Fundraising in the Hedge Fund Industry

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This paper studies fundraising process in the hedge fund industry. Using the 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 separating "cut-off" equilibrium in 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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In opaque hedge fund industry high search and due diligence costs make the fundraising process challenging even for funds with a good reputation and a strong track record. Numerous 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 in Rubinstein and Wolinsky (1987). Second, intermediaries may help alleviate adverse selection problems, as in Booth and Smith (1986). Third, intermediaries may add value by decreasing the costs of making and implementing decisions, as in Spulber (2001).

Others think that intermediaries impose unnecessary costs on our 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 also opposed and publicly criticized intermediaries on numerous occasions. A notable example is the introduction of class B shares of Berkshire Hathaway. Berkshire Hathaway class A stock has never undergone a split and has been historically traded at high price levels. To satisfy demand of small investors who could not afford buying these high priced stocks, intermediaries started to sell fractional units of Berkshire's stock. Fighting back the rent-extracting intermediaries, Berkshire Hathaway issued class B shares to cut off the middleman and to make its stock more affordable.

This paper contributes to the above debate. It starts with an empirical analysis of 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 funds

report to the U.S. Securities and Exchange Commission ("the SEC") under Regulation D. These filings have detailed information on all third parties involved in the fundraising process. This information allows one to identify the hedge funds offered to investors directly and those sold to investors through intermediary brokers. I then match this dataset with the Morningstar hedge funds database using a fuzzy match algorithm. My final dataset contains information on fundraising process, contract characteristics, and performance of hedge funds.

First, I take perspective of investors and examine net of fee performance of hedge funds across distribution channels. I find that, on average, broker-sold funds underperform directly-sold funds by a substantial margin. To insure that the result is not driven by heterogeneity in hedge funds' risk exposure, I account for risk using the seven tradable hedge fund factors as suggested by Fung and Hsieh (2004). Broker-sold funds again consistently underperform directly-sold funds by 1.6% on a risk-adjusted basis after accounting for fees. Following Berk and Binsbergen (2013), I also analyze the dollar value added by funds and find that broker-sold funds return to their investors, on average, $210,000 per month less than directly-sold funds do.

Second, I take perspective of hedge funds and compare pre-fee performance of directly-sold and broker-sold hedge funds. Since hedge funds do not report their pre-fee performance, one has to reconstruct gross returns series from reported after-fee returns and fee structure of a hedge fund. To do so, I follow the modified methodology of Brooks, Clare and Motson (2007), Hodder, Jackwerth and Kolokolova (2012), and Kolokolova (2010). I 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. To the extent that pre-fee risk-adjusted performance can be thought of as indicator of skill, this evidence contradicts the view that intermediaries help to identify skillful funds.

Third, I analyze whether investors of directly-sold funds and those of broker-sold funds face different investment costs by comparing funds' fees across distribution

channels. 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 study the heterogeneity of clientele of directly-sold and broker-sold funds. Since hedge funds do not disclose information about their clients, I use empirical proxies for investors' sophistication. In particular, investment size may be correlated with expertise of investors. Indeed, Calvet, Campbell and Sodini (2009) find that financial sophistication is correlated with wealth in the Swedish household data. Regulators also define investors who qualify for the accredited investor status and may invest in hedge funds based on investors' income or net worth. I find that funds sold directly have a larger minimum and average investment size than funds sold by brokers. Interpreting contractually defined minimum investment size as the size of fund's marginal investor, this evidence suggests that broker-sold funds and directly-sold funds may target different clienteles; broker-sold funds attract, on average, less sophisticated investors than directly-sold funds do.

One should not, however, rush to the conclusion that intermediaries are not useful. The choice of fundraising channel is an equilibrium outcome; therefore my empirical findings have no causal interpretation, but rather provide an empirical description of an equilibrium. To think more carefully through equilibrium, I present a stylized model of fundraising in the hedge fund industry where through game-theoretic approach I model interaction of differentially-skilled hedge funds, heterogeneous investors and rent-extracting intermediary broker. This model reconciles the documented empirical findings on after-fee performance, skill, compensation and clientele across distribution channels.

The model builds on the work of Nanda, Narayanan and Warther (2000) and Stoughton, Wu and Zechner (2011). The key frictions in the model are due-diligence costs of investors as well as rent extraction by broker.

There are two hedge funds that differ in skill. Hedge funds do not have their own capital and have to raise funds from investors, for whom the process of find-

ing and vetting a suitable fund is costly. Investors differ in their search and due diligence costs. Sophisticated investors, like David Swensen who manages the Yale University endowment, have low due diligence costs, whereas others with no industry connections incur high costs. A hedge fund may choose to pay some fee and hire an intermediary broker, who will certify the type of the fund and persuade investors to allocate their capital into it. Note that to microfound due diligence costs of investors, one should introduce a fraudulent fund that runs away with capital it collects if no due diligence is conducted. For expositional simplicity and without loss of generality I focus on the two fund case in the paper and present the three fund case in the internet appendix.

I solve for a separating Nash equilibrium, in which funds endogenously choose portfolio management fees and capital-raising channels, whereas investors decide to invest into hedge funds either on their own or based on recommendation of an intermediary. Investors and funds sort themselves across distribution channels: the higher skill fund becomes directly sold, while the lower skill fund hires the broker; low cost investors invest into hedge fund industry directly, whereas high cost investors seek for advice of the intermediary broker.

The equilibrium has a simple intuition. The existence of both funds is socially optimal, since both funds generate positive returns which are greater than the outside option. Sophisticated investors search and vet the higher skill fund, which allows the fund avoid paying the cost of hiring broker. The lower skill fund, however, is unable to attract investment capital on its own and hires the broker for capital introduction. Internalizing the due-diligence process and certifying quality of the fund, the broker channels the remaining high-cost investors to the low skill fund. Thus, the broker resolves the inefficiency: it allows the high-cost investors to allocate their endowments into the hedge fund industry, while the lower skill fund gets investment capital.

The rent extraction of the broker and the relative outperformance of the higher skill fund over the lower skill fund are necessary for the existence of the separat-

ing equilibrium. The higher skill fund separates from the lower skill fund when it generates a sufficiently high return that is enough to compensate for the marginal investors' due diligence costs.

Model has implications about the skill, after-fee performance, fees and clientele across distribution channels that matches the empirical findings of this paper.

I also calibrate the model and estimate the implied average compensation that brokers receive for their capital introduction services.

This paper relates to the literature on capital formation in the asset management industry. Presidential address Duffie (2010) emphasizes the issue of slow moving investment capital. Only a small amount of capital may be contemporaneously available in the system resulting in inefficiencies and undermining smooth operation of financial system. Intermediaries may help to overcome frictions, connecting capital with investment opportunities. The classic paper of Berk and Green (2004) rationalizes investors' behavior in the asset management setting. The competitive investors rationally invest or withdraw capital while learning about the fund's skill from fund's realized return. Garleanu and Pedersen (2016) present efficiently inefficient model of asset management industry where the number of investors who invest through managers, the number of informed asset managers, the management fee, and the asset prices are determined in equilibrium with search friction and costly information acquisition.

Empirical literature identified several factors that affect capital formation in the asset management industry. Consistent with predictions of theoretical models and common intuition, research documents a strong relation between fund's track record and capital flows as in the mutual fund studies of Chevalier and Ellison (1997), Sirri and Tufano (1998) and the hedge fund studies of Goetzmann, Ingersoll and Ross (2003), Fung et al. (2008). The shape of flow-to-performance relation in the mutual fund industry found to be convex as in Chevalier and Ellison (1997), Horst and Salganik-Shoshan (2014), Baquero and Verbeek (2015), whereas the mixed evidence is established for the hedge funds as in Agarwal, Daniel and Naik (2004), Goet-

zmann, Ingersoll and Ross (2003) and Baquero and Verbeek (2009). Contractual characteristics such as lockup periods, forced redemptions, advance notice period and gate provisions affect capital flows as well as discussed in Getmansky et al. (2015).

My paper contributes to this literature by analyzing capital formation in the hedge fund industry and the role that intermediaries play in this process, or more broadly, distribution channels and marketing in the asset management industry. 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 accounting for fees. Possible behavioral explanation is that brokers provide the substantial intangible benefits or "babysit" investors as in Gennaioli, Shleifer and Vishny (2015). Alternatively, this finding may be rationalized by partition of mutual fund clientele into sophisticated investors who invest on their own and disadvantaged investors who need investment advice as in Nanda, Narayanan and Warther (2000). This makes it even more surprising that I find similar result in a hedge funds setting where a typical investor is a sophisticated financial institutions or an individual qualified for accredited investor status. Exploring heterogeneity of brokers, 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. In contrast, I find that hedge funds offered through in-house brokers underperform both directly sold funds and funds sold through outside brokers.

The mutual fund literature documents that directly-sold mutual funds charge lower fees than mutual funds sold through brokers. In contrast, I find that incentive fees are higher for directly-sold hedge funds than that of broker-sold hedge funds, while I find no difference in hedge funds' management fees across different fundraising channels. Furthermore, in-house brokers receive a higher front load comparing to outside brokers. Whereas, I find that 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 also document a better after-fee performance of directly-sold funds relative to broker-sold hedge funds. Yet, they do not analyze pre-fee performance and focus on studying fund families, rather than individual funds.

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 paper, I examine the choice of investors to perform due diligence on their own or delegate it to the broker, but I endogenize the choice of capital raising channels by hedge funds and this helps me to uncover important mechanism that may generate my empirical findings.

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

I. Data and main variables

My empirical analysis uses a combination of two databases: the database constructed from form D filings and the Morningstar hedge funds database.

A. Information on fundraising from form D filings

Even though 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 file a form D with the SEC. A notice has to be filed no later than 15 calendar days after the date of the first sale of the fund's offering. Filings have to be updated on annual basis as long as the fund remains open for investment. Any mistakes in the filings have to be reported as well.[1]

[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. Amendment

Table 1 outlines all data items in the form D and their descriptions. Items include fund's administrative information and detailed information about the fundraising process: fund's name, the address of fund's 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 disclosed 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] The downloaded sample covers period from January 2010 to December 2016. The beginning of the sample period coincides with the month when all hedge funds were required to submit forms electronically.

Each fund is uniquely identified by its *Central Index Key* or *CIK number*. 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 can learn that the fund was originated with Citadel Advisors in July 2009, raised $100 millions from one investor at the origination date, and later on $153 millions from seven investors by August 2010 and $446 millions from fifty-nine investors by September 2016.

The SEC requires funds to disclose information about any entity which is directly or indirectly compensated for advertising 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 information consists of brokers' biographical information, their Central Registration Depository ("CRD") number within the

to form D filing is denoted as D/A. 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.

[3]This information is reported in the item 12 *Sales Compensation* of form D filings.

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 shows the list of fifteen directly-sold and fifteen broker-sold open funds that raised the largest amount of capital by 2015. For example, Medallion fund of Renaissance Technologies raised $6.5 billions by 2015, and D.E. Shaw Oculus International fund of D.E. Shaw & Co raised $13 billions using a broker.

Brokers are heterogeneous. I classify brokers into in-house and outside brokers based on the similarity of the names of the brokers and the funds, estimating generalized Levenshtein distance between them and using fuzzy matching technique. For example, Fortress Convex Asia fund LP uses the capital introduction services of Fortress Capital Formation LLC, which I classify as an in-house broker. ING Clarion Market Neutral LP is sold by Citigroup Global Markets and Merrill Lynch, Pierce, Fenner and Smith Inc., which I classify 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 the outside broker-sold fund.

Table 3 shows ten most active brokerage firms which assist with capital raising to the largest number of hedge funds. This list comprises top investment banks such as Goldman Sachs, Morgan Stanley, and J.P. Morgan. For example, over the sample 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 offered by Goldman Sachs is 149 (30) investors.

I use information in filings (*Total Amount Sold*) to estimate the amount of capital inflows into each fund. 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.

Figure 3 shows the aggregate statistics on capital flows 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 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.

The hedge fund industry enjoyed capital inflows which steadily grew from 2010 to 2015. Over this period hedge fund industry attracted on average $300 billions per year, spiking above the average level in 2014. The spike in capital inflows coincides with the lifting of the SEC's hedge funds advertisement ban, which was implemented in September 2013.

B. Morningstar database and performance measures

The Morningstar CISDM hedge fund database available from Wharton Research Data Service ("WRDS") contains feeder 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 fund's after-fee performance and assets under management at a monthly frequency. This information can be used to construct measures of hedge fund performance both before and after fees.

The after-fee performance of the hedge fund is important for investors. Investor decides whether or not to invest in the hedge fund by comparing the fund's after-fee

return with his outside option. I consider three different measures of a fund's after-fee performance: the raw after-fee returns, the after-fee alpha and the after-fee dollar value added. The after-fee return is a basic performance measure that is directly available from the database. The after-fee alpha measures value-added by fund beyond its systematic risk exposure; I discuss the methodology of alpha estimation below. The after-fee dollar value added of hedge fund reflects the value that investors get on their hedge fund investment in dollar terms; Berk and Binsbergen (2013) propose to calculate this measure as a product of the fund's after-fee alpha and its assets under management.

Yet, skills of the fund may be better reflected by the pre-fee performance. Hedge fund databases report fund performance and net asset values ("NAV") after accounting for fees. To reconstruct the pre-fee returns time-series, I make several assumptions about the hedge funds' fee structure. The following six assumptions reflect the general practice on how hedge funds' fees are set. First, pro-rata management fees are paid at the end of the month on pre-fee net asset value at the end of the month. Second, 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. Third, 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. Fourth, 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. Fifth, management and incentive fees remain constant over time.[4] Sixth, 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 investors, who might invest in funds at different time are treated fairly and equally.[5]

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

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

The pre-fee return of the hedge fund is the growth rate of the pre-fee assets under management. I reconstruct the pre-fee assets under management as the sum of the reported after-fee assets under management and reconstructed management fees and incentive fees in dollars. I follow the methodology of Brooks, Clare and Motson (2007), Hodder, Jackwerth and Kolokolova (2012), and Kolokolova (2010) outlined in the Appendix.

I consider three different measures of fund's skill: the raw pre-fee returns, the pre-fee alpha and the pre-fee dollar value added of hedge fund.

Hedge funds usually employ various risky trading strategies. To make a sensible comparison of hedge funds performance, it is important to control for their exposure to systematic risk factors and calculate their risk-adjusted performances also known as alphas. As suggested by Fung and Hsieh (2004), I estimate the tradable alpha by regressing the annualized monthly excess return, R^e_{it}, on seven tradable risk factors.

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

To account for market exposure, I use annualized returns on the S&P500 index, $SNPMRF_t$. To adjust 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.[6] The correlation between the two time series is 0.96.

To account 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, to adjust 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.[7]

For every fund i in month t, I estimate its annualized monthly alpha, $\hat{\alpha}_{it}$, with a two-year rolling-window regression (1). To estimate the after-fee alpha of the hedge fund, I use after-fee annualized return time series as a dependent variable in regression (1). To estimate the pre-fee alpha of the hedge fund, I use reconstructed pre-fee annualized return time series as a dependent variable in regression (1).

I also estimate the dollar value added, $\hat{S_{it}}$, as a product of estimated annualized alpha, $\hat{\alpha}_{it}$, and the fund's assets under management for every fund i in month t. I use estimated after-fee alpha and pre-fee alpha to find after-fee and pre-fee dollar value added, respectively.

C. Matching form D filings and Morningstar database

I match the form D filings with the Morningstar database by the name of the fund using a fuzzy matching method. First, I estimate dissimilarity score for each form D fund with each fund in the Morningstar database based on dissimilarity measure of Levenshtein (1966). The measure calculates the minimum number of edits that are

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

[7]These factors can be downloaded from David Hsieh's Data Library accessible at https://faculty.fuqua.duke.edu/ dah7/HFRFData.htm.

needed to transform one fund name to another fund name. Two identical names will get zero dissimilarity score, whereas two different names will get high score. At the first pass, 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. Finally, I manually verify the results of the matching procedure.

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

First, often funds backfill returns prior to the date when they start 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 may lead to misleadingly good track records in the dataset and upward bias in expected returns due to the 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 database contains significant numbers of missing values in assets under management field. Following Joenväärä, Kosowski and Tolonen (2014), I fill in any missing observations with the most recent observations of

the past.

D. Summary statistics of the matched sample

The matched sample consists of 1,728 individual funds. These funds submitted in total 7,824 form D filings. In the matched sample 92% of funds are identified as hedge funds and 8% of funds are identified as other investment funds. The matched sample of funds represents 15% of funds that have filed form D and 8% of funds that are listed in the Morningstar database. These funds are at the intersection of the set of the form D filing funds and the set of the Morningstar listed funds. A low match rate between two databases is explained by the double conditioning. This sample includes funds that chose to submit data to the Morningstar datatbase and are open for investment. Jorion and Schwarz (2015) perform a similar exercise by matching form D funds with the Hedge Fund Research (HFR) and Lipper TASS databases. They are able to match in total 3,816 form D funds. Reassuringly, the match rate between the funds that file form D and Morningstar funds is consistent with the match rate between form D funds and Lipper TASS funds (1,896 funds).

In the final sample 1,103 funds are directly-sold and 625 funds are broker-sold. Furthermore, I identify 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.

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.

Overall, I do not find significant differences between the matched sample and the total form D sample of funds in terms of most observable characteristics.

Capital inflows into hedge funds do not differ significantly across distribution chan-

nels. 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 about 2.75 times smaller than that of a directly-sold fund.

II. Empirical findings

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

A. After-fee performance

After-fee performance differ across distribution channels. I first compare after-fee performance of funds sold by intermediaries and funds sold directly to investors using portfolio approach. From January 2009 to December 2015 I track performance of portfolios of directly-sold hedge funds and portfolio of broker-sold hedge funds; each portfolio is rebalanced monthly.

Figure 4 plots the after-fee cumulative performance dynamics for the portfolios. Panel A shows the performance of the equal-weighted portfolio of funds. Panel B displays the performance of value-weighted portfolios of funds. The portfolio of directly sold funds outperforms the portfolio of broker sold funds. For the equal-weighted scheme, the former portfolio growths from $100 to $130 over five years, with an annualized return of 5.38% per year. The latter portfolio increases from $100 to $125, with an annualized return of 4.56% per year. For the value-weighted scheme the difference is even more pronounced. The portfolio of directly sold funds rises from $100 to $136 with annualized return of 6.34% per year. The portfolio of broker sold funds increases from $100 to $126 with annualized return of 4.73% per year.

Next, I compare the after-fee alpha for the portfolio of directly-sold funds and that of broker-sold funds. I estimate annualized monthly alpha of portfolio, $\hat{\alpha}_t$, with a

two-year rolling-window regression (1), using the after-fee annualized return time series of portfolio as a dependent variable.

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 panel A of the figure displays time series of after-fee alphas for the equal-weighted portfolios. Panel B of the figure presents time-series dynamic of alpha for the value-weighted portfolios. 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 difference in after-fee alpha are 4.42% versus 3.37% per year. For the value-weighted scheme, the difference is 4.43% versus 3.55% per year.

Regression analysis provides consistent results. The unit of observation is a fund-month observation, and the dependent variable y_{it} is either the estimated after-fee alpha $\hat{\alpha}_{it}$ or the estimated after-fee dollar value added $\hat{S}_{it}$ of fund i at time t. The binary indicator B_{it}, which is equal to one if fund i at time t is sold through broker and zero if the fund raises capital directly from investors, is the main independent variable of interest. These controls include lagged fund's size, age and vintage year, as well as month fixed effects β_t, accounting for the time trends in investment opportunities.

$$y_{it} = \beta_0 + \beta_B \cdot B_{it} + \beta_X \cdot X_{it-1} + \beta_t + \tilde{\epsilon}_{it}. \tag{2}$$

Panel A of table 7 and panel A of table 8 show results of regression (2) estimation for the after-fee alpha and the after-fee dollar value added, respectively. The after-fee alpha of the broker-sold funds is, on average, 1.6% per year lower than that of directly-sold funds. The after-fee dollar value added of directly-sold funds, is on average, $210,000 per month less than that of the directly-sold funds. The results are economically significant and robust for inclusion of controls.

Further 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 add two indicator variables to regression (2). The binary indicator B_{it}^{I} equals to one if fund i at time t is sold through the in-house broker and zero otherwise. The binary indicator B_{it}^{O} equals to one if fund i at time t is sold through the outside broker and zero otherwise.

$$Y_{it} = \beta_0 + \beta_I \cdot B_{it}^{I} + \beta_O \cdot B_{it}^{O} + \beta_X \cdot X_{it} + \beta_t + \tilde{\epsilon}_{it}, \tag{3}$$

Table 9 displays the results of the estimation of regression (3). 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 only 1.4% lower than that of directly sold funds. A formal F-test, comparing the difference between in-house broker-sold and outside broker-sold funds, implies that the two alphas are statistically different from each other. The results are economically significant and robust for inclusion of controls.

B. Pre-fee performance

Pre-fee performance differs across the distribution channels.

Figure 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 panel A displays pre-fee alphas for the equal-weighted portfolios. Panel B presents pre-fee alphas for the value-weighted portfolios. The pre-fee alpha of directly-sold hedge funds is persistently higher than the pre-fee alpha of the broker-sold hedge funds regardless of portfolio-weighting scheme. For the equally-weighted scheme, the pre-fee alphas are 5.78% and 4.48% per year, respectively. For the value-weighted scheme, the

pre-fee alphas are 5.53% and 4.95% per year, respectively.

Regression analysis provides supportive evidence. The dependent variable y_{it} is either the estimated pre-fee alpha $\hat{\alpha}_{it}$ or the estimated pre-fee dollar value added $\hat{S}_{it}$ of fund i at time t.

Panel B of table 7 and panel B of table 8 show results of regression (2) estimation for the pre-fee alpha and the pre-fee dollar value added, respectively. The pre-fee alpha of the broker-sold funds is, on average, 2.0% per year lower than that of directly-sold funds. The pre-fee dollar value added of directly-sold funds, is on average, \$190,000 per month less than that of the directly-sold funds. The results are economically significant and robust for inclusion of controls.

Table 10 displays the results of the estimation of regression (3). I find that hedge funds that are sold through the in-house brokers, on average, have the same pre-fee alpha as those sold through the outside brokers. Both types of brokers underperform directly-sold hedge funds by about 2% per year. The results are also robust to inclusion of controls.

C. Fees structure

Fees structures differ across the directly-sold and the broker-sold funds. The analysis is performed at a fund-level, since the Morningstar database stores only the most recent snapshot of a fund's contractual characteristics. The dependent variable y_i is either the management fee or performance fee of fund i. The binary indicator B_i is equal to one if fund i is sold through broker and zero if the fund raises capital directly from investors. It tests for the difference between the fundraising channels after controlling for the vintage year of a fund λ_t.

$$Y_i = \beta_0 + \beta_B \cdot B_i + \lambda_t + \tilde{\epsilon}_i, \tag{4}$$

Table 11 presents the estimation results. There are no difference in management

fees, but noticeable difference in incentive fees. Columns (1) and (2) shows estimation of regression 4 for management fees as a dependent variable. On average, management fees that investors pay are 1.4%, but there is no significant difference in management fees either between directly-sold and broker-sold funds or between funds sold through in-house brokers and funds offered through outside brokers.

Columns (3) and (4) shows estimation of regression 4, using performance fees as a dependent variable. Directly-sold funds, on average, charge an incentive fee of 18.35%, which is 1.4% higher than the incentive fee of broker-sold funds. 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. An F-test rejects hypothesis that in-house broker-sold funds and outside broker-sold funds charge the same performance fees.

D. Clientele profile

Clientele profile differs across the directly-sold and the broker-sold funds. I perform analysis at a fund-level. The dependent variable y_i is either a minimum investment size or an average investment size of fund i.

Table 12 shows estimation of the regression (4), using minimum investment size as the dependent variable. The minimum investment size of directly-sold funds is, on average, \$1 million, which is \$0.27 millions higher than that of broker-sold funds. An F-test, however, does not rejects hypothesis that the minimum investment size of in-house broker-sold funds is the same as that of the outside broker-sold funds.

Table 12 also shows the estimates of the regression (4) with the average investment size as the dependent variable. The broker-sold funds have a \$12 millions lower average investment size than that of directly-sold funds. An F-test also rejects hypothesis that the average investment size of in-house broker-sold funds is the same as that of the outside broker-sold funds.

III. Theoretical motivation

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

A. A model of fundraising

Suppose there are three types of agents: hedge funds, investors, and intermediary brokers. The industry consists of 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 $\alpha_G > \alpha_B > 0$. To capture opacity of the hedge fund industry, I assume that alphas are known to the funds themselves, but unobservable to investors and the broker. To learn about the funds' alphas, investors and the broker should perform due diligence and study the hedge fund industry.

The fund does not have its own capital and has to raise funds from investors. It has two options and may either be approached by investors directly 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 dollar profits. Each fund chooses a fee and capital raising channel to maximize the total dollar fees collected from investors.

There is also a continuum of risk-neutral investors. Each investor is endowed with a unit of capital, which he may either invest 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 due diligence costs. There are professional investors with low due diligence costs and less sophisticated investors who have high due diligence costs. The due diligence

costs of investors, c, are uniformly distributed at interval from 0 to $\bar{C}$, $c \sim U[0; \bar{C}]$.

Each investor faces two options. He may perform due diligence of the hedge fund industry by himself or outsource it to the intermediary broker. In the first case, the investor learns about the funds' alphas and rationally invests in the fund that delivers the highest after-fee return. In the second case, the investor allocates his endowment into the fund recommended by the broker.

The broker performs due diligence and a certification of the fund at cost, $c_I > 0$. For the capital introduction service, the broker has to be compensated by the fund. The broker and the fund bargain and split the collected dollar fees. 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 as a fiduciary and allows for avoiding a moral hazard problem between the broker and the investors.

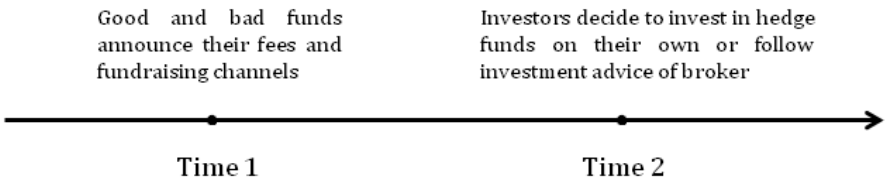
The key friction of the model is due diligence cost that arise because of opacity and risks of the hedge fund industry. Analyzing form ADV disclosures of registered hedge funds, Brown et al. (2008) find that approximately 16% of hedge funds have committed a felony or have financial-related charges or convictions. These examples underline risks that investors face. As pointed out by Garleanu and Pedersen (2016), prospective investors are aware of these risks and undertake extensive analysis of the track record, the investment process and the risk management systems of hedge funds to protect themselves against fraud and bad financial practices.

To motivate due diligence costs in the context of the fundraising game, one has to explicitly model the risk of investment in the hedge fund industry. Introduction of the third fraudulent negative alpha fund is a simple extension of the model that serves the purpose. Investors who do not perform due diligence of the hedge fund industry and invest in a random hedge fund face the risk of loosing money if they invest into the fraudulent fund. Both the fundraising game with two funds and that with three funds has the same mechanism and intuition. For simplicity of exposition, the main paper presents the game with two funds. Proposition 2 in internet appendix

outlines the fundraising game with three funds and microfounds due diligence.

The fundraising game has a sequential structure 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 fund 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 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 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 $\pi_\theta\Big(s_\theta; s_{-\theta}; \mu(s_\theta, s_{-\theta})\Big)$. It depends on the strategy of the type-θ fund s_θ, the strategies of the other fund $s_{-\theta}$, and a measure

of investors, who decide to invest in the fund, denoted as $\mu(s_\theta, s_{-\theta}) \subset [0; \bar{C}]$. Given strategy $s_\theta = (f_\theta, X_\theta)$, the profit of the type-θ fund is determined as

$$\pi_\theta\Big(s_\theta; s_{-\theta}; \mu(s_\theta, s_{-\theta}))\Big) = \pi_\theta\Big((f_\theta, X_\theta); s_{-\theta}; \mu(s_\theta, s_{-\theta})\Big) = \tag{5}$$

$$\begin{cases} f_\theta \cdot \int_{\mu(s_\theta, s_{-\theta})} dc, & \text{if } X_\theta = 0 \quad \text{(5a)} \\ (1-G) \cdot f_\theta \cdot \int_{\mu(s_\theta, s_{-\theta})} dc, & \text{if } X_\theta = 1. \quad \text{(5b)} \end{cases}$$

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 (5a). 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 (5b). Note that $\int_{\mu(s_\theta, s_{-\theta})} dc$ is the assets under management of the fund since every investor invests unit endowment.

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

$$U_{\theta c} = \begin{cases} \alpha_\theta - f_\theta - c, & \text{if performs due diligence by himself} \quad \text{(6a)} \\ \alpha_\theta - f_\theta, & \text{if outsorces due diligence to the broker.} \quad \text{(6b)} \end{cases}$$

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, as in (6a). If the investor follows financial advice, then his utility equals to the after-fee return on the type-θ fund since the investor outsources due diligence process to the broker, as in (6b).

Let's denote the profit that the broker gets $\pi_I\Big(s_\theta; s_{-\theta}; \mu(s_\theta, s_{-\theta})\Big)$. 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:

$$\pi_I\Big(s_\theta; s_{-\theta}; \mu(s_\theta, s_{-\theta})\Big) = \tag{7}$$

$$\begin{cases} 0, & \text{if } X_\theta = 0 \quad (7a) \\ \dfrac{G}{1-G} \cdot \pi_\theta\Big(s_\theta; s_{-\theta}; \mu(s_\theta, s_{-\theta})\Big) - c_I, & \text{if } X_\theta = 1. \quad (7b) \end{cases}$$

The broker makes a profit when the fund is broker-sold ($X_\theta = 1$), as in (6b), and he gets nothing when the fund is directly-sold to investors ($X_\theta = 0$), as in (6a).

Definition of "cut-off" equilibrium.

The Nash equilibrium of the fundraising game is defined as follows:

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

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

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

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

(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. $\mu(s_G, s_B) = \Big[0; \min\{\hat{c}(s_G, s_B), \bar{C}\}\Big]$ will invest on their own. Investors with costs that are greater than the cost of the marginal investor, i.e $\mu(s_B, s_G) = \Big(\min\{\hat{c}(s_B, s_G), \bar{C}\}; \bar{C}\Big]$ 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 due diligence cost, $\hat{c}(s_\theta, s_{-\theta})$. Since the investors base of the fund $\mu(s_\theta, s_{-\theta})$ may be fully described by a threshold 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 1. 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* $f_B^* = \alpha_B$.

$$s_G^* = \Big(\frac{\alpha_G}{2}, 0\Big), \tag{8}$$

$$s_B^* = \Big(\alpha_B, 1\Big). \tag{9}$$

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:*

$$\hat{c}^* = \frac{\alpha_G}{2}, \tag{10}$$

$$U_{G\hat{c}^*} = U_{B\hat{c}^*} = 0. \tag{11}$$

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:

$$\max\left\{1 - \frac{\alpha_G}{4 \cdot \bar{C}}; \frac{c_I}{\alpha_B \cdot (\bar{C} - \frac{\alpha_G}{2})}\right\} \leqslant G < 1 \tag{12}$$

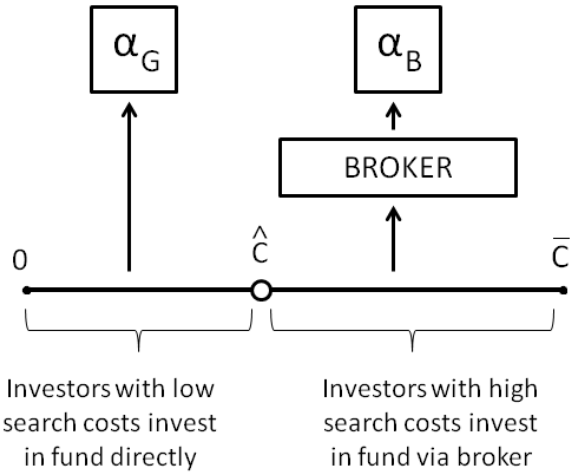
$$\alpha_B < \hat{c}^* = \frac{\alpha_G}{2} < \bar{C}. \tag{13}$$

I verify the existence of the separating "cut-off" equilibrium by confirming the op-

timality of the players' strategies. Thr proof of Proposition 1 is presented in the Appendix.

The separating "cut-off" equilibrium of the fundraising game is illustrated in Figure 2. In the equilibrium investors and funds sort themselves across distribution channels: the good fund becomes directly sold, while the bad fund hires a broker; low cost investors invest into hedge fund industry directly, whereas high cost investors use advice of intermediary broker.

Figure 2. : Separating equilibria of the fundraising game



B. Model implications

This model has implications about the skill, after-fee performance, compensation and clientele of across distribution channels in the hedge fund industry. I discuss model implications and reconcile them with the empirical findings.

First, the model has implications for the after-fee returns that investors receive on their investments, $\alpha_\theta - f_\theta$. The equilibrium strategy of the good fund (8) 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 (9) implies that broker-sold fund extracts all generated surplus through fees, making its investors indifferent about investing in the fund and the outside option. Thus, the model predicts that 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 documented in figure 4, figure 5 and panel A of table 7 support the prediction about the after-fee performance of directly-sold funds is higher than that of 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 (8) and that of the bad fund (9) imply that the good fund raises capital directly, while the bad fund raises funds through the broker. Together with condition (A16), it implies that broker-sold funds are expected to 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 this 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 (8) implies that the directly-sold fund charges fee, $f_G = \frac{\alpha_G}{2}$. The equilibrium strategy of the bad fund (9) states that the broker-sold fund charges fee, $f_B = \alpha_B$. Condition (A16) 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 consistent with this 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 differences in clientele of the funds. In equilibrium, investors with costs smaller than the costs of the marginal investor

invest in the directly-sold fund $\mu(s_G, s_B) = [0; \hat{c}]$, while investors with costs higher than cost of the marginal investor invest in the broker-sold fund $\mu(s_B, s_G) = [\hat{c}; \bar{C}]$. 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 $\frac{\hat{c}+\bar{C}}{2}$.

Table 12 displays the tests of the above prediction. 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. Consistent with the prediction I find that minimum investment size and average investment size of directly-sold funds is larger than that of broker-sold funds.

C. Compensation for the broker

The model allows to infer 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 (7).

I use information about the fund's assets under management, performance, and compensation structure to estimate the total dollar fees collected by hedge funds. Using methodology for the reconstruction of the pre-fee returns that is described in detail in the section 2, I estimate the dollar management fees using equations (C2) and dollar incentive fees using equation (C3). I find the total dollar fees collected as a sum of the annual dollar management fees and the dollar incentive fees. Suppose 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 (7).

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 $\frac{1}{3}$, 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. Form D filings that hedge funds report to the SEC provide unique insights into the subject. Information reported in the filings allows 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 have a larger average investor's size, a larger minimum investment size and charge higher incentive fees compared to that of funds offered to investors by brokers. These findings provide empirical description of the equilibrium rather than identify causal effects of intermediaries in fundraising.

A stylized model can explain these empirical findings and emphasize possible mechanism. In equilibrium, sophisticated investors who are better at due diligence will sort themselves into better funds, whereas less sophisticated investors delegate due diligence to the broker who than matches them with the worse funds that it mar-

kets. Endogeneity of the hedge funds' choice of capital raising channel is important. Better funds avoid hiring a broker, whereas the worse funds cannot attract investors on their own and hire the broker for its capital introduction service.

Numerous financial intermediaries, such as brokers, dealers, and advisers, are at a core of financial system, stemming the debate on the role that they play. Reflecting on this subject in the context of fundraising in the hedge fund industry, I conclude that although Warren Buffet may be right that intermediaries do not help to identify the best investments, never-the-less they may mitigate capital raising inefficiency and connect new capital with feasible investment opportunities.

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

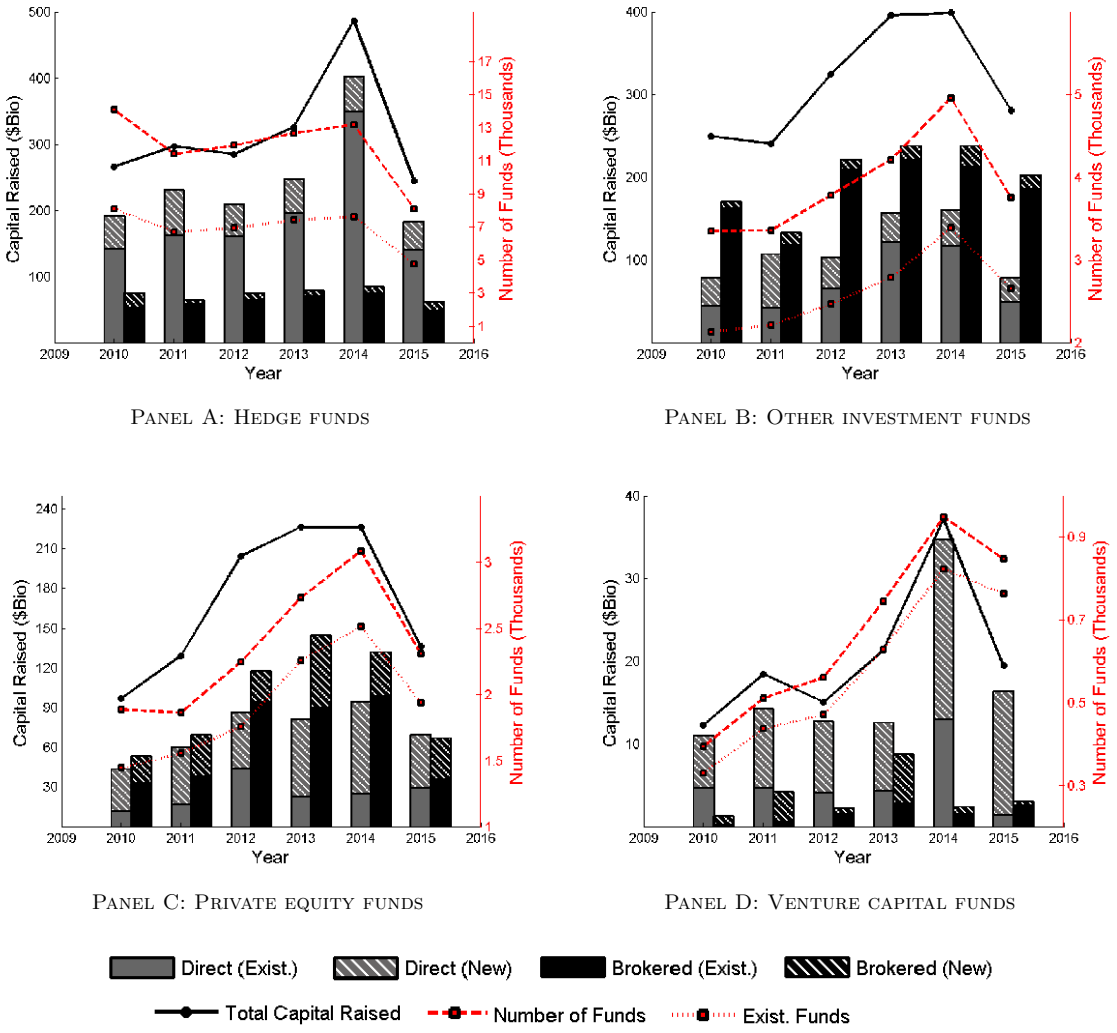
Table 2 presents fifteen directly sold hedge funds (Panel A) and broker sold hedge funds (Panel B) that were open for investment and raised maximum amount of capital by 2015. Table reports fund's name, name of management company and total amount of capital raised (in millions of dollars).

Table 3—: Top broker firms in capital introduction business

	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

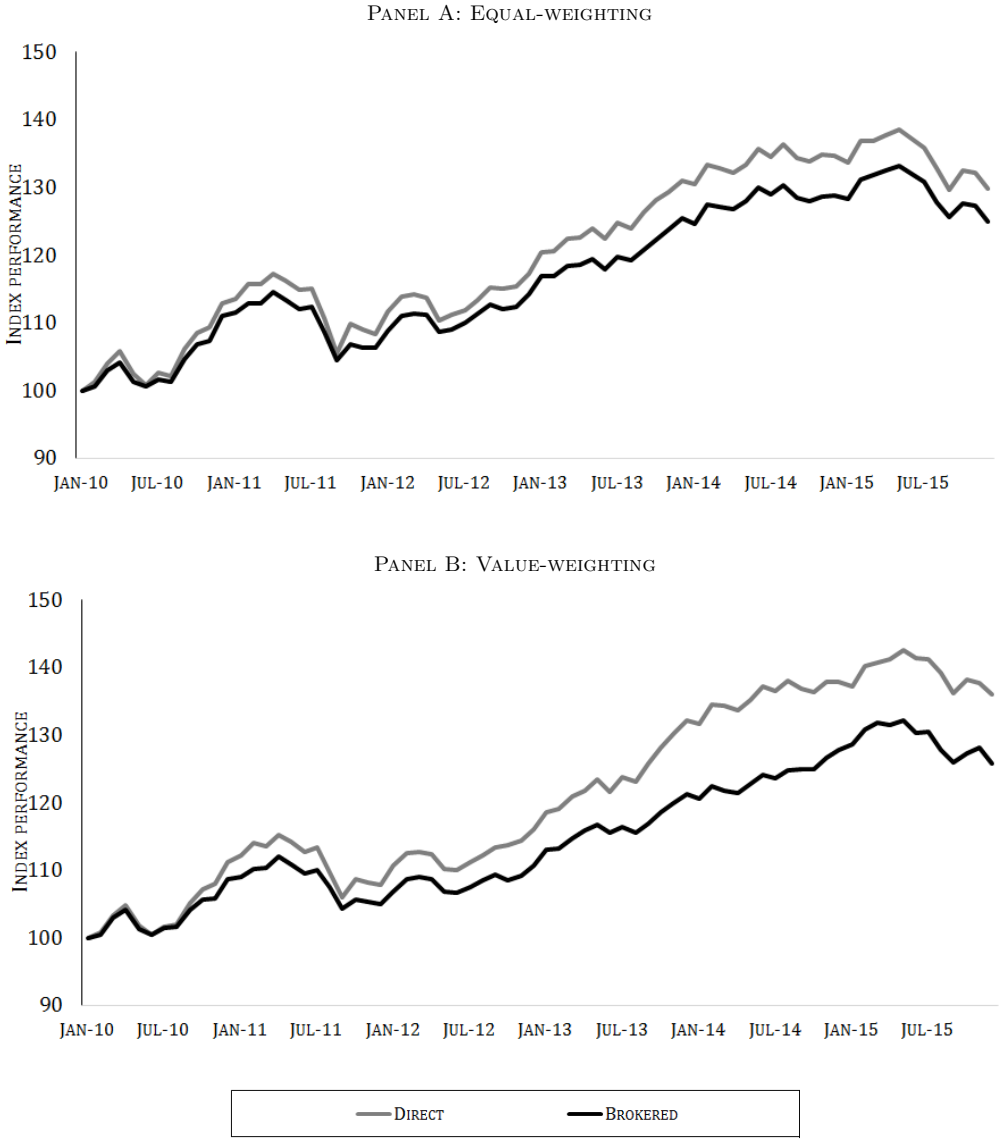


Figure 4 displays after-fee performance of portfolio of directly sold hedge funds (grey solid line) relative to performance of portfolio of broker sold hedge funds (black solid line) over the period from January 2010 to December 2015, assuming initial investment of $100. The sample of funds consists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

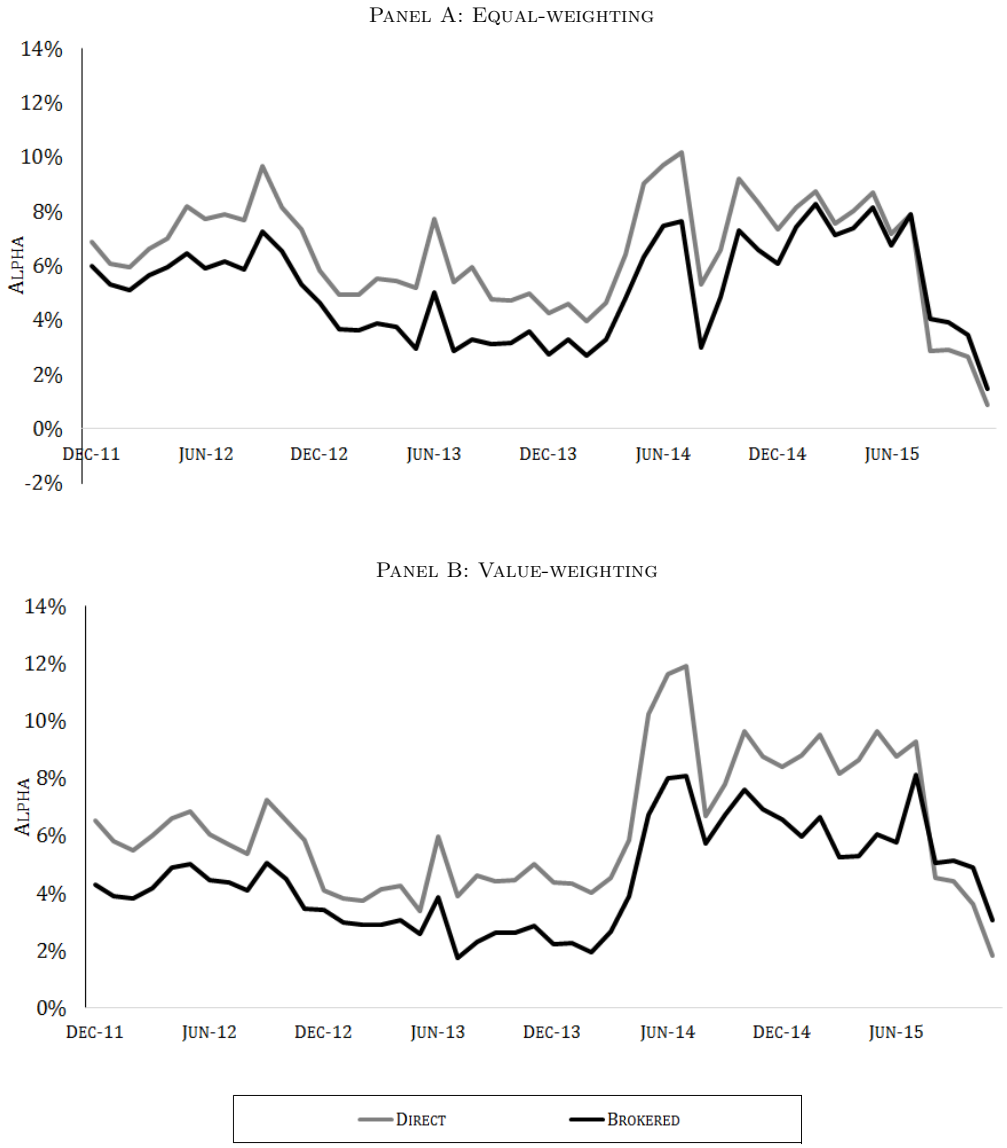


Figure 5 displays a time varying risk-adjusted performance (alpha) for the equally-weighted and value-weighted funds of hedge funds that are displayed in Panel A and Panel B, accordingly. Alphas of funds of funds are estimated with the rolling-window Fung and Hsieh (2004) seven-factor model (1). The 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 (4) and (3), 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 (4) and (3), 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. Solution for Proposition 1

This section presents solution for Proposition 1. I verify the existence of the separating "cut-off" equilibrium by confirming the optimality of the players' strategies.

Good fund.

The good fund chooses optimally its fee and capital raising channel to maximize its profits (5). 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, $\mu(s_G, s_B) = \Big[0; min\{\hat{c}(s_G, s_B), \bar{C}\}\Big]$. 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.

$$\text{(A1)} \qquad \pi_G\Big((f_G, 0); s_B; \hat{c}(s_G, s_B)\Big) = \max_{f_G} \quad f_G \cdot \int_0^{min\left\{\hat{c}\left((f_G,0);s_B\right),\bar{C}\right\}} dc$$

subject to

$$\text{(A1a)} \qquad 0 \leqslant f_G \leqslant \alpha_G$$

$$\text{(A1b)} \qquad \alpha_G - f_G - \hat{c}((f_G, 0); s_B) = 0.$$

The fee feasibility constraint (A1a) 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

(A1b) 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 (A1), 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 (A1) is equivalent to the following quadratic optimization:

$$\text{(A2)} \qquad \max_{f_G} \quad f_G \cdot (\alpha_G - f_G)$$

subject to

$$\text{(A2a)} \qquad 0 \leqslant f_G \leqslant \alpha_G.$$

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:

$$\text{(A3)} \qquad \pi_G\Big((\frac{\alpha_G}{2}, 0); s_B; \hat{c}(s_G, s_B)\Big) = \frac{\alpha_G^2}{4}.$$

The threshold due diligence costs are equal to

$$\text{(A4)} \qquad \hat{c} = \frac{\alpha_G}{2}.$$

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:

(A5) $$\hat{c} < \bar{C}.$$

Substituting (A4) into (A5), I get the second condition in (13).

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 $\mu(s_G, s_B) = [0; \bar{C}]$. 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.

(A6) $$\pi_G\Big((f_G, 1); s_B; \hat{c}(s_G, s_B)\Big) = \max_{f_G} \quad (1 - G) \cdot f_G \cdot \int_0^{\bar{C}} dc$$

subject to

(A6a) $$0 \leqslant f_G \leqslant \alpha_G$$

(A6b) $$G \cdot f_G \cdot \int_0^{\bar{C}} dc \geqslant c_I.$$

The fee feasibility constraint (A6a) is similar to (A1a). 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 (A6b) 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 $\alpha_G \cdot \bar{C}$.

$$\pi_G\Big((\alpha_G, 1); s_B; \hat{c}(s_G, s_B)\Big) = (1 - G) \cdot \alpha_G \cdot \bar{C}. \tag{A7}$$

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

$$\pi_I\Big((\alpha_G, 1); s_B; \hat{c}(s_G, s_B)\Big) = G \cdot \alpha_G \cdot \bar{C} - c_I. \tag{A8}$$

Finally, the good fund optimally chooses the capital-raising channel by comparing profits (A3) that it gets if it is directly-sold to investors with the profits (A7) 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:

$$\pi_G\Big((\frac{\alpha_G}{2}, 0); s_B; \hat{c}(s_G, s_B)\Big) > \pi_G\Big((\alpha_G, 1); s_B; \hat{c}(s_G, s_B)\Big). \tag{A9}$$

Substituting (A3) and (A7) into condition (A9) gives the first constraint on the bargaining power (12) of the broker:

$$G \geq 1 - \frac{\alpha_G}{4 \cdot \bar{C}}. \tag{A10}$$

Bad fund.

The bad fund optimally chooses a fee and capital raising channel which maximizes

its profits (5). 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 due diligence costs $c > \hat{c}$ approach the broker and invest their capital in the fund that is certified and recommended by the broker. Its investor base is $\mu(s_B, s_G) = (\hat{c}(s_B, s_G); \bar{C}]$ 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.

$$\text{(A11)} \qquad \pi_B\Big((f_B, 1); s_G; \hat{c}(s_B, s_G)\Big) = \max_{f_B} \quad (1 - G) \cdot f_B \cdot \int_{\hat{c}(s_B, s_G)}^{\bar{C}} dc$$

subject to

$$\text{(A11a)} \qquad 0 \leqslant f_B \leqslant \alpha_B$$

$$\text{(A11b)} \qquad G \cdot f_B \cdot \int_{\hat{c}(s_B, s_G)}^{\bar{C}} dc \geqslant c_I.$$

The fee feasibility constraint (A11a) states that the fund cannot charge a fee f_B bigger than the return α_B that it generates. The broker brings investors $\mu(s_B, s_G) = (\hat{c}(s_B, s_G); \bar{C}]$ to the bad fund and receives a fraction G of the total dollar fees that the fund charges. The participation constraint of the broker (A11b) 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 $\alpha_B \cdot [\bar{C} - \frac{\alpha}{2}]$

$$\pi_B\Big(s_G;(\alpha_B,1);\hat{c}(s_B,s_G)\Big)=(1-G)\cdot\alpha_B\cdot[\bar{C}-\frac{\alpha_G}{2}]. \tag{A12}$$

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

$$\pi_I\Big(s_G;(\alpha_B,1);\hat{c}(s_B,s_G)\Big)=G\cdot\alpha_B\cdot[\bar{C}-\frac{\alpha_G}{2}]-c_I>0. \tag{A13}$$

Condition (A13) yields the second constraint (12) on the bargaining power of the broker.

$$G\geqslant\frac{c_I}{\alpha_B\cdot(\bar{C}-\frac{\alpha_G}{2})} \tag{A14}$$

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

$$\alpha_B-f_B-\hat{c}<\alpha_G-f_G-\hat{c}. \tag{A15}$$

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

(A16) $$\alpha_B < \frac{\alpha_G}{2}.$$

The combination of conditions (A5), (A10), (A14), and (A16) 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 (12) 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.

(A17) $$\frac{\alpha_G^2}{4} > \alpha_G \cdot \bar{C} - c_I.$$

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

(A18) $$c_I > \alpha_G \cdot [\bar{C} - \frac{\alpha_G}{4}].$$

If the due diligence cost is low and condition (A18) is violated, then only the good fund survives.

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.[8] 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[9], 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.[10] 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

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

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).

Appendix. Reconstruction of hedge fund pre-fee returns

I make several assumptions about the hedge funds' fee structure to reconstruct pre-fee returns. The following six assumptions 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) 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 investors, who might invest in funds at different time are treated fairly and equally.

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, f_M, and incentive fee, f_I both measured in percentage terms.

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

$$NAV(t) = NAV^*(t) - F_M(t) - F_I(t). \tag{C1}$$

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

$$F_M(t) = NAV^*(t) \cdot f_M/12. \tag{C2}$$

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):

$$F_I(t) = \max(0; NAV^*(t) - F_M(t) - \text{Netflows}(t) - \text{HWM}(t)) \cdot f_I. \tag{C3}$$

Solving the system of equations (C1), (C2), and (C3), I express the pre-fee net asset value, dollar management fees, and the dollar incentive fees

$$\begin{cases} NAV^*(t) = NAV(t) + F_M(t) + F_I(t) & \text{(C4)} \\ F_M(t) = [NAV(t) + F_I(t)] \cdot \dfrac{f_M/12}{1 - f_M/12} & \text{(C5)} \\ F_I(t) = [NAV(t) - \text{Netflows}(t) - \text{HWM}(t)] \cdot \dfrac{f_I}{1 - f_I} \cdot & \\ \qquad\qquad \mathbb{I}\left[NAV(t) - \text{Netflows}(t) > \text{HWM}(t)\right] & \text{(C6)} \end{cases}$$

Dollar incentive fees (C6) 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:

$$1 + R^*(t) = \frac{NAV^*(t) - \text{Netflows}(t)}{NAV^*(t-1) - F_M(t-1)}. \tag{C7}$$

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)).

$$\text{Netflows}(t) = NAV(t) - NAV(t-1) \cdot (1 + R(t)). \tag{C8}$$

Finally, Substituting (C1) and (C8) into (C7), I estimate the pre-fee return $R^*(t)$.

Robustness checks

Figure D1. : Performance of hedge fund portfolios: after fee + no bias correction

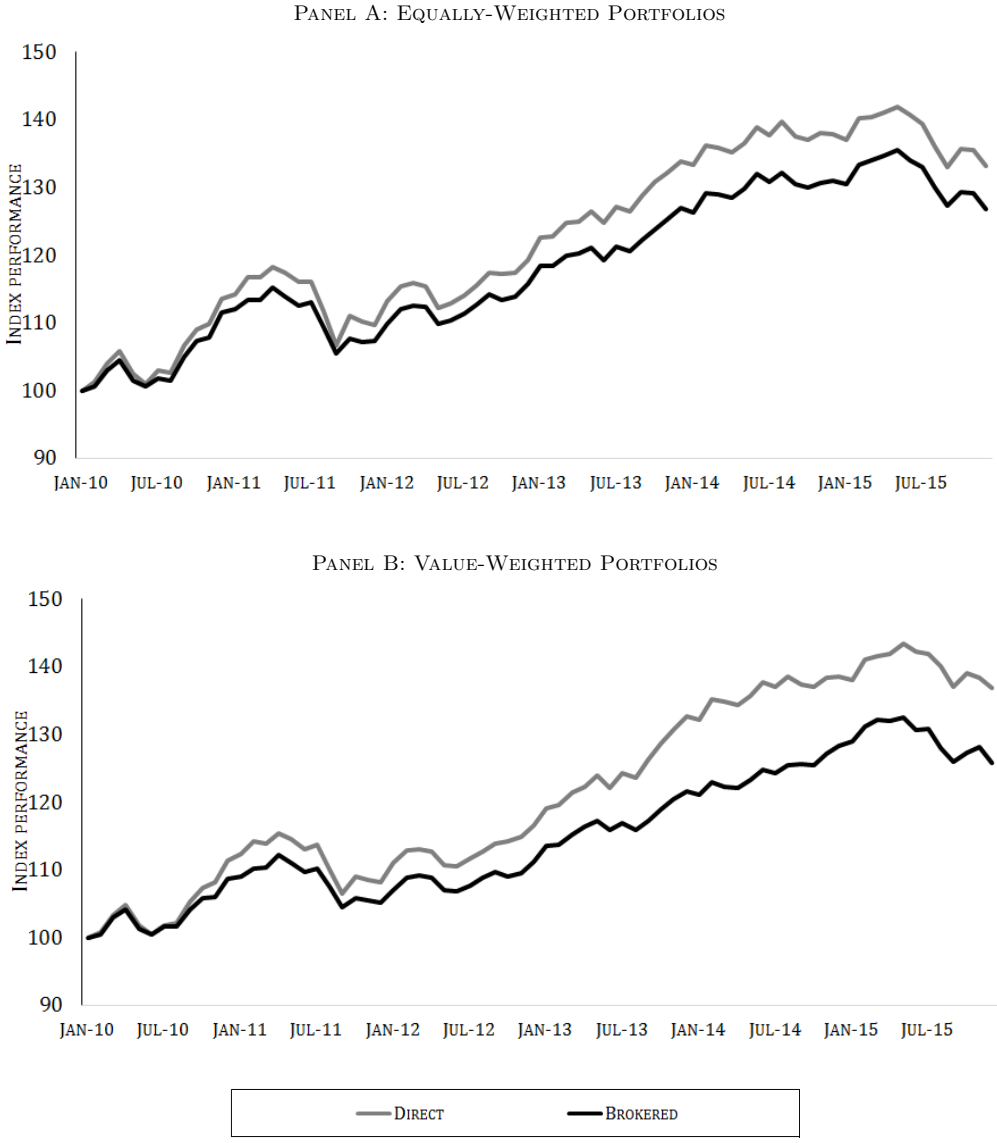

Figure D1 displays after-fee performance of fund of directly sold hedge funds (grey solid line) relative to performance of fund of broker sold hedge funds (black solid line) over the period from January 2010 to December 2015, assuming initial investment of $100. The sample of funds consists of funds 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 D1—: 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 D1. Results of Fung and Hsieh (2004) seven-factor models estimation for portfolio of directly sold and broker sold funds are presented in Table D1. 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 D2—: 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 D2. Results of Fung and Hsieh (2004) seven-factor models estimation for portfolio of directly sold and broker sold funds are presented in Table D2. 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 D3—: 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 D3 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 D4—: 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 D4 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 D5—: 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 D5 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 D6—: Heterogeneity of brokers

	Pre-fee alpha		
	(1)	(2)	(3)
B^I_{it}	-0.022***	-0.019***	-0.020***
	(0.003)	(0.002)	(0.002)
B^O_{it}	-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 D6 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: $\hat{\alpha}_{it} = \beta_0 + \beta_I \cdot B^I_{it} + \beta_O \cdot B^O_{it} + \beta_x \cdot X_{it} + \beta_t + \tilde{\epsilon}_{it}$. 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.