Fundraising in the Hedge Fund Industry

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This paper studies fundraising process in hedge fund industry. Using SEC form D filings of hedge funds, I document that funds that are sold to investors by intermediary brokers underperform funds that are offered to investors directly by 2% (1.6%) per year on a risk-adjusted basis before (after) fees. Funds that are sold to investors directly on average have larger investment size and larger minimum investment size and charge higher performance fees comparing to funds offered to investors by brokers. These results are consistent with a stylized model of fundraising where hedge funds choose fees and capital raising channels and investors with heterogenous due-diligence costs allocate capital across hedge funds.

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Introduction

High search and due diligence costs due to the opacity of the hedge fund industry make the fundraising process challenging even for hedge funds with a good reputation and a strong track record. Financial intermediaries, such as brokers, consultants, and placement agents, help funds and investors to find one another and to overcome barriers to transact. This paper studies, empirically and theoretically, the role of intermediaries in the fundraising process of hedge funds.

There is yet no consensus about the role and social value of intermediaries. Some people think that intermediation is socially useful. This view is usually justified with several arguments. First, intermediaries may help counterparties find one another and transact, by exploiting their positional advantage and industry knowledge, as per Rubinstein and Wolinsky (1987). Second, intermediaries may help alleviate adverse selection problems, as per Booth and Smith (1986) and Garella (1989). Third, intermediaries may add value by decreasing the costs of making decisions and executions, as per Spulber (2001).

Others think that intermediaries impose unnecessary costs on society. Judge (2014) argues that intermediaries often promote institutional arrangements to maximize their economic rents, and illustrates her point using examples of real estate agents, stock brokers, mutual funds, and exchanges. Warren Buffett opposed and publicly criticized intermediaries on numerous occasions. For example, in 1996 class B shares of Berkshire Hathaway were issued as a response to unit trusts that sold fractional units of Berkshire's shares to small investors.

To analyze empirically the role that financial intermediaries play in the fundraising process of hedge funds, I download and process the entire collection of form D filings that hedge funds report to the U.S. Securities and Exchange Commission ("the SEC") under Regulation D. These filings have information on all third parties involved in the fundraising process. It allows one to identify the hedge funds offered to investors directly and those sold to investors through intermediary brokers.

I match this dataset with the Morningstar hedge funds database using a fuzzy match algorithm. My final dataset combines information on fundraising process, contract characteristics, and performance of hedge funds.

First, I find that, on average, broker-sold funds underperform the directly-sold funds by a substantial margin. Following Fung and Hsieh (2004), I find that broker-sold funds again consistently underperform directly-sold funds by 1.6% on a risk-adjusted basis after accounting for fees. As suggested by Berk and Binsbergen (2013), the measure of the dollar value added of broker-sold funds is, on average, $210,000 per month lower than that of directly-sold funds.

Second, I construct gross returns series using the modified methodology developed by Brooks, Clare and Motson (2007), Hodder, Jackwerth and Kolokolova (2012), and Kolokolova (2010), and document that broker-sold funds underperform directly-sold funds by 2% per year before fees as well. The pre-fee dollar value added by broker-sold funds is, on average, $190,000 per month lower than that of directly-sold funds. Since pre-fee risk-adjusted performance is a likely indication of skill, this evidence

contradicts the view that intermediaries help to identify skillful funds.

Third, I find that, on average, funds sold by brokers charge lower incentive fees compared to funds sold directly, whereas there is no significant difference in terms of management fees.

Fourth, I find that funds sold directly have a larger minimum and average investment size than funds sold by brokers. Regulators define investors who qualify for the accredited investor status based on their income or net worth, suggesting that size is correlated with sophistication of investor. Therefore, this evidence implies that broker-sold funds and directly-sold funds may target different clienteles; directly-sold funds attract, on average, more sophisticated investors than broker-sold funds.

Finally, I analyze heterogeneity of brokers, classifying brokers into in-house and outside brokers based on the similarity of names of a fund and a broker. I find that funds sold by in-house brokers underperform directly-sold funds by 2.1% per year on a risk-adjusted basis after accounting for fees, while funds sold by outside brokers underperform directly-sold funds by 1.4% per year. Funds sold by in-house and outside brokers underperform directly-sold funds by 2% per year on a risk-adjusted basis before accounting for fees. Moreover, funds sold by outside brokers have lower incentive fees than funds sold directly, while the incentive fees of funds sold by in-house brokers do not differ from those of funds sold directly. Funds that are sold through outside brokers have a lower minimum investment sizes than that of directly-sold funds, while the minimum investment sizes of funds sold through in-house brokers do not differ from that of directly-sold funds.

The choice of fundraising channels is an equilibrium outcome; therefore these empirical findings have no causal interpretation, but rather provide an empirical description of an equilibrium. I present a stylized theoretical model of fundraising in the hedge fund industry and show that the implications of the model are consistent with documented empirical findings. The model builds on the work of Nanda, Narayanan and Warther (2000) and Stoughton, Wu and Zechner (2011).

There are two funds that differ in skill: a good fund and a bad fund. Hedge funds do not have their own capital and have to raise funds from outside investors. Since the hedge fund industry is opaque, the process of finding and vetting a suitable fund is costly. To assist with fundraising, a hedge fund may hire an intermediary broker, who will certify the type of the fund and persuade investors to allocate their capital into the fund. Investors differ in their search and due diligence costs. Sophisticated investors have low search and due diligence costs, others have no industry connections and face high search and due diligence costs. I solve for a separating equilibrium, in which funds endogenously choose portfolio management fees and capital-raising channels, whereas investors decide to invest into hedge funds on their own or based on recommendation of an intermediary.

This equilibrium has a simple intuition. The existence of both types of funds is socially optimal, since both funds generate positive returns, which are greater than the outside option. Some investors, however, are not able to invest in the hedge fund industry without financial advice. Only sophisticated investors can find the

good fund, while other investors with high due-diligence costs are not able to do so. The broker steps in to resolve this inefficiency. The broker is able to lower the costs of investors by internalizing the due-diligence process and this allows the high-cost investors to allocate their endowments into the hedge fund industry. In return, the broker requires compensation. The bargaining power of the broker and the relative outperformance of the good fund over the bad fund are crucial for the existence of a separating equilibrium. The good fund separates from the bad fund when it generates a sufficiently high return that is enough to compensate for investors' search and due diligence costs. Investors in the good directly-sold fund get higher after-fee returns compared to the after-fee returns of the investors in the bad broker-sold fund, regardless of the fee that the bad broker-sold fund charges.

I calibrate the model and estimate the implied average compensation that brokers receive for their capital introduction services. I assume that the compensation of a broker is proportional to the total dollar fees that a hedge fund collects from its investors. I estimate the total dollar fees using data on the assets under management, the performance, and the compensation structure of the hedge fund. Assuming that the bargaining power of the broker equals to $1\backslash 3$, which corresponds to the equilateral division of the surplus among the fund, the investors, and the broker, I find the average annual compensation of the broker to be equal to \$1.5 millions. This is roughly consistent with the annualized estimated difference between the dollar value added by broker-sold funds and directly-sold funds in the data.

The paper is related to several strands of literature. It contributes to the literature on capital formation. Duffie (2010) discusses the problem of slow movement of investment capital to trading opportunities and its implications for asset price dynamics. Berk and Green (2004), Garleanu and Pedersen (2016), Vayanos (2004), Pastor and Stambaugh (2012), and Vayanos and Woolley (2013) model the asset management industry theoretically. There is also an extensive empirical literature that studies capital formation in the asset management industry. Chevalier and Ellison (1997) and Sirri and Tufano (1998) find that investors allocate their capital into mutual funds with a positive past performance and flee from mutual funds with negative past returns. The hedge fund literature also finds that the performance of funds is an important factor that affects capital flows. For example, Goetzmann, Ingersoll and Ross (2003) and Fung et al. (2008) find that alpha generating hedge funds experience larger capital inflows than funds that do not have alpha. Horst and Salganik-Shoshan (2014) find that capital flows to the highest performing strategies and to the better performing funds within the strategy. Baquero and Verbeek (2015) document that funds with a longer positive track record get more capital. Lu, Musto and Ray (2013) study the indirect advertising of hedge funds and find that it helps to attract capital. Baquero and Verbeek (2009) use a regime-switching model, while Jorion and Schwarz (2015) use form D filings to separate fund inflows and outflows and analyze flows to performance relationship. Getmansky (2002) studies the life-cycles of hedge funds at the individual and strategy level and finds that age, assets under management and the standard deviation of returns negatively affects

fund flows. Joenväärä, Kosowski and Tolonen (2013), Getmansky et al. (2015), and Aiken, Clifford and Ellis (2015) analyze the effect of liquidity restrictions on capital flows. My paper contributes to this literature by analyzing capital formation in the hedge fund industry and the role that intermediaries play in this process.

This paper is also related to studies on distribution channels and marketing in the asset management industry. Investors pay substantial amounts of money in the form of sales loads and broker commissions. This raises the questions of why they pay such high fees to intermediaries and what benefits these investors get in return. Bergstresser, Chalmers and Tufano (2009) and Del Guercio and Reuter (2014) find that mutual funds sold by brokers significantly underperform funds sold directly (both before and after fees). Possible explanations include the substantial intangible benefits that brokers provide and the partition of mutual fund clientele into sophisticated and disadvantaged investors. As opposed to mutual fund retail investors, hedge funds investors are usually sophisticated financial institutions and individuals qualified for accredited investor status. It may be understandable to find evidence of underperformance in broker-sold mutual funds, but it is more surprising to find the same result in a hedge funds setting. The authors also document that directly-sold mutual funds charge lower fees than mutual funds sold through brokers. I find the opposite result for the incentive fees of hedge funds, while I find no difference in hedge funds' management fees across different fundraising channels. Furthermore, Christoffersen, Evans and Musto (2013) establish that underperformance of broker-sold funds mostly arises in mutual funds that are sold through outside brokers rather than in-house brokers. The authors also document that in-house brokers receive a higher front load comparing to outside brokers. In contrast, I find that hedge funds offered through in-house brokers underperform both directly sold funds and funds sold through outside brokers. Also, hedge funds sold through in-house brokers charge higher incentive fees than funds sold through outside brokers.

The empirical analysis of this paper is closely related to that of Agarwal, Nanda and Ray (2013). The authors find that hedge funds that are selected by institutions investing directly outperform hedge funds that are selected by institutions that use advisory services. They analyze raw and style-adjusted after-fee performance of hedge fund investments aggregated at the level of hedge fund family, while granularity of data in my study allows to perform analysis at the individual fund level.

The theoretical part of the paper is related to the work of Stoughton, Wu and Zechner (2011), who model the interaction of active portfolio manager, financial adviser, and investors under various settings. Similar to their model, investors' choice of performing due diligence on their own or delegating it to the broker depends on their due diligence costs, but I emphasize the endogeneity of the choice of capital raising channels by hedge funds.

The rest of the paper is organized as follows. Section I describes the data and outlines the key economic variables that are used in the analysis. Section II documents the empirical findings on the fundraising process of hedge funds. Section III presents a simple model of fundraising that reconciles the empirical findings and estimates

the model-implied compensation that intermediaries receive for capital introduction services. Finally, section IV concludes the discussion.

I. Data

I use a combination of two databases. The first database is constructed from form D filings. The second is a Morningstar hedge funds database. Additional data is downloaded from Thomson Reuters and the David A. Hsieh Data Library.

1. Form D filings

Although hedge funds qualify for exemptions to formal registration of fundraising offerings, the Securities Act of 1933 requires all funds that raise capital from investors (with at least one U.S. investor) to notify regulators about the fundraising process by filing a form D with the SEC. A fund is required to file a notice no later than 15 calendar days after the *date of the first sale* of the fund's offering. As long as the fund remains open, it is required to update filings on an annual basis as well as in the case of detected mistakes in the previous filings.[1]

Table 1 summarizes all the data fields in the form D. Fund reports administrative information and information about its fundraising process: its name, the address of its principal place of business, the names and addresses of the executive officers, the amount of capital raised, the number and types of investors, and each person who is paid directly or indirectly in connection with the fundraising process. The information that funds disclose in Form D filings must be free of biases, since misreporting and failure to comply with the SEC requirements imposes significant reputational and legal risks and may result in criminal penalties.

Form D filings are publicly available. I download and process all the electronic form D filings from the SEC's Electronic Data Gathering, Analysis, and Retrieval system (EDGAR).[2] I start in January 2010, when all hedge funds were required to submit forms electronically. Thus, the downloaded sample covers period from January 2010 to December 2016.

Each fund in the EDGAR system is uniquely identified by its *Central Index Key* or *CIK number*. Thus, by knowing the name of the fund or its CIK number, one gets access to information about its fundraising. For example, a search for Citadel Global Equities fund will produce ten form D filings over the period from July 2009 to September 2016. From the filings, we learn that the fund was originated with Citadel Advisors in July 2009. The fund raised $100 millions from one investor at the origination date. Then, it raised $153 millions from seven investors by August 2010 and $446 millions from fifty-nine investors by September 2016.

[1]See detailed information about offering exemptions in Rules 504, 505, and 506 of Regulation D. Source: Sections 230.501 through 230.506 appear at 47 FR 11262, Mar. 16, 1982. Note that amendment to form D filing is denoted as D/A. Hereto, I refer to both initial form D notice and its amendments as form D filings. Compliance guide about filing and amending a Form D notice may be found at https://www.sec.gov/info/smallbus/secg/formdguide.htm.

[2]The EDGAR depository is accessible at https://www.sec.gov/edgar/searchedgar/webusers.htm.

In imposing strict standards on the marketing of hedge funds, the SEC requires funds to disclose in their form D filings information about any entity which is directly or indirectly compensated for advertising and offering a fund to investors. This information allows one to differentiate between the funds sold to investors by brokers and the funds offered to investors directly.[3] The disclosed information consists of brokers' biographical information, their Central Registration Depository ("CRD") number within the Financial Industry Regulatory Authority ("FINRA") system and the list of states in which they advertise offerings. For example, I classify Citadel Global Equities Fund as a directly-sold fund, since it does not employ any intermediary in the fundraising process, while Renaissance Institutional Equities Fund is an example of a broker-sold fund, since it is sold to clients by Renaissance Institutional Management LLC.

Table 2 displays the largest open directly-sold and broker-sold funds in 2015. For example, Medallion fund of Renaissance Technologies raised $6.5 billions by 2015, while D.E. Shaw Oculus International fund of D.E. Shaw & Co that raised $13 billions with the help of broker.

I classify intermediary brokers into *in-house brokers* and *outside brokers* based on the similarity of the names of the fund and the broker. For example, Fortress Convex Asia fund LP uses the capital introduction services of Fortress Capital Formation LLC. In this case, I classify Fortress Capital Formation LLC as an in-house broker. ING Clarion Market Neutral LP is sold by Citigroup Global Markets and Merrill Lynch, Pierce, Fenner and Smith Inc. In this case, I classify both brokers as outside brokers. Funds are classified as being sold by in-house brokers when they employ only in-house brokers. If a fund is sold by outside brokers, I refer to such fund as outside broker-sold fund. Thus, Fortress Convex Asia fund LP is classified as an in-house broker-sold fund and ING Clarion Market Neutral LP is classified as an outside broker-sold fund.

Table 3 displays ten broker firms in the capital introduction business which market the largest number of hedge funds. The list of the top brokers in this business comprises top investment banks such as Goldman Sachs, Morgan Stanley, and J.P. Morgan. For example, over the considered period, Goldman Sachs intermediates as many as 377 hedge funds. The average (median) amount of capital raised by funds that are intermediated by Goldman Sachs is $350 millions ($98 millions). The average (median) number of investors in funds that are intermediated by Goldman Sachs is 149 (30) investors. According to anecdotal evidence, big broker firms often offer their wealthy clients opportunities to invest in hedge funds through online platforms without having to go to the funds themselves.

Figure 3 shows the fundraising dynamics over the period from January 2010 to December 2015 comparing hedge fund industry with other alternative investments. I analyze four main alternative investment business types: hedge funds, private equity, venture capital and other investment funds, which includes fund of funds, commodity

[3]Hedge funds report information about intermediary brokers that are involved in fundraising process in Item 12 of form D filings, *Sales Compensation*

trading advisors("CTAs") and commodity trading operators ("CTOs"). Figure 3 is split into four panels. Panels A, B, C and D display hedge funds, other investment funds, private equity funds, and venture capital funds, respectively. Focusing on the difference between the fundraising channels, the figure visualizes the amount of capital that was raised by directly-sold and broker-sold funds over the considered period.

To estimate the amount of capital inflows, I use reported information on the *Total Amount Sold* that the fund reports in form D filings. I consider two cases: capital inflows at the fund's inception and capital inflows during the life of the fund. In the first case, the amount of capital raised at inception is directly reported in the Total Amount Sold variable. In the second case, it may be estimated as an increment of the Total Amount Sold variable between two consecutive fund's filings. I outline the methodology on capital inflows estimation in Appendix.

The hedge fund industry enjoyed capital inflows which steadily grew from 2010 to 2015, spiking above the average level in 2014 and recovering to the previous trend of inflows at $300 billions per year. The spike in capital inflows in 2014 coincides with the lifting of the SEC's advertisement ban, which was implemented in September 2013, following the JOBS Act directive.

2. Morningstar database and risk-adjusted returns

I use the Morningstar CISDM hedge fund database available from Wharton Research Data Service ("WRDS"). The database contains fund-level information on live and liquidated hedge funds. It keeps the most recent snapshot of fund's administrative information, such as name, address, inception date, compensation structure, minimum investment size, and liquidity restrictions. It also records the funds after-fee performance and assets under management at a monthly frequency.

I use Morningstar data to estimate the performance and skill of the hedge fund. Hedge funds usually employ various risky trading strategies. Thus, to make a sensible comparison of hedge funds, I control for their exposure to systematic risk factors and calculate their alphas. I estimate the tradable alpha regressing the annualized monthly excess return, R^e_{it}, on seven tradable risk factors, as suggested by Fung and Hsieh (2004):

$$\begin{aligned} R^e_{it} = \alpha_i + \beta_{Mkt} \cdot SNPMRF_t + \beta_{SmB} \cdot SMB_t + \beta_{T10y} \cdot BD10RET_t + \\ \beta_{Cr.Spr.} \cdot BAAMTSY_t + \beta_{pBD} \cdot PTFSBD_t + \beta_{pFX} \cdot PTFSFX_t + \\ \beta_{pCOM} \cdot PTFSCOM_t + \tilde{\epsilon}_{it}. \end{aligned} \tag{1}$$

To account for market exposure, I use annualized returns on the S&P500 index, $SNPMRF_t$. Adjusting for exposure to the size factor, I use an annualized return spread between the Russell 2000 and the S&P500 index, SMB_t, obtaining a time series for the Russell 2000 and the S&P500 indexes from Thomson Reuters Datastream.

To control for yield curve exposure, I follow the literature and use the annualized excess returns of the U.S. 10-year Treasury constant maturity bond, $BD10RET_t$. A tradable yield curve level factor that is used in this paper is Bank of America Merrill Lynch's U.S. 10-year Treasury constant maturity bond returns, which I download from Thomson Reuters Datastream. As a robustness check I used 10-year discount factors from the Federal Reserve Bank of St.Louis' Treasury yield curve estimates.[4] The correlation between the two time series is 0.96.

Accounting for credit spread exposure, I use an annualized return spread between Moody's Baa-rated corporate bond, $BAAMTSY_t$, and the U.S. 10-year Treasury constant maturity bond. To proxy Moody's Baa-rated corporate bond, I use the tradable Barclays Long Baa U.S. Corporate index, which can be downloaded from Thomson Reuters Datastream.

Finally, adjusting for the dynamic nature of the hedge funds' strategies, I follow Fung and Hsieh (2004) and use a trend-following bond factor, $PTFSBD_t$, a trend-following currency factor, $PTFSFX_t$, and a trend-following commodity factor, $PTFSCOM_t$, which are constructed from look-back options and can be downloaded from David A. Hsieh's Data Library.[5]

For every fund i in month t, I estimate its annualized monthly alpha, $\hat{\alpha}_{it}$, with a two-year rolling-window regression (1). The final sample consists of 29,051 fund-month observations.

Although, investors care about after-fee returns on their hedge fund investment, skills of funds are reflected in pre-fee returns. Hedge fund databases usually take the perspective of investors and report fund performance and net asset values ("NAV") after accounting for fees. To reconstruct pre-fee returns, I apply the modification of methodology that was used in Brooks, Clare and Motson (2007), Hodder, Jackwerth and Kolokolova (2012), and Kolokolova (2010)

I make several assumptions that reflect the general practice on the calculation of hedge funds' fees. [1] Pro-rata management fees are paid at the end of the month on pre-fee net asset value at the end of the month. [2] Incentive fees are accrued on a monthly basis, but are only paid at the end of the calendar year; reported after-fee net asset value and performance account for accrued incentive fees. [3] Hedge funds use the high-watermark provision and incentive fees are paid in case pre-fee net asset value adjusted for management fees are above the current high water mark. [4] The high-water mark is reset to a pre-fee net asset value if it exceeds the current high water mark; otherwise the high-water-mark stays as in the previous month. [5] Management and incentive fees remain constant over time.[6] [6] The equalisation credit/contingent redemption scheme is used to calculate net asset value to ensure that the fund managers are compensated correctly for positive performance, while

[4]FED's yield curve can be downloaded from Federal Reserve Economic Data (FRED): http://www.federalreserve.gov/pubs/feds/2006/200628/200628abs.html.

[5]David A. Hsieh's Data Library is accessible at https://faculty.fuqua.duke.edu/ dah7/HFRFData.htm.

[6]In reality hedge funds may update their compensation structure as documented by Deuskar et al. (2011), Agarwal and Ray (2012) and Schwarz (2007).

investors, who might invest in funds at different time are treated fairly and equally.[7]

For each fund I estimate the pre-fee net asset value, $NAV^*(t)$, and the pre-fee return, $R^*(t)$, using available data on after-fee net asset value, $NAV(t)$, after-fee return, $R(t)$, management fee (in percentage terms), f_M, and incentive fee (in percentage terms), f_I.

The hedge fund database reports after-fee net asset value, which is calculated as a pre-fee net asset value adjusted for management fees (in dollars), $F_M(t)$, and accrued incentive fees (in dollars), $F_I(t)$:

$$NAV(t) = NAV^*(t) - F_M(t) - F_I(t). \tag{2}$$

Dollar management fees are calculated based on the net assets of the fund at the end of the month, as per assumption [1]:

$$F_M(t) = NAV^*(t) \cdot f_M/12. \tag{3}$$

Incentive fees accrue if the net asset value after management fees and net capital flows are above the high water mark, following assumptions [2], [3], and [4]:

$$F_I(t) = \max(0; NAV^*(t) - F_M(t) - \text{Netflows}(t) - \text{HWM}(t)) \cdot f_I. \tag{4}$$

Solving the system of equations (2), (3), and (4), I express the pre-fee net asset value, dollar management fees, and the dollar incentive fees

$$\begin{cases} NAV^*(t) = NAV(t) + F_M(t) + F_I(t) & (5) \\ F_M(t) = [NAV(t) + F_I(t)] \cdot \dfrac{f_M/12}{1 - f_M/12} & (6) \\ F_I(t) = [NAV(t) - \text{Netflows}(t) - \text{HWM}(t)] \cdot \dfrac{f_I}{1 - f_I} \cdot \\ \qquad\qquad \mathbb{I}\left[NAV(t) - \text{Netflows}(t) > \text{HWM}(t)\right] & (7) \end{cases}$$

Dollar incentive fees (7) are accumulated only if the assets of the fund are above the high water mark, $NAV(t) - \text{Netflows}(t) > \text{HWM}(t)$; otherwise, the fund does not get any incentive fees.

Finally, I estimate the pre-fee return, $R^*(t)$, as a growth rate between the pre-fee assets under management at the beginning of the month and the pre-fee assets under management at the end of the month, adjusted for dollar netflows during the period:

$$1 + R^*(t) = \frac{NAV^*(t) - \text{Netflows}(t)}{NAV^*(t-1) - F_M(t-1)}. \tag{8}$$

[7]Equalisation Credit/Contingent Redemption accounting procedure is described and discussed in McDonnell (2003).

At the beginning of the investment period, assets under management are equal to pre-fee net assets at the end of the previous period adjusted for management fees. Also, the pre-fee net asset value has to be adjusted for netflows, which I estimate as in the literature on fund flows (Sirri and Tufano (1998), Agarwal, Daniel and Naik (2004)).

$$\text{Netflows}(t) = NAV(t) - NAV(t-1) \cdot (1 + R(t)). \tag{9}$$

Finally, Substituting (2) and (9) into (8), I estimate the pre-fee return $R^*(t)$.

3. Matching form D filings and Morningstar database

I match the form D filings with Morningstar database by the name of the fund using a fuzzy matching method.

First, I estimate the pairwise generalization of Levenshtein (1966) edit distance, a measure of dissimilarity, between the funds in Form D and Morningstar databases. I eliminate the pairs that have a dissimilarity score above 200. Second, I eliminate pairs of matched form D and Morningstar funds that report inception dates of more than six months apart from each other. Finally, I manually verify the results of the matching procedure.

The matched sample consists of 1,728 individual funds that in total submitted 7,824 form D filings. It represents 15% of Reg D funds and 8% of funds that are listed in the Morningstar database. Among the matched funds 92% of funds are identified as hedge funds and 8% of funds are identified as other investment funds. A low match rate is explained by the fact that the universe of Reg D funds consists only of funds that are open for investment and have at least one US investor. Additionally, not all form D funds may choose to be listed in Morningstar database.

Jorion and Schwarz (2015) are able to match in total 3,816 form D funds with 14,581 form D filings, using the Hedge Fund Research (HFR) and Lipper TASS databases. The match rate between the form D funds and Morningstar funds is consistent with the match rates of form D funds with hedge funds that report to TASS (1,896 funds).

In the matched sample there are 1,103 of directly-sold funds and 625 of broker-sold funds.

Focusing on the heterogeneity of brokers, I further differentiate the broker-sold funds into funds that are offered to investors through in-house brokers and funds that are sold to by outside brokers. In the matched sample of broker-sold funds I identify in total 537 funds that are sold by outside brokers, 56 fund that are sold by in-house brokers and 32 funds that are sold through both.

The matched database inherits all the biases that are usually associated with Morningstar database.

First, the information that hedge funds report to Morningstar database is not verifiable. Fund managers usually list their funds in hedge fund databases to market

their funds and attract potential investors. Agarwal, Mullally and Naik (2015) and Getmansky, Lee and Lo (2015) provide a comprehensive review of the limitations and potential biases in hedge fund data.

Often funds backfill returns prior to the date when they starts reporting to the data vendor. Thus, a fund manager has an incentive to list his hedge fund in a database after a period of good performance. As discussed in Edwards and Park (1996), this potentially leads to misleadingly good track records and may result in upward bias in expected returns due to this instant history or backfill bias.

Joenväärä, Kosowski and Tolonen (2014) estimate a backfill bias of around twenty months by analyzing snapshots of databases that have been taken on different dates. Following the literature practice, I exclude the first twenty-four months of returns observations since the inception of the funds to mitigate this bias.

Second, there is also survivorship bias. Funds have an incentive to stop reporting their performance after a period of bad performance. Therefore, underperforming funds may be under-represented, again biasing upwards the estimates of expected returns. To mitigate this bias, I consider both live and defunct funds moved to hedge fund graveyard files.

Third, Morningstar hedge fund data, unfortunately, contains significant numbers of missing assets under management. Following Joenväärä, Kosowski and Tolonen (2014), I fill in any missing observations with the most recent observations of the past.

Table 4 presents summary statistics on annual capital inflows, the number of investors, and the number of new investors across funds that are directly sold to investors and funds that are offered to investors through brokers from form D filings. Panel A presents the summary statistics for the whole sample of form D funds. Panel B presents summary statistics for the matched sample in order to examine any potential biases introduced by the matching procedure.

Annual capital inflows into hedge funds do not differ significantly across distribution channels. On average, directly-sold funds and broker-sold funds raise $49 millions per year. The median amount of capital raised by directly-sold funds is $3 millions and $5 millions for broker-sold funds. There are on average 12 investors in directly-sold funds and 33 investors in broker-sold funds. The average size of investment in a broker-sold fund is 2.75 less than that of a directly-sold fund.

I do not find significant differences between the matched sample and the total form D sample of funds, comparing a sample that consists of matched funds and sample of all form D funds on their observable characteristics.

II. Empirical evidence

This section provides an empirical description of the fundraising process of the hedge funds, focusing on the differences between “direct” and “brokered” distributions.

1. After-fee performance across distribution channels

To compare the performance of funds between fundraising channels, I construct two portfolios of funds. The first one consists of directly-sold funds, representing the anti-intermediation view. The second one comprises hedge funds that are offered to investors through brokers, representing the pro-intermediation view. The portfolios of funds are rebalanced monthly, so that newly originated funds are included and liquidated funds are excluded appropriately. Assuming an initial investment of $100, I track the portfolios of the funds' after-fee performance from January 2010 to December 2015.

Figure 4 plots the after-fee performance dynamics for the portfolios of funds. Panel A shows the performance of the portfolio of funds where the constituent funds are equally-weighted. Panel B displays the performance of portfolios of funds where the constituent funds are value-weighted. Portfolio of directly sold funds outperforms portfolio of broker sold funds over considered five year period. For the equally-weighted scheme, the portfolio of directly-sold funds increases from $100 to $130, with an annualized return of 5.38% per year over five years, while the portfolio of broker-sold funds rises from $100 to $125, with an annualized return of 4.56% per year. The difference is more pronounced when the value-weighted scheme is considered. Portfolio of directly sold funds increases from $100 to $136 with annualized return of 6.34% per year, while portfolio of broker sold funds increases from $100 to $126 with annualized return of 4.73% per year. The results also hold when I consider the full sample of hedge fund returns without adjusting for backfill bias. I present the results in Figure B1 in the Appendix.

Investors, however, should care about risk-adjusted returns. I estimate two-year rolling alpha of the portfolios of funds, adjusting performance for systemic risk exposure using equation (1). Figures 5 presents the time-series dynamics of the after-fee alphas of the portfolio of directly-sold funds and the portfolio of broker-sold funds. The figure is split into two sub-figures, which correspond to the equally-weighted scheme in Panel A and the value-weighted scheme in Panel B. The after-fee alpha of directly-sold hedge funds is persistently higher than the after-fee alpha of the broker-sold hedge funds regardless of portfolio-weighting scheme. For the equally-weighted scheme, the after-fee alpha of the directly-sold hedge funds is equal on average to 4.42% per year versus 3.37% per year for the broker-sold hedge funds. For the value-weighted scheme, the average alpha of the portfolio of directly-sold funds is equal to 4.43% as opposed to 3.55% for the portfolio of broker-sold funds.

I implement another robustness check and perform panel data analysis. For each hedge fund i in month t, I estimate its annualized monthly alpha, $\hat{\alpha}_{it}$, with a two year rolling-window regression (1). Then I estimate the difference between the alphas of the directly-sold funds and the broker-sold funds with a panel regression

$$\hat{\alpha}_{it} = \beta_0 + \beta_B \cdot B_{it} + \beta_X \cdot X_{it-1} + \beta_t + \tilde{\epsilon}_{it}, \tag{10}$$

where B_{it} is a dummy variable that is equal to one if fund i is sold through brokers and it is equal to zero if the fund raises capital directly. I use a set of controls, X_{it-1}, which includes the assets under management of hedge fund in a previous month, the age of the fund, and its vintage. I also control for aggregate demand shocks with time fixed effects, β_t. The coefficient of interest that measures the difference in the alphas of directly-sold and broker sold-funds is β_B.

Panel A of Table 7 presents the results of the estimation of regression (10). I find that the after-fee alpha of the broker-sold funds is, on average, 1.6% per year lower than that of directly-sold funds. The results are economically significant and robust for inclusion of the fund's size, age, vintage year controls and time fixed effects. I also find consistent results (reported in Appendix Table B3) for the sample of funds without correction for backfill bias.

I also compare the dollar value added measure of Berk and Binsbergen (2013) for directly-sold funds and that of broker-sold funds. I find monthly dollar value added to investors, $\hat{S}_{it}$, as a product of the after-fee alpha of the hedge fund and its assets under management in a given month. I perform panel data analysis and report results in Panel A of Table 8. I find that investors in the broker-sold fund receive, on average, \$210,000 per month less than investors in directly-sold funds. The results are robust when controlling for the age of the fund, its vintage and time fixed effects.

Exploiting heterogeneity across brokers, I analyze the difference in performance between funds that are sold by in-house brokers and funds that are offered by outside brokers. I perform a formal analysis with the following panel regression:

$$Y_{it} = \beta_0 + \beta_I \cdot B^I_{it} + \beta_O \cdot B^O_{it} + \beta_X \cdot X_{it} + \beta_t + \tilde{\epsilon}_{it}, \tag{11}$$

where $Y_{it} = \hat{\alpha}_{it}$ denotes the fund's annualized risk-adjusted performance. B^I_{it} is a dummy variable that is equal to one when the fund is offered to investors by an in-house broker and is equal to zero otherwise. B^O_{it} is a dummy variable that is equal to one when the fund is sold to investors through an outside broker and is equal to zero otherwise.

Table 9 displays the results of the estimation of regression (11). I find that the result of the under-performance of broker-sold funds is mostly driven by funds that are sold through in-house brokers. The average after-fee alpha of funds that are sold through in-house brokers is 2% lower than that of directly-sold funds, while average after-fee alphas of funds that are offered through outside brokers is 1.4% lower than that of directly sold funds. Performing a formal F-test and comparing the difference between in-house broker-sold and outside broker-sold funds, I find that the alpha of funds that are sold by in-house brokers is statistically different from the alpha of funds that are sold by outside brokers. The results are robust when the fund's size, vintage, and year-month controls. Furthermore, I perform additional robustness checks by estimating the regression (11) on the sample that does not correct for backfill bias, which is displayed in Table B5 in the Appendix.

The above findings on the underperformance of broker-sold hedge funds relative to directly-sold funds are consistent with the findings in the mutual funds literature. Bergstresser, Chalmers and Tufano (2009) were the first to establish that broker-sold mutual funds, with an average after-fee alpha of -2.28% per year, underperform directly-sold mutual funds, with an average after-fee alpha of -1.07% per year, by 1.21% per year. Del Guercio and Reuter (2014) and Reuter (2015) find similar results when considering different weighting schemes. Authors document the difference in equally-weighted after-fee alphas between the two groups of funds of 1.15% and that of the value-weighted after-fee alphas 0.64% per year. Christoffersen, Evans and Musto (2013) find that a 1% increase in the excess load paid to broker decreases mutual fund after-fee future performance by 0.24% over the next year. In contrast to my results, the authors find that the underperformance is mostly driven by mutual funds that are sold through outside brokers rather than in-house brokers.[8]

2. Pre-fee performance across distribution channels

Addressing the question of whether brokers help to identify skillfull hedge funds, I analyze the pre-fee risk-adjusted performance of funds across distribution channels. I estimate the two-year rolling pre-fee alpha of portfolios of funds, adjusting their pre-fee returns for systemic risk exposure using equation (1). Figures 6 presents the time-series dynamics of the pre-fee alphas of the portfolio of directly-sold funds and the portfolio of broker-sold funds. The figure is split into two sub-figures, which correspond to the equally-weighted scheme in Panel A and the value-weighted scheme in Panel B.

The pre-fee alpha of the portfolio of directly-sold hedge funds is persistently higher than the pre-fee alpha of the portfolio of broker-sold hedge funds regardless of the portfolio-weighting scheme. I find that for the equally-weighted scheme, the alpha of the portfolio of directly-sold hedge funds is equal, on average, to 5.78% versus 4.48% per year for the portfolio of broker-sold funds. For the value-weighted scheme, the average alpha of directly-sold funds is equal to 5.53% versus 4.95% for the broker-sold funds.

I implement another robustness check and compare the skill of the funds across distribution channels with a panel regression (10). Panel B of Table 7 presents the estimation results of the panel regression. I find that the funds that are sold to investors through brokers underperform funds that are offered to investors directly by 2% per year before accounting for fees. The results are robust for the inclusion of fund-level controls and time fixed effects. I perform a robustness check, using sample without adjusting for backfill bias and find consistent results reported in Panel B of Table B3 in the Appendix.

I also compare the dollar value added by directly-sold hedge funds and broker-sold hedge funds. I find the monthly dollar value added of the hedge fund as a product

[8]Christoffersen, Evans and Musto (2013) refer to outside brokers as non-affiliated brokers and in-house brokers as captive brokers.

of the pre-fee alpha of the hedge fund and its assets under management in a given month. The dollar value added measure estimates the amount of money that the hedge fund extracts from the financial markets. I perform a panel data analysis and report the results in Panel B of Table 8. I estimate that the value added by a broker-sold fund is, on average, \$190,000 per month lower than the value added by a directly-sold hedge fund. The result is robust in controlling for the age of the fund, its vintage and the time fixed effects.

Next, analyzing heterogeneity across brokers, I study the difference in skill between funds that are sold by in-house brokers and funds that are offered by outside brokers. Table 10 displays the estimation of the regression (11). I find that hedge funds that are offered by in-house brokers, on average, have the same pre-fee alpha as hedge funds that are sold through non-affiliated brokers and underperform directly-sold hedge funds by 2% per year. The results are robust for the inclusion of the size of the fund and its vintage year and controlling for time-variant demand shocks. Furthermore, I perform an additional robustness checks by the estimating regression (11) on the sample that does not correct for backfill bias and find similar results, which I report in Table B6 in the Appendix.

3. Fees across distribution channels

Next, I assess whether intermediaries help investors to find funds that charge lower fees. To answer this question, I use information about management fees and incentive fees that hedge funds report in Morningstar database. Since only the most recent contract characteristics are kept in the database, I perform a formal comparison using the following cross-sectional regression:

$$Y_i = \beta_0 + \beta_B \cdot B_i + \lambda_t + \tilde{\epsilon}_i, \tag{12}$$

where B_i is a dummy variable that is equal to one when fund is broker-sold and is equal to zero otherwise. The regression includes a control for the fund's vintage year, λ_t.

Table 11 compares the fees of hedge funds across the distribution channels. Columns (1) and (2) estimates the difference in the management fees of broker-sold and directly-sold hedge funds. On average, hedge funds charge their investors 1.4% management fees, but I do not find any significant difference between funds with different distribution channels. I also do not find any significant difference between the management fees that funds sold through in-house brokers and funds offered through outside brokers charge their investors. These results are not surprising since hedge funds uses management fees to cover their operational expenses.

Next, I estimate the difference in incentive fees that directly-sold funds and broker-sold funds charge their investors and present the results in columns (3) and (4). I find that directly-sold funds, on average, charge a incentive fee of 18.35%, which is 1.4% higher than the incentive fee of broker-sold funds. Analyzing the heterogeneity

of broker-sold funds, I establish that funds that are sold by outside brokers charge incentive fees that are, on average, 1.5% lower than fees that directly-sold funds charge, while funds that are sold by in-house brokers charge the same incentive fees as directly sold funds. Performing an F-test, I find that the incentive fee that funds sold by in-house brokers charge are significantly different from the incentive fees that funds sold by outside brokers charge.

The above results differ from the findings of the mutual fund literature. Bergstresser, Chalmers and Tufano (2009) establish that the non-distributional expenses of mutual funds that are sold through intermediaries are 23 basis points higher than those of mutual funds that are sold to investors directly, concluding that brokers do not help investors to identify mutual funds with lower non-distribution fees.

4. Clientele across distribution channels

I complete the empirical analysis by analyzing whether investors of broker-sold hedge funds differ from investors of directly-sold hedge funds. Since hedge funds are very secretive and do not disclose information about their investors, I use a minimum investment size and an average investment size as empirical proxies of the size of the hedge fund's marginal investor and average investor. To estimate the difference in the hedge funds' clientele across the distribution channels, I estimate a regression (12).

Columns (1) and (2) of Table 12 estimate the difference in the minimum investment size of broker-sold and directly-sold hedge funds. The minimum investment size of directly-sold funds is, on average, $1 million, which is $0.27 millions more than that of directly-sold funds. Further, analyzing the heterogeneity of brokers, I find that the minimum investment size of funds sold through in-house brokers does not differ from that of directly-sold funds, while the minimum investment size of funds sold through outside brokers is $0.21 millions lower than that of directly-sold funds. Performing an F-test, I find that the minimum investment size of in-house broker-sold funds is statistically different from the minimum investment size of outside broker-sold funds.

Columns (3) and (4) of Table 12 estimate the difference in the average investment size of broker-sold and directly-sold hedge funds. Comparing the average investment size, I find that broker-sold funds have a $12 millions lower average investment size than directly-sold funds.

These findings suggest that funds may target a different clientele.

III. Theoretical motivation

I presents a simple model of fundraising in the hedge fund industry. I then reconcile empirical findings with the model implications and estimate the compensation that brokers receive for capital introduction services.

1. Model of fundraising

Suppose there are three types of agents: hedge funds, investors, and brokers, who intermediate between hedge funds and investors. There are two risk-neutral funds that differ in their portfolio management skills: a good fund and a bad fund. Let θ denote a type of fund, where $\theta \in \{\text{G, B}\}$ corresponds to the good fund and the bad fund, respectively. The good and the bad funds deliver positive pre-fee risk-adjusted returns, α_G and α_B, respectively, with $\alpha_G > \alpha_B > 0$. I assume that alphas are known to the funds themselves, but unobservable to investors and the broker.

The fund does not have capital and has to raise it from investors. It can either directly raise capital from investors or use capital introduction services offered by the broker. For its portfolio management services, the fund charges performance-based fees, which are calculated as the fraction of generated profits. The fund chooses a fee and capital raising channel to maximize the total dollar fees that it collects from its investors.

There is also a continuum of risk-neutral investors. Each investor is endowed with a unit of capital, which he may either invested in one of the hedge funds or in an outside option (return of the outside option is normalized to zero). All investors qualify for the status of accredited investor and may invest in hedge funds. To capture heterogeneity among clientele, I assume that investors differ in their search and due diligence costs. There are professional investors with low search and due diligence costs and mainstream accredited investors who have high search and due diligence costs. I assume that the search and due diligence costs of investors, c, are uniformly distributed at interval from 0 to $\bar{C}$, $c \sim U[0; \bar{C}]$.

The investor has the following options. He may search for a fund himself and invest on his own after paying due diligence costs. Or, he may hire the intermediary broker and invest his money into a fund recommended by the broker. In the latter case, the broker performs due diligence and certifies the quality of the fund.

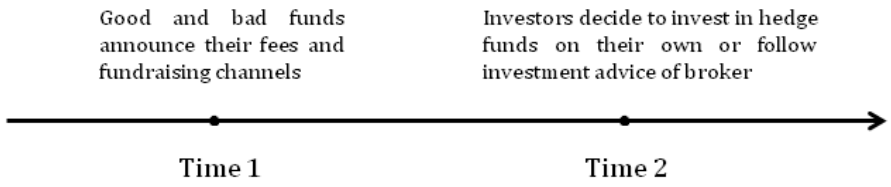
Due diligence is important since the hedge fund industry is opaque and there are fraudulent funds that investors should be aware of. Analyzing form ADV disclosures of registered hedge funds, Brown et al. (2008) find that approximately 16% of hedge funds have committed a felony or have financial-related charges or convictions. As pointed out by Garleanu and Pedersen (2016), hedge fund prospective investors usually undertake extensive analysis by studying the track record and evaluating the investment process and the risk management of funds. Fraudulent, negative alpha funds exist on the off-equilibrium path. Therefore, investors who do not perform due-diligence may loose money investing in these funds.

The broker performs due diligence and a certification of the fund at cost, $c_I > 0$. For the capital introduction service, the broker charges the fund some fraction of the fund's fees. The broker and the fund bargain with each other and split the collected dollar fees. I assume that the bargaining power of the broker is an exogenous parameter, $G \in (0; 1)$. Although I do not solve for an optimal contract for the broker, the performance-related compensation ensures that the broker acts in the interest of investors and allows for avoiding a moral hazard problem between

the broker and the investors.

The fundraising game has a simple sequential structure, which is illustrated in Figure 1. At time 1, the good fund and the bad fund simultaneously announce fees that they charge for portfolio management services and their choices of capital raising channels. At time 2, the investors decide whether to invest into the hedge fund industry on their own or hire an intermediary broker.

Figure 1. : Time line of the fundraising game



Strategies.

Let f_θ be a fee that a type-θ fund charges its investors. Let X_θ be the fund's choice of capital raising channel. If the type-θ fund is sold to investors directly then $X_\theta = 0$. If the type-θ fund is sold to investors by the broker, then $X_\theta = 1$. The strategy of type-θ is a vector, $s_\theta = (f_\theta, X_\theta)$, such that $s_\theta \in \mathbb{R}^+ \times \{0, 1\}$. The good fund and the bad fund have strategies s_G and s_B, respectively.

The investor decides either to perform a costly due diligence of the hedge fund industry at cost c and invest into one of the funds on his own or to approach the intermediary broker and follow his investment advice. In both cases, the investor pays a portfolio management fee, f_θ, upon investing into the type-θ hedge fund. The decision of the investor depends on his search and due diligence costs c and the strategies of the funds s_G and s_B.

Payoffs of players.

Let's denote the profit of type-θ hedge fund $\Pi_\theta\Big(s_\theta; s_{-\theta}; \mathbb{C}(s_\theta, s_{-\theta})\Big)$. It depends on the strategy of the type-θ fund s_θ, the strategies of the other fund $s_{-\theta}$, and a proportion of investors, who decide to invest in the fund, denoted as $\mathbb{C}(s_\theta, s_{-\theta}) \subset [0; \bar{C}]$. Given strategy $s_\theta = (f_\theta, X_\theta)$, the profit of the type-θ fund is determined as

$$\Pi_\theta\Big(s_\theta; s_{-\theta}; \mathbb{C}(s_\theta, s_{-\theta})\Big) = \Pi_\theta\Big((f_\theta, X_\theta); s_{-\theta}; \mathbb{C}(s_\theta, s_{-\theta})\Big) = \tag{13}$$

$$\begin{cases} f_\theta \cdot \int_{\mathbb{C}(s_\theta, s_{-\theta})} dc, & \text{if } X_\theta = 0 \quad (13a) \\ (1-G) \cdot f_\theta \cdot \int_{\mathbb{C}(s_\theta, s_{-\theta})} dc, & \text{if } X_\theta = 1. \quad (13b) \end{cases}$$

If the type-θ fund decides to be sold to investors directly ($X_\theta = 0$), then its profits are equal to the total dollar fees raised from the investors, as in (13a). If the type-θ fund decides to be sold to investors through the broker ($X_\theta = 1$), then the fund and the broker split the total dollar fees and the fund gets a fraction $1 - G$, which is determined by its bargaining power, as in (13b).

Let's denote $U_{\theta c}$ the utility of the investor with due diligence cost c, who allocates his endowment into the type-θ fund. It is equal to

$$U_{\theta c} = \alpha_\theta - f_\theta - c \cdot \mathbb{I}\{X_\theta = 0\}. \quad (14)$$

If the investor invests on his own, then his utility equals to the after-fee return of the type-θ fund adjusted for due-diligence costs. If the investor follows financial advice, then his utility equals to the after-fee return on the type-θ fund.

Let's denote the profit that the broker gets $\Pi_I\Big(s_\theta; s_{-\theta}; \mathbb{C}(s_\theta, s_{-\theta})\Big)$. It is equal to the compensation that the broker gets for the capital introduction service adjusted for due diligence cost c_I. The profit of the broker may be expressed in terms of the profit that the fund receives as follows:

$$\Pi_I\Big(s_\theta; s_{-\theta}; \mathbb{C}(s_\theta, s_{-\theta})\Big) = \Big(\frac{G}{1-G} \cdot \Pi_\theta\Big(s_\theta; s_{-\theta}; \mathbb{C}(s_\theta, s_{-\theta})\Big) - c_I\Big) \cdot \mathbb{I}\{X_\theta = 1\}. \quad (15)$$

The broker makes a profit when the fund is broker-sold ($X_\theta = 1$) and he gets no profit when the fund is directly-sold to investors ($X_\theta = 0$).

Definition of "cut-off" equilibrium.
I define the Nash equilibrium of the fundraising game as follows:

(i) The good fund chooses strategy s_G to maximize its profits

$$\Pi_G\Big(s_G; s_B; \mathbb{C}(s_G, s_B)\Big) \geq \Pi_G\Big(s'_G; s_B; \mathbb{C}(s'_G, s_B)\Big) \text{ for any } s'_G \in \mathbb{R}^+ \times \{0,1\}/\{s'_G \neq s_G\}.$$

(ii) The bad fund chooses strategy s_B to maximize its profits

$$\Pi_B\Big(s_B; s_G; \mathbb{C}(s_B, s_G)\Big) \geq \Pi_B\Big(s'_B; s_G; \mathbb{C}(s'_B, s_G)\Big) \text{ for any } s'_B \in \mathbb{R}^+ \times \{0,1\}/\{s'_B \neq s_B\}.$$

(iii) There is a cut-off marginal investor with due diligence cost $\hat{c}(s_\theta, s_{-\theta})$ who is indifferent about investing on his own or using the advice of a broker (or investing in an outside option). Investors with costs that are lower than the cost of the

marginal investor, i.e. $\mathbb{C}(s_G, s_B) = \Big[0; \min\{\hat{c}(s_G, s_B), \bar{C}\}\Big]$ will invest on their own. Investors with costs that are greater than the cost of the marginal investor, i.e $\mathbb{C}(s_B, s_G) = \Big(\min\{\hat{c}(s_B, s_G), \bar{C}\}; \bar{C}\Big]$ will approach the broker for investment advice.

(iv) The profit of the broker covers his due diligence cost, c_i.

Note that I restrict a space of the investor's strategies to "cut-off" strategy, which is determined by the marginal investor with a search and due diligence cost, $\hat{c}(s_\theta, s_{-\theta})$. Since the investors base of the fund $\mathbb{C}(s_\theta, s_{-\theta})$ may be fully described by a threshold search and due-diligence cost $\hat{c}(s_\theta, s_{-\theta})$ of the marginal investor, it allows me to simplify the notation for the profit of the type-θ fund in the following way, $\Pi_\theta\Big(s_\theta; s_{-\theta}; \hat{c}(s_\theta, s_{-\theta})\Big)$.

PROPOSITION. There exists a separating pure strategies "cut-off" equilibrium in the fundraising game. A good fund is directly-sold to investors and charges fee $f_G^* = \frac{\alpha_G}{2}$. *A bad fund raises capital through a broker and charges fees* $f_B^* = \alpha_B$.

$$s_G^* = \Big(\frac{\alpha_G}{2}, 0\Big), \tag{16}$$

$$s_B^* = \Big(\alpha_B, 1\Big). \tag{17}$$

A marginal investor with due diligence cost $\hat{c}^*$ *gets zero utility and is indifferent between investing into the hedge fund industry on his own or using the investment advice of a broker:*

$$\hat{c}^* = \frac{\alpha_G}{2}, \tag{18}$$

$$U_{Gc^*} = U_{Bc^*} = 0. \tag{19}$$

Investors with costs $c < \hat{c}^*$ *invest by themselves and those with* $c > \hat{c}^*$ *follow the recommendation of broker.*

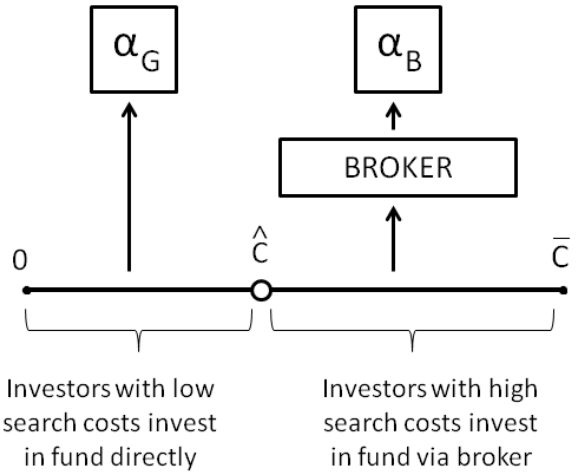
The necessary conditions for the existence of separating equilibrium are as follows:

$$\max\left\{1 - \frac{\alpha_G}{4 \cdot \bar{C}}; \frac{c_I}{\alpha_B \cdot (\bar{C} - \frac{\alpha_G}{2})}\right\} \leqslant G < 1 \tag{20}$$

$$\alpha_B < \hat{c}^* = \frac{\alpha_G}{2} < \bar{C}. \tag{21}$$

This separating "cut-off" equilibrium of the fundraising game is illustrated in Figure 2.

Figure 2. : Separating equilibria of the fundraising game



Solution.
I verify the existence of the separating "cut-off" equilibrium by confirming the optimality of strategies of the players' strategies.

Good fund.
The good fund chooses optimally its fee and capital raising channel to maximize its profits (13). Since the capital raising choice of the fund is binary, the profit maximization over a two-dimensional vector-strategy $s_G = (f_G, X_G)$ simplifies to two one-dimensional maximization problems. The first optimization corresponds to the choice by the good fund of engaging in direct capital raising. The second optimization corresponds to a choice by the good fund of raising capital through the broker.

First, let's calculate the profits that the good fund gets if it chooses to be directly-sold ($X_\theta = 0$). Its investor base includes either all the investors with due diligence costs that are smaller than threshold $\hat{c}$ or the entire population of investors, $\mathbb{C}(s_G, s_B) = \Big[0; min\{\hat{c}(s_G, s_B), \bar{C}\}\Big]$. The good fund chooses fee f_G to maximize its profits subject to the feasibility condition on fees and the participation constraint of the marginal investor.

$$\Pi_G\Big((f_G,0);s_B;\hat{c}(s_G,s_B)\Big) = \max_{f_G} \quad f_G \cdot \int_0^{min\left\{\hat{c}\left((f_G,0);s_B\right),\bar{C}\right\}} dc \tag{22}$$

subject to

$$0 \leqslant f_G \leqslant \alpha_G \tag{22a}$$

$$\alpha_G - f_G - \hat{c}((f_G,0);s_B) = 0. \tag{22b}$$

The fee feasibility constraint (22a) states that the fund can not charge a fee f_G that is bigger than the return α_G that it generates. The participation constraint (22b) says that the marginal investor has to be indifferent about receiving utility $\alpha_G - f_G - \hat{c}$ upon investment into the fund and the utility of zero upon investment in an outside option.

Solving the maximization (22), I am interested in the interior case. There is also a less interesting corner case when even the highest cost investor decides to invest into the hedge fund on his own ($\hat{c} > \bar{C}$). In this case, all investors, after performing their due-diligence, invest in the good fund only. I consider a more realistic case when $\hat{c} < \bar{C}$. Then the optimization problem (22) is equivalent to the following quadratic optimization:

$$\max_{f_G} \quad f_G \cdot (\alpha_G - f_G) \tag{23}$$

subject to

$$0 \leqslant f_G \leqslant \alpha_G. \tag{23a}$$

The hedge fund's choice of fee affects its profits directly through fee f_G and indirectly through the size of its investors base $\alpha_G - f_G$. The good fund exercises its monopoly power and sets a fee optimally at, $f_G = \frac{\alpha_G}{2}$. Thus, the strategy of the good fund that chooses to be sold to investors directly is $s_G = (\frac{\alpha_G}{2}, 0)$ and its profits are:

$$\Pi_G\Big((\frac{\alpha_G}{2},0);s_B;\hat{c}(s_G,s_B)\Big) = \frac{\alpha_G^2}{4}. \tag{24}$$

The threshold search and due diligence costs are equal to

$$\hat{c} = \frac{\alpha_G}{2}. \tag{25}$$

To ensure the interior case occurs, which makes it suboptimal for high-cost investors to invest on their own, the following condition has to be satisfied:

$$\hat{c} < \bar{C}. \tag{26}$$

Substituting (25) into (26), I get the second condition in (21).

Second, let's calculate the profits that the good fund gets if it chooses to be sold through broker ($X_G = 1$). In this case, both funds are offered to investors through a broker. However, the broker will only market the good fund, since in this case, he will receive higher compensation. Thus, all investors will be channelled to the good fund and $\mathbb{C}(s_G, s_B) = [0; \bar{C}]$. The good fund that is sold through the broker will choose fee f_G to maximize its profits subject to the feasibility condition on the fee and the participation constraint of the broker.

$$\Pi_G\Big((f_G, 1); s_B; \hat{c}(s_G, s_B)\Big) = \max_{f_G} \quad (1 - G) \cdot f_G \cdot \int_0^{\bar{C}} dc \tag{27}$$

subject to

$$0 \leqslant f_G \leqslant \alpha_G \tag{27a}$$

$$G \cdot f_G \cdot \int_0^{\bar{C}} dc \geqslant c_I. \tag{27b}$$

The fee feasibility constraint (27a) is similar to (22a). The broker helps to attract all investors to the good fund and gets a fraction G of the total dollar fees. The participation constraint of the broker (27b) ensures that the compensation that he receives is enough to cover his due diligence cost c_I.

Since the good fund gets all the investors regardless of the fees that it charges, it optimally sets a fee to extract all profits, leaving investors indifferent about investing into the fund or investing into the outside option. Thus, the good fund that chooses to be sold to investors through the broker sets fee $f_G = \alpha_G$. Its optimal strategy is $s_G = (\alpha_G, 1)$ and its profits are equal to the $(1-G)$ fraction of the generated surplus $\alpha_G \cdot \bar{C}$.

$$\Pi_G\Big((\alpha_G, 1); s_B; \hat{c}(s_G, s_B)\Big) = (1 - G) \cdot \alpha_G \cdot \bar{C}. \tag{28}$$

The profits of the broker equals the fraction G of the generated surplus after accounting for the due diligence costs of the broker.

$$\Pi_I\Big((\alpha_G, 1); s_B; \hat{c}(s_G, s_B)\Big) = G \cdot \alpha_G \cdot \bar{C} - c_I. \tag{29}$$

Finally, the good fund optimally chooses the capital-raising channel by comparing profits (24) that it gets if it is directly-sold to investors with the profits (28) that it gets if it is sold to investors through a broker. For the good fund to become directly-sold, the following incentive compatibility condition must be met:

$$\Pi_G\Big((\frac{\alpha_G}{2}, 0); s_B; \hat{c}(s_G, s_B)\Big) > \Pi_G\Big((\alpha_G, 1); s_B; \hat{c}(s_G, s_B)\Big). \tag{30}$$

Substituting (24) and (28) into condition (30) gives the first constraint on the bargaining power (20) of the broker:

$$G \geq 1 - \frac{\alpha_G}{4 \cdot \bar{C}}. \tag{31}$$

Bad fund.
The bad fund optimally chooses a fee and capital raising channel which maximizes its profits (13). Similar to the analysis for the good fund, I consider two separate cases, which correspond to the choice of fundraising of the bad fund.

First, let's calculate the profits that the bad fund gets if it chooses to be sold to investors through broker ($X_B = 1$). Investors with search and due diligence costs $c > \hat{c}$ approach the broker and invest their capital in the fund that the broker recommends. Its investor base is $\mathbb{C}(s_B, s_G) = (\hat{c}(s_B, s_G); \bar{C}]$ for the interior case when $\hat{c} < \bar{C}$. The bad fund chooses fee f_B to maximize its profit subject to the feasibility condition on the fee and the participation constraint of the broker.

$$\Pi_B\Big((f_B, 1); s_G; \hat{c}(s_B, s_G)\Big) = \max_{f_B} \quad (1 - G) \cdot f_B \cdot \int_{\hat{c}(s_B, s_G)}^{\bar{C}} dc \tag{32}$$

subject to

$$0 \leqslant f_B \leqslant \alpha_B \tag{32a}$$

$$G \cdot f_B \cdot \int_{\hat{c}(s_B, s_G)}^{\bar{C}} dc \geqslant c_I. \tag{32b}$$

The fee feasibility constraint (32a) states that the fund cannot charge a fee f_B bigger than the return α_B that it generates. The broker brings investors $\mathbb{C}(s_B, s_G) = (\hat{c}(s_B, s_G); \bar{C}]$ to the bad fund and receives a fraction G of the total dollar fees that the fund charges. The participation constraint of the broker (32b) ensures that the compensation that he receives is enough to cover his due diligence cost c_I.

The choice of fees of the bad fund has only a direct effect on its profit, since its investors' base comes from the broker. Thus, it maximizes its profits by extracting all profits through fees and making its investors indifferent about investing into the fund or investing in an outside option. Thus, the bad fund that chooses to be sold to investors through the broker sets the fee $f_B = \alpha_B$. Its strategy is $s_B = (\alpha_B, 1)$ and its profits are equal to the $(1 - G)$ fraction of the generated surplus $\alpha_B \cdot [\bar{C} - \frac{\alpha}{2}]$

$$\Pi_B\Big(s_G; (\alpha_B, 1); \hat{c}(s_B, s_G)\Big) = (1 - G) \cdot \alpha_B \cdot [\bar{C} - \frac{\alpha_G}{2}]. \tag{33}$$

The profits that the broker gets is a fraction G of the generated surplus after accounting for the due diligence costs of the broker.

$$\Pi_I\Big(s_G;(\alpha_B,1);\hat{c}(s_B,s_G)\Big)=G\cdot\alpha_B\cdot[\bar{C}-\frac{\alpha_G}{2}]-c_I>0. \tag{34}$$

Condition (34) yields the second constraint (20) on the bargaining power of the broker.

$$G\geqslant\frac{c_I}{\alpha_B\cdot(\bar{C}-\frac{\alpha_G}{2})} \tag{35}$$

Second, consider the case when the bad fund chooses to be directly sold ($X_B=0$) and its strategy is described as $s_B=(f_B,0)$. When the bad fund decides to be directly sold, we have to insure that it will not attract any investors regardless of the fee that it sets. To attract more investors, the bad fund may set zero fees $f_B=0$. In this case, its strategy is $s_B=(0,0)$.

I need to ensure that the marginal investor $\hat{c}$ still prefers to invest into the good fund that is sold directly rather than into the bad fund that is sold directly and charges no fees. The marginal investor invests into the good directly-sold fund if

$$\alpha_B-f_B-\hat{c}<\alpha_G-f_G-\hat{c}. \tag{36}$$

Since $f_B=0$ and $f_G=\frac{\alpha_G}{2}$, I get

$$\alpha_B<\frac{\alpha_G}{2}. \tag{37}$$

The combination of conditions (26), (31), (35), and (37) determine the necessary conditions for the existence of a pure strategy separating the "cut-off" equilibrium in Proposition 1.

Discussion of equilibrium. I consider several cases in relation to the parameters of the model to illustrate equilibrium. When the bargaining power of the broker is high $G\to 1$, the broker extracts all generated surplus. In this case, condition (20) is always satisfied and the good fund never wants to use the capital introduction services of the broker.

In the case of competition among the brokers, the broker should make enough profit to cover his due diligence cost c_I. If the fund hires a competitive broker, then the profit of the fund equals the generated surplus adjusted by the due diligence cost of the broker.

$$\frac{\alpha_G^2}{4}>\alpha_G\cdot\bar{C}-c_I. \tag{38}$$

If the due diligence cost is high, then the good fund and the bad fund separate:

$$c_I>\alpha_G\cdot[\bar{C}-\frac{\alpha_G}{4}]. \tag{39}$$

If the due diligence cost is low and condition (39) is violated, then only the good fund survives.

2. Model implications

Next, I discuss the implications of the the fundraising model and reconcile the model predictions with the empirical results from Section II.

First, the model has implications for the after-fee return that investors receive on their hedge fund investments, $\alpha_\theta - f_\theta$. The equilibrium strategy of the good fund (16) implies that the after-fee returns of investors in the directly-sold fund are determined by the reservation value for the marginal investor and are equal to $\frac{\alpha_G}{2}$. The equilibrium strategy of the bad fund (17) implies that broker-sold fund extracts all generated surplus through fees, making its investors indifferent about investing in the fund and the outside option. Therefore, the after-fee return of the broker-sold fund investor is equal to 0. Thus, the after-fee returns of directly-sold funds are higher than the after-fee returns of broker-sold funds $\frac{\alpha_G}{2} > 0$.

The empirical patterns that are documented in Figure 4, Figure 5 and Panel A of Table 7 support the prediction about the after-fee performance of directly-sold and broker-sold funds.

Second, the model also makes predictions about the pre-fee return of directly-sold and broker-sold funds. The equilibrium strategies of the good fund (16) and that of the bad fund (17) imply that the good fund raises capital directly, while the bad fund raises funds through the broker. Together with condition (37), it implies that broker-sold funds underperform directly-sold funds, even before accounting for portfolio management fees $\alpha_G > \alpha_B$.

The empirical findings of Figure 6 and Panel B of Table 7 support the model prediction about the pre-fee performance of directly-sold and broker-sold funds.

Third, the model makes a prediction about portfolio management fees that funds charge. The equilibrium strategy of the good fund (16) implies that the directly-sold fund charges fee, $f_G = \frac{\alpha_G}{2}$. The equilibrium strategy of the bad fund (17) states that the broker-sold fund charges fee, $f_B = \alpha_B$. Condition (37) from Proposition 1 implies that the fees that directly-sold funds charge their investors are higher than the fees that broker-sold funds charge their investors $f_G = \frac{\alpha_G}{2} > \alpha_B = f_B$.

Table 11 presents the results of testing the above prediction. I find that directly-sold funds charge higher incentive fees than broker-sold funds. I do not find, however, any significant difference between the management fees of directly-sold and broker-sold funds.

Fourth, the model makes predictions about clientele of the funds. In equilibrium, investors with costs smaller than the costs of the marginal investor invest in the directly-sold fund $\mathbb{C}(s_G, s_B) = [0; \hat{c}]$, while investors with costs higher than cost of the marginal investor invest in the broker-sold fund $\mathbb{C}(s_B, s_G) = [\hat{c}; \bar{C}]$. Thus, the model predicts that the marginal and average investor of the directly-sold fund has lower costs than the marginal and average investor of the broker-sold fund. If the sizes of the investors is negatively correlated with their due diligence and search

costs, then the model implies that the marginal investor of the directly-sold fund with cost $\hat{c}$ is bigger than the marginal investor of the broker-sold fund with cost $\bar{C}$. Also, the average investor of the directly-sold fund with cost $\frac{\hat{c}}{2}$ is bigger than average investor of the broker-sold fund with cost $\frac{\hat{c}+\bar{C}}{2}$.

Using minimum investment size as an empirical proxy of the size of the marginal investor and the average investment size as a proxy of the size of average investor, I test the model predictions of the clientele of hedge funds. Table 12 displays the tests of the above prediction.

3. Compensation for the broker

I estimate the economic magnitude of compensation that broker receives for capital introduction services. In the fundraising model, the broker and the fund split the dollar profits. Compensation for the broker is proportional to the total dollar fees that hedge fund collects from its investors, with the proportionality constant being equal to the bargaining power of the broker, as in (15).

I use information about the fund's assets under management, performance, and compensation structure to estimate the total dollar fees. Using methodology for the reconstruction of the pre-fee returns that is described in detail in the section Data, I estimate the dollar management fees using equations (3) and dollar incentive fees using equation (4). I find the total dollar fees collected as a sum of the annual dollar management fees and the dollar incentive fees. I consider the bargaining power of the broker to be in the range of 5% to 95%. The lower bound corresponds to the low bargaining power and the upper bound to the high bargaining power. Knowing the total annual dollar fees and the bargaining power of the broker, I estimate the fees that the broker gets for a capital introduction service using equation (15).

For every broker-sold fund in the matched sample, I estimate the annual compensation that broker receives. I report the average annual compensation in Table 13. Depending on the bargaining power, the estimates of the annual compensation of the broker vary from \$241,000 to \$4.58 million. For a bargaining power of 1\3, which corresponds to the equilateral division of surplus among the fund, its investors, and the broker, I estimate the average compensation that the broker receives to be \$1.45 million per year.

IV. Conclusion

This paper analyzes empirically and theoretically the fundraising process in the hedge fund industry. I analyze form D filings that hedge funds report to the SEC with regard to their fundraising process. Information that the funds report in their filings allows me to differentiate between the funds that raise capital directly from investors and those that use the capital introduction services of intermediary brokers. I find that funds that are sold to investors through intermediaries underperform funds that are offered to investors directly on a risk-adjusted basis, both before and after accounting for fees. I also find that hedge funds that are sold to investors directly

on average have a larger average investors size, a larger minimum investment size and charge higher incentive fees compared to funds offered to investors by brokers. These findings provide empirical description of the equilibrium.

I also present a stylized model that has a simple intuition and reconciles the above empirical findings. In equilibrium, sophisticated investors who are better at due diligence will sort themselves into better funds, which avoid having to internalize the high cost of hiring a broker, while bad funds hire a broker, which mitigates capital-raising inefficiency, but requires compensation for capital introduction services. Brokers' bargaining power and the relative outperformance of the good fund over the bad fund are essential for the existence of separating equilibria. The calibrate model implies that average broker compensation is $1.5 million per year, which is consistent with the empirically estimate, value-added difference between the broker-sold funds and the directly-sold funds.

Table 1—: Outline of form D filings

Item	Description
1. Issuer's identity	Name and type of entity that initiates fundraising.
2. Principal place of business and contact information	Administrative information about the fundraising entity.
3. Related persons	Information about all executive officers, directors, and promoters associated with the fundraisning offer.
4. Industry group	Information on the entity's industry group that most accurately reflects the use of capital raised. *Banking and financial services* includes *pooled investment funds*, which comprises *hedge funds*, *private equity funds*, *venture capital funds*, and *other investment funds*.
5. Issuer size	Information of revenue range or aggregate net asset value of fundraising entity. Hedge funds and other investment funds may decline to response to this question.
6. Federal exemptions and exclusions claimed	Provision(s) that are claimed to exempt the capital raising from formal offering registration.
7. Type of filing	Information on whether the entity is filing a new notice or an amendment to a notice.
8. Duration of offering	Information on duration of fundraising offering.
9. Type(s) of securities offered	Information on the type of security offered, which includes equity, debt, options, and pooled investment fund interests.
10. Business combination transactions	Information on whether the fundraising offering is made in connection with business combination transactions, such as merger or acquisition.
11. Minimum investment size	Minimum dollar amount of investment that will be accepted from any outside investor.
12. Sales compensation	Information about each person that has been or will be paid directly or indirectly any commission in connection with fundraising.
13. Offering and sales amounts	Dollar amount of capital raised up to date.
14. Investors	Total number of investors who already have invested in the offering and number of non-accredited investors.
15. Sales commissions and finders' fees expenses	Information on estimate of sales commissions and finders' fee expenses.
16. Use of proceeds	Estimation of commissions that are paid to related persons.

Table 1 describes information about their fundraising process that hedge funds disclose in form D filings. Column Item outlines main categories of the form D. Column Description provides key information that fundraising entity reports in item.

Table 2—: Largest funds by distribution channel

Fund	Fund family	Capital raised
PANEL A: Directly sold funds		
VERDE ALPHA FUND LTD	Verde Asset Management	20,221
GLOBAL ASCENT LTD	Global Ascent	16,524
OZ OVERSEAS FUND II LTD	OZ Management	15,290
CANYON VALUE REALIZATION FUND LTD	Canyon Capital Advisors	14,745
ADAGE CAPITAL PARTNERS LP	Adage Capital Management	14,049
CONVEXITY CAPITAL OFFSHORE LP	Convexity Capital GP	11,155
ABERDEEN FIXED INCOME FUNDS POOLED TRUST	Aberdeen Asset Management	10,783
DYMON ASIA MACRO FUND	Dymon Asia Capital	10,733
TUDOR BVI GLOBAL FUND LTD	Tudor Investment Corp	10,587
LONE CASCADE LP	Lone Pine Capital	10,347
ANCHORAGE CAPITAL PARTNERS OFFSHORE LTD	Anchorage Capital Group	10,063
GLENVIEW CAPITAL PARTNERS CAYMAN LTD	Glenview Capital Management	9,495
KING STREET CAPITAL LP	King Street Capital	9,473
BROOKSIDE CAPITAL PARTNERS FUND LP	Brookside Capital Management	8,905
BAUPOST VALUE PARTNERS LP IV	The Baupost Group	8,603
PANEL B: Broker sold funds		
D.E. SHAW COMPOSITE INTERNATIONAL FUND	D.E. Shaw & Co	18,235
RENAISSANCE INSTITUTIONAL EQUITIES FUND LLC	Renaissance Technologies LLC	16,192
MESIROW ABSOLUTE RETURN FUND LTD	Mesirow Advanced Strategies Inc	15,096
D.E. SHAW OCULUS INTERNATIONAL FUND	D.E. Shaw & Co	13,390
RENAISSANCE INSTITUTIONAL DIVERSIFIED ALPHA	Renaissance Technologies LLC	10,232
GRAHAM GLOBAL INVESTMENT FUND II SPC LTD	Graham Capital Management	10,199
GRAHAM GLOBAL INVESTMENT FUND I SPC LTD	Graham Capital Management	9,227
BREVAN HOWARD FUND LTD	Brevan Howard Capital Management LP	8,412
MESIROW ABSOLUTE RETURN FUND (INSTITUTIONAL)	Mesirow Advanced Strategies Inc	8,196
D.E. SHAW COMPOSITE FUND LLC	D.E. Shaw & Co	7,779
DRAWBRIDGE SPECIAL OPPORTUNITIES FUND LP	Fortress Investment Group LLC	7,056
MILLENNIUM USA LP	Millennium Management LLC	6,868
PERMAL FIXED INCOME HOLDINGS NV	Permal Asset Management Inc	6,847
WEATHERLOW FUND I LP	Evanston Capital Management LLC	6,804
PAULSON ADVANTAGE PLUS LP	Paulson & Co	6,419

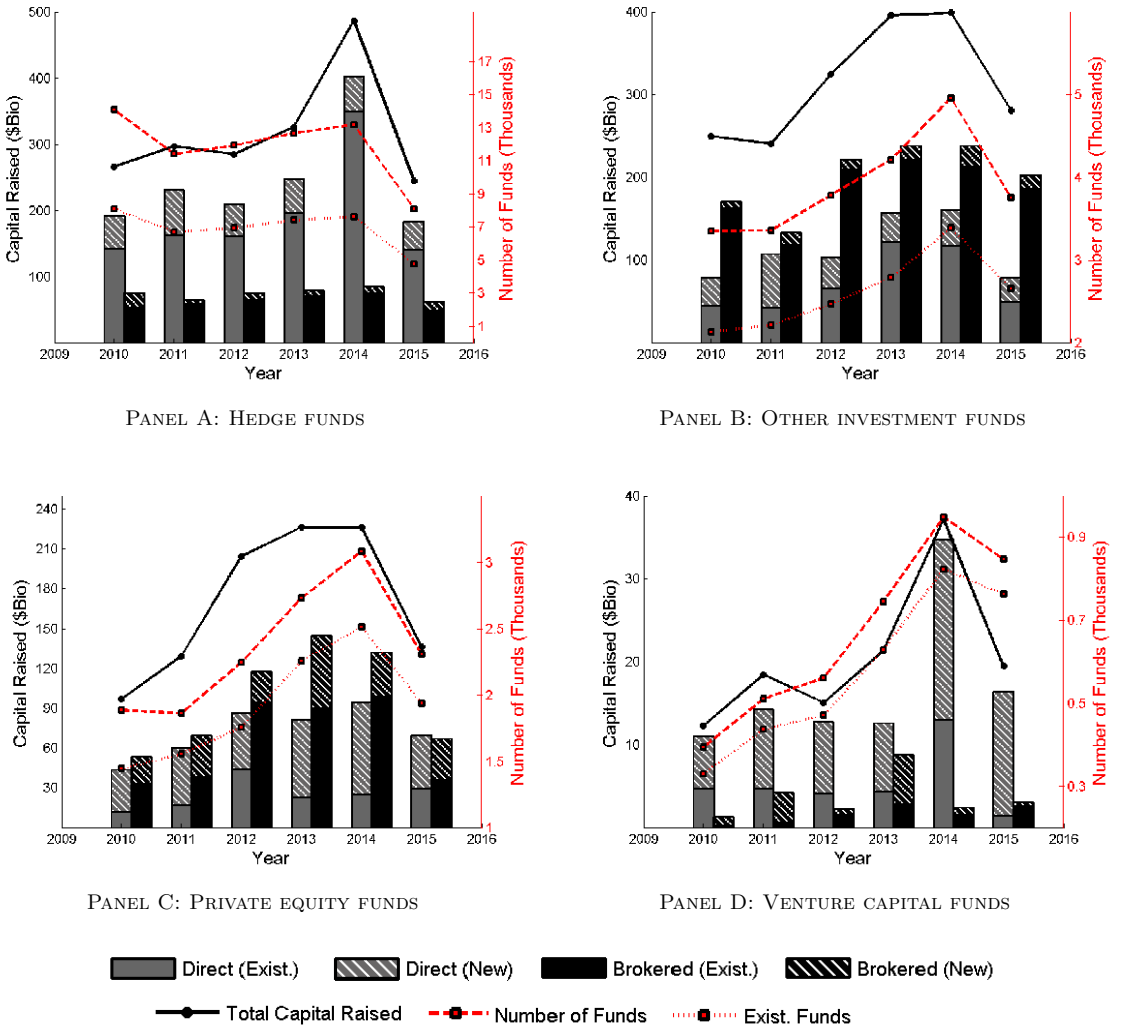
Table 2 presents fifteen directly sold hedge funds (Panel A) and broker sold hedge funds (Panel B) that were open for investment and raised maximum amount of capital by 2015. Table reports fund's name, name of management company and total amount of capital raised (in millions of dollars).

Table 3—: Top players in fundraising industry

	Name	# Funds	Capital raised	# Investors
1.	GOLDMAN SACHS & CO	377	350	149
			[98]	[30]
2.	WELLS FARGO ADVISORS, LLC	364	176	271
			[25]	[16]
3.	MORGAN STANLEY & CO	359	428	436
			[77]	[99]
4.	J.P. MORGAN SECURITIES LLC	295	765	248
			[256]	[69]
5.	MERRILL LYNCH	275	319	469
			[118]	[158]
6.	CITIGROUP GLOBAL MARKETS INC	242	403	453
			[87]	[81]
7.	CREDIT SUISSE SECURITIES LLC	210	367	433
			[97]	[57]
8.	UBS FINANCIAL SERVICES INC	191	443	347
			[193]	[128]
9.	DEUTSCHE BANK SECURITIES INC	170	385	76
			[23]	[6]
10.	BARCLAYS CAPITAL INC.	114	395	144
			[156]	[75]

Table 3 provides information on the top broker firms that intermediate fundraising process. Top broker firms are defined as those companies that intermediate the largest number of funds. Table reports broker's name, average [median] amount of capital raised by funds that are intermediated by the same broker firm (in millions of dollars) and average [median] number of investors in funds with the same broker. Statistics are calculated using sample of Form D filings from January 2009 to December 2015 for hedge funds and other investment companies. For each broker statistics are calculated on sample of funds that are intermediated by this broker, using information that is available in the latest available form D filings where the broker is reported.

Figure 3. : Fundraising in alternative investment industry



Panel A: Hedge funds

Panel B: Other investment funds

Panel C: Private equity funds

Panel D: Venture capital funds

Figure 3 displays fundraising dynamics in alternative investment industry from 2010 to 2015, using information that funds report in form D filings. Panel A, B, C and D displays evolution of hedge funds, other investment funds, private equity and venture capital industries, respectively. Bars indicate amount of capital (in billions of dollars, left y-axis) that funds have raised from investors during a given year. Grey solid bars indicate capital that was raised by existing directly-sold funds. Grey hatched bars display capital that was raised by newly opened directly-sold funds. Black solid bars indicate capital inflows into existing broker-sold funds. Black hatched bars show capital that was raised by newly opened broker-sold funds. Black solid line (right y-axis) indicates total amount of capital raised in a given year. Red dashed line displays total number of funds that raise capital from investors in a given year (in thousands, right y-axis). Appendix describes methodology that is used to estimate capital inflows. Red dotted line indicates total number existing funds (in thousands, right y-axis).

Table 4—: Summary statistics

	Direct	Brokered	Diff.	P-value
PANEL A: form D filings				
Average Inflows	47.80	48.50	0.70	(0.92)
Median Inflows	2.66	5.00	2.34	
Average [Inflows >0]	66.80	63.30	-3.50	(0.74)
Median [Inflows >0]	9.63	12.00	2.37	
Average # Investors	48	142	94***	(0.00)
Median # Investors	15	42	27	
Average # New Investors	12	33	21***	(0.00)
Median # New Investors	5	7	2	
# Filings	31,031	9,283		
# Funds	9,650	1,925		
PANEL B: form D filings and Morningstar				
Average Inflows	45.50	47.31	1.81	(0.71)
Median Inflows	3.43	4.23	0.80	
Average [Inflows >0]	60.30	59.91	-0.39	(0.95)
Median [Inflows >0]	9.04	8.50	-0.54	
Average # Investors	75	118	43***	(0.00)
Median # Investors	42	74	32	
Average # New Investors	14	27	13***	(0.00)
Median # New investors	6	7	1	
# Filings	2,872	1,129		
# Funds	1,103	625		

Table 4 describes information that funds report in form D filings for directly sold funds and broker sold funds over the period from January 2009 to December 2015. Panel A focuses on the sample of all hedge funds that file forms D. Panel B presents results for the sample of funds that file forms D and list their funds at Morningstar database. Table presents information about the average and median annual capital inflows(in millions of dollars), average and median annual positive capital inflows (in millions of dollars), average and median number of investors and average positive minimum investment size (in thousands of dollars). Methodology that is used to estimate annual capital inflows is outlined in Appendix. Column Diff. reports difference between the values for directly sold and broker sold funds. Column P-value reports p-value (in parenthesis) of T-test for means across directly sold and broker sold funds groups. Statistical significance at the 1%, 5% and 10% levels is denoted by *, **, and *** respectively.

Figure 4. : Performance of directly sold and broker sold hedge funds

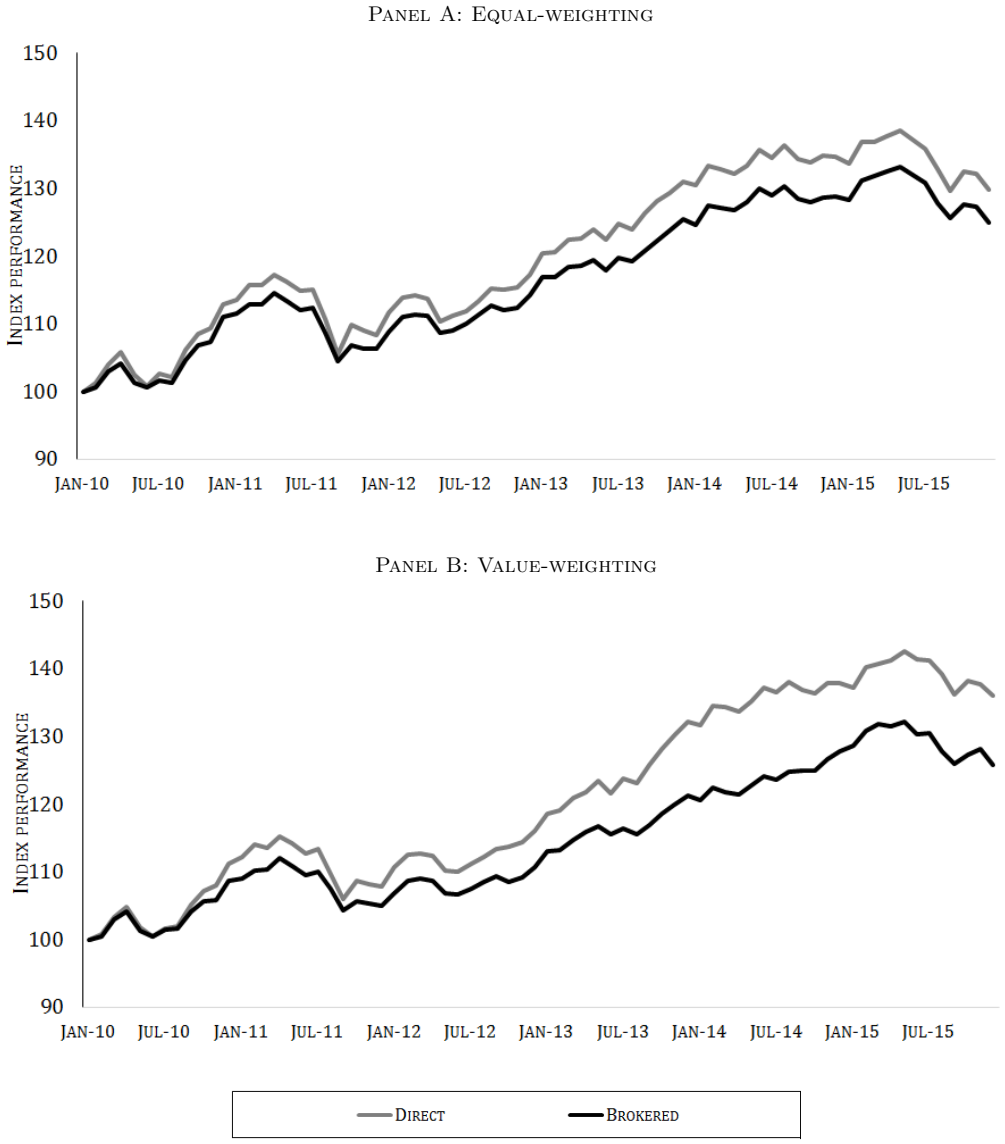


Figure 4 displays after-fee performance of fund of directly sold hedge funds (grey solid line) relative to performance of fund of broker sold hedge funds (black solid line) over the period from January 2010 to December 2015, assuming initial investment of $100. The sample of funds consists of funds that are listed in Morningstar database and file form D filings. Panel A displays after-fee performance of funds of funds where constituent hedge funds are equally-weighted. Panel B displays after-fee performance of funds of funds where constituent hedge funds are value-weighted. Returns of funds are adjusted for backfill bias.

Table 5—: After-fee systematic risk exposure of hedge funds

	$\bar{R}$	$\hat{\alpha}$	$\hat{\beta}_{Mkt}$	$\hat{\beta}_{SmB}$	$\hat{\beta}_{T10y}$	$\hat{\beta}_{Cr.Spr.}$	$\hat{\beta}_{pBD}$	$\hat{\beta}_{pFX}$	$\hat{\beta}_{pCOM}$	R^2
	PANEL A: Equal-Weighting									
Direct	4.79%**	4.42%**	0.12*	0.38***	0.10	0.25***	-0.02*	0.01	-0.01	68%
	(0.02)	(0.02)	(0.06)	(0.04)	(0.07)	(0.09)	(0.01)	(0.01)	(0.01)	
Brokered	3.97%*	3.37%*	0.12**	0.32***	0.07	0.18**	-0.07*	0.01	-0.01*	68%
	(0.02)	(0.02)	(0.05)	(0.03)	(0.06)	(0.07)	(0.01)	(0.01)	(0.01)	
	PANEL B: Value-Weighting									
Direct	5.39%	4.433%**	0.13***	0.31***	0.07	0.16**	-0.02*	0.01	-0.01	66%
	(0.02)	(0.02)	(0.05)	(0.03)	(0.06)	(0.07)	(0.01)	(0.01)	(0.01)	
Brokered	4.16%	3.552%**	0.12***	0.25***	0.05	0.15**	-0.01*	0.01	-0.01	62%
	(0.02)	(0.01)	(0.04)	(0.03)	(0.05)	(0.06)	(0.01)	(0.01)	(0.01)	

Table 5 presents estimation of Fung and Hsieh (2004) seven-factor model for fund of directly sold (row "Direct") and broker sold funds (row "Brokered"). Panel A displays results for funds of funds where constituent funds are equally-weighted. Panel B reports results for funds of funds where constituent funds are value-weighted. The sample of funds is restricted to funds that are listed in Morningstar database and file form D filings. The seven-factor model (1) is estimated using after-fee monthly returns between January 2010 and December 2015, where the first 24-months of fund's performance are excluded to adjust for backfill bias. Table displays estimated annualized excess after-fee return of fund of fund, $\bar{R}$, estimated annualized alpha, $\hat{\alpha}$, estimated exposures to market factor, $\hat{\beta}_{Mkt}$, estimated exposure to size spread factor, $\hat{\beta}_{SmB}$, estimated exposure to yield curve level factor, $\hat{\beta}_{T10y}$, estimated exposure to credit spread factor, $\hat{\beta}_{Cr.Spr.}$, and estimated exposures to bond, commodity and forex trend-following factors, $\hat{\beta}_{pBD}$, $\hat{\beta}_{pFX}$ and $\hat{\beta}_{pCOM}$, as well as the adjusted R^2. Figures in parentheses are the Newey and West (1987) heteroscedasticity and autocorrelation consistent standard errors. Statistical significance at the 1%, 5% and 10% levels is denoted by *, **, and *** respectively.

Table 6—: Pre-fee systematic risk exposure of hedge funds

	$\bar{R}$	$\hat{\alpha}$	$\hat{\beta}_{Mkt}$	$\hat{\beta}_{SmB}$	$\hat{\beta}_{T10y}$	$\hat{\beta}_{Cr.Spr.}$	$\hat{\beta}_{pBD}$	$\hat{\beta}_{pFX}$	$\hat{\beta}_{pCOM}$	R^2
	PANEL A: Equally-weighted									
Direct	6.17%***	5.78%***	0.12*	0.39***	0.11	0.25***	-0.02*	0.01	-0.01	69%
	(0.02)	(0.02)	(0.06)	(0.04)	(0.07)	(0.09)	(0.01)	(0.01)	(0.01)	
Brokered	5.12%***	4.48%**	0.17**	0.33***	0.07	0.18**	-0.01*	0.01	-0.01*	69%
	(0.02)	(0.02)	(0.05)	(0.03)	(0.06)	(0.07)	(0.01)	(0.01)	(0.01)	
	PANEL B: Value-weighted									
Direct	6.62%***	5.53%***	0.14***	0.32***	0.07	0.16**	-0.02*	0.01	-0.01	65%
	(0.02)	(0.02)	(0.05)	(0.03)	(0.06)	(0.07)	(0.01)	(0.01)	(0.01)	
Brokered	5.50%***	4.95%***	0.11***	0.26***	0.05	0.15**	-0.01	0.01	-0.01	61%
	(0.02)	(0.01)	(0.04)	(0.03)	(0.05)	(0.06)	(0.01)	(0.01)	(0.01)	

Table 6 presents estimation of Fung and Hsieh (2004) seven-factor model for fund of directly sold (row "Direct") and broker sold funds (row "Brokered"). Panel A displays results for funds of funds where constituent funds are equally-weighted. Panel B reports results for funds of funds where constituent funds are value-weighted. The sample of funds is restricted to funds that are listed in Morningstar database and file form D filings. The seven-factor model (1) is estimated using pre-fee monthly returns between January 2010 and December 2015, where the first 24-months of fund's performance are excluded to adjust for backfill bias. Table displays estimated annualized excess pre-fee return of fund of fund, $\bar{R}$, estimated annualized alpha, $\hat{\alpha}$, estimated exposures to market factor, $\hat{\beta}_{Mkt}$, estimated exposure to size spread factor, $\hat{\beta}_{SmB}$, estimated exposure to yield curve level factor, $\hat{\beta}_{T10y}$, estimated exposure to credit spread factor, $\hat{\beta}_{Cr.Spr.}$, and estimated exposures to bond, commodity and forex trend-following factors, $\hat{\beta}_{pBD}$, $\hat{\beta}_{pFX}$ and $\hat{\beta}_{pCOM}$, as well as the adjusted R^2. Figures in parentheses are the Newey and West (1987) heteroscedasticity and autocorrelation consistent standard errors. Statistical significance at the 1%, 5% and 10% levels is denoted by *, **, and *** respectively.

Figure 5. : After-fee alphas of directly sold and broker sold hedge funds

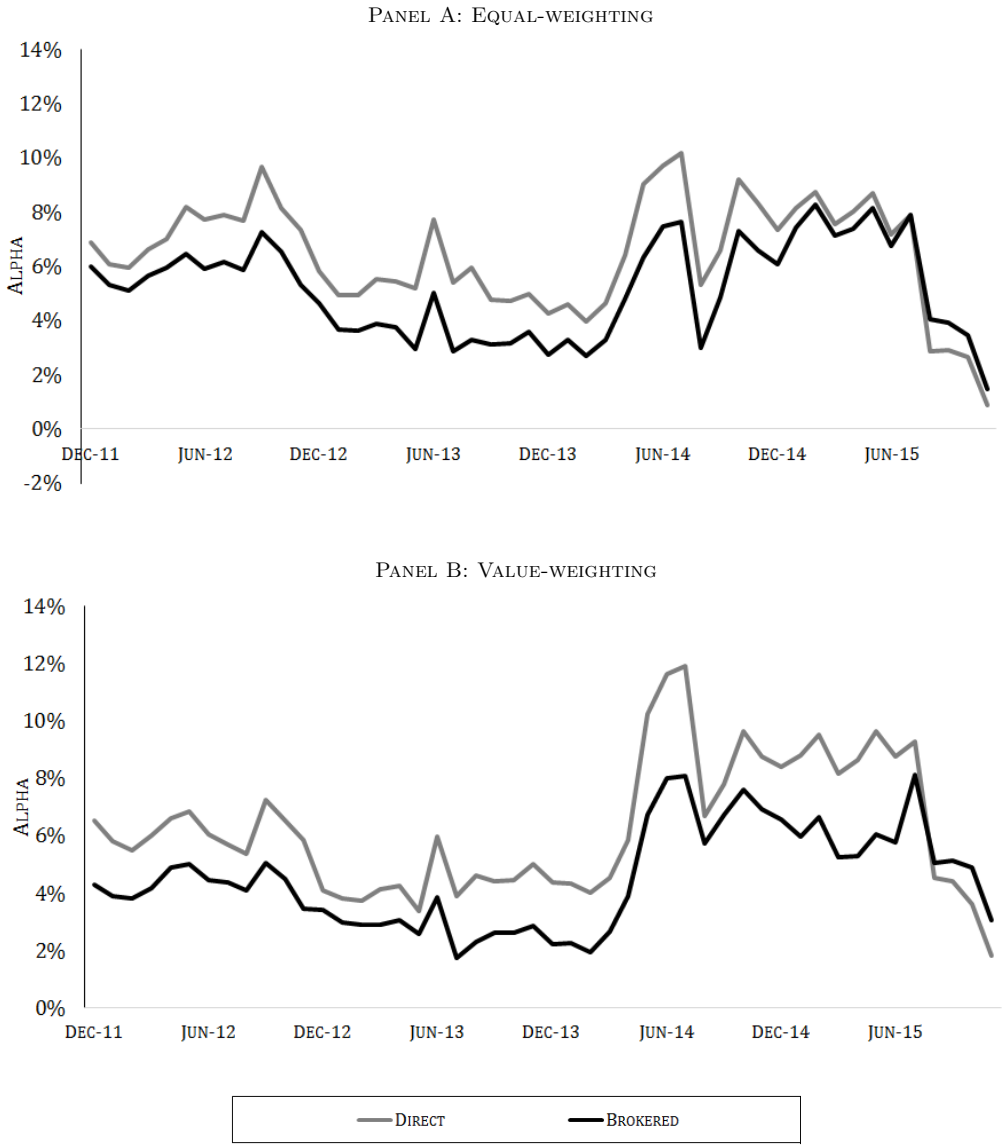


Figure 5 displays a time varying risk-adjusted performance (alpha) for the equally-weighted and value-weighted funds of hedge funds that are displayed in Panel A and Panel B, accordingly. Alphas of funds of funds are estimated with the rolling-window Fung and Hsieh (2004) seven-factor model (1). The rolling-window regressions (with 24 months window) are estimated for each portfolio using monthly after-fee returns between January 2010 and December 2015 (adjusted for backfill bias). Rolling after-fee alpha of fund of directly sold funds is displayed with grey solid line and that of fund of broker sold funds is displayed with black solid line.

Figure 6. : Pre-fee alphas of directly sold and broker sold hedge funds

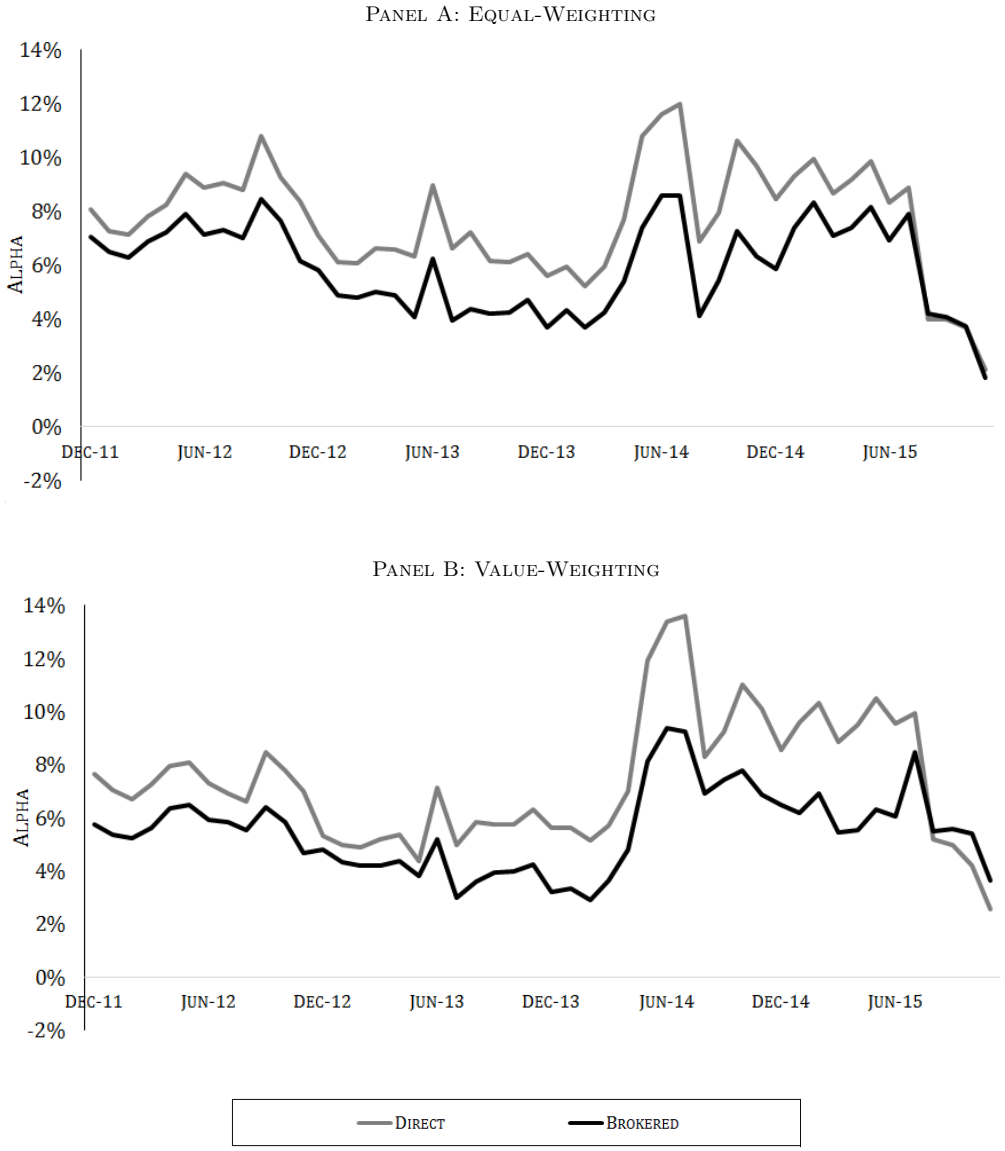


Figure 6 displays a time varying risk-adjusted performance (alpha) for the equally-weighted and value-weighted funds of hedge funds that are displayed in Panel A and Panel B, accordingly. Alphas of funds of funds are estimated with the rolling-window Fung and Hsieh (2004) seven-factor model (1). The rolling-window regressions (with 24 months window) are estimated for each fund of funds using monthly pre-fee returns between January 2010 and December 2015 (adjusted for backfill bias). Rolling pre-fee alpha of fund of directly sold funds is displayed with grey solid line and that of fund of broker sold funds is displayed with black solid line.

Table 7—: Alphas of directly and broker sold hedge funds

	Alpha		
	(1)	(2)	(3)
PANEL A: After-fee			
B_{it}	-0.013***	-0.016***	-0.016***
	(0.002)	(0.002)	(0.002)
$\ln(Asset_{it-1})$	—	0.007***	0.007***
	—	(0.001)	(0.001)
Age_{it}	—	-0.0001	-0.0005**
	—	(0.0002)	(0.0002)
Vintage	No	Yes	Yes
Time FE	No	No	Yes
# Obs.	29,051	29,051	29,051
R^2	0.02%	4%	7%
PANEL B: Pre-fee			
B_{it}	-0.016***	-0.021***	-0.021***
	(0.002)	(0.001)	(0.001)
$\ln(Asset_{it-1})$	—	0.008***	0.008***
	—	(0.001)	(0.001)
Age_{it}	—	-0.0001	0.0007***
	—	(0.0002)	(0.0002)
Vintage	No	Yes	Yes
Time FE	No	No	Yes
# Obs.	28,493	28,493	28,493
R^2	0.3%	4%	7%

Table 7 presents estimates of difference in risk-adjusted performance between directly sold and broker sold hedge funds with panel regression $\hat{\alpha}_{it} = \beta_0 + \beta_B \cdot B_{it} + \beta_s \cdot X_{it-1} + \beta_t + \tilde{\epsilon}_{it}$. Fund level controls X_{it-1} include logarithm of assets under management in the previous period, age, and vintage year and time fixed effects β_t. Panel A displays results for after-fee alphas of hedge funds. Panel B displays results for pre-fee alphas of hedge funds. The sample covers hedge funds that are listed in Morningstar database and file form D filings over period from January 2010 to December 2015. Figures in parentheses are the Newey and West (1987) heteroscedasticity and autocorrelation consistent standard errors clustered by month. Statistical significance at the 1%, 5% and 10% levels is denoted by *, **, and *** respectively.

Table 8—: Value added by directly and broker sold hedge funds

	Dollar value added		
	(1)	(2)	(3)
PANEL A: After-fee			
B_{it}	-0.214***	-0.209***	-0.211***
	(0.051)	(0.048)	(0.048)
Age_{it}	—	-0.0004	-0.017**
	—	(0.003)	(0.004)
Vintage	No	Yes	Yes
Time FE	No	No	Yes
# Obs.	29,051	29,051	29,051
R^2	1%	4%	5%
PANEL B: Pre-fee			
B_{it}	-0.198***	-0.182***	-0.189***
	(0.058)	(0.056)	(0.056)
Age_{it}	—	-0.001	0.014***
	—	(0.004)	(0.004)
Vintage	No	Yes	Yes
Time FE	No	No	Yes
# Obs.	28,493	28,493	28,493
R^2	0.06%	3%	4%

Table 8 presents estimates of difference in dollar value added (in millions of dollars) by directly sold and broker sold hedge funds with panel regression $\hat{S}_{it} = \beta_0 + \beta_B \cdot B_{it} + \beta_s \cdot X_{it} + \beta_t + \tilde{\epsilon}_{it}$. Fund level controls X_{it} include fund's age, vintage year and time fixed effects β_t. Panel A displays results for after-fee dollar value added by hedge funds. Panel B displays results for pre-fee dollar value added of hedge funds. The sample covers hedge funds that are listed in Morningstar database and file form D filings over period from January 2010 to December 2015 with an adjustment for backfill bias. Figures in parentheses are the Newey and West (1987) heteroscedasticity and autocorrelation consistent standard errors clustered by month. Statistical significance at the 1%, 5% and 10% levels is denoted by *, **, and *** respectively.

Table 9—: Heterogeneity of brokers

	After-fee alpha		
	(1)	(2)	(3)
B^I_{it}	-0.020***	-0.020***	- 0.021***
	(0.003)	(0.003)	(0.003)
B^O_{it}	-0.014***	-0.014***	-0.014***
	(0.002)	(0.002)	(0.002)
$\ln(Asset_{it-1})$	0.006***	0.007***	0.007***
	(0.001)	(0.001)	(0.001)
Age_{it}	0.0000	-0.0001	-0.0008
	(0.0000)	(0.0002)	(0.0005)
Vintage	No	Yes	Yes
Time FE	No	No	Yes
# Obs.	28,854	28,854	28,854
R^2	1%	3%	4%
Ho: In-house = Outside			
F-test	3.73*	4.36**	4.74**
p-value	0.06	0.04	0.03

Table 9 estimates difference in after-fee risk adjusted performance between directly sold hedge funds and funds that are sold through in-house broker or outside broker with panel regression: $\hat{\alpha}_{it} = \beta_0 + \beta_{in} \cdot B^I_{it} + \beta_{out} \cdot B^O_{it} + \beta_x \cdot X_{it} + \beta_t + \tilde{\epsilon}_{it}$. B^I_{it} is a dummy variable that is equal to one when the fund is sold through in-house broker and is equal to zero otherwise. B^O_{it} is a dummy variable that is equal to one when the fund is sold through outside broker and is equal to zero otherwise. Regression includes fund level controls, X_{it}, such as fund's age, vintage year and time fixed effects, β_t. The sample of funds is restricted to funds that are listed in Morningstar database and file form D filings over period from January 2010 to December 2015, using backfill corrected sample of hedge fund returns observations. Figures in parentheses are the Newey and West (1987) heteroscedasticity and autocorrelation consistent standard errors clustered by month. Statistical significance at the 1%, 5% and 10% levels is denoted by *, **, and *** respectively. Table presents results of F-test for hypothesis that alphas of funds that are sold through in-house brokers is equal to alphas of funds that are sold through outside brokers.

Table 10—: Heterogeneity of brokers

	Pre-fee alpha		
	(1)	(2)	(3)
B^I_{it}	-0.020***	-0.018***	-0.020***
	(0.003)	(0.003)	(0.003)
B^O_{it}	-0.019***	-0.020***	-0.020***
	(0.002)	(0.002)	(0.002)
$\ln(Asset_{it-1})$	0.008***	0.008***	0.008***
	(0.001)	(0.001)	(0.001)
Age_{it}	0.0000	-0.0001	-0.0006
	(0.0000)	(0.0002)	(0.0004)
Vintage	No	Yes	Yes
Time FE	No	No	Yes
# Obs.	28,304	28,304	28,304
R^2	1%	4%	5%
Ho: In-house = Outside			
F-test	0.02	-0.26	0.11
p-value	0.89	0.61	0.74

Table 10 estimates difference in pre-fee risk-adjusted performance between directly sold hedge funds and funds that are sold through in-house broker or outside broker with panel regression: $\hat{\alpha}_{it} = \beta_0 + \beta_{in} \cdot B^I_{it} + \beta_{out} \cdot B^O_{it} + \beta_x \cdot X_{it} + \beta_t + \tilde{\epsilon}_{it}$. B^I_{it} is a dummy variable that is equal to one when the fund is sold through in-house broker and is equal to zero otherwise. B^O_{it} is a dummy variable that is equal to one when the fund is sold through outside broker and is equal to zero otherwise. Regression includes fund level controls, X_{it}, such as fund's age, vintage year and time fixed effects, β_t. The sample of funds is restricted to funds that are listed in Morningstar database and file form D filings over period from January 2010 to December 2015, using backfill corrected sample of hedge fund returns observations. Figures in parentheses are the Newey and West (1987) heteroscedasticity and autocorrelation consistent standard errors clustered by month. Statistical significance at the 1%, 5% and 10% levels is denoted by *, **, and *** respectively. Table presents results of F-test for hypothesis that alphas of funds that are sold through in-house brokers is equal to alphas of funds that are sold through outside brokers.

Table 11—: Fees of directly sold and broker sold funds

	Management fee		Incentive fee	
	(1)	(2)	(3)	(4)
B_i	0.000	—	-0.014***	—
	(0.000)	—	(0.004)	—
B_{it}^I	—	-0.000	—	0.006
	—	(0.000)	—	(0.006)
B_{it}^O	—	0.000	—	-0.015***
	—	(0.000)	—	0.004
Vintage	Yes	Yes	Yes	Yes
R^2	5%	5%	4%	5%
#Obs.	1,376	1,370	1,289	1,283
Ho: In-house = Outside				
F-test	—	0.95	—	5.95**
p-value	—	0.33	—	0.01

Table 11 presents estimation of cross-sectional regressions (12) and (11), comparing fee structure of directly sold and broker sold hedge funds. Columns (1) and (2) present results for management fees. Columns (3) and (4) present results for incentive fees. Figures in parentheses are the Newey and West (1987) heteroscedasticity and autocorrelation consistent standard errors. Statistical significance at the 1%, 5% and 10% levels is denoted by *, **, and *** respectively.

Table 12—: Clientele of directly sold and broker sold funds

	Min. investment size		Aver. investment size	
	(1)	(2)	(3)	(4)
B_i	-0.272***	—	-12.033***	—
	(0.086)	—	(3.608)	—
B_{it}^I	—	-0.472***	—	-15.566***
	—	(0.217)	—	(4.623)
B_{it}^O	—	-0.282**	—	-5.716*
	—	(0.091)	—	(3.293)
Vintage	Yes	Yes	Yes	Yes
R^2	3%	3%	3%	3%
#Obs.	1,365	1,338	1,577	1,570
Ho: In-house = Outside				
F-test	—	0.69	—	4.76**
p-value	—	0.40	—	0.03

Table 12 presents estimation of cross-sectional regressions (12) and (11), comparing clientele of directly sold and broker sold hedge funds. Columns (1) and (2) present results for minimum investment size (in millions of $). Columns (3) and (4) present results for average investment size (in millions of $). Figures in parentheses are the Newey and West (1987) heteroscedasticity and autocorrelation consistent standard errors. Statistical significance at the 1%, 5% and 10% levels is denoted by *, **, and *** respectively.

Table 13—: Average broker fee: bargaining power

Bargaining Power	5%	10%	20%	30%	50%	60%	70%	80%	90%	95%
Dollar Fee	$0.241	$0.482	$0.964	$1.446	$2.410	$2.893	$3.375	$3.857	$4.339	$4.580

Table 13. This table presents estimates of average annual fee (in millions $) that fund pays to broker, who intermediates fund's capital raising process. Fee is estimated for a given broker's bargaining power. The sample of funds is restricted to funds that are listed in Morningstar database and may be classified as broker-sold funds according to information in form D filings. Annual dollar broker fees are estimated under considered fee specification, using the methodology that is described in Appendix. For a given bargaining power table displays average annual dollar fee across broker-sold funds.

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Appendix. Capital inflows estimation

To estimate capital inflows into industry, I use the following methodology. Among various information that fund reports in its form D filings, is up-to-date information on total amount of capital raised from investors, which is reported in the field Total Amount Sold.[9] To estimate the amount of capital raised by the fund, we should consider two cases: capital inflows at fund's inception and capital inflows during the life of the fund. In the first case, amount of capital raised at inception is directly reported in Total Amount Sold variable. In the second case, it may be estimated as an increment of Total Amount Sold variable between two consecutive fund's filings. For example, Citadel Global Equities Fund[10], that was opened in July, 2009, reports capital inflow of $100 millions in its first filing. The fund reports $ 153 millions as total amount sold to investors in its next filing in August, 2010. Thus, total capital inflows into the fund between July, 2009 and August, 2010 build up to $53 millions. As funds sometimes file amendment to their form D filings more than once a year, I estimate an amount of capital raised, using information from the latest filing in a given year.

Due to self-reporting nature of form D filings, there are some funds in the sample that mistakenly report their yearly inflows instead of up-to-date total amount of money raised from investors, which is required by Regulation D. I identify those funds when inflow that are estimated using the introduced methodology are negative.[11] (*** Add the percentage of confused funds by type). Funds that misreport information about total amount of capital raised are excluded from analysis.

Unfortunately, form D filings do not allow to recover an exact timing of capital inflows, but rather estimate capital inflows during the period between the filings. Therefore, additional assumptions are required to determine the year of capital inflows into the fund. As above, I consider two scenarios separately. The first case corresponds to capital raising at fund's inception. In this case, I assume that capital inflows happened in the year of the first fund's form D filing. The second scenario corresponds to the situation when fund is already in operation, meaning that fund has filed several form D filings. Specifically, the earlier filing of the fund is registered in month, m_1, of year, y_1, while the next consecutive filing occurs in month, m_2, of year, y_2. In this scenario, I assume that capital inflows occurred in year $y_1(y_2)$ if the period between the two filings mostly belongs to year $y_1(y_2)$. Using the example of Citadel fund, I estimate that capital inflows of $100 millions happened in 2009 (corresponds to the first case) and $53 millions were raised in 2010 (corresponds to the second case).

[9] Total Amount Sold is reported in field (b) of form D Item 13 (Offering and Sales Amounts).
[10] Citadel Global Equities Fund LLC is identified by Central Index Key (CIK) 1468448.
[11] By construction capital inflows is non-negative variable.

ROBUSTNESS CHECKS

Figure B1. : Performance of hedge fund portfolios: after fee + no bias correction

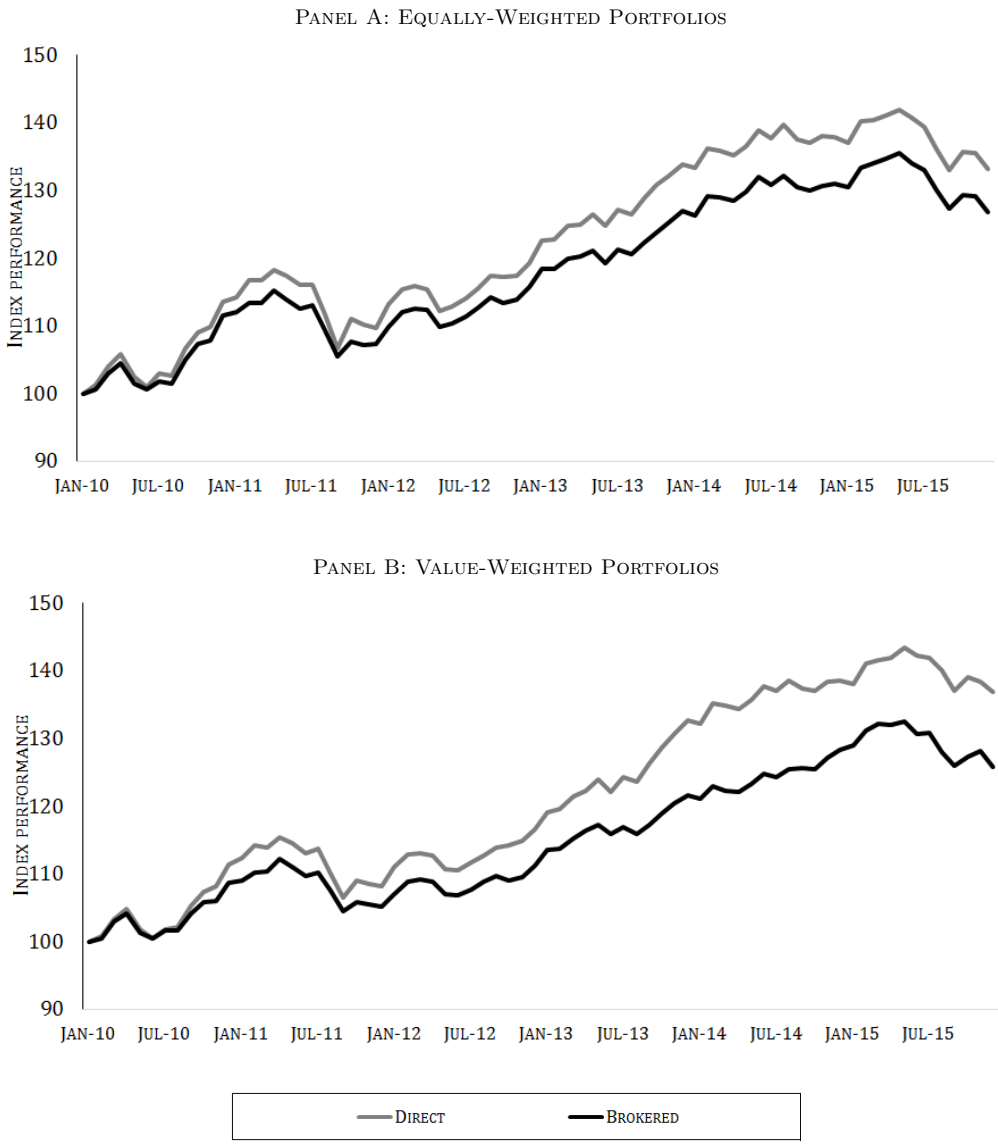

Figure B1 displays after-fee performance of fund of directly sold hedge funds (grey solid line) relative to performance of fund of broker sold hedge funds (black solid line) over the period from January 2010 to December 2015, assuming initial investment of $100. The sample of funds consists of funds that are listed in Morningstar database and file form D filings. Panel A displays after-fee performance of funds of funds where constituent hedge funds are equally-weighted. Panel B displays after-fee performance of funds of funds where constituent hedge funds are value-weighted. Returns of funds are adjusted for backfill bias.

Table B1—: Performance of Hedge Fund Portfolios: After Fee + Bias

	$\bar{R}$	$\hat{\alpha}$	$\hat{\beta}_{Mkt}$	$\hat{\beta}_{SmB}$	$\hat{\beta}_{T10y}$	$\hat{\beta}_{Cr.Spr.}$	$\hat{\beta}_{pBD}$	$\hat{\beta}_{pFX}$	$\hat{\beta}_{pCOM}$	R^2
	PANEL A: Equally-Weighted Portfolio									
Direct	4.793%**	4.421%**	0.12*	0.38***	0.10	0.25***	-0.02*	0.01	-0.01	68%
	(0.02)	(0.02)	(0.06)	(0.04)	(0.07)	(0.09)	(0.01)	(0.01)	(0.01)	
Brokered	3.968%*	3.366%*	0.12**	0.32***	0.07	0.18**	-0.07*	0.01	-0.01*	68%
	(0.02)	(0.02)	(0.05)	(0.03)	(0.06)	(0.07)	(0.01)	(0.01)	(0.01)	
	PANEL B: Value-Weighted Portfolio									
Direct	5.391%	4.433%**	0.13***	0.31***	0.07	0.16**	-0.02*	0.01	-0.01	66%
	(0.02)	(0.02)	(0.05)	(0.03)	(0.06)	(0.07)	(0.01)	(0.01)	(0.01)	
Brokered	4.157%	3.552%**	0.12***	0.25***	0.05	0.15**	-0.01*	0.01	-0.01	62%
	(0.02)	(0.01)	(0.04)	(0.03)	(0.05)	(0.06)	(0.01)	(0.01)	(0.01)	

Table B1. Results of Fung and Hsieh (2004) seven-factor models estimation for portfolio of directly sold and broker sold funds are presented in Table B1. Panel A displays results for the equally-weighted portfolio of funds, while Panel B reports results for the value-weighted portfolio of funds. Portfolios of directly sold and broker sold funds (that is constructed using a sub-sample of funds that report to Morningstar and file forms D) are reported in row Direct and row Brokered, respectively. The seven-factor model (1) is estimated using after-fee monthly returns between January 2010 and December 2015, where the first 24-months of fund's performance are excluded to adjust for back-fill bias. Table displays estimated annualized expected annualized excess return of portfolio,$\bar{R}$, estimated annualized alpha, $\hat{\alpha}$, the estimated exposures to the market, $\hat{\beta}_{Mkt}$, the estimated exposure to size spread factor, $\hat{\beta}_{SmB}$, the estimated exposure to yield curve level factor, $\hat{\beta}_{T10y}$, the estimated exposure to credit spread factor, $\hat{\beta}_{Cr.Spr.}$, and the estimated exposures to bond, commodity and forex trend-following factors, $\hat{\beta}_{pBD}$, $\hat{\beta}_{pFX}$ and $\hat{\beta}_{pCOM}$, as well as the adjusted R^2. Figures in parentheses are the Newey and West (1987) heteroscedasticity and autocorrelation consistent standard errors. Statistical significance at the 1%, 5% and 10% levels is denoted by *, **, and *** respectively.

Table B2—: Performance of hedge fund portfolios: pre fee + bias

	$\bar{R}$	$\hat{\alpha}$	$\hat{\beta}_{Mkt}$	$\hat{\beta}_{SmB}$	$\hat{\beta}_{T10y}$	$\hat{\beta}_{Cr.Spr.}$	$\hat{\beta}_{pBD}$	$\hat{\beta}_{pFX}$	$\hat{\beta}_{pCOM}$	R^2
	PANEL A: Equally-Weighted Portfolio									
Direct	6.167%***	5.781%***	0.12*	0.39***	0.11	0.25***	-0.02*	0.01	-0.01	69%
	(0.02)	(0.02)	(0.06)	(0.04)	(0.07)	(0.09)	(0.01)	(0.01)	(0.01)	
Brokered	5.120%***	4.481%**	0.17**	0.33***	0.07	0.18**	-0.01*	0.01	-0.01*	69%
	(0.02)	(0.02)	(0.05)	(0.03)	(0.06)	(0.07)	(0.01)	(0.01)	(0.01)	
	PANEL B: Value-Weighted Portfolio									
Direct	6.620%***	5.532%***	0.14***	0.32***	0.07	0.16**	-0.02*	0.01	-0.01	65%
	(0.02)	(0.02)	(0.05)	(0.03)	(0.06)	(0.07)	(0.01)	(0.01)	(0.01)	
Brokered	5.504%***	4.948%***	0.11***	0.26***	0.05	0.15**	-0.01	0.01	-0.01	61%
	(0.02)	(0.01)	(0.04)	(0.03)	(0.05)	(0.06)	(0.01)	(0.01)	(0.01)	

Table B2. Results of Fung and Hsieh (2004) seven-factor models estimation for portfolio of directly sold and broker sold funds are presented in Table B2. Panel A displays results for the equally-weighted portfolio of funds, while Panel B reports results for the value-weighted portfolio of funds. Portfolios of directly sold and broker sold funds (that is constructed using a sub-sample of funds that report to Morningstar and file forms D) are reported in row Direct and row Brokered, respectively. The seven-factor model (1) is estimated using pre-fee monthly returns between January 2010 and December 2015. Table displays estimated annualized expected annualized excess return of portfolio,$\bar{R}$, estimated annualized alpha, $\hat{\alpha}$, the estimated exposures to the market, $\hat{\beta}_{Mkt}$, the estimated exposure to size spread factor, $\hat{\beta}_{SmB}$, the estimated exposure to yield curve level factor, $\hat{\beta}_{T10y}$, the estimated exposure to credit spread factor, $\hat{\beta}_{Cr.Spr.}$, and the estimated exposures to bond, commodity and forex trend-following factors, $\hat{\beta}_{pBD}$, $\hat{\beta}_{pFX}$ and $\hat{\beta}_{pCOM}$, as well as the adjusted R^2. Figures in parentheses are the Newey and West (1987) heteroscedasticity and autocorrelation consistent standard errors. Statistical significance at the 1%, 5% and 10% levels is denoted by *, **, and *** respectively.

Table B3—: Alphas of directly and broker sold hedge funds

	Alpha		
	(1)	(2)	(3)
PANEL A: After-fee			
B_{it}	-0.012***	-0.013***	-0.013***
	(0.002)	(0.002)	(0.002)
$\ln(Asset_{it-1})$	—	0.007***	0.007***
	—	(0.001)	(0.001)
Age_{it}	—	-0.0002	-0.001**
	—	(0.0002)	(0.0004)
Vintage	No	Yes	Yes
Time FE	No	No	Yes
# Obs.	26,572	26,572	26,572
R^2	0.1%	4%	6%
PANEL B: Pre-fee			
B_{it}	-0.015***	-0.018***	-0.019***
	(0.002)	(0.002)	(0.002)
$\ln(Asset_{it-1})$	—	0.009***	0.009***
	—	(0.001)	(0.001)
Age_{it}	—	-0.0002	0.0007
	—	(0.0002)	(0.0004)
Vintage	No	Yes	Yes
Time FE	No	No	Yes
# Obs.	25,712	25,712	25,712
R^2	0.2%	4%	6%

Table B3 presents estimates of difference in risk-adjusted performance between directly sold and broker sold hedge funds with panel regression $\hat{\alpha}_{it} = \beta_0 + \beta_B \cdot B_{it} + \beta_s \cdot X_{it-1} + \beta_t + \tilde{\epsilon}_{it}$. Fund level controls X_{it-1} include logarithm of assets under management in the previous period, age, and vintage year and time fixed effects β_t. Panel A displays results for after-fee alphas of hedge funds. Panel B displays results for pre-fee alphas of hedge funds. The sample covers hedge funds that are listed in Morningstar database and file form D filings over period from January 2010 to December 2015. Figures in parentheses are the Newey and West (1987) heteroscedasticity and autocorrelation consistent standard errors clustered by month. Statistical significance at the 1%, 5% and 10% levels is denoted by *, **, and *** respectively.

Table B4—: Value added by directly and broker sold hedge funds

	Dollar value added		
	(1)	(2)	(3)
PANEL A: After-fee			
B_{it}	-0.135***	-0.160***	-0.169***
	(0.060)	(0.054)	(0.055)
Age_{it}	—	0.002	-0.031***
	—	(0.003)	(0.009)
Vintage	No	Yes	Yes
Time FE	No	No	Yes
# Obs.	26,472	26,472	26,472
R^2	0.02%	3%	4%
PANEL B: Pre-fee			
B_{it}	-0.101***	-0.127***	-0.141***
	(0.068)	(0.065)	(0.066)
Age_{it}	—	0.001	-0.026**
	—	(0.004)	(0.009)
Vintage	No	Yes	Yes
Time FE	No	No	Yes
# Obs.	25,712	25,712	25,712
R^2	0.01%	4%	4%

Table B4 presents estimates of difference in dollar value added (in millions of dollars) by directly sold and broker sold hedge funds with panel regression $\hat{S}_{it} = \beta_0 + \beta_B \cdot B_{it} + \beta_s \cdot X_{it} + \beta_t + \tilde{\epsilon}_{it}$. Fund level controls X_{it} include fund's age, vintage year and time fixed effects β_t. Panel A displays results for after-fee dollar value added by hedge funds. Panel B displays results for pre-fee dollar value added of hedge funds. The sample covers hedge funds that are listed in Morningstar database and file form D filings over period from January 2010 to December 2015 with an adjustment for backfill bias. Figures in parentheses are the Newey and West (1987) heteroscedasticity and autocorrelation consistent standard errors clustered by month. Statistical significance at the 1%, 5% and 10% levels is denoted by *, **, and *** respectively.

Table B5—: Heterogeneity of brokers

	After-fee alpha		
	(1)	(2)	(3)
B^I_{it}	-0.023***	-0.022***	-0.022***
	(0.003)	(0.002)	(0.002)
B^O_{it}	-0.015***	-0.014***	-0.014***
	(0.002)	(0.002)	(0.002)
$\ln(Asset_{it-1})$	0.006***	0.006***	0.006***
	(0.001)	(0.001)	(0.001)
Age_{it}	-0.0001***	-0.0002	-0.0010**
	(0.0000)	(0.0002)	(0.0004)
Vintage	No	Yes	Yes
Time FE	No	No	Yes
# Obs.	32,026	32,026	32,026
R^2	0.7%	3%	4%
Ho: In-house = Outside			
F-test	3.73*	4.36**	4.74**
p-value	0.06	0.04	0.03

Table B5 estimates difference in after-fee risk-adjusted performance between directly sold hedge funds and funds that are sold through in-house broker or outside broker with panel regression: $\hat{\alpha}_{it} = \beta_0 + \beta_I \cdot B^I_{it} + \beta_O \cdot B^O_{it} + \beta_x \cdot X_{it} + \beta_t + \tilde{\epsilon}_{it}$. B^I_{it} is a dummy variable that is equal to one when the fund is sold through in-house broker and is equal to zero otherwise. B^O_{it} is a dummy variable that is equal to one when the fund is sold through outside broker and is equal to zero otherwise. Regression includes fund level controls X_{it}, such as fund's age, vintage year and time fixed effects β_t. The sample of funds is restricted to funds that are listed in Morningstar database and file form D filings over period from January 2010 to December 2015, using full sample of hedge fund returns observations. Figures in parentheses are the Newey and West (1987) heteroscedasticity and autocorrelation consistent standard errors clustered by month. Statistical significance at the 1%, 5% and 10% levels is denoted by *, **, and *** respectively. Table presents results of F-test for hypothesis that alphas of funds that are sold through in-house brokers is equal to alphas of funds that are sold through outside brokers.

Table B6—: Heterogeneity of brokers

	Pre-fee alpha		
	(1)	(2)	(3)
B_{it}^{I}	-0.022***	-0.019***	-0.020***
	(0.003)	(0.002)	(0.002)
B_{it}^{O}	-0.021***	-0.020***	-0.020***
	(0.001)	(0.001)	(0.001)
$\ln(Asset_{it-1})$	0.008***	0.009***	0.009***
	(0.001)	(0.001)	(0.001)
Age_{it}	-0.0000*	-0.0002	-0.0008
	(0.0000)	(0.0002)	(0.0004)
Vintage	No	Yes	Yes
Time FE	No	No	Yes
# Obs.	30,929	30,929	30,929
R^2	1%	4%	5%
Ho: In-house = Outside			
F-test	0.04	0.18	0.38
p-value	0.83	0.67	0.53

Table B6 estimates difference in pre-fee risk-adjusted performance between directly sold hedge funds and funds that are sold through in-house broker or outside broker with panel regression: $\hat{\alpha}_{it} = \beta_0 + \beta_I \cdot B_{it}^{I} + \beta_O \cdot B_{it}^{O} + \beta_x \cdot X_{it} + \beta_t + \tilde{\epsilon}_{it}$. B_{it}^{I} is a dummy variable that is equal to one when the fund is sold through in-house broker and is equal to zero otherwise. B_{it}^{O} is a dummy variable that is equal to one when the fund is sold through outside broker and is equal to zero otherwise. Regression includes fund level controls X_{it}, such as fund's age, vintage year and time fixed effects β_t. The sample of funds is restricted to funds that are listed in Morningstar database and file form D filings over period from January 2010 to December 2015, using full sample of hedge fund returns observations. Figures in parentheses are the Newey and West (1987) heteroscedasticity and autocorrelation consistent standard errors clustered by month. Statistical significance at the 1%, 5% and 10% levels is denoted by *, **, and *** respectively. Table presents results of F-test for hypothesis that alphas of funds that are sold through in-house brokers is equal to alphas of funds that are sold through outside brokers.