Side-by-Side Management of Hedge Funds and Private Equity Funds*

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Abstract

This paper examines the impact of simultaneous management of hedge funds and private equity funds on the fund performance. We find that these 'side-by-side' managed hedge funds and private equity funds underperform their peers. The results are robust to different portfolio weighting methods, subsample analyses, and different fund screening methods. Further, we find the underperformance of side-by-side hedge (private equity) funds is stronger when the fund management firms have already managed a large number of hedge (private equity) funds. Our results suggest that simultaneous management of different types of funds will distract the fund managers' limited attention, which further distorts the fund performance.

JEL Classification: G11, G24, G41

Keywords: Hedge Fund; Private Equity; Side-by-side Management; Distraction

1. Introduction

The performance of simultaneously, or side-by-side (SBS hereafter), managed funds in different assets or investment strategies has attracted ample attention from both practitioners and academic researchers. Proponents of SBS arrangements contends that it creates value by sharing information and helps to attract and retain the best fund managers. However, opponents argue that there exist severe agency or distraction problems. The fund managers could extract personal benefits at the cost of fund investors through strategic manipulation of the operations in different funds. At the same time, SBS management could largely distract the fund managers' limited time and resources, leading to poor performance.

Previous literature has investigated different types of SBS management, such as SBS management between mutual funds and hedge funds (Nohel, Wang, and Zheng, 2010; Cici, Gibson, and Moussawi, 2010), SBS management between hedge funds and funds of hedge funds (Agarwal, Lu, and Ray, 2016), SBS management between mutual funds and ETFs (Aiken, Sherrill, and Upton, 2022; Luo and Schumacher, 2022). However, despite the rapid growth of asset under management (AUM) in alternative assets in recent years[1], it is surprising that the current literature does not pay attention to SBS between hedge funds and private equity funds. In this paper, we fill this gap by documenting the extent of the SBS managed hedge funds and private equity funds and examining the performance of the SBS funds.

Prior to 2000, hedge fund and private equity belonged to totally different fields. However, since the early 2000s, managers have started to cross over into each other's territory and take on SBS management. They argue that it creates synergy and value for investors while growing their business. Therefore, it is worthwhile to empirically validate whether it creates or destroys investors' value given both hedge funds and private equity funds are the main

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[1] Total alternative assets size in 2021 was $13.3 trillion, of which hedge funds and private equity funds account for 35% and 41% respectively, and the total size is expected to grow at 11.7% of compounded annual growth rate up to US$23.2 trillion by the end of 2026 (2022 Preqin Global Alternatives Reports).

alternative asset classes in which institutional investors allocate a substantial portion of their investment assets.[2]

We hypothesize that the performance of the SBS hedge funds and private equity funds could be affected by two competing channels: distraction, and synergy. The distraction hypothesis argues that managing multiple funds simultaneously can lead to poor performance due to limited time and attention. For instance, literature shows that hedge fund managers who are distracted by marital events (Lu, Ray, and Teo, 2016) or managing multiple funds (Boyson, 2009; Li, Li, Wang, and He, 2021) underperform their peers. Meanwhile, Agarwal, Lu, and Ray (2016) find that hedge funds established by fund of hedge funds firms underperform, partially due to the expansion beyond core competencies. In this regard, we conjecture that SBS managers suffer not only from distraction but from lack of skills. As a result, their original fund business underperforms peers due to distraction effect while their new fund business underperforms peers due to lack of expertise especially given hedge funds and private equity funds require different investment skills with different target investment horizon.

On the other hand, the synergy hypothesis predicts that SBS funds will outperform non-SBS funds. Firms managing hedge funds and private equity funds simultaneously could share their trading information to generate profitable trading ideas. Although regulatory restrictions (i.e. 'Chinese Wall') may limit the flow of information between hedge fund and private equity fund, information sharing is still possible. Massoud, Nandy, Saunders, and Song (2011) document that hedge funds can acquire private information by participating in syndicated loans. Li, Mukherjee, and Sen (2021) show that analysts and mutual fund managers enjoy an information advantage of the stocks if their affiliated brokerage firm helps the firm insiders

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[2] For example, Harvard University Endowment allocated 36% to hedge funds and 23% to private equity out of $42 trillion assets-under-management in 2020. Yale Endowment allocated 21.6% to hedge funds and 15.8% to private equity out of $31 trillion assets-under-management in 2020.

execute the insiders' stock trade. Thus, SBS funds could also benefit from information sharing and perform better.

For the empirical test, we first extract all hedge fund data and private equity data from the Preqin database for a period from year 2000 to 2020. Preqin was selected as it is regarded as the most popular private equity fund database and provides a clear and accurate indicator to distinguish the master funds and feed funds which helps to avoid potential issues on the duplicate funds. We then classify hedge funds and private equity funds into four sub-categories: 1) hedge fund whose management firm doesn't have any simultaneous PE in operation (HF* hereafter), 2) hedge fund whose management firm has simultaneous PE (PE-HF hereafter), 3) private equity fund whose management firm doesn't have any simultaneous HF in operation (PE* hereafter), and 4) private equity fund whose management firm has simultaneous HF (HF-PE hereafter).[3] We identify 172 side-by-side management firms that manage a total of 846 hedge funds (12.9% of total 6,543 hedge fund samples) and 1,622 private equity funds (19.8% of total 8,200 private equity fund samples) simultaneously, suggesting that side-by-side management is widespread.

We examine the performance of the SBS funds (i.e., PE-HF and HF-PE) against their peers, chosen on the basis of primary strategy and fund size, following the matching procedure of Nohel, Wang, and Zheng (2010), which ensures that the results are not driven by the fund characteristics. We find that PE-HF underperforms HF* by 0.26% per month (3.12% per year) based on Fung and Hsieh (2004) seven-factor adjusted alpha. For the private equity fund performance measure, we use the reported internal rate of return (IRR) and find similar results, i.e., HF-PE underperforms PE* by about 5% per year. Additionally, the underperformance of

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[3] We identify the SBS funds at the fund management firm level instead of the fund manager level because Preqin does not provide the information of fund managers of each fund. Although the PE-HF sample and HF-PE sample share the same fund management firms, the observation number of the two samples are not necessarily the same. For example, suppose we only have one SBS fund management firm, which operates three HFs and one PE. In this case, there will be three PE-HFs, but only one HF-PE.

the SBS hedge funds (the SBS private equity funds) is more significant when the management firms are associated with more numbers of hedge funds (private equity funds) under management. The results suggest the distraction effect from new business on the original business is amplified when the firm already manages more existing funds. We also compare the performance of hedge funds before and after the SBS management is adopted and find hedge fund performance declines by 0.43% per month after entering a new private equity business.[4]

We find the SBS managed hedge funds and private equity funds underperform against their peers. Particularly in hedge fund industry, the performance of original hedge fund business deteriorates after the firm enters a new private equity business. Then how does the new business perform against peers?

We classify the management firms into HF-first firms and PE-first firms based on whether the firm starts with a hedge fund or private equity fund.[5] We find the hedge funds launched by PE-first firms underperform their peer hedge funds, and similarly, the private equity funds launched by HF-first firms underperform their peer private equity funds.

From the empirical results, we find strong support for the *distraction* hypothesis, which predicts the SBS management damages the fund performance of the existing business. In addition, the crossover between hedge fund and private equity business should be regarded as an firm-level business expansion beyond core capability, which may result in more harm than benefit for the performance of existing individual funds. However, we would like to acknowledge three major caveats to our analysis. First, our SBS identification is at the fund

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[4] We cannot compare the performance of SBS managed private equity before and after the SBS management is adopted as the private equity does not provide time-series performance data, which is available only after the fund liquidation.

[5] More specifically, we classify PE-HF into PE-First-HF and HF-First-HF then compare only PE-First-HF against HF peers to examine the performance of new HF business by PE-first firms. Similarly, we classify HF-PE into HF-First-PE and PE-First-PE and compare only HF-First-PE against PE peers to examine the performance of new PE business by HF-first firms.

management firm level, instead of the individual fund manager level. The underperformance is interpreted as an average effect. If the SBS funds are run by different individual fund managers, the underperformance may disappear. Second, due to the data limitation, all our analyses are conducted at the individual fund level, instead of the fund management firm level. Expanding the business line could benefit the fund management firm as a whole, such as by generating more fees or accessing more capital. Firms operating in different fields can also have more investment options and flexibility to take advantage of different investment opportunities. Third, we do not have the full investment portfolio of the fund management firm. At the firm level, these portfolios could exhibit lower overall volatility as different risk exposures are cancelled away. It also might be that the firm simultaneously manages other types of funds, which could drive the empirical finding in our paper.

We contribute to the literature on a fast-growing alternative asset management industry by focusing on a previously unexplored managers who simultaneously manage hedge funds and private equity funds. To our knowledge, our paper is the first to identify these managers and document their performance. Our evidence supports the idea that the skills in hedge fund (private equity) management are not necessarily applicable to private equity (hedge fund) management and the expansion into the other playground is detrimental to the existing investors. Given that many alternative asset managers have shifted from one type of investment to the other as part of their business growth strategy, our findings provide timely implications to investors.

Additionally, our study also highlights the role of limited attention of the managers on the SBS fund performance. Previous literature has mainly focused on the traditional principal-agent issue or the potential interest conflicts when examining the side-by-side fund management (e.g., Nohel, Wang, and Zheng, 2010). We document the firm could suffer from

the limited attention when engaging in SBS management, which could damage the whole business.

2. Literature Review and Hypothesis Development

2.1 Institutional Background

The term "alternative" in the "alternative investment" differentiates the investment from "traditional" investments. Whereas traditional investments are made in liquid assets, such as publicly traded stocks, bonds, and cash, via public exchanges and markets, alternative investments are made in more illiquid assets, such as privately traded stocks, private debts, real estate, and infrastructure assets. In 2019, the global equity market capitalization of traditional investments is estimated at US$95 trillion and the global bond market at US$106 trillion[6], while the alternative investment market is estimated at US$11 trillion.[7] Although there is no global consensus on the definition of "alternative investments", practitioners generally use the term "alternative" to broadly refer to asset classes other than publicly traded, long-only equities and fixed-income assets. Therefore, examples of alternative investments include but are not limited to (1) privately traded illiquid stocks and debts, (2) derivative components that allow the "shorting" of equities and fixed-income assets, and (3) new asset classes, such as commodities, natural resources, real estate, and infrastructure. In this study, we focus on the two most important alternative investment vehicles in this market, namely the Hedge Fund (HF) and the Private Equity Fund (PE).

Generally, both hedge fund and private equity fund will use the limited partnership legal structure. Only qualified investors could invest in the hedge fund and private equity fund. The qualified investors are defined as the "accredited investor" by SEC, which impose certain

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[6] Source: The Securities Industry and Financial Markets Association (SIFMA).
[7] Source: Preqin Ltd.'s website on private capital.

requirement on the investor wealth and income. These investors are generally high net worth individuals with rich and sophisticated investment experience. Based on the limited partnership structure, an investor, known as the Limited Partner ("LP") in the world of alternative investment, chooses a fund manager, known as the General Partner ("GP"). Generally, the GP only has a small or even zero ownership of the fund, but GP has a dominating control right of the fund.

Although hedge funds and private equity funds are similar and both operate in the same alternative investment domain, they are different in many respects. Putting aside their different regulatory regimes, these investments are different because HF managers realize returns mostly through the public markets, whereas PE managers own significant or control ownership of private companies and assets to make management decisions at the portfolio level to create longer-term value beyond economic or industry cycle. Although HFs are more illiquid than traditional investments, they are still relatively liquid compared to other alternative investments, as they execute various market strategies, such as long-short equity, the market-neutral approach, managed futures, and multi-strategies. Therefore, HFs maintain liquidity that mostly lasts from months to a year, whereas PEs' liquidity often lasts from 5 to 10 years, if not longer. Finally, HFs are generally open-ended and allow investors to "flow" their money in and out of a fund, whereas PEs are generally closed-ended once their fundraising is complete.[8] Table 1 briefly summarizes the key differences between HFs and PEs.

[Insert Table 1 here]

2.2 Literature Review

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[8] PEs collect "commitments" of investors during their fundraising phase. Investors make actual investments upon the fund manager's "capital call" for each investment transaction each year. The sum of all of these capital calls does not exceed the investor's original commitment.

In this section, we briefly review the currently literature on three streams: the performance of the hedge funds, the performance of private equity funds, and the impact of SBS fund management.

Ackermann, McEnally, and Ravenscraft (1999) document that hedge funds could consistently beat the mutual funds, but hedge funds cannot reliably outperform the standard market indices. They further show that the incentive fees are the driving characteristic for the outperformance of the hedge funds. Fung and Hsieh (2001, 2004) propose the framework of the common risk factors in evaluating the hedge fund performance, which include the stock market return, size factor, default spread, term spread, currency trend-following factor, bond trend-following factor, and commodity trend-following factor. In the same line, Amin and Kat (2003), Stulz (2007), Aggarwal and Jorion (2010), and Agarwal, Arisoy, and Naik (2017) further explore the average hedge fund performance relatively to other investment tools, such as mutual funds. In addition to the overall performance of hedge funds, a much richer literature focuses on the cross-sectional difference of the hedge fund performance. Bali, Brown, and Caglayan (2011, 2012, 2014) investigate whether the exposure to systematic risk factors could predict the cross-section of hedge fund returns. Li, Zhang, and Zhao (2011) and Chen, Cliff, and Zhao (2017) examine whether the hedge fund managers' managerial skills could improve the fund performance. Gao, Gao, and Song (2018) document that hedge fund exploring the rare disaster risks gains abnormal return. Chen, Han, and Pan (2021) find that hedge fund will ride on instead of betting against the market sentiment to profit from equity mispricing.

Compared with the research on hedge fund, the research on private equity fund is much less. Kaplan and Stromberg (2009), Gohil and Vyas (2016), and Mason and Utke (2022) provide some comprehensive reviews, especially Gohil and Vyas (2016) summarize the literature on the private equity performance. Different from the findings on hedge fund performance, researchers suggest that on average the private equity fund could outperform the

public market (Moskowitz and Vissing-Jørgensen, 2002; Ljungqvist and Richardson, 2003; Harris, Jenkinson, and Kaplan, 2014). Another obvious difference between the hedge fund research and private equity fund research is that there lacks some dominating assessment method on the private equity fund performance. Different researchers suggest different method to evaluate the private equity performances, including constructing venture indexes, correcting selection bias, constructing comparable public firm portfolios, or using new risk models (Gompers and Lerner, 1997; Hwang, Quigley, and Weedward, 2005; Korteweg and Sorensen, 2010; and Ang, Chen, Goetzmann, and Phalippou, 2018). In terms of cross-sectional differences, Driller and Kaserer (2009) show that GP skills and the stand-alone risk will affect the PE fund performance. Ewens, Jones, and Rhodes-Kropf (2013) find that VCs with greater idiosyncratic risks perform better than VCs with lower idiosyncratic risks.

Another related literature investigates the potential interactions between different funds. For example, Nohel, Wang, and Zheng (2010) and Cici, Gibson, and Moussawi (2010) examine the performance of side-by-side management of hedge funds and mutual funds, and they find some mixing results. Nohel, Wang, and Zheng (2010) argue that side-by-side mutual fund managers outperform mutual fund peers, but the side-by-side hedge funds do not underperform. Cici, Gibson, and Moussawi (2010) suggest that side-by-side mutual fund managers underperform mutual fund peers. Agarwal, Lu, and Ray (2016) examine the simultaneous management of hedge funds and funds of hedge funds. They find evidence of value creation when hedge fund firms start funds of hedge funds, but value destruction when fund of hedge funds firms start hedge funds. Li, Li, Wang, and He (2021) suggest that hedge fund managers will be distracted after they manage additional hedge funds, leading to lower overall performance. Luo and Schumacher (2021) study the side-by-side management in the ETF industry and document that although the side-by-side ETFs charge higher fees, institutional

investors will still transfer their capital from mutual funds to the ETFs under the same fund managers due to the manager-client loyalty.

2.3 Hypothesis Development

The research question in this study is quite intuitive and direct. We examine the fund performance of simultaneously managed hedge funds and private equity funds. Specifically, we ask (1) *does a hedge fund outperform its peers if its fund management firm simultaneously manages a private equity fund* and (2) *does a private equity fund outperform its peers if its fund management firm simultaneously manages a hedge fund?* For investors, the above questions are fundamental and significant as they care about whether side-by-side management of hedge funds and private equity funds may add or destroy value for fund-level investors. To answer these questions, we propose two competing hypotheses.

In the first hypothesis, we call it the distraction hypothesis. Although hedge funds and private equity funds have substantial similarities, such as similar limited partnership structure, similar fee structure, they also have obvious differences. First, their investment targets are different. Most hedge funds invest in the public market, whereas private equity funds invest in the private market. It is common practice for a hedge fund to buy and sell in the public market to obtain a relatively short-term profit based on market mispricing. In contrast, a private equity fund screens targeted private firms, purchases control rights, actively manages the firms in which it invests, and ultimately takes profits from selling its control rights. As a result, the investment skills required by hedge fund and private equity could be substantially different. In addition, the lifecycle of a single investment in the private equity fund can take at least several years, and sometimes more than a decade. Whereas the hedge fund investment cycle could be much shorter. Hedge fund investors can redeem their investment after a short period. In general, hedge funds are more liquid than private equity funds, which could exert much short-term pressure for the hedge fund managers. Expanding into a new business line beyond the core

competencies can result in poor performance for not just the newly started entity but also for the original business (Boyson, 2009; Agarwal, Lu, and Ray, 2016).

In addition to the different fund characteristics, fund managers, or GPs, may also suffer from the limited attention issue. The cross-discipline operation of different funds may distract their fund managers, even if such a cross-discipline operation is done at the firm level. In practice, a firm-level management team generally includes a large number of highly experienced senior portfolio managers who directly or indirectly manage daily fund operations. Those fund managers may face a capacity issue, as human resources in fund management firms are generally limited. When the fund management firm expands to a new business, current fund managers are likely to be distracted.[9] As a result, the performance of both the new funds and existing funds will be distorted. In summary, the distraction hypothesis predicts the following testable outcomes:

H1A: SBS hedge fund underperforms its peer single hedge funds, and SBS private equity fund underperforms its peer single private equity funds.

In the competing hypothesis, we call it the synergy hypothesis. Simultaneously managed hedge funds and private equity funds can facilitate the information sharing within a fund management firm, which can be viewed as a value-increasing activity. Even if they invest in different asset markets with different liquidity, they can still share some macro-level or sector-level information that affects the prices of all assets in the same sectors. The information could be shared either formally or informally. Massoud, Nandy, Saunders, and Song (2011) document that hedge funds can acquire private information by participating in syndicated loans and trade on that information to make a profit. Li, Mukherjee, and Sen (2021) show that analysts and mutual fund managers affiliated with brokerage firms that help firm insiders trade

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[9] Although it is possible to argue that new fund managers can be hired to operate new funds, alternative investment firms are often strict about controlling their labor costs, and a hiring process takes place only after the new fund's fees begin to flow.

stocks have a substantial information advantage about the insiders' firm and perform much better than analysts and managers who have no such connection. Along the same lines, it is reasonable to assume that hedge funds and private equity funds in the same fund management firm may exchange useful information that is unavailable to their peers, which improves their decision-making process. Thus, the synergy hypothesis predicts the following testable outcomes:

H1B: SBS hedge fund outperforms its peer single hedge funds, and SBS private equity fund outperforms its peer single private equity funds.

Lastly, although it is not likely, there could still exist potential interest conflicts. As the information disclosure is very limited for both hedge funds and private equity funds, the SBS fund managers could have more flexibility to manipulate the fund performance of one SBS fund at the cost of the other SBS fund investors and obtain personal or firm-level benefits. In this case, we predict that either SBS hedge fund outperforms its peers, or SBS private equity fund outperforms its peers, but not both.

3. Sample Selection and Research Design

In this part, we illustrate the sample construction procedures and present some summary statistics on the final sample. We also provide detailed description of the fund performance measurement. The hedge fund and private equity fund data come from Preqin dataset. The risk factors are collected from Bloomberg terminal and the website of Prof. Kenneth French.

3.1 Data Sources

All the data on the hedge fund performance and private equity fund performance come from Preqin, which is an independent global database service provider. Preqin has been regarded as the most reputable data source in PE sector by industry practitioners and academics. It is one of the few data providers dedicated to the whole alternative assets industry, which covers the buyout and venture capital, private debt, hedge funds, real estate, infrastructure, and

natural resources. For the hedge fund data, there also exists several other popular data sources, such as BarclayHedge, HFR, and Lipper TASS. Joenväärä, Kauppila, Kosowski, and Tolonen (2021) make comprehensive comparison on hedge fund data sources and count Preqin as one of seven selected major hedge fund data providers. They mention that Preqin is more popular among practitioners but less frequently used by academics. More importantly, as our research focus is to compare the SBS performance of hedge funds and private equity funds, Preqin is the most suitable data source.

In details, for the hedge fund data, we have fund-month level information, such as monthly rate of return, monthly AUM, inception date, investment strategy, etc. Preqin also provides an easy method to identify the master hedge fund and feeder hedge fund, which enables us to screen the master hedge fund easily. For private equity data, relatively less information is available. We only have the fund-level Internal Rate of Return ("IRR") as the single performance measure. In addition, we also have the initial AUM, inception year, and investment strategy, among others.

3.2 Sample Construction: Matching Process

As discussed previously, we classify the entire sample into four subcategories. For hedge funds sample, if the hedge fund management firm only manage hedge funds, these hedge funds will be classified as non-SBS hedge funds, and we denote these hedge funds as HF*. If the hedge fund management firm also simultaneously manages at least one private equity fund, these hedge funds will be classified as SBS hedge fund, or PE-HF. Similarly, for PE sample, PE* represents private equity funds whose fund management firms only manage private equity fund. HF-PE represents private equity funds whose fund management firms simultaneously manage at least one hedge fund.

[Insert Figure 1 here]

Figure 1 illustrates the sample composition and the matching process we used to construct the testing sample. The entire market can be divided into three groups, composed of (1) funds that manage HF only (HF*), (2) funds that manage PE only (PE*), and (3) funds that manage both HF and PE (PE-HF and HF-PE). The PE-HF sample and HF-PE sample are not necessary the same. PE-HF represents the SBS hedge funds sample, while HF-PE represents the SBS private equity sample. Although the fund management firms are the same, each firm could manage different numbers of hedge funds or private equity funds.

Although the SBS management becomes more and more popular, compared with the entire sample, the PE-HF and HF-PE still account for relatively small proportion. To make the results more reliable, we follow Nohel, Wang, and Zheng (2010) to construct matched samples for HF and PE, respectively. For HF sample, we match each PE-HF with another HF* with the most similar size of AUM and the same fund investment strategy. Specifically, in each month, we sort all HF by size of AUM, and divide the funds into decile groups. For each PE-HF in each month, we select a group of HF*s from the same AUM decile group and with the same investment strategy. We label this matching procedure as one-to-N matching. We further pick the one HF* fund whose AUM is most close to the PE-HF and construct a one-to-one matched HF* sample. Through this matching process, we make sure that the performance of the SBS funds is comparable to those non-SBS funds.

For PE sample, we conduct similar matching procedures. However, the main difference is that each PE has only one fund level characteristics, and we lack the time-series PE data.[10] As a result, PE sample is relatively small. In the matching process, instead of having decile groups based on monthly AUM, we use the fund inception year, also known as the vintage of

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[10] Even if most of private equity funds provide quarterly performance report to their respective investors, such information is not available in public. Preqin keeps one IRR data per fund and the date it received. Preqin has accumulated quarterly performance data for each private equity fund, but it is only available to limited users at higher fees. In addition, the data quality is not necessarily better than the fund level IRRs. See Section 7.4 for more discussion.

fund, to create AUM deciles. For each HF-PE, we select a group of HF* sample from the same inception year and with the same investment strategy. In addition to this one-to-N matching process, we also construct the one-to-one matched sample. Similar as the hedge fund sample, we pick the one private equity fund with the closest initial AUM. Through this matching process, we ensure that the SBS funds and the corresponding benchmark funds have the similar fund characteristics, and their performances are comparable.

As of December 2020, Preqin claims that they cover 42,882 investment firms and 117,653 investment funds. We start with full list of North America-Headquartered PE and HF management firms with their funds started in January 2000 until December 2020. For PE data, we have the fund-level Net IRR (%), Net Multiple (X), Final Close Size (USD mm), Strategy, Vintage/Inception Year, Geographic Focus, etc. For HF data, we have the Monthly Return (Net %), Fund Size (USD mm), Strategy, Date of Record, among others. For the hedge fund data, the original dataset contains 14,393 funds. Following previous literature, we remove all the feeder funds, as they are duplications of the corresponding master funds. After that, we get 6543 master hedge funds. For the private equity fund, the original dataset contains 8,200 PE funds from 2000 to 2020. Figure 1 Panel C summarizes the final dataset.

Following the above matching process, we identified 846 PE-HFs whose fund management firms also simultaneously manage at least one private equity fund. For the other 5697 HF* hedge funds, their fund management firms only operate in the hedge fund industry. Similarly, we identified 1,622 HF-PEs whose fund management firms also operate in the hedge fund sector. As discussed previously, the PE-HF sample and HF-PE sample are not necessarily the same. The SBS fund management firms could manage different numbers of hedge funds or private equity funds.

3.3 Summary Statistics

Table 2 reports the detailed sample description statistics. Panel A shows HF sample distribution by 16 investment strategies. Panel B reports PE sample distribution by 12 investment strategies. Panel C shows the trend in the number of HF over 20 years. Panel D shows the distribution of HF and PE by inception year. Panel E shows fund characteristics for the two hedge fund samples, i.e., HF* and PE-HF.

[Insert Table 2 Here]

In Panel A, we report HF sample data distribution by investment strategy. We separate the Fund of Hedge Fund ("FHF") from general HF data as we conduct robustness test in the later chapter by taking out FHF data. There are 5,788 HF samples excluding FHF and 755 FHF samples. The most common investment strategy is "Equity Strategies" (2,160 funds), followed by "Managed Futures/CTA/Others" (1,043 funds), "Credit Strategies" (739 funds), and "Event Driven Strategies" (475 funds). For FHF, the most common investment strategy is "Multi-Strategies" (388 fund), accounting for more than 50% of the total FHF. The distribution is overall similar between PE-HF and HF*. In Panel B, we report PE sample distribution by 12 investment strategies as defined in Preqin database. The most common investment strategy is "Real Estate" (1,953 funds), followed by "Buyout" (1,324 funds) and "Fund of Funds" (984 funds).

In Panel C, we show the hedge fund sample distribution in each year, including the number of hedge funds and the median AUM. Overall, there is increasing trend in the number of active funds year by year, reaching a peak in 2015. The increasing trend is more obvious for the PE-HF. On average, the proportion of the PE-HF increase from around 12% at the beginning of the sample to about 15% at the end of the sample. When comparing the size of AUM for PE-HF and HF*, the median size of AUM for PE-HF is much larger than the median size of AUM for HF*. This result suggests that conducting a matching process is necessary. In

Panel D, we show the sample distribution of both HF and PE by inception year.[11] The time-series trend in the fund numbers is similar as that in Panel C. The newly established hedge funds increase in the early years, and then decrease at the very last years. But the private equity funds show a persistent increasing trend.

Table 1 Panel E also reports the annual fund characteristics for the PE-HF and the matched HF*. For each year, we only report the year-end comparison. The pattern is very interesting. The funds' ages are similar among different groups. For the fund AUM, the one-to-one matched HF* show a bit larger AUM compared to the PE-HF, but the one-to-N matched HF* show a bit smaller AUM compared to the PE-HF. This is good as it can help to rule out potential impact from the fund AUM on the fund performance if we find similar results using these two different benchmarks. Overall, the fund characteristics between PE-HF and the matched HF* are comparable.

In Table 3, we further present the summary statistic for the monthly risk factors and the monthly hedge fund returns. We collect the risk factors from both Bloomberg and Prof. Kenneth French's website. Following Harvey, Rattray, Sinclair, and Van Hemert (2017), we include the Carhart (1997) four factors, and another four common risk factors used in the hedge fund literature. In details, we extract three factors from Bloomberg, including the bond factor (Barclays U.S. Treasury Index, Bloomberg ticker: LUATTRUU index), credit factor (Citigroup USBIG High-Grade Credit Index minus the Barclays U.S. Treasury Index, Bloomberg ticker: SBC2A10P index and LUATTRUU index), and the FX carry factor (Deutsche Bank G10 currency, Bloomberg ticker: DBHTG10U index). Previous literature suggests that the hedge fund may also have an exposure to the volatility factor because of positions in nonlinear instruments (such as options) or the nature of their dynamic trading strategies (Bali, Brown,

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[11] For the hedge fund, the inception year goes back to 1977. There are 593 hedge funds established prior to 2000. To save space, we exclude them from this Panel.

and Caglayan, 2014; Hamill, Rattray, and Van Hemert, 2016). The volatility factor is the return

of the one-month, at-the-money S&P 500 straddle (one call and one put option) position. The

return is calculated using the option data from OptionMetrics Ivy database. We also include

the Carhart (1997) four factors in the equity market, which are the market factor (MKT), the

size factor (SMB), the value factor (HML), and the momentum factor (MOM). All the factors

are monthly time-series data.

[Insert Table 3 Here]

To calculate the SBS hedge fund (i.e., PE-HF) performance, we first calculate the fund

performance for the one-to-one matched and one-to-N matched sample. For each month, we

calculate the equal-weighted average return for all PE-HF and the two corresponding

benchmarks. Thus, we will have three time-series performance data for the PE-HF and the two

benchmarks. The correlation matrix suggests that the PE-HF performance is highly correlated

with the two benchmarks, suggesting that the matching is successful.

4. Empirical Results on the Hedge Fund Performance

In this section, we report the main empirical results on the performance of PE-HF. We

first present the portfolio analysis results, and then use an event study to address the causality

concern and provide additional evidence.

4.1 Baseline Analysis on Hedge Fund: Portfolio Approach

To evaluate the hedge fund performance, we focus on the abnormal returns adjusted by

the common factor model as in Equation (1) below.

$$R_{i,t} - r_{f,t} = \alpha_i + \beta_{i,M}(MKT_t - r_{f,t}) + \beta_{i,S} * SMB_t + \beta_{i,V} * HML_t + \beta_{i,m} * MOM_t$$
$$+\beta_{i,B} * Bond_t + \beta_{i,C} * Credit_t + \beta_{i,f} * FX\_Carry_t + \beta_{i,v} * Vol\_SP500_t + \varepsilon_{i,t} \tag{1}$$

In the above equation, $R_{i,t}$ is the monthly return for different hedge fund portfolios. $r_{f,t}$ is the

monthly risk-free rate. MKT, SMB, HML, and MOM are the Carhart (1997) four factors. Bond,

Credit, FX_Carry, and Vol_SP500 are the additional risk factors used in the hedge fund

literature. α_i is the regression intercept of the regression, and it measures the abnormal performance of the hedge fund portfolio.

In the empirical analysis, we compare the risk-adjusted performance of the portfolio formed by PE-HF and the portfolio based on the benchmark hedge funds (i.e., matched HF*s). We follow the matching process as stated in section 3.2 to construct the two benchmarks. For each month from January 2000 to December 2020, we construct three equal-weighted portfolios for the PE-HF and the two benchmarks and calculate the portfolio returns. We then regress the monthly portfolio returns and the differences in monthly portfolio return for PE-HF and the two benchmarks using the specification in Equation (1). The factor loadings and the alphas are then reported in Table 4.

[Insert Table 4 Here]

Table 4 Panel A shows the results for the one-to-one matched benchmark, and Panel B shows the results for the one-to-N matched benchmark. In case there are synergy effects between the hedge fund operation and private equity fund operation, we expect the PE-HF outperforms the HF*, i.e., the difference between PE-HF portfolio and HF* portfolio should be positive. In contrast, if it is the distraction hypothesis, we expect the PE-HF should underperform compared with the benchmark, i.e., the differences should be negative.

Panel A shows that the alphas for the PE-HF and HF* are all positive, with the magnitudes of 0.41 (t-stat=4.00) and 0.68 (t-stat=5.17) per month, respectively. The positive alphas suggest that hedge funds outperform compared with the risk factor model. The results are similar and comparable with those reported in Table 4 as in Nohel, Wang, and Zheng (2010). More importantly, when looking at the difference between the performance of PE-HF and HF*, it is significantly negative at about -0.26 (t-stat=-3.28) per month, i.e., about 3% each year. The negative and significant result suggests the PE-HF underperforms compared with the benchmark (i.e., matched HF*). In Panel B, we report the results using the one-to-N benchmark

and repeat the analysis as in Panel A. Results are similar to those in Panel A. The difference between PE-HF and the benchmark return is negative at the 1% significance level.

Overall, the results suggest that when the fund management firm managing hedge funds and private equity fund simultaneously, the SBS hedge fund underperforms compared with similar single managed hedge funds. Thus, the results support the distraction hypothesis, i.e., H1A, and reject H1B, the synergy hypothesis.

4.2 Baseline Analysis on Hedge Fund: Event Study Approach

To better identify the causal relationship and provide more evidence, we further conduct an event study to explore the hedge fund performance before and after the private equity fund is launched. During this short period, the characteristics of the fund management firm should be relatively stable. In case the hedge fund performance changes, the difference should be driven by the launch of the new private equity fund.

In the empirical design, we first extract the fund management firm of the SBS hedge fund. Then, we extract all the private equity funds managed by this fund management firm, and the corresponding private equity fund inception year. In case the fund management firm has multiple PEs, we will pick the earliest PE vintage year as the event time. We then extract and compare the hedge fund performance before and after this earliest PE vintage year.

Due to the data limitation, we can only get inception year of the private equity fund, and the detailed month and date information is not available. For each PE-HF, after we get the inception year of the simultaneously managed private equity fund, we extract the hedge fund performance for one year before the year of private equity inception and for one year after the inception. The fund performance during the PE inception year is excluded. Thus, for each PE-HF, we have 24 monthly returns, 12 returns from the pre-inception period and 12 returns from the post-inception period. We also control the monthly AUM, fund flow, fund age, and the

previous fund performance for the PE-HF. Then, we use the following regression model to test

the fund performance around the PE inception.

$$R_{i,t} - r_{f,t} = \alpha_i + \beta_1 * Post_{PE\,i,t} + \beta_2 * ExRet12_{i,t-1} + \beta_3 * Std(ExRet)_{i,t-1}$$

$$+\beta_4 * Flow12_{i,t-1} + \beta_5 * Ln(AUM)_{i,t-1} + \beta_6 * Ln(Age)_{i,t-1} \qquad (2)$$

$$+(time\ fixed\ effects) + (investment\ strategy\ fixed\ effects) + \varepsilon_{i,t}$$

In the above Equation (2), $R_{i,t}$ is the PE-HF's monthly return. Both the raw return and

the one-to-N benchmark adjusted return are tested.[12] $Post_{PE\,i,t}$ is an indicator variable that

equals to 1 if the return observation is after the private equity inception, and 0 otherwise. For

the control variables, We include the average monthly excess return over the previous 12 month

(ExRet12), the standard deviation of the monthly excess return (Std(ExRet)), the average fund

flow over the previous 12 month (Fow12) as defined in Sirri and Tufano (1998), fund AUM

(Ln(AUM)) in each month, and fund age (Ln(Age)). We also control for time fixed effect and

the fund investment strategy fixed effects. We expect the coefficient β_1 to be significantly

negative.

[Insert Table 5 here]

Table 5 reports the results. Not surprisingly, all the coefficients on the variable

$Post_{PE\,i,t}$ are negative, suggesting the PE-HF performs worse after the fund management firm

launches the private equity fund. Take Column (4) for an example, the coefficient is -0.52 (t-

stat=-2.10), suggesting that PE-HF underperforms by more than 0.5% each month after the

private equity fund is launched. The magnitude is significant and economically meaningful.

The results are similar using other different regression specifications as illustrated in Column

(1) to Column (3). Specifically, our results are not affected whether we use the raw return or

the benchmark adjusted returns, and not affected by adding other control variables. In summary,

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[12] Using one-to-one benchmark adjusted return generates similar results.

the empirical results show that the same hedge fund underperforms after the fund management firm launches the private equity fund, supporting the distraction hypothesis.

5. Empirical Results on the Private Equity Performance

In the above section, we have shown that hedge funds underperform if the fund management firm simultaneously manage the private equity fund. We conjecture that the SBS management of hedge funds and private equity fund distract the fund manager's limited attention. However, it is also possible that the fund managers or the management firms transfer the profits from the hedge fund to the private equity fund and record the losses to the hedge fund, which leads to potential agency problem. In this case, although the SBS hedge fund performance will be poor, the SBS private equity fund could perform better. To further investigate the possibility and distinguish the hypotheses, we investigate the performance of the SBS private equity funds. If it is the distraction hypothesis, we expect the SBS private equity fund should underperform compared to the peers.

To conduct the empirical test, we use the similar testing method as used in the hedge fund test, but we only use the portfolio analysis approach due to the data limitation. Specifically, we construct the time-series private equity performance data and run the following regression to compare the average performance of HF-PE and matched PE*.

$$
\begin{aligned}
R_{i,t} - r_{f,t} = \alpha_i &+ \beta_{i,M}\left(MKT_t - r_{f,t}\right) + \beta_{i,S} * SMB_t + \beta_{i,V} * HML_t + \beta_{i,m} * MOM_t \\
&+ \beta_{i,B} * Bond_t + \beta_{i,C} * Credit_t + \beta_{i,f} * FX\_Carry_t + \beta_{i,v} * Vol\_SP500_t + \varepsilon_{i,t}
\end{aligned}
\tag{3}
$$

In the above equation, $R_{i,t}$ is the annualized IRR for different private equity fund portfolio. $r_{f,t}$ is the annualized risk-free rate. MKT, SMB, HML, and MOM are the Carhart (1997) four factors. Bond, Credit, FX_Carry, and Vol_SP500 are the additional risk factors. α_i is the regression intercept of the regression, and it measures the abnormal performance of the private equity fund.

In the empirical test, we first match HF-PE and PE* using the procedure illustrated in section 3.2. Different from the monthly hedge fund performance data, we only have fund-level data. Thus, we match the private equity fund based on the inception year and the investment strategy, and then calculate the average IRR for HF-PE and the matched PE* in the same inception year. Although there lack commonly used risk models to evaluate the private equity performance, the matching process ensures HF-PE is comparable to HF*. Thus, the difference should be a reliable measure to evaluate the relative performance of the HF-PE.

[Insert Table 6 here]

Table 6 Panel A and B report the results for one-to-one matched results and one-to-N matched results. All the returns or the alphas are reported in annualized percentage returns. If the fund management firm transfers the profits from hedge fund to private equity fund, HF-PE should outperform PE*. In contrast, if it is the distraction hypothesis, we expect HF-PE to underperform compared with the benchmarks. Thus, we focus on the differences between HF-PE and PE*. In both panels, the differences are negative and significant. Specifically, the results are -5.06% (t-stat=-2.85) and -2.74% (t-stat=-2.48) per year for Panel A and Panel B. The negative results reject the potential synergy effect created between hedge fund and private equity fund. When the fund management firm simultaneously manage the hedge fund and private equity fund, both the hedge fund and the private equity fund underperform compared to the matched peer groups. Taken together, these results support the distraction hypothesis and reject the synergy hypothesis and the agency hypothesis.

Overall, the results suggest that when the firm simultaneously operates in both hedge fund and private equity fund, the limited time, resources, and attention could get distracted, leading to lower performance of both hedge funds and private equity funds.

6. Cross-sectional Analysis: Limited Attention and Fund Management Firm Origin

The underperformance of SBS managed funds is consistent with the distraction hypothesis that the cross-discipline operation will distract the fund managers' limited attention. To provide more direct support, we conduct additional cross-sectional tests, and focus on the role of the limited attention and the origin of the fund management firms, i.e., whether the firm starts as a hedge fund management firm or a private equity fund management firm.

6.1 The Role of Limited Attention

Generally, the human resource in the fund management firms is limited. In many cases, the alternative investment firms will strictly maintain the labor expenses. The firm-level management team will generally contain a large portion of the senior portfolio managers, who will directly manage the day-to-day fund operation. Let's compare two hedge fund management firms A and B. Firm A manages a large number of hedge funds, and firm B only manages one hedge fund. It is more likely that the firm management team and the senior portfolio managers in firm A have already operated multiple funds simultaneously, leading to heavier workload, busier life, and exhausted attention. In this case, when the fund management firm expands to the new private equity fund business, the distraction impact on the current hedge fund managers will be stronger for firm A than for firm B. The new hiring process are not likely to take place until the fee flow from the new fund is visible.

To empirically test the above argument, we estimate the numbers of funds under operation for each fund management firm, and we do this for the PE-HF fund management firms and HF-PE fund management firms separately. After that, we repeat the portfolio analysis as in Table 4 and Table 6, but divide the PE-HFs and HF-PEs into subsamples based on whether the fund management firms have more funds under management or firms with fewer funds under management. The results are reported in Table 7.

[Insert Table 7 here]

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Overall, the results confirm that PE-HF underperforms compared with HF*, and HF-PE underperforms compared with PE*, which are consistent with the distraction hypothesis. More importantly, the underperformance is more significant if the fund management firms have more funds under operation. As shown in Table 7 Panel A, when the hedge fund management firms have already operated a large number of hedge funds, starting a new private equity fund will distort the existing hedge fund performance more significantly. The detrimental impact for firms managing more hedge funds is almost twice as that for firms managing less hedge funds. The results exhibit similar patterns for the private equity as reported in Panel B. To sum up, the results provide additional support for the distraction hypothesis. When the fund management firms have heavy workload, starting a new cross-discipline fund affect the fund performance more significantly.

6.2 The Role of Fund Management Firm Origin

In this section, we further test whether the origin of the fund management firms will impact the SBS fund performance. Although the SBS managed hedge funds and private equity funds require the fund management firm to manage these two types of funds simultaneously for some period of time, the fund management firm could start out initially as either a hedge fund management firm or a private equity fund management firm. Thus, it is reasonable to assume that these two types of firms could have different sector-specific human capital or investment skills. Specifically, we classify the SBS fund management firms into two types based on their initial business operation. If the firm starts out as a hedge fund management firm and later expands to private equity fund, we define it as a HF-first firm. On the other hand, we define the firm as a PE-first firm. Assume SBS hedge fund A is managed by a HF-first fund management firm, and SBS hedge fund B is managed by a PE-first fund management firm. It is expected that SBS hedge fund A should be less affected compared with SBS hedge fund B, as the HF-first fund management firm is more competent than the PE-first firm.

In the empirical test, of the SBS hedge funds, roughly 85% are run by HF-first fund management firms. However, of the SBS private equity funds, only 55% are run by PE-first fund management firms. These results suggest that private equity fund management firms are less likely to expand to the hedge fund sector, but the hedge fund management firms are more likely to expand to the private equity sector. We further test the performance of the SBS funds conditioning on whether their management firm is HF-first firm or PE-first firm.

[Insert Table 8 here]

Table 8 presents the results. Panel A shows the results for SBS hedge funds, and Panel B shows the results for SBS private equity funds. The results are quite interesting. As in Panel A, although SBS hedge funds underperform compared with their peers, the PE-first SBS hedge funds underperform more significantly compared with the HF-first SBS hedge funds. The magnitude (-0.38 and -0.24 for one-to-one match and one-to-N match) is more than 1.5 times of that when the SBS hedge funds are managed by HF-first firms (-0.25 and -0.16 for the one-to-one match and one-to-N match). Further, this underperformance is mainly driven by the PE-first SBS hedge fund itself, instead of the benchmark hedge fund. The results provide potential rationale that PE-first fund management firms are less likely to expand to the hedge fund sector.

When looking at the SBS private equity funds, the underperformance is quite similar regardless the SBS private equity fund is managed by HF-first or PE-first fund management firms. The SBS private equity funds managed by HF-first firms even perform slightly better compared with the SBS private equity funds managed by PE-first firms.

Overall, taken the results in Table 7 and Table 8 together, we conclude that SBS fund management will distract the firm's human resources and limited time and attention, leading to poorer fund performance. Expanding to new business beyond the core competencies is not necessarily a good decision.

7. Robustness Tests

7.1 Robustness Tests for the SBS Hedge Fund Performance

Our baseline setting follows Nohel, Wang, and Zheng (2010) and uses the equal weighted (EW) portfolio weighting scheme. In this section, the first robustness test uses the value-weighted (VW) portfolio weighting scheme. In the second test, we exclude the funds of hedge funds from the sample, and only use the hedge funds as the testing assets. Table 9 reports the results. Panel A shows the VW portfolio results, and Panel B reports the results based on a subsample excluding the funds of hedge funds. The results are materially the same as our baseline results, PE-HFs underperform compared with their peers.

[Insert Table 9 here]

7.2 Robustness Tests for the SBS Private Equity Fund Performance

Similar as the robustness tests for the hedge funds, we also calculate the VW portfolio return for the private equity funds. In addition, the IRR data may not be accurate if the private equity funds are still alive. Thus, we repeat the tests using only liquidated private equity funds. Table 10 reports the results. Panel A shows the VW portfolio results, and Panel B reports the results based on liquidated private equity funds. Overall, the results are materially the same.

[Insert Table 10 here]

7.3 Additional Test for the Hedge Fund Performance: Pooled Regression

Unlike the previous analysis based on the matched sample, we also try to include all of the monthly observations and conduct a pooled regression analysis. Specifically, we define a PE-HF dummy variable that equals to 1 if the hedge fund is a SBS hedge fund, and 0 otherwise. Then, we regress the hedge funds' monthly returns on this dummy variable, with different controls. Table 11 reports the results. Overall, the coefficients of the PE-HF dummy variable are all significantly negative in all regressions, suggesting that SBS hedge funds underperform compared with other hedge funds. The results also support the distinction hypothesis.

[Insert Table 11 here]

7.4 Additional Test for the Private Equity Fund Performance: Quarterly IRR

Our baseline regression for the private equity fund uses the fund-level IRR as the fund performance. The Preqin data vendor also provides the quarterly IRR data for some funds. But the quarterly IRR data are not necessarily better than the fund-level IRR for several reasons. First, a PE has no obligation to disclose its fund performance during its life span or even after liquidation. As a result, all the quarterly interim IRRs are estimated at the funds' own discretion. Second, there is no mutually agreed standard method to measure the interim private equity fund performance. The quarterly IRR may not be comparable among different PEs. Third, the single fund-level IRR is a relatively reliable performance measure for private equity investments as it incorporates all the cashflows. Fourth, the interim quarterly IRRs are available only for a limited number of funds. Therefore, we use the fund-level IRR in our baseline analysis.

However, given these drawbacks, we also test whether our results still hold if we use the quarterly IRR data. We repeat the matching process in each quarter and construct the quarterly portfolio analysis for the private equity funds. Thus, we will have three quarterly time-series return data for HF-PE and the two matched PE*. The results are reported in Table 12. Overall, the results are consistent with those using the fund-level IRR data. The HF-PE significantly underperforms compared with the PE*.

[Insert Table 12 here]

8. Conclusion

Hedge funds and private equity funds are similar in terms of fund manager's compensation scheme (e.g. both charges performance fee in addition to the traditional management fee) and regulations (e.g. lower requirements on the information disclosure than mutual fund). Thus, an investigation on the SBS management between hedge funds and private equity funds could provide timely implications for both investors, fund managers, and regulators.

In this study, we investigate how the cross-discipline operation in the alternative investment industry will affect the fund performance. We show that when the hedge fund management firms start up a new private equity fund, the existing hedge fund will underperform compared with the comparable single peer funds. This underperformance also exists when the private equity fund management firms start up a new hedge fund. The results are robust to a set of different empirical settings, such as using different portfolio weighting methods, using different fund screening methods, or using pooled regression analysis.

To explain the empirical findings, we conjecture that the cross-discipline operation will distract the fund managers' attention. This distraction becomes much stronger when the fund management firms have already operated a larger number of funds. Overall, the results suggest the cost to become diversified funds dominates the potential benefits associated with the information spillover from different disciplines. However, we do acknowledge that it is still puzzling why some fund management firms still choose to adopt such a seemingly "loss" strategy. We leave it for future studies.

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Panel A: Simultaneous management
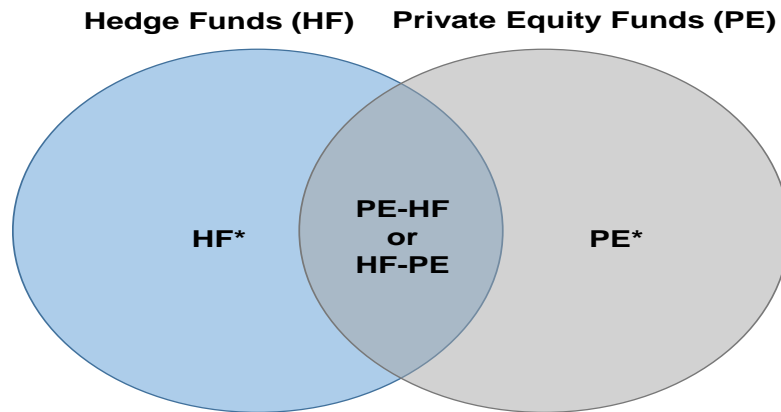
Panel B: Matching Process
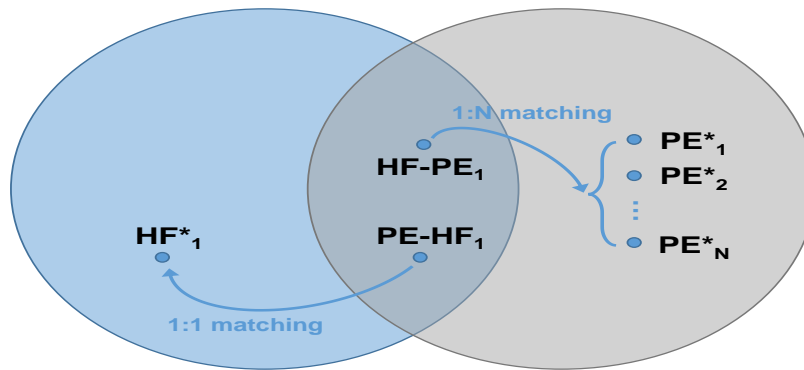
Panel C: final sample distribution
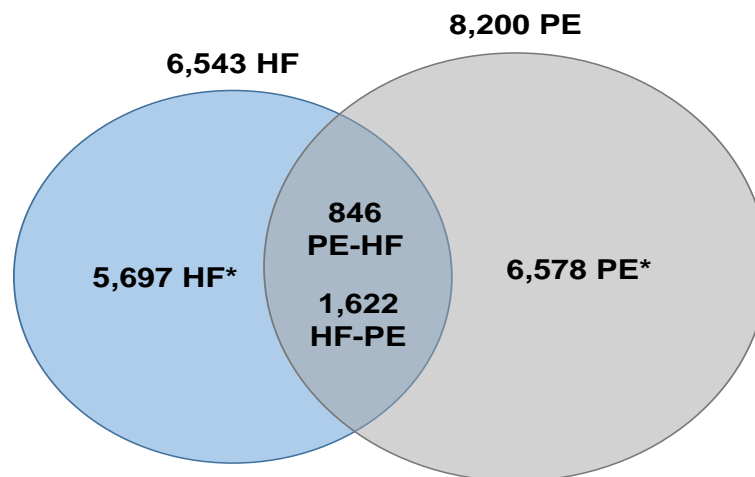
Figure 1: Sample illustration
This figure shows the fund structure of the simultaneous management and the matching process we used to construct the testing sample.

Table 1. Summary of Key Differences between Hedge Funds and Private Equity Funds

This table summarizes the key differences between hedge funds and private equity funds.

	Hedge Fund (HF)	Private Equity Fund (PE)
Fund Horizon	• Flexible to cash out any time after lockup expires in < 1 year	• At least 3-5 years, often 7-10 years
Investment Focus	• Short-term return • Market-based strategies	• Long-term return • Often involves ownership/control
Asset Liquidity	• Medium	• Low
Structure	• Open-ended fund	• Closed-ended fund
Public Disclosure	• Little	• Little
Data Availability	• Medium	• Low

Table 2. Descriptive Statistics

This table reports the sample distribution for the hedge fund sample and the private equity sample. Panel A shows the hedge fund sample distribution by the 16 popular hedge fund investment strategies. Panel B reports the private equity fund sample distribution by the 12 major private equity investment strategies. Panel C reports the time trend of hedge fund in each year. Panel D shows the fund sample distribution by the fund inception year. Panel E presents the fund characteristics between the PE-HF and the corresponding matched HF*. Fund age is defined as the number of months since the fund inception. The final sample covers from 2000 to 2020.

Panel A: HF and Fund of Hedge Fund (FHF) Data Distribution by Investment Strategy

Code	Investment Strategy	Number of Funds			% PE-HF
		HF	HF*	PE-HF	
101	HF Credit Strategies	739	551	188	25.44%
102	HF Equity Strategies	2,160	1,936	224	10.37%
103	HF Event Driven Strategies	475	392	83	17.47%
104	HF Macro Strategies	356	307	49	13.76%
105	HF Multi-Strategy	434	363	71	16.36%
106	HF Niche Strategies	184	171	13	7.07%
107	HF Relative Value Strategies	397	372	25	6.30%
108	Managed Futures/CTA/Others	1,043	1,006	37	3.55%
	Total HF	5,788	5,098	690	11.92%
201	FHFs Credit Strategies	32	22	10	31.25%
202	FHFs Equity Strategies	173	139	34	19.65%
203	FHFs Event Driven Strategies	24	21	3	12.50%
204	FHFs Macro Strategies	40	35	5	12.50%
205	FHFs Multi-Strategy	388	298	90	23.20%
206	FHFs Niche Strategies	16	15	1	6.25%
207	FHFs Relative Value Strategies	19	17	2	10.53%
208	Fund of CTA/Others	63	52	11	17.46%
	Total FHF	755	599	156	20.66%

Panel B: PE Data Distribution by Investment Strategy

Code	Investment Strategy	Number of Funds			% HF-PE
		PE	PE*	HF-PE	
101	Buyout	1,324	1,165	159	12.01%
102	Direct Lending/Distressed Debt	540	232	308	57.04%
103	Early Stage	656	640	16	2.44%
104	Expansion / Late Stage	166	162	4	2.41%
105	Fund of Funds	984	720	264	26.83%
106	Growth	359	310	49	13.65%
107	Infrastructure	201	134	67	33.33%
108	Mezzanine	254	196	58	22.83%
109	Natural Resources	303	267	36	11.88%
110	Real Estate	1,953	1,538	415	21.25%
111	Venture Capital	721	678	43	5.96%
112	Others	739	536	203	27.47%
	Total PE	8,200	6,578	1,622	19.78%

(Table 2 cont'd)

Panel C: HF Data Distribution by Year

Year	# HF	# HF*	Median AUM	# PE-HF	Median AUM	% PE-HF
2000	156	137	29.90	19	112.00	12.18%
2001	188	165	36.39	23	44.58	12.23%
2002	237	209	41.94	28	102.95	11.81%
2003	283	246	53.07	37	180.00	13.07%
2004	335	296	60.65	39	320.75	11.64%
2005	392	338	65.46	54	379.19	13.78%
2006	447	386	63.36	61	339.00	13.65%
2007	524	450	73.58	74	392.87	14.12%
2008	634	544	48.31	90	234.37	14.20%
2009	735	630	48.66	105	184.00	14.29%
2010	879	755	51.03	124	191.14	14.11%
2011	1,093	946	47.23	147	178.56	13.45%
2012	1,436	1,256	49.57	180	205.64	12.53%
2013	1,743	1,541	48.57	202	202.82	11.59%
2014	1,978	1,720	53.70	258	211.24	13.04%
2015	2,030	1,740	54.42	290	211.99	14.29%
2016	2,029	1,716	52.50	313	190.00	15.43%
2017	1,973	1,659	59.83	314	182.53	15.91%
2018	1,908	1,598	55.32	310	185.67	16.25%
2019	1,850	1,544	55.77	306	232.93	16.54%
2020	1,728	1,444	59.96	284	262.83	16.44%
Total	6,543	5,697	-	846	-	12.93%

(Table 2 cont'd)

Panel D: HF and PE Data Distribution by Inception Year

Inception Year	Number of Funds			% PE-HF	Number of Funds			% HF-PE
	HF	HF*	PE-HF		PE	PE*	HF-PE	
2000	104	91	13	12.50%	340	292	48	14.12%
2001	129	115	14	10.85%	246	197	49	19.92%
2002	154	132	22	14.29%	195	154	41	21.03%
2003	180	152	28	15.56%	192	152	40	20.83%
2004	210	178	32	15.24%	283	245	38	13.43%
2005	217	171	46	21.20%	418	325	93	22.25%
2006	202	173	29	14.36%	482	396	86	17.84%
2007	275	232	43	15.64%	481	374	107	22.25%
2008	308	264	44	14.29%	461	353	108	23.43%
2009	318	271	47	14.78%	224	169	55	24.55%
2010	397	347	50	12.59%	331	258	73	22.05%
2011	425	365	60	14.12%	395	319	76	19.24%
2012	439	371	68	15.49%	385	314	71	18.44%
2013	473	413	60	12.68%	457	358	99	21.66%
2014	411	370	41	9.98%	468	391	77	16.45%
2015	346	311	35	10.12%	502	405	97	19.32%
2016	332	283	49	14.76%	521	433	88	16.89%
2017	324	291	33	10.19%	518	415	103	19.88%
2018	275	258	17	6.18%	523	415	108	20.65%
2019	216	206	10	4.63%	492	391	101	20.53%
2020	215	200	15	6.98%	286	222	64	22.38%
Total	5,950	5,194	756	12.71%	8,200	6,578	1,622	19.78%

(Table 2 cont'd)

Panel E: Fund Characteristic between PE-HF and matched HF*

Year /Month	# Funds	PE-HF				One-to-one matched HF*				One-to-N matched HF*			
		(1) Mean Age	(2) Median Age	(3) Mean AUM	(4) Median AUM	(5) Mean Age	(6) Median Age	(7) Mean AUM	(8) Median AUM	(9) Mean Age	(10) Median Age	(11) Mean AUM	(12) Median AUM
2000/12	12	116	55	97	34	86	55	806	28	58	48	317	27
2001/12	20	106	75	115	80	92	83	476	73	64	51	210	70
2002/12	29	100	75	119	68	83	77	235	67	62	52	152	66
2003/12	37	93	71	172	149	76	52	245	137	68	56	198	121
2004/12	50	84	54	198	144	70	43	322	211	65	59	241	199
2005/12	65	91	65	232	160	75	55	333	270	67	61	256	227
2006/12	86	85	59	319	262	72	56	371	291	70	65	307	228
2007/12	109	79	60	551	317	89	71	1,179	344	78	68	659	293
2008/12	158	79	62	430	204	85	75	1,110	216	77	74	623	211
2009/12	190	84	71	1,487	213	92	71	1,252	333	82	83	597	230
2010/12	239	86	71	1,379	264	100	89	1,397	290	82	74	664	251
2011/12	284	94	78	934	197	105	88	1,391	246	84	77	645	215
2012/12	312	99	85	959	242	111	99	1,904	450	90	85	769	235
2013/12	343	98	82	940	218	112	100	2,110	269	92	87	800	214
2014/12	372	102	88	977	210	126	119	2,397	331	96	97	813	237
2015/12	399	106	90	960	219	120	107	2,579	261	104	102	834	247
2016/12	408	110	93	813	209	127	113	2,172	253	108	109	742	238
2017/12	412	113	98	779	196	147	131	2,238	289	110	111	717	236
2018/12	411	120	103	811	194	160	131	2,104	271	115	115	705	232
2019/12	410	128	114	944	240	136	116	2,355	289	118	120	734	266
2020/12	374	145	128	1,187	282	144	127	1,327	379	123	118	901	304
Total	55,419	105	87	920	215	118	98	2,109	300	97	91	728	235

Table 3. Descriptive Results on Risk Factors and Hedge Fund Performance

This table reports the summary statistics of the risk factors used in the tests and the monthly hedge fund returns. Panel A reports the mean, median, and corresponding distributions of the return and factors used in the paper. Ret is the average monthly return for the PE-HF. Ret_B1 is the average monthly return for the one-to-one matched HF*. Ret_B2 is the average monthly return for the one-to-N matched HF*. MKT, SMB, HML, and MOM are the Fama-French three factors and the Carhart momentum factor. Bond is the monthly change of the Barclays US Treasure Index. Credit is the monthly change of the Citigroup USBIG High-Grade Credit Index minus the Barclays US Treasure Index. FX_Carry is the monthly change of the Deutsche Bank G10 currency carry index. Vol_SP500 is the monthly return of the straddles for the S&P 500 Index. Panel B reports the correlation matrix for the variables.

Panel A: Summary Statistics

Variable (N=252)	Mean	Std. Dev.	P25	P50	P75
Ret	0.60	1.93	-0.19	0.80	1.71
Ret_B1	0.86	1.82	-0.12	0.86	1.82
Ret_B2	0.76	1.80	-0.06	0.89	1.87
MKT	0.55	4.57	-1.97	1.14	3.29
SMB	0.25	3.23	-1.74	0.20	2.02
HML	0.08	3.25	-1.67	-0.10	1.62
MOM	0.18	5.32	-1.83	0.35	2.94
Bond	0.40	1.26	-0.33	0.40	1.05
Credit	0.30	2.09	-0.76	0.40	1.42
FX_Carry	0.17	2.47	-1.09	0.31	1.62
Vol_SP500	-3.63	66.70	-48.23	-14.51	28.04

Panel B: Correlation Matrix

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	Ret	1.00									
2	Ret_B1	0.91	1.00								
3	Ret_B2	0.95	0.97	1.00							
4	MKT	0.82	0.78	0.80	1.00						
5	SMB	0.37	0.37	0.41	0.29	1.00					
6	HML	0.07	0.09	0.07	0.00	-0.19	1.00				
7	MOM	-0.29	-0.29	-0.27	-0.38	0.04	-0.21	1.00			
8	Bond	-0.31	-0.29	-0.30	-0.36	-0.17	-0.11	0.22	1.00		
9	Credit	0.32	0.30	0.32	0.27	0.05	0.01	-0.14	0.37	1.00	
10	FX_Carry	0.58	0.52	0.56	0.51	0.17	0.21	-0.19	-0.20	0.23	1.00
11	Vol_SP500	-0.10	-0.11	-0.11	-0.12	-0.01	-0.05	0.16	0.13	0.00	-0.09

Table 4. Hedge Fund Performance: Portfolio Approach

This table reports relative performance of PE-HF to different benchmarks using portfolio analysis approach. In each month, we form two equal-weighted portfolios for PE-HF and corresponding HF*. Panel A shows the results based on the one-to-one matched HF*. Panel B shows the results based on the one-to-N matched HF*. In each panel, we separately report the risk factor adjusted alpha and the factor loadings for the PE-HF portfolio, the HF* portfolio, and the difference between the two portfolios during the period from January 2000 to December 2020. For the factor model, we include Carhart (1997) four-factors, and another four popular risk factors used in the hedge fund literature, including Bond, Credit, FX_Carry, and Vol_SP500. The detailed factor definition is listed in Table 3. The t-statistics are shown in parentheses are computed based on standard errors with Newey-West corrections. ***, **, and * indicates 1%, 5%, and 10% significance level, respectively.

Panel A. One-to-One Match Results

	Alpha	MKT	SMB	HML	MOM	Bond	Credit	FX_Carry	Vol_SP500
PE-HF	0.41***	0.27***	0.09***	0.03	0.01	-0.11	0.12***	0.15**	-0.00
	(4.00)	(10.69)	(2.86)	(0.71)	(0.50)	(-0.80)	(2.68)	(2.57)	(-0.00)
HF*	0.68***	0.25***	0.10***	0.05	0.00	-0.08	0.10**	0.09**	-0.00
	(5.17)	(6.83)	(2.95)	(0.93)	(0.19)	(-0.52)	(2.10)	(2.16)	(-0.51)
Difference	-0.26***	0.02	-0.01	-0.02	0.00	-0.03	0.02	0.06	0.00
	(-3.28)	(0.61)	(-0.63)	(-0.80)	(0.36)	(-0.51)	(0.54)	(1.28)	(0.66)

Panel B. One-to-N Match Results

	Alpha	MKT	SMB	HML	MOM	Bond	Credit	FX_Carry	Vol_SP500
PE-HF	0.41***	0.27***	0.09***	0.03	0.01	-0.11	0.12***	0.15**	-0.00
	(4.00)	(10.69)	(2.86)	(0.71)	(0.50)	(-0.80)	(2.68)	(2.57)	(-0.00)
HF*	0.57***	0.25***	0.11***	0.04	0.01	-0.08	0.11**	0.11**	-0.00
	(5.25)	(8.54)	(4.39)	(0.82)	(0.72)	(-0.59)	(2.44)	(2.22)	(-0.37)
Difference	-0.16***	0.02	-0.02	-0.01	-0.00	-0.02	0.00	0.04	0.00
	(-2.96)	(0.77)	(-1.29)	(-0.77)	(-0.34)	(-0.54)	(0.10)	(1.64)	(0.85)

Table 5. Performance of Hedge Fund: Event Study Analysis

This table reports the results of the event study on PE-HF performance around the private equity fund inception. We compare HF performance before and after the fund management firm starts the PE business. Column (1) and (2) show the results based on raw return, and Column (3) and (4) report the results based on benchmark adjusted return. $Post_{PE}$ is an indicator variable defined as 1 if the return observation is after the private equity inception, and 0 otherwise. Exret12 is the average excess return during the previous 12 months. Std(Exret) is the standard deviation of the monthly excess return during previous 12 months. Flow12 is the monthly money flow, defined as the average monthly percentage net growth of the fund AUM that is driven by inflow and outflow (Sirri and Tufano, 1998). Ln(AUM) is about the monthly AUM of the hedge fund. Ln(Age) is about the fund age, defined as the number of months since the hedge fund inception. In all regression, we include the time fixed effects and fund investment type/strategy fixed effect. The t-statistics in parentheses are based on standard errors clustered at fund level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

	Raw Return		Benchmark Adjusted Return	
	(1)	(2)	(3)	(4)
$Post_{PE}$	-0.49*	-0.43*	-0.59**	-0.52**
	(-1.82)	(-1.94)	(-2.13)	(-2.10)
ExRet12		-0.03		0.11
		(-0.26)		(0.64)
Std(ExRet)		0.16*		0.14
		(1.85)		(1.39)
Flow12		-0.01		0.00
		(-0.29)		(0.15)
Ln(AUM)		-0.15***		0.02
		(-3.02)		(0.29)
Ln(Age)		0.27		0.20
		(1.49)		(0.88)
Intercept	1.47***	0.79	0.50***	-0.91
	(8.03)	(0.99)	(2.66)	(-0.84)
Time FE	Yes	Yes	Yes	Yes
Fund type FE	Yes	Yes	Yes	Yes
Observations	1,255	1,255	1,255	1,255
Adjusted R^2	0.483	0.483	0.074	0.074

Table 6. Private Equity Performance: Portfolio Approach

This table reports relative performance of HF-PE to different benchmarks using a portfolio analysis approach. In each year, we form two equal-weighted portfolios for the HF-PE and corresponding PE*. Panel A shows the results based on the one-to-one matched PE*. Panel B shows the results based on the one-to-N matched PE*. In each panel, we separately report the risk factor adjusted alpha and the factor loadings for HF-PE portfolio, PE* portfolio, and the difference between the two portfolios during the period from 2000 to 2015. For the factor model, we include Carhart (1997) four-factors and another four popular risk factors used in the hedge fund literature, including Bond, Credit, FX_Carry, and Vol_SP500. The detailed factor definition is listed in Table 3. The t-statistics are shown in parentheses are computed based on standard errors with Newey-West corrections. ***, **, and * indicates 1%, 5%, and 10% significance level, respectively.

Panel A. One-to-One Match Results

	Alpha	MKT	SMB	HML	MOM	Bond	Credit	FX_Carry	Vol_SP500
HF-PE	8.70***	-0.11*	0.49***	0.00	0.12**	-0.18	0.18**	0.10	-0.02***
	(4.00)	(-1.78)	(4.69)	(0.16)	(2.49)	(-0.69)	(2.13)	(1.22)	(-3.54)
PE*	13.76***	-0.05	0.64***	-0.05	0.22***	-0.01	0.18	0.21*	-0.02***
	(4.58)	(-0.59)	(3.57)	(-0.89)	(3.99)	(-0.02)	(0.87)	(1.81)	(-3.82)
Difference	-5.06***	-0.06	-0.15	0.05	-0.10**	-0.17	0.00	-0.11*	0.01
	(-2.85)	(-0.57)	(-1.18)	(0.99)	(-2.45)	(-0.56)	(0.00)	(-1.83)	(1.38)

Panel B. One-to-N Match Results

	Alpha	MKT	SMB	HML	MOM	Bond	Credit	FX_Carry	Vol_SP500
HF-PE	8.70***	-0.11*	0.49***	0.00	0.12**	-0.18	0.18**	0.10	-0.02**
	(4.00)	(-1.78)	(4.69)	(0.16)	(2.49)	(-0.69)	(2.13)	(1.22)	(-3.54)
PE*	11.44***	-0.04	0.53**	-0.10***	0.16***	-0.05	0.16	0.13**	-0.02***
	(4.53)	(-0.75)	(3.20)	(-2.65)	(4.45)	(-0.15)	(1.26)	(2.25)	(-3.56)
Difference	-2.74**	-0.07	-0.03	0.10***	-0.05	-0.13	0.02	-0.03	0.00
	(-2.48)	(-0.93)	(-0.34)	(3.59)	(-1.18)	(-0.95)	(0.23)	(-0.55)	(0.75)

Table 7. The Impact of Distraction

This table examines the impact of fund management firm or fund manager's limited attention on the performance of simultaneously managed funds. We estimate the numbers of funds under operation for each fund management firm, and we do this for the PE-HF firms and HF-PE firms separately. After that, we repeat the portfolio analysis as in Table 4 and Table 6, but divide the PE-HFs and HF-PEs into subsamples based on whether the fund management firms have more funds under management or have fewer funds under management. The t-statistics are shown in parentheses are computed based on standard errors with Newey-West corrections. ***, **, and * indicates 1%, 5%, and 10% significance level, respectively.

Panel A: Hedge fund results based on subsamples

	Firms with more HFs under management		Firms with fewer HFs under management	
	One-to-One Match Alpha	One-to-N Match Alpha	One-to-One Match Alpha	One-to-N Match Alpha
PE-HF	0.26***	0.26***	0.56***	0.56***
	(2.80)	(2.80)	(4.84)	(4.84)
HF*	0.59***	0.55***	0.74***	0.59***
	(4.90)	(5.65)	(5.29)	(4.85)
Difference	-0.33***	-0.29***	-0.18**	-0.03
	(-4.20)	(-5.45)	(-2.00)	(-0.38)

Panel B: Private equity fund results based on subsamples

	Firms with more PEs under management		Firms with fewer PEs under management	
	One-to-One Match Alpha	One-to-N Match Alpha	One-to-One Match Alpha	One-to-N Match Alpha
HF-PE	7.98***	7.98***	9.60***	9.60***
	(2.95)	(2.95)	(5.61)	(5.61)
HE*	13.46***	11.23***	14.27***	11.84***
	(4.27)	(4.53)	(4.68)	(4.47)
Difference	-5.48***	-3.25**	-4.67**	-2.25*
	(-3.85)	(-2.42)	(-2.08)	(-1.73)

Table 8. The Impact of Fund Management Firm Origin: HF-first and PE-first

This table examines the impact of fund management firms' origin on the performance of simultaneously managed funds. We classify the SBS fund management firms into two types: HF-first or PE-first, based on whether the firms start as a hedge fund management firm or private equity management firm. After that, we repeat the portfolio analysis as in Table 4 and Table 6, but divide the PE-HFs and HF-PEs into subsamples based on the type of the fund management firms. The t-statistics are shown in parentheses are computed based on standard errors with Newey-West corrections. ***, **, and * indicates 1%, 5%, and 10% significance level, respectively.

Panel A: Hedge fund results based on subsamples

	HF-first Firms		PE-first Firms	
	One-to-One Match Alpha	One-to-N Match Alpha	One-to-One Match Alpha	One-to-N Match Alpha
PE-HF	0.42***	0.42***	0.27***	0.27***
	(3.91)	(3.91)	(2.74)	(2.74)
HF*	0.67***	0.58***	0.65***	0.51***
	(4.90)	(5.24)	(6.09)	(4.89)
Difference	-0.25***	-0.16***	-0.38***	-0.24***
	(-2.79)	(-2.61)	(-4.47)	(-3.61)

Panel B: Private equity fund results based on subsamples

	HF-first Firms		PE-first Firms	
	One-to-One Match Alpha	One-to-N Match Alpha	One-to-One Match Alpha	One-to-N Match Alpha
HF-PE	9.66***	9.66***	7.54***	7.54***
	(4.04)	(4.04)	(3.97)	(3.97)
PE*	14.52***	12.30***	13.46***	10.64***
	(6.20)	(4.71)	(3.77)	(4.39)
Difference	-4.85***	-2.64***	-5.93**	-3.10*
	(-3.65)	(-5.27)	(-2.27)	(-1.87)

Table 9. Robustness Checks: Hedge Fund Performance

This table presents several robustness tests results for the hedge fund performance. We repeat the portfolio analysis as in Table 4, but using different subsamples or different portfolio weighting methods. The t-statistics are shown in parentheses are computed based on standard errors with Newey-West corrections. ***, **, and * indicates 1%, 5%, and 10% significance level, respectively.

Panel A: Results based on AUM value weighted portfolio

	One-to-One Match Alpha	One-to-N Match Alpha
PE-HF	0.44***	0.44***
	(4.57)	(4.57)
HF*	0.59***	0.56***
	(5.94)	(5.14)
Difference	-0.15**	-0.12*
	(-1.99)	(-1.93)

Panel B: Results based on sample excluding Funds of Hedge Fund

	One-to-One Match Alpha	One-to-N Match Alpha
PE-HF	0.46***	0.46***
	(3.95)	(3.95)
HF*	0.78***	0.65***
	(5.34)	(5.57)
Difference	-0.32***	-0.19***
	(-3.37)	(-3.03)

Table 10. Robustness Checks: Private Equity Fund Performance

This table presents several robustness tests results for the private equity fund performance. We repeat the portfolio analysis as in Table 6, but using different subsamples or different portfolio weighting methods. The t-statistics are shown in parentheses are computed based on standard errors with Newey-West corrections. ***, **, and * indicates 1%, 5%, and 10% significance level, respectively.

Panel A: Results based on AUM value weighted portfolio

	One-to-One Match Alpha	One-to-N Match Alpha
HF-PE	10.39***	10.39***
	(5.47)	(5.47)
PE*	15.95***	12.02***
	(7.78)	(5.50)
Difference	-5.56***	-1.63**
	(-7.02)	(-2.34)

Panel B: Results based on sample of liquidated private equity funds

	One-to-One Match Alpha	One-to-N Match Alpha
HF-PE	4.95	4.95
	(0.48)	(0.48)
PE*	17.23*	12.59
	(1.94)	(1.46)
Difference	-12.28***	-7.64**
	(-2.90)	(-2.18)

Table 11. Additional Test on the Hedge Fund Performance: Pooled Regression

This table presents additional robustness test results for the hedge fund performance. We run a pooled regression based on the full sample. Return is the monthly return of the hedge funds. PE-HF is an indicator variable which equals 1 if the hedge fund is associated with at least one simultaneously managed private equity fund, and 0 otherwise. ExRet12 is the average excess return during the previous 12 months. Std(Exret) is the standard deviation of the monthly excess return during previous 12 months. Flow12 is the average fund flow, defined as the average monthly percentage net growth of the fund AUM driven by inflow and outflow (Sirri and Tufano, 1998). Ln(AUM) is monthly AUM and Ln(Age) is fund age, defined as the number of months since the fund inception. The t-statistics in parentheses are based on standard errors clustered at fund level. ***, **, and * denote significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable: Return	(1)	(2)	(3)	(4)
PE-HF	-0.13***	-0.17***	-0.12***	-0.08**
	(-3.82)	(-4.98)	(-3.67)	(-2.29)
ExRet12				0.16***
				(7.09)
Std(ExRet)				0.09***
				(4.44)
Flow12				-0.00**
				(-2.55)
Ln(AUM)				0.00
				(0.56)
Ln(Age)				-0.10***
				(-8.36)
Intercept	0.72***	0.72***	0.72***	0.69***
	(69.01)	(67.10)	(72.53)	(9.04)
Time FE	Yes	No	No	No
Fund type FE	No	Yes	No	No
Time*Type FE	No	No	Yes	Yes
Observations	537,512	537,512	537,423	275,617
Adjusted R^2	0.004	0.106	0.185	0.217

Table 12. Additional Test on the Private Equity Fund Performance: Quarterly IRR

This table presents the robustness test results for the private equity fund performance using the quarterly IRR data. We repeat the portfolio analysis as in Table 6. The t-statistics are shown in parentheses are computed based on standard errors with Newey-West corrections. ***, **, and * indicates 1%, 5%, and 10% significance level, respectively.

	One-to-One Match Alpha	One-to-N Match Alpha
HF-PE	11.49***	11.49***
	(7.96)	(7.96)
PE*	14.97***	14.64***
	(14.53)	(15.11)
Difference	-3.48***	-3.15***
	(-5.55)	(-4.27)