ln(GP_Age)	-0.0135	-0.0227	-0.0206	0.0596	0.0560	0.0000110	0.0114	0.0961
	(-0.10)	(-0.17)	(-0.16)	(0.41)	(0.45)	(0.00)	(0.09)	(0.69)
Ln(GP_Size, t-1)	0.0232	0.0165	0.0150	0.0839	0.0138	0.00673	0.00397	0.0622
	(0.57)	(0.37)	(0.34)	(1.58)	(0.34)	(0.15)	(0.09)	(1.15)
Ln(GP_NumFunds)	0.799***	0.845***	0.848***	0.465*	0.785***	0.848***	0.855***	0.490**
	(4.04)	(4.26)	(4.29)	(1.93)	(3.93)	(4.30)	(4.35)	(2.03)
C. LP characteristics								
LP_Perf (t-1)		-1.079	-1.007	-0.905		-0.355	-0.236	-0.114
		(-1.49)	(-1.32)	(-1.15)		(-0.58)	(-0.36)	(-0.17)
Ln(LP_Age)		-0.198	-0.212	-0.193		-0.154	-0.170	-0.122
		(-0.99)	(-1.04)	(-0.86)		(-0.97)	(-1.07)	(-0.74)
Ln(LP_TotalCommit, t-1)		0.0594	0.0596	0.0926		0.0466	0.0537	0.0859*
		(1.06)	(1.05)	(1.56)		(0.98)	(1.11)	(1.67)
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
GP type fixed effect	No	No	No	Yes	No	No	No	Yes
No. observations	3936	3761	3761	3756	4149	3736	3655	3627

Panel C: The Likelihood for GP to Launch a New PE Funds in Cold Years								
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
	Vintages in Downside Market (S&P)				Vintaes in Low PE-Vintage Years			
A. Relationship								
GP's Relation with its Existing LP (t-1)	0.456**	0.490**	0.584**	0.688***	0.691***	0.776***	0.950***	1.027***
	(2.11)	(2.24)	(2.47)	(2.77)	(3.49)	(3.81)	(4.25)	(4.64)
LP's Relation with its Existing GP (t-1)			-0.408	-0.185			-1.773***	-1.287**
			(-0.64)	(-0.27)			(-3.26)	(-2.30)
GP_Perf*GP's Relation with its Existing LP			-1.965	-1.478			7.475***	6.113***
			(-0.80)	(-0.60)			(3.63)	(2.73)
B. GP characteristics								
GP_Perf (t-1)	-0.167	-0.602	2.048	1.576	1.862***	1.821***	-8.615***	-7.002**
	(-0.49)	(-1.57)	(0.61)	(0.47)	(6.12)	(5.37)	(-3.00)	(-2.27)
Ln(GP_Age)	-0.121	-0.153	-0.149	-0.00416	-0.228*	-0.305**	-0.270**	-0.00906
	(-0.88)	(-1.14)	(-1.10)	(-0.03)	(-1.67)	(-2.23)	(-1.97)	(-0.06)
Ln(GP_Size, t-1)	0.0244	0.0686	0.0665	0.102**	-0.0183	-0.0173	-0.0288	-0.0156
	(0.58)	(1.43)	(1.38)	(1.97)	(-0.35)	(-0.30)	(-0.49)	(-0.23)
Ln(GP_NumFunds)	1.311***	1.288***	1.295***	0.925***	1.357***	1.402***	1.379***	0.940***
	(6.28)	(5.80)	(5.83)	(3.73)	(7.44)	(7.37)	(7.20)	(3.87)
C. LP characteristics								
LP_Perf (t-1)		0.159	0.108	0.354		0.378	1.064	1.609*
		(0.14)	(0.09)	(0.28)		(0.45)	(1.23)	(1.83)
Ln(LP_Age)		0.184	0.209	0.146		0.241	0.319	0.00813
		(0.73)	(0.85)	(0.56)		(1.13)	(1.55)	(0.04)
Ln(LP_TotalCommit, t-1)		-0.214***	-0.192***	-0.186***		-0.101**	-0.0637	-0.00720
		(-3.78)	(-3.13)	(-2.84)		(-2.13)	(-1.24)	(-0.13)
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
GP type fixed effect	No	No	No	Yes	No	No	No	Yes
No. observations	1537	1338	1338	1315	2219	2114	2114	2100

Table 8: The Likelihood of Getting a New Partner

We estimate the following Logistic (Models 1 to 5) and Probit (Models 6 to 10) regression models:

$$D_{i,j,t} = \alpha_0 + \beta_1 GP\_Perf_{j,t-1} + \beta_2 GP\_Relation_{j,t-1} + \beta_3 LP\_Perf_{i,t-1} + \beta_4 LP\_Relation_{i,t-1} + C \times M_{i,j,t} + e_{i,j,t},$$

where$D_{i,j,t}$ is a dummy variable that takes the value of 1 when an *unrelated* LPi invests in a fund newly launched by a GP j in year$t$ and the value of 0 if the *unrelated* LP does not invest in the new fund (i.e., we exclude all investments made by related LPs),$GP_Perf_{j,t-1}$and $LP_Perf_{i,t-1}$refer to lagged performance of the GP and LP, respectively,$LP\_Relation_{i,t-1}$ refers to the relationship between the LP and all its *existing* GPs prior to year$t$,$GP\_Relation_{j,t-1}$ refers to the relationship of the GP and all its *existing* LPs prior to year$t$, and $M_{i,j,t}$ stacks a list of control variables on the characteristics of the LP, the GP, as well as the fund. In Panel A, an LP and GP's existing relations refer to the commitment-weighted average (VW) relationship between the LP and all its existing GPs and the VW relationship between the GP and all its existing LPs, respectively. In Panel B, the relationship is computed between an LP/GP and its leading partner (in terms of invested value). The standard errors are clustered at the GP-LP level with fixed year effects. As a robustness check, we also include fixed fund-style and LP-style effects in models 6, and12.All GP and LP control variables are lagged. Numbers with "*", "**" and "***" are significant at the 10%, 5% and 1% level, respectively.

Panel A: Likelihood of Getting a New Partner Regressed on the VW Relation with All Existing Partners												
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
	Logistic Regressions						Probit Regressions					
A-1. GP's Relation with its Existing LP												
GP_Relation(t-1)	0.278***	0.353***			0.381***	0.216**	0.115***	0.140***			0.156***	0.0883**
	(3.44)	(3.64)			(3.90)	(2.15)	(3.58)	(3.65)			(3.99)	(2.19)
GP_Perf*GP_Relation(t-1)		-0.307			-0.435	-0.164		-0.0941			-0.155	-0.0685
		(-0.48)			(-0.67)	(-0.26)		(-0.39)			(-0.62)	(-0.28)
GP_perf^2(t-1)*GP_Relation(t-1)		-0.626			-0.582	-0.703		-0.239			-0.251	-0.268
		(-0.65)			(-0.60)	(-0.71)		(-0.65)			(-0.67)	(-0.70)
A-2. LP's Relation with its Existing GP												
LP_Relation(t-1)			-1.516***	-1.491***	-1.487***	-1.481***			-0.588***	-0.583***	-0.579***	-0.577***
			(-17.80)	(-13.80)	(-12.89)	(-12.91)			(-16.91)	(-13.62)	(-12.62)	(-12.46)
GP_Perf(t-1)*LP_Relation(t-1)				0.375	0.240	0.185				0.122	0.0658	0.0472
				(0.54)	(0.33)	(0.25)				(0.46)	(0.24)	(0.17)
GP_perf(t-1)^2*LP_Relation(t-1)				-1.396	-1.251	-1.163				-0.393	-0.340	-0.302
				(-1.23)	(-1.07)	(-0.96)				(-0.89)	(-0.75)	(-0.64)
B. GP Characteristics												
GP_Perf (t-1)	0.500**	0.929	0.609***	0.173	0.845	0.841	0.165**	0.296	0.215***	0.0722	0.310	0.339
	(2.40)	(1.03)	(3.01)	(0.21)	(0.69)	(0.69)	(2.03)	(0.88)	(2.70)	(0.22)	(0.66)	(0.72)
GP_Perf (t-1)^2	-0.676**	0.185	-0.837***	0.784	1.537	1.041	-0.231*	0.0946	-0.305**	0.153	0.492	0.249
	(-2.19)	(0.14)	(-2.74)	(0.58)	(0.85)	(0.56)	(-1.90)	(0.19)	(-2.53)	(0.29)	(0.69)	(0.34)
Log(GP_Age)	0.134***	0.135***	0.133***	0.133***	0.122***	0.0956**	0.0630***	0.0635***	0.0636***	0.0635***	0.0572***	0.0486**
	(3.08)	(3.09)	(3.56)	(3.55)	(2.79)	(2.03)	(3.58)	(3.60)	(4.16)	(4.15)	(3.18)	(2.54)
log(GP_Size, t-1)	-0.245***	-0.246***	-0.210***	-0.211***	-0.249***	-0.218***	-0.0996***	-0.0998***	-0.0884***	-0.0884***	-0.102***	-0.0910***
	(-12.48)	(-12.52)	(-14.52)	(-14.55)	(-12.67)	(-10.46)	(-12.30)	(-12.31)	(-14.21)	(-14.21)	(-12.44)	(-10.46)
C. LP characteristics												
LP_Perf(t-1)	0.695***	0.695***	1.073***	1.072***	1.026***	0.897***	0.258***	0.258***	0.411***	0.411***	0.386***	0.327***
	(4.51)	(4.51)	(7.29)	(7.28)	(6.42)	(5.40)	(4.16)	(4.17)	(6.82)	(6.82)	(5.90)	(4.78)
Concentration of GP	-1.318***	-1.318***	-1.508***	-1.509***	-1.545***	-1.396***	-0.468***	-0.468***	-0.536***	-0.536***	-0.551***	-0.498***
in the LP Port (t-1)	(-11.74)	(-11.75)	(-12.65)	(-12.66)	(-12.28)	(-11.37)	(-11.26)	(-11.26)	(-12.10)	(-12.10)	(-11.68)	(-10.64)
log(LP_TotalCommit, t-1)	0.295***	0.295***	0.345***	0.345***	0.348***	0.396***	0.117***	0.117***	0.137***	0.137***	0.138***	0.157***
	(19.94)	(19.94)	(23.62)	(23.61)	(22.34)	(23.37)	(19.41)	(19.41)	(22.80)	(22.79)	(21.52)	(22.56)
Log(LP_Age)	-0.263***	-0.263***	-0.178***	-0.179***	-0.191***	-0.125***	-0.0943***	-0.0942***	-0.0618***	-0.0620***	-0.0663***	-0.0397**
	(-5.83)	(-5.84)	(-4.66)	(-4.69)	(-4.60)	(-2.76)	(-5.39)	(-5.39)	(-4.04)	(-4.06)	(-3.99)	(-2.19)
D. Fund characteristics												
log(Fund_Size)	0.858***	0.862***	0.829***	0.830***	0.869***	0.875***	0.342***	0.344***	0.335***	0.335***	0.350***	0.355***
	(30.87)	(30.95)	(33.89)	(33.94)	(30.96)	(29.13)	(29.51)	(29.47)	(32.20)	(32.20)	(29.34)	(27.26)
log(Fund_Sequence)	0.318***	0.318***	0.363***	0.363***	0.323***	0.248***	0.114***	0.114***	0.140***	0.140***	0.120***	0.0920***
	(6.56)	(6.54)	(8.19)	(8.19)	(6.61)	(4.71)	(5.80)	(5.77)	(7.64)	(7.64)	(5.97)	(4.25)
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund type fixed effect	No	No	No	No	No	Yes	No	No	No	No	No	Yes
LP type fixed effect	No	No	No	No	No	Yes	No	No	No	No	No	Yes
No. observations	207443	207443	217167	217167	191043	189016	207443	207443	217167	217167	191043	189016

Panel B: Likelihood of Getting a New Partner Regressed on the Relation with the Existing Leading Partner												
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
	Logistic Regressions						Probit Regressions					
A-1. GP's Relation with its Existing LP												
GP_Relation(t-1)	0.230***	0.306***			0.298***	0.154*	0.0968***	0.124***			0.124***	0.0629*
	(3.40)	(3.74)			(3.43)	(1.73)	(3.57)	(3.80)			(3.58)	(1.75)
GP_Perf*GP_Relation(t-1)		-0.185			-0.114	0.214		-0.0530			-0.0439	0.0696
		(-0.33)			(-0.19)	(0.37)		(-0.25)			(-0.19)	(0.31)
GP_perf^2(t-1)*GP_Relation(t-1)		-0.906			-0.857	-1.101		-0.361			-0.327	-0.394
		(-1.07)			(-0.99)	(-1.26)		(-1.10)			(-0.96)	(-1.13)
A-2. LP's Relation with its Existing GP												
LP_Relation(t-1)			-0.586***	-0.651***	-0.641***	-0.638***			-0.241***	-0.266***	-0.261***	-0.257***
			(-11.24)	(-9.48)	(-8.87)	(-8.80)			(-11.28)	(-9.76)	(-9.09)	(-8.86)
GP_Perf(t-1)*LP_Relation(t-1)				0.937*	0.917*	0.904*				0.350*	0.336*	0.333*
				(1.94)	(1.84)	(1.81)				(1.87)	(1.74)	(1.72)
GP_perf(t-1)^2*LP_Relation(t-1)				-1.320*	-1.313*	-1.258				-0.444	-0.436	-0.409
				(-1.78)	(-1.75)	(-1.64)				(-1.53)	(-1.49)	(-1.37)
B. GP Characteristics												
GP_Perf (t-1)	0.518**	0.801	0.624***	-0.443	-0.311	-0.468	0.171**	0.253	0.223***	-0.179	-0.131	-0.171
	(2.52)	(0.99)	(2.93)	(-0.77)	(-0.31)	(-0.48)	(2.13)	(0.83)	(2.69)	(-0.80)	(-0.34)	(-0.45)
GP_Perf (t-1)^2	-0.693**	0.509	-0.803**	0.689	1.938	1.691	-0.237**	0.240	-0.291**	0.216	0.696	0.555
	(-2.25)	(0.43)	(-2.49)	(0.79)	(1.31)	(1.14)	(-1.97)	(0.53)	(-2.30)	(0.62)	(1.22)	(0.95)
Ln(GP_Age)	0.149***	0.149***	0.155***	0.155***	0.153***	0.114**	0.0696***	0.0698***	0.0721***	0.0724***	0.0712***	0.0569***
	(3.53)	(3.52)	(3.90)	(3.92)	(3.40)	(2.36)	(4.09)	(4.10)	(4.50)	(4.52)	(3.91)	(2.94)
Ln(GP_Size, t-1)	-0.247***	-0.249***	-0.216***	-0.216***	-0.250***	-0.215***	-0.101***	-0.101***	-0.0900***	-0.0899***	-0.103***	-0.0896***
	(-12.99)	(-13.10)	(-13.95)	(-13.96)	(-12.53)	(-10.07)	(-12.88)	(-12.95)	(-13.80)	(-13.78)	(-12.57)	(-10.24)
C. LP characteristics												
LP_Perf(t-1)	0.724***	0.724***	0.765***	0.765***	0.780***	0.615***	0.271***	0.272***	0.291***	0.291***	0.294***	0.219***
	(4.79)	(4.79)	(4.95)	(4.95)	(4.76)	(3.59)	(4.48)	(4.49)	(4.70)	(4.70)	(4.48)	(3.19)
Concentration of GP	-1.300***	-1.300***	-1.105***	-1.103***	-1.103***	-0.911***	-0.460***	-0.460***	-0.397***	-0.396***	-0.396***	-0.327***
in the LP Port (t-1)	(-11.76)	(-11.77)	(-9.79)	(-9.78)	(-9.41)	(-8.04)	(-11.26)	(-11.26)	(-9.49)	(-9.48)	(-9.07)	(-7.59)
Ln(LP_TotalCommit, t-1)	0.293***	0.293***	0.313***	0.312***	0.314***	0.366***	0.116***	0.116***	0.125***	0.125***	0.126***	0.146***
	(20.00)	(20.01)	(21.15)	(21.14)	(20.17)	(21.77)	(19.44)	(19.44)	(20.79)	(20.79)	(19.81)	(21.38)
Ln(LP_Age)	-0.258***	-0.258***	-0.180***	-0.180***	-0.190***	-0.101**	-0.0921***	-0.0919***	-0.0627***	-0.0628***	-0.0659***	-0.0317*
	(-5.84)	(-5.84)	(-4.27)	(-4.28)	(-4.24)	(-2.04)	(-5.39)	(-5.38)	(-3.83)	(-3.84)	(-3.79)	(-1.66)
D. Fund characteristics												
Ln(Fund_Size)	0.868***	0.871***	0.824***	0.823***	0.863***	0.862***	0.345***	0.347***	0.332***	0.331***	0.346***	0.349***
	(31.74)	(31.89)	(32.25)	(32.27)	(30.29)	(28.32)	(30.36)	(30.40)	(30.86)	(30.84)	(29.02)	(26.73)
Ln(Fund_Sequence)	0.314***	0.312***	0.346***	0.345***	0.308***	0.238***	0.112***	0.110***	0.130***	0.130***	0.110***	0.0856***
	(6.57)	(6.52)	(7.48)	(7.48)	(6.16)	(4.39)	(5.76)	(5.69)	(6.86)	(6.86)	(5.37)	(3.86)
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund type fixed effect	No	No	No	No	No	Yes	No	No	No	No	No	Yes
LP type fixed effect	No	No	No	No	No	Yes	No	No	No	No	No	Yes
No. observations	218138	218138	197628	197628	183239	180969	218138	218138	197628	197628	183239	180969

Table 9: The Likelihood for LPs to Get Hot Funds Based on Past Investments in Cold Funds

We estimate the following Logistic (models 1, 2, 5, and 6) and Probit (models 3, 4, 7, and 8) regression models: $D_{i,j,t} = \alpha_0 + \beta_1 Cold\_Investment_{i,j,t-1} + \beta_2 Cold\_Investment\ with\ Low\ Relation_{i,j,t-1} + C \times M_{i,j,t} + e_{i,j,t}$, where $D_{i,f,t}$ is a dummy variable that takes the value of 1 when LP i invests in a hot fund launched by a GP j in year t and the value of 0 if LP i invests in a cold fund launched by a GP j in year t. In Models 1 to 4, the variable $Cold\_Investment_{i,j,t-1}$ is a dummy variable that takes the value of 1 if LP i had invested in the cold funds launched by GP j in the past five years, and 0 otherwise. In Models 5-8, $Cold\_Investment_{i,j,t-1}$ refers to the logarithm of the number of cold funds launched by GP j (plus one) that LP i had invested in the past five years. The variable $Cold\_Investment\ with\ Low\ Relation_{i,j,t-1}$ interacts $Cold\_Investment_{i,j,t-1}$ with a dummy variable that takes value of one when the existing relationship between LP i and GP j' belongs to the bottom half of all none-zero GP-LP relationships. The vector $M_{i,j,t}$ stacks a list of control variables on the characteristics of the LP, the GP, as well as the fund. Numbers with "*", "**" and "***" are significant at the 10%, 5% and 1% level, respectively.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
	Cold_Investment = Dummy				Cold_Investment = Number of cold funds invested			
	Logistic Regressions		Probit Regressions		Logistic Regressions		Probit Regressions	
A. LP-GP Relationship								
Cold_Investment	0.515***	0.0621	0.196***	-0.0443	0.562***	0.156	0.197***	-0.0153
	(5.03)	(0.58)	(3.81)	(-0.79)	(4.52)	(1.13)	(3.22)	(-0.22)
Cold_Investment with Low Relation		1.466***		0.699***		1.877***		0.873***
		(10.88)		(9.71)		(10.56)		(9.24)
Relation	1.798***	1.861***	0.913***	0.943***	1.810***	1.851***	0.921***	0.938***
	(37.04)	(38.32)	(38.73)	(40.15)	(37.30)	(38.08)	(39.57)	(40.26)
B. GP Characteristics								
GP_Perf (t-1)	4.660***	4.794***	1.896***	1.930***	4.594***	4.809***	1.867***	1.933***
	(12.84)	(13.16)	(12.12)	(12.28)	(12.61)	(13.04)	(11.94)	(12.21)
GP_Perf (t-1)^2	-4.193***	-4.339***	-1.696***	-1.737***	-4.140***	-4.352***	-1.672***	-1.739***
	(-8.86)	(-9.11)	(-8.29)	(-8.43)	(-8.73)	(-9.07)	(-8.17)	(-8.40)
Ln(GP_Age)	0.246***	0.265***	0.117***	0.124***	0.238***	0.259***	0.114***	0.122***
	(4.20)	(4.58)	(4.77)	(5.11)	(4.06)	(4.46)	(4.67)	(5.01)
Ln(GP_Size)	-0.213***	-0.218***	-0.104***	-0.105***	-0.214***	-0.220***	-0.104***	-0.106***
	(-6.15)	(-6.26)	(-7.44)	(-7.57)	(-6.17)	(-6.30)	(-7.46)	(-7.59)
C. LP characteristics								
LP_Perf (t-1)	0.883***	0.880***	0.391***	0.393***	0.888***	0.885***	0.391***	0.394***
	(5.08)	(5.01)	(5.10)	(5.07)	(5.10)	(5.03)	(5.09)	(5.08)
Concentration of GP	-0.929***	-0.908***	-0.383***	-0.377***	-0.934***	-0.908***	-0.384***	-0.378***
in the LP Port (t-1)	(-7.12)	(-6.94)	(-7.23)	(-7.07)	(-7.16)	(-6.94)	(-7.24)	(-7.07)
Ln(LP_TotalCommit, t-1)	0.270***	0.270***	0.119***	0.118***	0.271***	0.271***	0.119***	0.119***
	(14.17)	(14.16)	(14.55)	(14.46)	(14.27)	(14.22)	(14.63)	(14.50)
Ln(LP_Age)	-0.132**	-0.124*	-0.0741***	-0.0684***	-0.135**	-0.121*	-0.0754***	-0.0678**
	(-2.07)	(-1.95)	(-2.81)	(-2.59)	(-2.11)	(-1.89)	(-2.87)	(-2.56)
D. Fund characteristics								
Ln(Fund_Size)	0.709***	0.702***	0.324***	0.322***	0.712***	0.705***	0.326***	0.324***
	(17.00)	(16.81)	(18.17)	(18.15)	(17.13)	(16.93)	(18.21)	(18.23)
Ln(Fund_Sequence)	0.206***	0.223***	0.0787***	0.0822***	0.217***	0.228***	0.0821***	0.0839***
	(3.42)	(3.70)	(2.94)	(3.06)	(3.62)	(3.78)	(3.06)	(3.11)
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund type fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
LP type fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. observations	126695	126695	126695	126695	126695	126695	126695	126695

Table 10: Relationship Building and LP Categories

We apply the Logistic (Models 1 to 6) and Probit(Models 7-12) models:$D_{i,f,t} = \alpha_0 + \beta_1 GP_Perf_{f,t-1} + \beta_2 Relation_{i,f,t-1} + \beta_3 GP_Perf_{f,t-1} \times Relation_{i,f,t-1} + C \times M_{f,t} + e_{i,f,t}$to various types of LPs,where$D_{i,f,t}$ is a dummy variable that takes the value of 1 if LPi invested in $Fund_{f,t}$ newly launchedin period t, $GP\_Perf_{f,t-1}$ refers to lagged GP performance, $Relation_{i,f,t-1}$ refers to the relationship between the LP and the GP of the fund prior to the vintage year (to save space we focus on Rel_PartnerYear), and $M_{f,t}$stacks a list of control variables. The Appendix provides the detailed definitions. Standard errors are clustered at the GP-LP level with fixed year and fund-style effects. Numbers with "*", "**" and "***" are significant at the 10%, 5% and 1% level, respectively.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
			Logistic Regressions						Probit Regressions			
	Advisor	Bank-ave	Endowment	Insurance	Pension	Others	Advisor	Bank-ave	Endowment	Insurance	Pension	Others
A. GP Characteristics												
GP_Perf (t-1)	4.904*	1.957	3.149***	2.233	0.831***	1.341***	1.808*	0.794	1.167***	0.906	0.294***	0.518***
	(1.70)	(0.62)	(3.45)	(0.94)	(3.94)	(3.04)	(1.87)	(0.82)	(3.32)	(0.95)	(3.27)	(2.74)
GP_Perf (t-1)^2	-9.022*	-7.663	-4.483***	-3.574	-1.465***	-1.521**	-3.544**	-3.250*	-1.676***	-1.311	-0.576***	-0.609**
	(-1.86)	(-1.31)	(-3.36)	(-0.98)	(-4.63)	(-2.29)	(-2.06)	(-1.77)	(-3.04)	(-0.97)	(-4.27)	(-2.14)
Ln(GP_Age)	-0.0945	-0.118	-0.00215	-0.0217	0.0280	0.139	0.0496	-0.130	0.0279	-0.0142	0.0437**	0.0899**
	(-0.27)	(-0.22)	(-0.02)	(-0.05)	(0.64)	(1.60)	(0.38)	(-0.78)	(0.49)	(-0.09)	(2.24)	(2.34)
Ln(GP_Size)	0.00788	-0.105	-0.303***	-0.377***	-0.332***	-0.287***	-0.0247	-0.00431	-0.114***	-0.192***	-0.153***	-0.140***
	(0.04)	(-0.35)	(-4.86)	(-2.92)	(-17.90)	(-7.42)	(-0.37)	(-0.05)	(-4.01)	(-3.13)	(-17.63)	(-7.91)
B. LP-GP Relationship												
Relation (t-1)	3.092***	2.211*	2.881***	2.445***	2.429***	2.108***	1.473***	0.952**	1.433***	1.228***	1.271***	1.098***
	(7.63)	(1.94)	(16.84)	(5.92)	(52.64)	(21.26)	(8.74)	(1.97)	(18.33)	(6.49)	(56.16)	(21.92)
GP_Perf (t-1)*Relation (t-1)	-0.768	-5.808	-4.281***	-1.882	-2.180***	-2.356***	-0.107	-2.464	-1.981***	-0.706	-1.065***	-1.175***
	(-0.23)	(-1.02)	(-3.60)	(-0.46)	(-7.26)	(-3.52)	(-0.06)	(-0.80)	(-3.66)	(-0.34)	(-6.99)	(-3.62)
GP_perf (t-1)^2*Relation (t-1)	-2.951	24.28**	7.574***	6.039	3.766***	3.878***	-2.272	11.16**	3.504***	2.309	1.918***	1.908***
	(-0.32)	(2.47)	(3.85)	(0.45)	(7.23)	(3.25)	(-0.46)	(2.21)	(4.01)	(0.33)	(7.52)	(3.51)
C. LP characteristics												
LP_Perf (t-1)	4.031**	7.176*	0.626*	4.475	0.832***	-0.983***	1.488*	2.615**	0.255	1.796	0.385***	-0.438***
	(1.99)	(1.72)	(1.65)	(0.69)	(5.20)	(-3.59)	(1.82)	(2.41)	(1.63)	(0.67)	(5.40)	(-3.60)
Concentration of GP	1.056	3.637	-0.779**	0.945	-1.090***	-0.0362	0.464	1.305	-0.374***	-0.173	-0.452***	-0.00989
in the LP Port (t-1)	(1.18)	(1.09)	(-2.34)	(0.15)	(-8.57)	(-0.25)	(1.56)	(1.51)	(-3.01)	(-0.07)	(-8.70)	(-0.16)
Ln(LP_TotalCommit, t-1)	0.749***	-4.482*	0.277***	0.643	0.284***	0.248***	0.311***	-1.484**	0.132***	0.0309	0.128***	0.112***
	(5.67)	(-1.92)	(5.05)	(0.26)	(18.35)	(7.49)	(6.22)	(-2.03)	(5.91)	(0.03)	(18.71)	(7.67)
Ln(LP_Age)	-0.407	-1.354	0.168	-0.179	-0.250***	0.210**	-0.155	-0.472*	0.0237	-0.239	-0.112***	0.0995***
	(-0.94)	(-1.60)	(1.11)	(-0.09)	(-4.76)	(2.55)	(-1.15)	(-1.88)	(0.41)	(-0.31)	(-5.07)	(2.78)
D. Fund characteristics												
Ln(Fund_Size)	0.659***	0.173	0.836***	0.612**	0.893***	0.764***	0.304***	0.0351	0.353***	0.315***	0.410***	0.360***
	(3.80)	(0.38)	(9.74)	(2.52)	(31.59)	(14.09)	(4.22)	(0.31)	(9.08)	(3.15)	(30.99)	(14.71)
Ln(Fund_Sequence)	-0.745**	0.842	0.684***	0.644*	0.406***	0.170*	-0.349**	0.337	0.300***	0.318**	0.171***	0.0527
	(-2.19)	(1.20)	(4.13)	(1.70)	(8.55)	(1.86)	(-2.53)	(1.61)	(4.31)	(1.99)	(8.04)	(1.28)
Year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fund type fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
No. observations	5703	1837	27204	1381	152903	37842	5703	1837	27204	1381	152903	37842

Table 11: Robustness Checks on Alternative Proxies of LP-GP Relationship

We estimate the following Logistic (Models 1 to 3) and Probit (Models 4 to 6) regression models:

$$D_{i,f,t} = \alpha_0 + \beta_1 GP\_Perf_{f,t-1} + \beta_2 Relation_{i,f,t-1} + \beta_3 GP\_Perf_{f,t-1} \times Relation_{i,f,t-1} + C \times M_{f,t} + e_{i,f,t},$$

where $D_{i,f,t}$ is a dummy variable that takes the value of 1 if LPi had invested in $Fund_{f,t}$ newly launchedin period t, $GP\_Perf_{f,t-1}$ refers the performance of the GP of the fund prior to the vintage of the fund, $Relation_{i,f,t-1}$ refers to the alternative proxies of the relationship between the LP and the GP of the fund prior to the vintage year (i.e., Rel_Intensity, Rel_Dummy, and Rel_LongTerm), and $M_{f,t}$stacks a list of control variables, including the logarithm of GP's age (GP_Age), the logarithm of the size of GP (GP_Size), the logarithm of LP's total historical investments in the PE industry (LP_TotalCommit) as well as the logarithm of the size and sequence of the fund. Standard errors are clustered at the GP and LP levels with fixed year, fund-style, and LP-style effects. All GP and LP control variables are lagged. The Appendix provides the detailed definition. Numbers with "*", "**" and "***" are significant at the 10%, 5% and 1% level, respectively.

A. Perforamnce of Funds regressed on VW LP-GP Rel_Intensity and Rel_LongTerm

	A1. Perforamnce of Funds regressed on VW LP-GP Rel_Intensity			
	Model 1	Model 2	Model 3	Model 4
	VW LP-GP Rel_Intensity		VW LP-GP Rel_LongTerm	
Rel_Intensity (t-1)	0.0206	-0.0720*		
	(0.76)	(-1.80)		
GP_Perf (t-1)*Rel_Intensity (t-1)		0.603**		
		(1.97)		
Rel_LongTerm (t-1)			0.0162	-0.0220
			(1.14)	(-1.39)
GP_Perf (t-1)*Rel_LongTerm (t-1)				0.236**
				(2.05)
GP, LP and Fund Characteristics	Yes	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes	Yes
Fund type fixed effect	Yes	Yes	Yes	Yes
No. observations	766	766	766	766

B. Capital Commitment regressed on VW LP-GP Relationship

	Model 1	Model 2	Model 4	Model 5
	Logistic Regressions		Probit Regressions	
A. GP Characteristics				
GP_Perf (t-1)	1.017***	0.788***	0.364***	0.297***
	(5.41)	(4.61)	(4.66)	(4.07)
GP_Perf (t-1)^2	-1.438***	-1.308***	-0.548***	-0.532***
	(-5.22)	(-5.02)	(-4.71)	(-4.77)
B. LP-GP Relationship				
Rel_Intensity (t-1)	4.622***		2.486***	
	(64.45)		(84.57)	
GP_Perf (t-1)*Rel_Intensity (t-1)	-2.819***		-1.178***	
	(-6.07)		(-5.95)	
GP_perf (t-1)^2*Rel_Intensity (t-1)	4.114***		1.862***	
	(6.01)		(6.23)	
Rel_LongTerm (t-1)		1.850***		0.963***
		(48.11)		(79.34)
GP_Perf (t-1)*Rel_LongTerm (t-1)		-1.244***		-0.601***
		(-5.13)		(-6.96)
GP_perf (t-1)^2*Rel_LongTerm (t-1)		2.278***		1.155***
		(5.61)		(8.68)
GP, LP and Fund Characteristics	Yes	Yes	Yes	Yes
Fixed Effects	Year-Fund type-LP type		Year-Fund type-LP type	
No. observations	229117	229117	229117	229117

Figure 1: LP-GP Relation for Performance-Sorted Deciles

We first sort PE funds into ten deciles according to fund performance, and then compute the average values of the LP-GP relation for funds with each decile. In Panel A, x-axis represents the performance of a given decile, while the y-axis plots the (commitment) value-weighted average of the LP-GP relationship for funds within this decile. In Panel B, the y-axis plots the relationship between the leading LP and GP of the funds within each decile.The Appendix provides the detailed definitions.