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Intermediated Investment Management

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ABSTRACT

Intermediaries such as financial advisers serve as an interface between portfolio managers and investors. A large fraction of their compensation is often provided through kickbacks from the portfolio manager. We provide an explanation for the widespread use of intermediaries and kickbacks. Depending on the degree of investor sophistication, kickbacks are used either for price discrimination or aggressive marketing. We explore the effects of these arrangements on fund size, flows, performance, and investor welfare. Kickbacks allow higher management fees to be charged, thereby lowering net returns. Competition among active portfolio managers reduces kickbacks and increases the independence of advisory services.

THE MONEY MANAGEMENT INDUSTRY has been recognized as having substantial influence on financial markets. The Investment Adviser Association estimates the total amount of assets managed by investment advisers registered with the U.S. Securities and Exchange Commission (SEC) to be $42.3 trillion at its peak in April 2008.[1] An important reason for the enormous size of the money management business is that there are often multiple layers of advisory services between investors and the ultimate portfolio manager. In many cases, investors do not delegate their wealth directly to money managers, but rather rely on intermediaries. Examples of such intermediaries include financial advisers who manage separate accounts for their clients,

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[1] See *Evolution Revolution: A Profile of the Investment Adviser Profession*, by Investment Adviser Association (2008).

full-service brokers who help investors select mutual funds, pension fund consultants who help trustees select portfolio managers, and funds of funds or feeder funds that identify mutual and hedge funds for their investors. According to a survey by the Investment Company Institute, in 2007 80% of U.S. households owning mutual funds (outside defined contribution plans) used professional advisory services.[2] Further, Chen, Hong, and Kubik (2010) document that the management of 27% of the mutual funds in their sample is outsourced by fund management companies to unaffiliated advisory firms. In the hedge fund industry, more than one-third of all assets under management is now originated by funds-of-funds, according to Hedge Fund Research.[3]

The increased role of the intermediary in the money management industry has been the focus of considerable attention recently. In the notorious case of Bernard Madoff, the majority of assets directed to his scheme came through "feeder funds" (e.g., Fairfield Greenwich). The "pay to play" nature of public pension plan investing through placement agents was uncovered in the cases of the New York State pension plan as well as CalPERS.[4] In each of these cases, concerns have been raised about the way in which intermediaries are compensated. At one end of the compensation spectrum are "fee-only" financial advisers. These advisers are compensated solely by their clients and receive no rebates. At the other end of the spectrum, however, are intermediaries who are primarily compensated by rebates from the fund management company. This may result in favorable treatment toward funds with high rebates. For example, in the case of mutual funds, brokers often receive direct compensation by sharing front-end loads, back-end loads and 12b-1 fees with the management company. Intermediaries may also receive marketing and sales support from fund management companies.[5] Many other forms of kickbacks exist in the industry under various revenue sharing agreements. While the rebate-based compensation scheme is still dominant in mutual fund distribution, recent years have also seen a trend toward fee-based advisory services, where financial advisers charge their clients directly. Since 1990, mutual fund advisory programs such as the "wrap account" have become popular. Wrap account managers help their clients select mutual funds and charge a percentage fee based on assets in the account. Indeed, according to Strategic Insight, the annual inflows into such accounts increased from less than $20 billion to an estimated $85 to $90 billion in 2007.[6] In addition to the advisory fees charged to the clients, wrap account managers may receive rebates from fund management companies as well.

[2] See *Ownership of Mutual Funds through Professional Financial Advisers, 2007*, by the Investment Company Institute (2008). According to the same study, 24% of all mutual fund assets are held through defined contribution plans.

[3] See *HFR Global Hedge Fund Industry Report: First Quarter 2009*, by Hedge Fund Research (2009).

[4] In the latter case, one of these agents received more than $50 million from one portfolio management firm for assistance in obtaining CalPERS's business.

[5] For example, one of the major financial advisory firms, Ameriprise Financial, in its publication *Purchasing Mutual Funds through Ameriprise Financial* (2009), reported that it received more than $150 million marketing support from mutual fund companies in 2008.

[6] See *Windows into the Mutual Fund Industry: 2007 in Review*, by Strategic Insight (2008).

Given the above concerns, legislation is currently under consideration that would extend the notion of client fiduciary duty to the role of brokerage advice to mitigate conflicts of interest. Yet the role of intermediaries in the investment management industry has largely been ignored by the existing literature. Most previous studies on delegated portfolio management consider only the bilateral relationship between investors and portfolio managers.[7] By contrast, this paper models the intermediary as a distinct agent and focuses precisely on the economic role that intermediaries play. We analyze several questions related to investment management intermediation. Why is intermediation so prevalent in the investment management industry? Why is it common practice for the intermediary to be compensated by the portfolio manager instead of directly by the client? How do intermediation and kickbacks affect fund performance and investor welfare, and how do these results accord with empirical facts? And, how does competition among portfolio managers affect the compensation scheme of the intermediary?

Our model consists of investors, a representative financial adviser, a passively held pool of assets (e.g., index fund), and a pool of assets run by a portfolio manager (active fund). The active fund can involve trading traditional assets (stocks and bonds) or alternative assets, such as private equity, foreign currency, real assets, etc., that are not present in the passive fund. When investors are sophisticated they are able to fully anticipate equilibrium outcomes, while if investors are unsophisticated, they can be persuaded to invest in lower returning assets due to promotional activities by the adviser. Investors have heterogeneous wealth levels, and can go directly to the portfolio manager or through the indirect channel by using an adviser. To invest directly, investors must pay a fixed cost to identify an active portfolio manager who does not underperform the passive fund. As a result, only high net worth individuals invest directly. Portfolio managers have market power and optimally select their fees. But as the active fund has diminishing returns to size, there is an optimal amount of assets invested actively. Financial advisers also charge a fee, which compensates them for their costs of providing asset allocation services to their clients.

We first derive an equilibrium assuming that the financial advisers are independent and must charge investors their full costs to break even. We then extend this model by allowing the portfolio manager to provide kickbacks to the adviser. These kickbacks can be used by the adviser to cover part of the costs of operations or as marketing support. We solve for the optimal amount of rebates preferred by the portfolio manager as well as the impact on management fees, fund size, and flows. We then extend the analysis to the case of competition between active portfolio managers. Finally, we derive the equilibrium without an adviser and compare all the scenarios.

Our major findings are as follows. First, we rationalize the widespread use of financial advisers. Advisers exist in our model to facilitate the participation of small investors in actively managed portfolios by economizing on information

[7] For example, Bhattacharya and Pfleiderer (1985) and Stoughton (1993).

costs. As long as investors are rational and the advisory industry is competitive, the existence of the adviser increases the elasticity of investor demand and reduces management fees. Therefore investors' welfare can be improved by the presence of financial advisers. This result is only true, however, if kickbacks from the portfolio manager to the adviser do not exist. When kickbacks exist, investor welfare is always lower but total welfare, including the benefit to portfolio managers, is higher than without advisers. Second, we explain the widespread use of side payments as a method for compensating advisers. When investors are sophisticated, kickbacks serve as a price discrimination mechanism, effectively subsidizing the cost of advice to smaller investors. Alternatively, when investors are unsophisticated, kickbacks support aggressive marketing of the active fund by the adviser. Surprisingly, when advisers are influenced by kickbacks from the portfolio manager, the use of advisory services increases. Third, kickbacks are always associated with higher portfolio management fees and negatively impact fund performance, regardless of investor sophistication. When investors are sophisticated, kickbacks only affect the high net worth investors; when they are unsophisticated, all investors are negatively affected. Fourth, the variety of distribution channels by which a fund is sold is related to its performance. Underperforming funds are only sold indirectly. Active funds with performance equal to or above passive funds are sold simultaneously through direct and indirect channels. Fifth, we find that competition among active portfolio managers reduces the use of kickbacks. The recent trend toward more independent advisory services can therefore be rationalized as a consequence of an increasingly competitive environment. Finally, our results point to potential policy implications on the regulation of kickbacks. Our model suggests that better disclosure of kickbacks and their uses would be beneficial to investors. In fact, if rebates are allowed, it is better that they are paid in the form of transparent monetary assistance to financial advisers than as fund-specific promotional activities (for example, sales seminars, marketing materials, etc.).

Several recent studies try to measure empirically the economic impact of intermediation in investment management. Bergstresser, Chalmers, and Tufano (2009) compare mutual funds offered through the brokerage channel with those offered directly to investors.[8] They find that, even before marketing fees are deducted, risk-adjusted returns are lower for funds offered through the brokerage channel as compared to those offered directly. Chen et al. (2010) document that mutual funds managed externally significantly underperform those run internally. Ang, Rhodes-Kropf, and Zhao (2008) and Brown, Goetzmann, and Liang (2004) find that funds-of-funds underperform average hedge funds. In each of these cases, the use of intermediaries does not appear to bring economic benefits to investors.

A few empirical papers examine the potential conflicts of interest in the mutual fund distribution channels more explicitly. Edelen, Evans, and Kadlec

[8] Some examples of mutual fund companies that use direct channels include Fidelity, Vanguard, and Janus. Examples of companies that offer their products through brokers include American Funds and Putnam.

(2008) find that actively managed funds improve fund distributions by compensating their brokers with abnormally high commissions and this leads to lower fund returns. Christoffersen, Evans, and Musto (2007) find that higher revenue sharing with unaffiliated brokers leads to more fund inflows, and higher revenue sharing with captive brokers mitigates outflows. Chen, Yao, and Yu (2007) show that mutual funds managed by insurance companies underperform their non-insurance counterparts by more than 1% per year. The authors find that this has to do with the fact that insurance funds are often cross-sold through the extensive broker–agent network of their parent firms.

A seminal paper on the subject of investment management is the American Finance Association presidential address of Sharpe (1981). Sharpe analyzes the coordination failure in the presence of multiple portfolio managers. Recently, this model has been extended by Bindsbergen, Brandt, and Koijen (2008), who derive a linear performance benchmark to better align incentives. By contrast, we consider the role of an intermediary between the client and the portfolio manager.[9]

An interesting paper exploring the role of kickbacks in the medical field is that of Pauly (1979). Pauly considers a medical practitioner who is able to engage in "fee-splitting" practices with a specialist. He finds that there is no point in prohibiting such practices in a fully competitive environment because services are provided at marginal cost. However, when there are market imperfections such as monopoly or incomplete pricing of insurance, fee splitting can actually improve client welfare. The role of rebates has been extensively studied in the marketing literature. However, most of the studies, for example, Gerstner and Hess (1991), focus on rebates that are provided to end consumers instead of to the intermediary (retailer). One exception is Taylor (2002), who shows that rebates to the retailer can be used as a coordination mechanism to align the interests of the manufacturer and the retailer. In a recent paper, Inderst and Ottaviani (2009) also address the issue of kickbacks to intermediaries. Their model structure is very different and does not allow for simultaneous access to the product (the active fund in our paper) through multiple channels: all customers must go through an adviser.

Our paper is organized as follows. In Section I, we set up the basic model, with behavioral assumptions on the three sets of participants in the game: investors, financial advisers, and the portfolio manager. In Section II, we derive the equilibrium without kickbacks from the portfolio manager. Section III derives the impact of kickbacks from the portfolio manager to the adviser, considering both the cases of sophisticated and unsophisticated investors. Our model is generalized to imperfect competition between portfolio managers in Section IV. Section V considers the equilibrium in a situation in which advisory services are not available. Section VI compares the four alternative scenarios. Finally, Section VII concludes the paper.

[9] Other papers concerning the structure of the investment management industry include Mamaysky and Spiegel (2002), Gervais, Lynch, and Musto (2005), Massa (1997), Grundy (2005), and Ding (2008).

I. Model Setup

In this section, we describe the agents, their behavior, and how they interact. There are three classes of agents in the model: (1) the active portfolio manager; (2) the set of financial advisers, modeled as a representative agent; and (3) the pool of investors in the economy.

A. Assets and Portfolio Managers

There are two types of assets in which investors can invest. First, there is a passive fund, such as an index fund, with an expected risk-adjusted *gross* return R_m (i.e., one plus the rate of return). Both investors and advisers can invest in the passive fund without cost.

The second type of asset is an active fund, whose expected gross return (once again risk-adjusted) is equal to R_p. The active portfolio manager utilizes her expertise in managing the fund. However, because of market impact or limited applicability of the portfolio manager's expertise, we assume decreasing returns to scale in the amount of investment. Specifically, we assume that

$$R_p = \alpha - \gamma A, \tag{1}$$

where α represents the expected return on the first dollar of capital invested in the active fund (assumed to be greater than the passive return) and γ is a coefficient representing the rate at which returns decline with respect to the aggregate amount of funds, A, that are placed with the portfolio manager. For a discussion of this assumption, see Berk and Green (2004) and Dangl, Wu, and Zechner (2008).[10]

In addition to investing in the passive asset and obtaining returns equal to R_m, investors can choose to delegate their portfolio decisions to a financial adviser who advises multiple clients, or they can decide to invest directly with the portfolio manager. Because there are potentially many active managers with $\alpha < R_m$, that is, whose expected return does not exceed the return of the passive fund irrespective of fund size, investors who want to invest directly must pay a fixed screening cost C_0 to avoid them.[11] Therefore, the only method for a direct investor to identify a portfolio manager who is potentially superior, $\alpha > R_m$, is to pay the cost C_0. In our single-period model, it is impossible for some investors to "free-ride" by waiting for the choices of others. In a more general model, it will always pay for some investors to pay such a screening cost to obtain superior returns on actively managed funds, before their returns are depreciated by the diseconomies of scale. Investors can avoid the fixed screening cost if they delegate their funds to the adviser.

[10] Chen et al. (2004) find that large mutual funds underperform small ones. Fung et al. (2008) find that capital inflows attenuate the ability of hedge fund managers to deliver alpha.

[11] Note that active funds with $\alpha < R_m$ do not exist on the equilibrium path. However, if off the equilibrium path an investor chooses an active fund without paying the screening cost, then inferior funds could be chosen.

The financial adviser has the expertise required to ascertain potentially superior portfolio managers. Any fixed cost of information that he might incur can be distributed across many individual investors and is therefore negligible on a per client basis. On the other hand, the adviser is likely to face increased variable costs related to the amount of assets he allocates to the active portfolio manager. As the amount allocated for a given client increases, this is likely to require more detailed and frequent communication between adviser and client, and potential conflicts of interest between adviser and client are likely to become more severe, with the adviser's legal risks increasing. Further, as the adviser handles more assets, he has to deal with a larger number of clients. As a result, his compliance costs of monitoring client qualifications and dealing with regulatory reporting requirements increases with assets under management. More staff must also be retained to deal with a larger number of clients and more branch offices must be opened. For simplicity, therefore, we assume that the adviser incurs a constant marginal cost c_A per unit of capital allocated to the active fund, and a zero fixed cost. The adviser can also allocate capital costlessly to the passive fund.[12]

Finally, we describe the nature of the fees that are charged by the portfolio manager and the financial adviser. We assume that the adviser charges a proportional fee f_A based on the end-of-period value of actively managed assets. This fee is determined endogenously in the model due to competition among advisers. In fact, we assume perfectly competitive behavior so that the fee satisfies a zero-profit condition. This also implies that the adviser is not able to charge for the funds allocated to the passive fund because the investors obtain no benefit from using him in this case.[13] The portfolio manager also charges a proportional fee f_P on the end-of-period value of the assets managed. Using proportional fees for advisory and portfolio management services on the basis of end-of-period wealth links the fees to portfolio performance, and therefore aligns the interests of the client, adviser, and portfolio manager. It is also common practice in the advisory industry as well as for mutual funds. Introducing incentive fees would only create distortions in risk-taking and would be a detriment unless the effort choices of the manager and the adviser need to be motivated.

In sum, investors must decide amongst three investing strategies. If they invest in the passive fund themselves, they get a return of R_m. If they invest directly with the portfolio manager, they pay a fixed search cost as well as

[12] Our simplified cost structure is representative of the more general situation where the variable cost of investing is lower for the direct channel and the fixed cost is lower for the indirect channel. In fact, we can interpret the fixed cost of investing directly as the cost of hiring a *personal adviser* and ensuring that he only works on behalf of the direct investor and is therefore not subject to the same potential conflict of interest or the same legal risks as in the case where the adviser works for many investors. The fixed cost of retaining such a personal adviser is relatively high, while the variable cost is relatively low. Our results are essentially unchanged under this more general cost structure.

[13] In a model in which individual investors incur additional costs of investing in the passive fund on their own, the adviser could charge a fee on total assets under management.

the portfolio management fee. If they delegate their decision to the adviser, they have to pay two fees on the actively invested portion of their holdings: both the advisory fee and the portfolio management fee. The portfolio manager can receive funds directly from the investors (the direct channel) or indirectly through the financial adviser (the indirect channel).

B. Investors' Behavior

Assume that each investor has wealth $x + C_0$, where x follows a Pareto distribution with the following probability density function:

$$f(x) = \frac{kA_m^k}{x^{k+1}}, \quad k > 1, \tag{2}$$

where $A_m > 0$ denotes the minimum wealth level (net of the search cost C_0).[14] The Pareto distribution has been widely used to describe the distribution of wealth among individuals. Empirical studies have found that this distribution characterizes actual wealth distributions fairly well, except for its properties at the lower end.[15] An important feature of this distribution is that the probability density $f(x)$ decreases monotonically in wealth, implying that the fraction of wealthy investors is relatively small while the fraction of investors with low levels of wealth is relatively large. The parameter k characterizes the extent of wealth equality. Complete equality of wealth is characterized by $k \to \infty$, while $k \to 1$ corresponds to complete inequality.

We standardize the population to be one. Therefore, the total wealth available for investment is

$$W = \int_{A_m}^{\infty} xf(x)dx + C_0 = \frac{kA_m}{k-1} + C_0, \quad k > 1. \tag{3}$$

Based on their wealth level, investors can choose whether to invest directly or indirectly. Let A_D and A_I denote the amounts of direct and indirect investment allocated to the active fund. Therefore, the total amount of money under active management is $A = A_D + A_I$ and the expected return of the actively managed portfolio is $R_p = \alpha - \gamma(A_D + A_I)$.

Investors take returns as given and have no market power, that is, they are atomistic and do not take into account the diseconomy of scale in active portfolio management when they decide where to channel their funds. Therefore, the amount of capital invested in the actively managed fund via the adviser will adjust until investors earn their reservation rate, R_m. Thus, investing through the adviser is identical to investing in the passive fund. An investor with wealth $A^* + C_0$ will be indifferent between contracting directly with the portfolio

[14] Our general conclusions do not depend on this specific assumption about the wealth distribution. In previous versions, we used several different assumptions about the wealth distribution; our results are qualitatively similar. Including C_0 in initial wealth simplifies the subsequent notation.

[15] See Persky (1992) for a brief review of this literature.

manager and getting a net return $R_p(1 - f_p)$ and investing via the adviser, where A^* satisfies the following condition:

$$[\alpha - \gamma(A_D + A_I)](1 - f_P)A^* = R_m(A^* + C_0),$$

that is,

$$A^* = \frac{C_0 R_m}{(1 - f_P)[\alpha - \gamma(A_D + A_I)] - R_m}. \tag{4}$$

It is obvious that all investors whose wealth is smaller than $A^* + C_0$ will prefer to invest via the adviser who charges a proportional fee whereas those with wealth greater than $A^* + C_0$ will prefer to contract directly with the portfolio manager (or equivalently, hire a personal adviser with a fixed fee). We therefore refer to this latter set of investors as "high net worth individuals."

Given that all investors with wealth levels greater than $A^* + C_0$ invest directly, we can solve for the amount of money channeled directly to the portfolio manager:

$$A_D = \int_{A^*}^{\infty} x f(x) dx = \frac{k A_m^k}{(k-1)(A^*)^{k-1}}. \tag{5}$$

Note that if $A^* = A_m$, then $A_D = W - C_0$, and all investors would contract with the portfolio manager directly. To make our analysis interesting, we assume that if all wealth net of the search cost C_0 is invested in the active portfolio, the return of the active portfolio will be lower than that of the passive fund, that is,

$$\alpha - \gamma(W - C_0) < R_m. \tag{6}$$

II. Independent Adviser Equilibrium

We now solve for the equilibrium in our model of investment management. First we discuss the behavior of the adviser and subsequently the behavior of the portfolio manager. In this section, we assume that there are no kickbacks to the adviser so that his decision making is uninfluenced in that it is based entirely on the respective asset returns. We refer to such advisers as independent advisers. In the next section, we allow for kickbacks from the portfolio manager to the advisers.

A. Advisers' Behavior

Because the representative fund adviser charges a proportional advisory fee f_A based on the end-of-period value of the active fund investment in his clients' accounts, he solves the problem

$$\max_{w} \quad w\{f_A[\alpha - \gamma(A_D + A_I)](1 - f_P) - c_A\}, \tag{7}$$

where w represents the portfolio weight of the active asset. When solving this problem, the adviser takes the returns on the active fund as given as well as the proportional advisory fee.

In order for the adviser's optimization problem to have a solution that supports positive funds channeled to both active and passive funds, the coefficient on w in (7) must be zero, or

$$f_A[\alpha - \gamma(A_D + A_I)](1 - f_P) - c_A = 0. \tag{8}$$

In addition, the fact that investors are indifferent to using the adviser implies

$$[\alpha - \gamma(A_D + A_I)](1 - f_P)(1 - f_A) - R_m = 0. \tag{9}$$

Substituting (9) into (8) gives the following equilibrium condition:

$$[\alpha - \gamma(A_D + A_I)](1 - f_P) = R_m + c_A. \tag{10}$$

Notice that (10) implies that the net return of the actively managed portfolio exceeds the return on the passive asset by exactly the marginal cost of advisory services. If the net return of the actively managed portfolio were below this threshold value, no rational investor would invest actively using the adviser. Conversely, if the net return were above this threshold value, the advisor would invest everything in the actively managed portfolio, which would depreciate its expected return.[16]

Equations (8) and (9) can also be used to determine the equilibrium fee charged by the adviser. Substituting and solving for f_A yields

$$f_A = \frac{c_A}{R_p(1 - f_P)} = \frac{c_A}{R_m + c_A}. \tag{11}$$

In other words, the fee compensates the advisor for the cost incurred.[17]

To determine which investors will invest via the direct channel, we substitute equation (10) into equation (4) and get

$$A^* = \frac{C_0 R_m}{c_A}. \tag{12}$$

Notice that this threshold level of wealth does not depend on α. Therefore, the investors can optimally decide whether to collect information in equilibrium without knowing the portfolio manager's potential ability, α.

Another important property of this result is that the threshold level of wealth, which determines the amount of money invested directly through equation (5),

[16] Note that w in the solution to (7) is indeterminate because it does not matter in our model whether the funds invested passively are held on account with the adviser or by the investors themselves. However, the total amount of wealth invested actively through the adviser is determinate and solved for below.

[17] Note that c_A must be "discounted" by $R_p(1 - f_P)$ because it is proportional to the assets allocated at the beginning of the period whereas the advisory fee is proportional to the end-of-period value of the portfolio.

is independent of the fees of the portfolio manager. This is because of the competitive nature of the adviser. If the portfolio manager attempts to increase her fees, for the same gross return, investors would reduce the amount of capital allocated to active management via the adviser. Therefore, the same *net* return is achieved by active investing and thus there is no effect on the marginal direct investor or the aggregate amount of money invested directly. This property is critical to understanding the model and will be exploited below.

B. Portfolio Manager's Behavior

The portfolio manager optimizes the management fee f_P to maximize her profit,

$$\max_{f_P} \Pi_P = [\alpha - \gamma(A_D + A_I)](A_D + A_I) f_P, \tag{13}$$

taking into account the equilibrium condition (10).

It is easy to solve this for the optimal portfolio manager fee, which we record as a proposition.

PROPOSITION 1: *The optimal portfolio manager fee in the investment management equilibrium without fee rebates is*

$$f_P^* = \frac{\alpha - R_m - c_A}{\alpha + R_m + c_A}. \tag{14}$$

Using this result, it is straightforward to see that the optimal management fee is increasing in managerial ability α. Further, we can solve for the portfolio manager's profit,

$$\Pi_P = \frac{(\alpha - R_m - c_A)^2}{4\gamma}, \tag{15}$$

and the total assets allocated to the portfolio manager,

$$A_I + A_D = \frac{\alpha - R_m - c_A}{2\gamma}. \tag{16}$$

We assume that C_0 is big enough, or γ is small enough, to ensure that A_I implied by equations (5), (12), and (16) is positive, that is, not all investment allocated to the active portfolio comes from the direct channel.[18]

In summary, the investment management equilibrium features positive profits of the portfolio manager and zero profit of the investment adviser. Returns on the actively managed portfolio net of management fees are greater than those of the passive fund. Net returns earned by direct investors in the active fund exceed those earned by indirect investors. Nevertheless, only the high

[18] If this condition does not hold, the adviser is not used at all. In this case, the analysis in Section V would apply.

net worth individuals find it optimal to invest directly. Furthermore, because total fund size is increasing in managerial ability while the amount of money invested through the direct channel is not, our model implies that the importance of indirect sales through financial advisers increases with fund size. Ceteris paribus, large funds sell a larger fraction through advisers whereas small funds feature proportionally more direct investors.

III. Fee Rebates

We now extend the model to allow for rebates or kickbacks from the portfolio manager to the financial adviser. The idea here is that the portfolio manager desires to influence the decisions of the financial adviser, so that the fund is accessed by small investors to a greater extent. The purpose of this section is to derive the equilibrium amount of kickbacks and evaluate the impact of such activities on asset returns and fund flows, as well as the fees charged by advisers and the portfolio manager.

We begin by setting up the general model in which the rebate can be used for two purposes by the competitive advisers: (1) as a subsidy to cover operating business costs or (2) as a subsidy to support the adviser's promotional efforts in aggressively selling the active fund to investors. We then consider two scenarios. First, we assume that investors are *sophisticated* in the sense that they fully anticipate the impact of rebates on the equilibrium outcomes of net asset returns and their decisions cannot be easily influenced by aggressive marketing efforts. Second, we assume that investors are *unsophisticated*, which means that they are susceptible to selling pressures by the adviser and are ex ante unable to fully anticipate the extent to which their judgments are compromised.

A. General Model with Rebates

Suppose that the portfolio manager provides a rebate of δ for each dollar directed to her portfolio by the adviser. The kickback is specified ex ante and assumed without loss of generality to be paid at the end of the period. Further, suppose that the adviser can spend some fraction, $e \in [0, 1]$, of the rebate in *promotional effort*, and retain the rest, $(1 - e)\delta$, to assist with his operating business costs, c_A. The promotional effort helps to embellish the returns to the active fund and make it look more attractive. Alternatively, we can suppose that the promotional activities provide a nonpecuniary benefit to investors.[19] To model the inflated demand for active funds, we assume that indirect investors' reservation expected returns can be lowered by the amount $\eta e \delta$, where η is a parameter characterizing how susceptible investors are to promotional effort. Higher values of η imply higher levels of investor susceptibility.

[19] One actual scenario described to us by a well-known finance professor is that his mother kept her money with an adviser simply because the adviser always remembered her birthday by sending a floral bouquet.

In contrast to the previous case without rebates, now the adviser has to consider the net rebate after effort expenditure, $(1-e)\delta$. Therefore, his objective becomes

$$\max_{w,e\in[0,1]} \quad w\{f_A[\alpha-\gamma(A_D+A_I)](1-f_P)-c_A+(1-e)\delta\}.$$

Because the adviser's promotional effort reduces the indirect investors' reservation return by $\eta e\delta$, the appropriate modification of (9) becomes

$$[\alpha-\gamma(A_D+A_I)](1-f_P)(1-f_A)=R_m-\eta e\delta. \tag{17}$$

Substituting this participation constraint into the adviser's optimization problem gives the following objective:

$$\max_{w,e\in[0,1]} \quad w\{[\alpha-\gamma(A_D+A_I)](1-f_P)-R_m-c_A+[1+(\eta-1)e]\delta\}.$$

It is obvious that if $\eta<1$, the optimal e^* is zero, and the adviser keeps 100% of the rebate. If $\eta=1$, e is irrelevant for the adviser's objective function, so it is assumed to be zero without loss of generality. If $\eta>1$, then the optimal e^* is one, and all rebates are employed in promotional activities by the adviser. As before, in order for the adviser's optimization problem to have a solution that supports positive funds channeled to both the active and passive funds, the coefficient on w must be zero, or

$$[\alpha-\gamma(A_D+A_I)](1-f_P)=R_m+c_A-[1+(\eta-1)e^*]\delta.$$

Substituting the expressions for the optimal e^* into the above equation, we see the net expected return of the active portfolio (before advisory fee) is

$$[\alpha-\gamma(A_D+A_I)](1-f_P)=\begin{cases} R_m-\delta+c_A & \text{if } \eta\le 1\\ R_m-\eta\delta+c_A & \text{if } \eta>1. \end{cases} \tag{18}$$

Combining this result with equation (17) and taking account of the optimal e^*, we find the equilibrium advisory fee to be

$$f_A=\begin{cases} \dfrac{c_A-\delta}{R_m-\delta+c_A} & \text{if } \eta\le 1\\ \dfrac{c_A}{R_m-\eta\delta+c_A} & \text{if } \eta>1. \end{cases} \tag{19}$$

One can see that there are essentially two cases of interest. First, when promotional efforts are not *efficient* in lowering investors' reservation return ($\eta\leqslant 1$), then advisers choose not to engage in such activities by setting $e^*=0$. From equation (17), we have a situation in which indirect investors achieve the same reservation return as in the case without rebates, R_m. As a result of competition among advisers, their fees, f_A, are decreasing in the amount of the rebate, δ. This indicates that the rebate is effectively "passed on" to the investors.

The situation is very different when $\eta > 1$. In this case, indirect investors hold portfolios with returns below the passive asset and the advisory fee increases with the rebate. The intuition here is as follows. Because the rebate is entirely devoted to promoting the active fund ($e^* = 1$), the fee of a competitive adviser must be set to exactly cover his advisory cost. But now, because the returns of the adviser's portfolio are negatively impacted by the marketing expenditure, the fee expressed as a percent of *end-of-period* portfolio value must increase to cover the advisory costs.

These two cases lead to very different outcomes and we therefore analyze them separately in the following two subsections. In the first case, $\eta \leqslant 1$, indirect investors achieve the same return as the alternative (passive) asset. We refer to this as the *sophisticated investor* scenario. In the second case, $\eta > 1$, indirect investors are manipulated by the adviser's marketing activities. We thus refer to this as the *unsophisticated investor* scenario.

B. Sophisticated Investors

In our model with sophisticated investors, we assume that investors not only anticipate that aggressive marketing will not be employed, but also rationally anticipate the amount of fee rebates and the effect that this will have on equilibrium net returns. From (18), the expected net return of the active portfolio is $R_m + c_A - \delta$ for the case of $\eta \leqslant 1$. As in the case without rebates, we can substitute this equilibrium net return into (4) and get the threshold level of wealth:

$$A^* = \frac{C_0 R_m}{c_A - \delta}. \tag{20}$$

We see first, by comparing equations (20) with (12), that the rebate changes the marginal investor who is indifferent between investing directly and indirectly to one with a higher wealth level. Consequently, the amount of funds invested directly decreases. A key result is thus that kickbacks shift investors from the direct investment channel to the indirect investment channel. This occurs because kickbacks lead to a lower equilibrium return of the active portfolio. As a result, fewer investors are willing to pay the fixed search cost. As investors are shifted into the indirect channel, they suffer a welfare loss because they are now pushed down to their reservation return. As before, though, the portfolio manager's fee is constrained by the asset allocation decision of the adviser and the amount of direct investment.

We now endogenize the rebate by allowing the portfolio manager to choose her optimal δ. The total amount of rebate equals the amount of indirect investment in the active portfolio times the rebate for each dollar invested: $A_I\delta$. The portfolio manager maximizes her profit net of the kickback payments. Therefore, her problem is

$$\max_{f_P,\delta} \quad \Pi_p = [\alpha - \gamma(A_D + A_I)](A_D + A_I) f_P - A_I \delta$$

subject to the constraints (18) (for the case $\eta \leqslant 1$), (5), and (20). We can now solve for the optimal portfolio manager fees and kickback payments imparted to the financial adviser.

PROPOSITION 2: *In the sophisticated investor equilibrium with rebates, the optimal fee charged by the portfolio manager is*

$$f_P^* = \frac{\alpha - R_m - c_A + 2c_A/k}{\alpha + R_m + c_A}. \tag{21}$$

The optimal rebate from the portfolio manager to the financial adviser is

$$\delta^* = \frac{c_A}{k}. \tag{22}$$

Proof: See Appendix A. Q.E.D.

Proposition 2 shows that there is an interior optimal rebate. The intuition for this result is as follows. The rebate allows the portfolio manager to increase her fees, as embodied in equation (21). However, for fund shares that are sold to indirect investors, the portfolio manager does not benefit from higher fees because they are fully offset by the rebate to the advisers. Therefore, the portfolio manager simply optimizes the rebate to maximize the surplus she extracts from the direct investors. As the rebate increases, the surplus she extracts per dollar of directly invested wealth increases; however, the amount of directly invested wealth decreases because some investors will switch to the indirect channel. The latter effect dominates for sufficiently large rebates.

Substituting the optimal fee given by equation (A.1) back into the objective function and using again constraint (18) for the case of $\eta \leqslant 1$, we get

$$\Pi_P = \frac{(\alpha - R_m - c_A)^2}{4\gamma} + A_D\delta. \tag{23}$$

Comparing this expression with equation (15), we see that the portfolio manager's profit in the new equilibrium is simply her profit in the equilibrium without kickbacks plus the loss of remaining direct investors due to lower fund returns.

Effectively subsidizing the adviser permits the portfolio manager to price discriminate between large and small investors while charging the same management fee. Because high net worth investors enjoy some surplus, they have a lower elasticity of demand compared to indirect investors, who only get their reservation return. Therefore, the portfolio manager would optimally like to charge higher fees to the high net worth investors, without adversely affecting the demand of small investors.[20] Rebates allow the portfolio manager to extract some surplus of the large investors.

[20] This is consistent with the inverse-elasticity rule of monopolist pricing. See, for example, Tirole (1988).

From equation (22), we can easily see that the optimal rebate is increasing in the advisory cost c_A and decreasing in k, which measures the degree of equality of the wealth distribution. The advisory cost c_A represents the maximum rebate that can be provided before all investors leave the direct channel. Not surprisingly, therefore, the optimal rebate is increasing in c_A. The relation between the optimal rebate and k is also intuitively appealing. When k is large, there are fewer high net worth investors, and thus the portfolio manager does not extract much surplus by providing a rebate. By contrast, when k is close to one, the fraction of high net worth investors is relatively large. As a result, the portfolio manager has a stronger incentive to subsidize to be able to extract their surplus. In this case, the adviser's fee, from equation (19), approaches zero. Advisory fees are always strictly positive because $k > 1$. Explicit examples in practice include the fees charged by wrap account managers and funds of hedge fund advisers.

To further analyze the impact of optimal fee rebates, we compute the equilibrium size of the fund. Substituting the optimal fee given by equation (A.1) into (18) (for the case of $\eta \leqslant 1$), we find that the fund size in the equilibrium with kickbacks is exactly the same as the fund size in the equilibrium without kickbacks, that is, equation (16). Intuitively this occurs because, in both cases, the indirect investors are marginal investors in the sense that a slight decrease in net returns would lead them to switch to the passive portfolio. Their reservation return is R_m. Because the advisory services market is competitive, the portfolio manager has to cover the cost of advisory services and therefore the marginal cost of obtaining one dollar from the indirect investor is $R_m + c_A$, which is independent of kickbacks. When the portfolio manager optimizes the fund size, she equates this marginal cost with the marginal increase in the end-of-period portfolio value resulting from an additional dollar of indirect investment, which is also independent of the kickback. Because both the marginal benefit and the marginal cost are independent of the kickback, fund size is identical in both cases.

We summarize the impact of kickbacks in Proposition 3.

PROPOSITION 3: *In the sophisticated investor equilibrium with kickbacks, the active fund size is the same as when advisers are independent. However, more investors use advisory services by investing indirectly and the net return (after the management fee) of the active fund is lower. The portfolio manager charges a higher fee, while advisers charge a lower fee but receive a compensatory kickback from the portfolio manager.*

Because we have shown that fund size is constant while management fees increase because of rebates, our model predicts lower performance for actively managed mutual funds that use greater levels of rebates. This conforms to some recent evidence from mutual funds, which shows that rebates in the form of excess commissions paid to brokerage firms are associated with poor fund performance (Edelen et al. (2008)). Our results also predict that the portfolio management fee has a one-for-one negative impact on the fund's net return, which is consistent with the finding of Carhart (1997). Our model shows these empirical patterns can result from conflicts of interest in the distribution channel for funds.

A striking result of our analysis is that, despite the potential conflicts of interest associated with the rebates, financial advisers are actually used to a greater extent in equilibrium than when there are no rebates. The reason is that the portfolio manager optimally raises her fees, which makes direct investment less attractive. The adviser is forced to lower his own fees to remain competitive with the alternative asset. Hence, the volume of the adviser's asset management business increases.

C. Unsophisticated Investors

We now turn to the analysis where $\eta > 1$ and financial advisers use the rebate for promotional activities, which results in a reduction in the reservation return of indirect investors below the alternative (passive) asset. Obviously, if this were anticipated ex ante, nobody would use a financial adviser and we would wind up in an equilibrium without advisers (see Section V). Because investors are unsophisticated, they may be unable to anticipate this outcome. To analyze the equilibrium outcome under such a scenario, we now assume that at the time when investors have to decide whether to pay the search cost, they believe (incorrectly) that they are in the equilibrium without rebates. As a result, equation (12) for the threshold value A^* applies.[21] However, ex post, after an investor pays the search cost, she rationally invests passively if the expected net return of the active fund is below that of the passive asset. Our unsophisticated investors model therefore assumes that the initial unsophistication is overcome after paying the search cost. Of course, this cost is sunk in the sense that direct investors may regret having paid it once they find out that the active fund may underperform.

From equation (18), we know that the expected return of the active portfolio is not less than R_m if and only if $\delta \leqslant c_A/\eta$ for the case $\eta > 1$. Therefore, the amount of money invested through the direct channel is the same as in the independent adviser equilibrium *only if* $\delta \leqslant c_A/\eta$. Otherwise, the amount of money invested directly is $A_D = 0$. Substituting out f_P in the portfolio manager's objective function using the second case in equation (18) gives

$$\begin{aligned}\Pi_P &= [\alpha - \gamma(A_D + A_I) - (R_m + c_A - \eta\delta)](A_D + A_I) - A_I\delta \\ &= -\gamma(A_D + A_I)^2 + (\alpha - R_m - c_A)(A_D + A_I) + [\eta A_D + A_I(\eta - 1)]\delta, \quad (24)\end{aligned}$$

where $A_D = \frac{kA_m^k c_A^{k-1}}{(k-1)(C_0 R_m)^{k-1}}$ over the range $\delta \leqslant c_A/\eta$ and is zero otherwise. Because $\eta > 1$, this objective function is linearly increasing in δ except at $\delta = c_A/\eta$, where A_D has a discrete jump toward zero. It is easy to see that, in this case, if rebates are unbounded, the optimal δ goes to infinity because the portfolio manager can essentially expropriate unlimited amounts of wealth from indirect investors.

[21] Our results are qualitatively unaffected if instead the investors were to assume they were in an equilibrium in which rebates are provided but not used for promotional activities.

To account for the fact that there are natural limits to the degree to which advisers' marketing efforts can exploit indirect investors, we assume that the rebate is bounded above by $\bar{\delta} > c_A/\eta$.[22] Therefore, there are two potential levels of δ that may maximize the portfolio manager's profit: $\delta = c_A/\eta$ or $\delta = \bar{\delta}$.

We record the equilibrium solution in the case of unsophisticated investors in the following proposition.

PROPOSITION 4: *In the unsophisticated investor equilibrium* ($\eta > 1$)*, there are two possible optimal rebates. In one case,* $\delta = c_A/\eta$ *and the optimal management fee is equal to*

$$f_P^* = \frac{\alpha - R_m + c_A/\eta}{\alpha + R_m + c_A/\eta}.$$

In this case, the active fund and the passive fund have identical net returns. In the other case, the optimal rebate is equal to its upper bound, $\delta = \bar{\delta}$*, the optimal management fee is*

$$f_P^{*'} = \frac{\alpha - R_m - c_A + (\eta + 1)\bar{\delta}}{\alpha + R_m + c_A - (\eta - 1)\bar{\delta}},$$

and the active fund underperforms the passive fund.

Proof: See the Internet Appendix.[23] Q.E.D.

The comparative statics that determine which of the two possibilities occurs is given by the following.

COROLLARY 1: *The unsophisticated investor equilibrium is more likely to imply underperformance by the active fund if (1) the upper limit on feasible rebates,* $\bar{\delta}$*, is high; (2) the fraction of high net worth investors in the economy is relatively low, that is, if* k *is high; (3) the fixed search cost,* C_0*, is high; (4) managerial ability,* α*, is high; or (5) investors are more vulnerable to marketing activity, that is, if* η *is high.*

Proof: See the Internet Appendix at *The Journal of Finance* website. Q.E.D.

The economic intuition for these results is as follows. The portfolio manager faces a tradeoff between the benefit of extracting more from the indirect investors and the cost of losing the direct investors. When the restriction on the maximum rebate $\bar{\delta}$ is less binding, the potential gain on aggressively marketing the fund and serving only the indirect investors is high, which induces the portfolio manager toward the underperformance equilibrium. When C_0 or k is high, fewer investors will pay the search cost, so the cost of losing those

[22] Assuming an upper bound for the rebate in the case of $\eta > 1$ is equivalent to assuming that there is a limit to the degree that marketing effort is effective in lowering the investor's reservation return. This would arise, for example, if the marketing effort required is a convex function of the reduction in the investor's reservation return below R_m. The upper bound may also reflect some regulatory restrictions on the maximum rebate.

[23] An Internet Appendix for this article is available online in the "Supplements and Datasets" section at http://www.afajof.org/supplements.asp.

investors is relatively low to the portfolio manager, which also makes the portfolio manager favor the equilibrium of serving only the indirect investors. When managerial ability α is high, the potential gain from actively marketing the fund is greater because the portfolio manager can capitalize on a larger fund size. Finally, when η is high, the marketing effort required to influence the investors is lower, which again favors the equilibrium with aggressive marketing and underperformance of the active fund.

Looking at different scenarios of investor sophistication, we can derive several implications of the institutional nature of intermediated investment management. First, fund performance net of management fees is negatively related to rebates to financial advisers, irrespective of the degree of investor sophistication. When investors are rational, the rebates are passed on to the investors through lower advisory fees, and the performance of the active fund is compromised but still above that of the passive fund. If investors are unsophisticated, then the rebates are used for aggressive marketing, and the active fund will either underperform or perform equally well as the passive fund. Second, the diversity with which a fund is channeled to investors is related to its performance. Underperforming funds are only sold indirectly. Active funds with performance equal to or above passive funds are sold simultaneously through direct and indirect channels. Third, when investors are rational, disclosure of rebates is not relevant because they are anticipated. When investors are unsophisticated, disclosure of the rebates can be valuable. Through disclosure, investors will be alerted to the presence of excessive promotional activities, and will therefore make a more informed decision about using advisory services. Fourth, when investors are sophisticated, the existence of rebates affects the welfare of direct investors only. When they are unsophisticated, then rebates make both direct and indirect investors worse off.

IV. Competition in Active Portfolio Management

We now introduce an environment in which there is more than one active portfolio manager. For simplicity, we consider two managers competing for the same pool of investors as before. Our results can easily be generalized to the case with a finite number of portfolio managers. We focus on the case of sophisticated investors in this section ($\eta \leqslant 1$).

A central issue in the case of competition is whether it increases or decreases the rebate imparted to the asset allocation choices of advisers. One hypothesis is that competition disciplines portfolio managers and induces lower kickbacks; the opposite hypothesis holds that competition creates stronger incentives for the portfolio managers to provide kickbacks to advisers. In this case, they are in a race to outdo each other.

A. Independent Advisers

We assume that the two portfolio managers are pursuing similar active strategies. The portfolio managers are symmetric with respect to ability and therefore both have potential abnormal returns α. Because the portfolio managers use similar strategies, the expected return of each fund is related not only to its own size, but also to the size of the other fund, that is, there is a negative size externality within each fund sector. More specifically, we assume that the gross return, R_{Pi}, of portfolio manager i is given by

$$R_{Pi} = \alpha - \gamma(A_i + \rho A_j), \quad i = 1, 2; j = 1, 2; i \neq j,$$

where $A_i \equiv A_{Di} + A_{Ii}$ is the size of the fund managed by manager i (both direct and indirect investment), and $\rho \in [0, 1]$ is a parameter characterizing the similarity between the investment strategies employed by the two portfolio managers. When $\rho = 1$ the two investment strategies are identical, so the competition between the portfolio managers is most intense, and the same diseconomy of scale occurs regardless of whether an increase in fund size occurs within the fund or with its rival. On the other hand, $\rho = 0$ indicates that the strategies are uncorrelated, and, as a result, the diseconomy of scale effect is confined to the individual fund level. Consistent with the diseconomy of scale at the fund sector level, Naik, Ramadorai, and Stromqvist (2007) find that for four out of eight hedge fund strategies, capital inflows have statistically preceded negative movements in strategy alpha. Wahal and Wang (2011) measure the competition between mutual funds by the extent of overlapping security holdings. When new funds enter with similar holdings, they find a significant negative impact on the fees, returns, and flows of the incumbent funds.

We employ the concept of Cournot–Nash competitive strategies with respect to fund sizes. In this case, each portfolio manager optimizes her fund size, taking as given the size the other fund,

$$\max_{A_i} \Pi_{Pi} = [\alpha - \gamma(A_i + \rho A_j)]A_i f_P, \tag{25}$$

subject to essentially the same condition as equation (10) considered earlier on the behavior of the financial advisers:

$$[\alpha - \gamma(A_i + \rho A_j)](1 - f_P) = R_m + c_A. \tag{26}$$

Substituting out f_P in the objective function using the constraint, and considering the first-order conditions for both portfolio managers simultaneously, we obtain the following proposition.

PROPOSITION 5: *The Cournot–Nash equilibrium involving competition among portfolio managers is unique and symmetric. The equilibrium fund sizes are*

$$A_i^* = \frac{\alpha - R_m - c_A}{(2 + \rho)\gamma}, \quad i = 1, 2. \tag{27}$$

The equilibrium management fee is

$$f_P^* = \frac{\alpha - R_m - c_A}{\alpha + (1 + \rho)(R_m + c_A)}. \tag{28}$$

Proposition 5 shows that as long as the investment strategies are positively correlated, that is, $\rho > 0$, the size of each individual active fund is smaller than the fund size in the monopolist case (equation (16)). However, the aggregate amount of funds under active management is always greater because each individual fund size is more than one-half of the size of the monopolist fund. Further, management fees are lower (equation (28) as compared to (14)). As a result, even though the aggregate fund size is larger, net returns on active portfolios are the same as in the monopolist case. If portfolio managers employ completely different strategies, that is, $\rho = 0$, individual fund size and management fees will be the same as in the monopolist case, and the aggregate amount of money under active management will be doubled.

B. Subsidized Advisers

Now we consider the Cournot–Nash equilibrium in which each portfolio manager provides a rebate, δ, to the adviser. In this case, the portfolio managers' optimization problem can be written as

$$\max_{A_{Di}, A_{Ii}} \Pi_{Pi} = \{\alpha - \gamma[(A_{Di} + A_{Ii}) + \rho(A_{Dj} + A_{Ij})]\}(A_{Di} + A_{Ii}) f_P - A_{Ii}\delta, \quad (29)$$

subject to the constraints

$$\{\alpha - \gamma[(A_{Di} + A_{Ii}) + \rho(A_{Dj} + A_{Ij})]\}(1 - f_P) = R_m + c_A - \delta, \quad (30)$$

$$A_D \equiv \textstyle\sum_{i=1}^{2} A_{Di} = \dfrac{k A_m^k (c_A - \delta)^{k-1}}{(k-1)(C_0 R_m)^{k-1}}. \quad (31)$$

The solution to this problem is provided in the following proposition.

PROPOSITION 6: *The solution to the Cournot–Nash competition game between two portfolio managers who can influence the financial advisers through kickbacks is unique and symmetric. The equilibrium features the same total fund size as in the case without kickbacks. However, the allocation through the indirect channel is larger and that through the direct channel is smaller. The optimal rebate is*

$$\delta^* = \frac{c_A}{2k-1}, \quad (32)$$

and the optimal fee schedule for each portfolio manager is

$$f_P^* = \frac{\alpha - R_m - c_A + (2+\rho)\delta^*}{\alpha + (1+\rho)(R_m + c_A)}. \quad (33)$$

Proof: See Appendix B. Q.E.D.

This proposition shows that our results on the impact of fee rebates carry through to the case of (imperfect) competition between multiple portfolio managers. As before, the amount of funds actively managed is not affected by kickbacks. Not surprisingly, we find that more funds are managed actively when there is more competition. However, it is not true that there is a "race in outdoing" the other portfolio manager in terms of rebates. In fact, they optimally select a lower rebate to the advisers as compared to the monopolistic case. The reason has to do with the direct investors. Increasing the rebate financed by increasing fees implies that one fund will lose high net worth investors to a competitor that does not follow suit. Therefore, even if the fund could gain access to more indirect investors, it winds up losing direct investors and this effect dominates. As a result, competitive forces actually counteract the tendency to subsidize the advisers. Hence, recent trends toward more independent advisory services could be due to a greater degree of competitive pressures between active portfolio managers.

Our results highlight that the negative size externality parameter, ρ, only impacts the fees charged by the portfolio manager, but not the extent of rebates. This occurs because, for any given rebate, the threshold level of wealth that determines whether someone is a direct or indirect investor is independent of ρ. Rebates are used as a means to extract surplus from direct investors and therefore are not affected by ρ either. This also implies that net returns are unaffected by the size externality. On the other hand, when the negative externality is more significant, portfolio managers do compete more aggressively by lowering their fees, and the aggregate active investing is diminished.

V. Equilibrium without Advisers

To investigate the role of financial advisers in delegated portfolio management, we now examine an equilibrium in which financial advisers do not exist. When there is no investment adviser, the only vehicle for active investing is directly through the portfolio manager. As a result, $A_I = 0$; the fund size is determined solely by A_D. The portfolio manager maximizes her profit by choosing an optimal fee. Therefore, the portfolio manager's problem can be written as

$$\max_{f_P} \quad \Pi_P = (\alpha - \gamma A_D)A_D f_P \tag{34}$$

subject to the constraints (4) and (5) with $A_I = 0$.

Note that the informational assumptions made here are somewhat stronger than those needed previously in the setting with a financial adviser. Recall that the decision of whether to invest directly did not depend in equilibrium on the potential value of active management, α, when the financial adviser is present. Now we must assume that the direct investor knows in advance which α will obtain after the cost C_0 is expended. This, of course, does not violate our earlier justification for the cost because, without paying it, investors would bear an adverse selection problem. Problem (34) is now solved in the next proposition.

PROPOSITION 7: *In the portfolio management equilibrium without advisers, there exists a unique interior optimal fund size and management fee, which are* *the solutions to the following set of equations:*

$$\alpha - R_m - 2\gamma A_D - \frac{\lambda k}{k-1} A_D^{1/(k-1)} = 0, \tag{35}$$

and

$$f_P = \frac{\alpha - \gamma A_D - (R_m + \lambda A_D^{1/(k-1)})}{\alpha - \gamma A_D}, \tag{36}$$

where

$$\lambda \equiv C_0 R_m (\frac{k-1}{k A_m^k})^{1/(k-1)}. \tag{37}$$

Proof: See the Internet Appendix. Q.E.D.

Analytical solutions to the equation system in Proposition 7 can be obtained for special values of k, for example, $k = 1.5$ or $k = 2$. For general values of k, the solutions can be found using numerical methods.

In the following section, we compare outcomes for the four scenarios previously considered. In particular, we address the question of whose interests financial advisers really serve: investors' or the portfolio manager's. The key question is how investors are impacted by the presence of the adviser and kickbacks. We also consider the consequence of rebates on total welfare of investors and the portfolio manager.

VI. Comparison of Equilibria

To illustrate the differences, we construct a numerical example and solve for the equilibria in the following four cases: (1) no adviser case; (2) independent adviser case; (3) rebates to the adviser with sophisticated investors—referred to as the subsidized adviser case; and (4) rebates to the adviser with unsophisticated investors—referred to as the unsophisticated investor case.

A. Calibration

There are seven parameters in our model with sophisticated investors: α, R_m, γ, A_m, C_0, c_A, and k. For the unsophisticated investor case, there are two additional parameters: η and $\bar{\delta}$. We now describe how we calibrate these parameters.

We first set the expected gross return of the passive portfolio, R_m, to 1.04. According to Hung et al. (2008), a typical fee charged to investors with \$100,000 to \$1 million in assets under management by investment advisers is 1.25% in the United States. Considering the potential rebates received by some advisers, we set the advisory cost, c_A, equal to 1.5%. For the diseconomy of scale parameter, γ, we refer to the study by Chen et al. (2004). In their Table 1, they report a difference of eight basis points per month in market-adjusted returns between the second and fourth mutual fund size quintiles. The average size difference between these two groups is \$143 million. Because larger mutual funds in reality may be run by managers with higher ability, thereby counteracting the negative size effect, this return difference ratio of $0.0008 \cdot 12/(143 \cdot 10^6)$ understates the true diseconomy of scale. We therefore multiply it by a factor of three to give an estimated $\gamma \approx 2 \cdot 10^{-10}$. We set α equal to 1.08, so that the size of the active fund in the equilibrium with sophisticated investors is \$62.5 million, which matches the fund size in the median quintile of Chen et al. (2004). For the wealth distribution parameter k, we utilize the interval $k \in [1.5, 2]$. The midpoint of this range, 1.75, translates into a Gini coefficient equal to 0.4, which matches the U.S. income distribution as published in the 2009 Human Development Report (United Nations Development Program). The minimum wealth level, A_m, is set equal to $5 \cdot 10^7$, so that the aggregate wealth of investors net of the search cost exceeds the active fund size in all equilibria considered in our comparative study. The fixed search cost, C_0, is set equal to $5 \cdot 10^6$. In the subsidized adviser equilibrium with $k = 1.75$, this implies that 23% of the investment allocated to the active fund comes from the direct channel. This accords with the empirical data, reported by the Investment Company Institute, that 74% of the mutual fund assets held by U.S. households (outside defined contribution plans) are purchased through professional financial advisers.[24] Finally, to parameterize the unsophisticated investor equilibrium, we set $\bar{\delta}$ to 0.015, which implies that the portfolio manager cannot provide a rebate higher than the actual advisory cost, c_A. We also set $\eta = 1.6$ for illustration purposes.

B. Outcomes

In this subsection, we analyze the equilibrium fund size, the amount of direct investment, the management fee, and net returns as a function of k. In drawing cross-sectional conclusions from these outcomes, we interpret these results as though they occur in segmented environments, rather than a common environment where all distributional choices are endogenously determined. The results are illustrated in Figure 1 .

We plot the fund size in the four equilibria in Panel A of Figure 1. Here the solid line represents the fund sizes in both the independent and subsidized adviser equilibria because they are the same. As one can see from the graph, the size of the active portfolio is substantially larger in the presence of financial advisers, especially when k is large, that is, when the fraction of high net worth investors in the economy is small. This is because financial advisers help small investors invest in the active portfolio. The unsophisticated investor case has the highest fund size. This is because the marketing efforts of the adviser generate more demand from indirect investors. As discussed in Subsection III.C, when k is low, both direct and indirect investors hold the active fund. As k increases, there is a discrete jump in fund size when the maximal rebate is used and the extreme amount of promotional activity causes excessive investment by indirect investors, even though direct investors are driven away.

[24] Note that because the population has been normalized to one, A_m and C_0 are *aggregate* quantities rather than measured at the individual level.

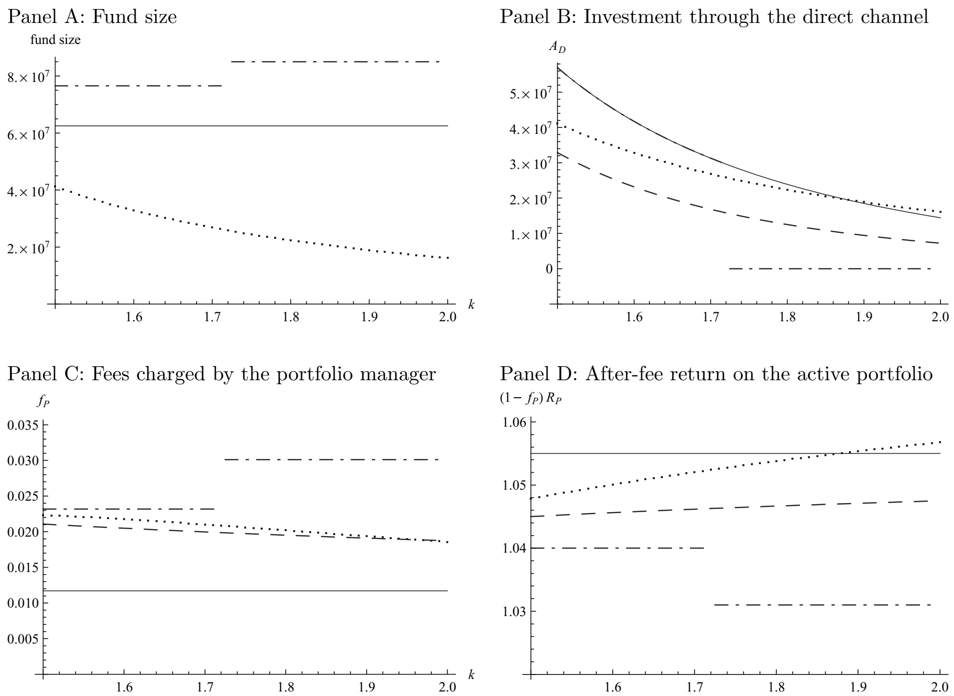

Figure 1. Comparison between equilibria. Solid lines correspond to the equilibrium with independent advisers (in Panel A, it also corresponds to the equilibrium with subsidized advisers), dashed lines correspond to the equilibrium with subsidized advisers, and dotted lines correspond to the equilibrium without advisers. Fund size and fund flow are in dollar terms. Management fees are a decimal fraction. After-fee returns equal one plus the rate of return. The parameter η is between zero and one in these three cases. The values of parameters other than k are as follows: $R_m = 1.04$, $\alpha = 1.08$, $\gamma = 2 \cdot 10^{-10}$, $A_m = 5 \cdot 10^7$, $C_0 = 5 \cdot 10^6$, and $c_A = 0.015$. The dashed-dot lines correspond to the case of unsophisticated investors, in which two additional parameters are specified: $\eta = 1.6$, and $\bar{\delta} = 0.015$. In Panel B, the dashed-dot line is invisible over the lower range of k because it overlaps with the solid line.

Note that before-fee returns are inversely related to fund size. Panel A of Figure 1 therefore implies that before-fee performance is higher if the fund is sold only through the direct channel (i.e., in the no adviser equilibrium) than in an environment where the fund is sold through both channels. By contrast, in a situation where a fund is sold solely through indirect channels (i.e., in the equilibrium with $\delta = \bar{\delta}$), we should expect to observe lower gross returns. This is supported by empirical evidence in Bergstresser et al. (2009), who show that returns are higher for direct channel funds as compared to brokered funds even before marketing fees are deducted.

Panel B of Figure 1 compares the amount of investment through the direct channel. In the case without advisers, this is equivalent to the total fund size. In all scenarios, direct investment decreases as k increases, that is, when there are fewer high net worth individuals. Direct investing in the unsophisticated investor case corresponds to the independent adviser case for lower values of

k and disappears entirely for higher values of k. Not surprisingly, the direct channel investment is smaller when advisers are subsidized than when they are independent because some investors are shifted to the indirect channel due to the kickbacks.

We now turn to the effect of the existence of independent advisers on the amount of direct investment in the active fund. There are two effects to consider. First, for given management fees, the absence of advisers increases the amount of direct investment, as there is no substitute. However, there is a second effect due to the endogeneity of the management fee. In the absence of advisers, it is optimal for the portfolio manager to charge higher fees because demand is less elastic. The magnitude of this second effect increases when there are more high net worth investors, which corresponds to a small k. The second effect dominates the first in this region.

Panel C of Figure 1 illustrates the portfolio manager's fees as a function of k. In the case of independent advisers, the fee is constant. This is because the indirect investors are the marginal investors, and their reservation return is independent of their wealth. Moreover, the fee charged in the independent adviser case is by far the lowest of the four scenarios. The reason for the low fee is that the presence of the adviser effectively makes demand more elastic and thus fee reductions are more profitable for the portfolio manager.

If investors are sophisticated, rebates are used to price discriminate against high net worth investors. As k becomes larger, that is, as the number of high net worth investors becomes smaller, the potential benefit of price discrimination decreases. Therefore, the optimal fee is decreasing in k. By contrast, in the unsophisticated investor case, the rebate is used for promotion instead of price discrimination. Now, for higher values of k, the portfolio manager prefers to only sell indirectly and does not moderate her fees to attract direct investors. Thus, fees are higher at the upper end of the range of k.

Panel D of Figure 1 compares the return of the active portfolio after management fees. Consistent with the results on the difference in fees, the net return is always lower in the cases with kickbacks as compared to the situation without kickbacks. The net returns in the absence of the adviser are related to the direct investment decision of high net worth investors. When there are many of them (k small), the portfolio manager can capitalize by increasing her fees to a greater extent. As a result, the net returns are reduced below the independent adviser case. When there are fewer of them (k large), the portfolio manager is only able to sell to a smaller number of direct investors at a lower fee, and thus the net returns are more attractive than in the independent adviser case. Finally, the net returns are lowest in the unsophisticated investor case because the fund size is not only larger than in the other cases, but fees are higher as well.

C. Welfare Analysis

We now analyze how aggregate welfare is affected by the presence of advisers, as well as by fee rebates. Investment advisers (when in existence) always have zero surplus. Therefore, we consider only the welfare of the portfolio manager and the investors. We measure the surplus of the investors relative to the default of investing in the passive asset and earning the net return R_m. Thus, except for the unsophisticated investor case, indirect investors earn zero surplus.

The effect of rebates on investor welfare is unambiguously negative. Recall that when investors are sophisticated, fee rebates shift some investors from the direct channel to the indirect channel. These investors lose their surplus, while investors who remain in the direct channel get a lower net return as the portfolio manager raises her fee. Indirect investors are not affected because the higher portfolio management fee is offset by the lower advisory fee. In the unsophisticated investor case, the expected return on the active fund is either equal to or below the passive return. High net worth investors get no benefit from having paid the search cost, therefore they experience a welfare reduction. Furthermore, because rebates are used for marketing instead of being passed through, indirect investors' welfare is also negatively affected. Obviously, the portfolio manager's profit increases when rebates are used because zero rebate is feasible in her optimization problem.

Combining the profit of the portfolio manager with the surplus earned by the investors, we compute the total welfare in the four scenarios. The details of these computations are carried out in Appendix B. Denote total welfare and investor surplus by U^i and S^i, respectively, where the superscript i indicates different equilibria: $i = 0$ (no adviser), $i = 1$ (independent advisers), $i = 2$ (subsidized advisers), and $i = 3$ (unsophisticated investors). We are able to prove the following proposition:

PROPOSITION 8: *The level of total welfare in the four equilibria is given, respectively, by*

$$U^0 = (\alpha - \gamma A_D^0 - R_m)A_D^0 - \theta^0 C_0 R_m, \tag{38}$$

$$U^1 = A_D^1 c_A - \theta^1 C_0 R_m + \Pi_P^1, \tag{39}$$

$$U^2 = A_D^2(c_A - \delta) - \theta^2 C_0 R_m + \Pi_P^2, \tag{40}$$

$$U^3 = -A_I^3 \eta\delta - \theta^1 C_0 R_m + \Pi_P^3, \tag{41}$$

where $A_D^i = \frac{kA_m^k}{(k-1)(A_i^*)^{k-1}}$ *denotes the amount of assets invested in the active portfolio directly,* $\theta^i \equiv (\frac{A_m}{A_i^*})^k$ *denotes the fraction of investors choosing the direct channel,* Π_P^i *denotes the portfolio manager's profit, and* A_I^3 *denotes the amount of indirect investment in the unsophisticated investor equilibrium. Furthermore,*

$$U^1 > U^2, \quad U^1 > U^3, \quad S^1 > S^2 > S^3. \tag{42}$$

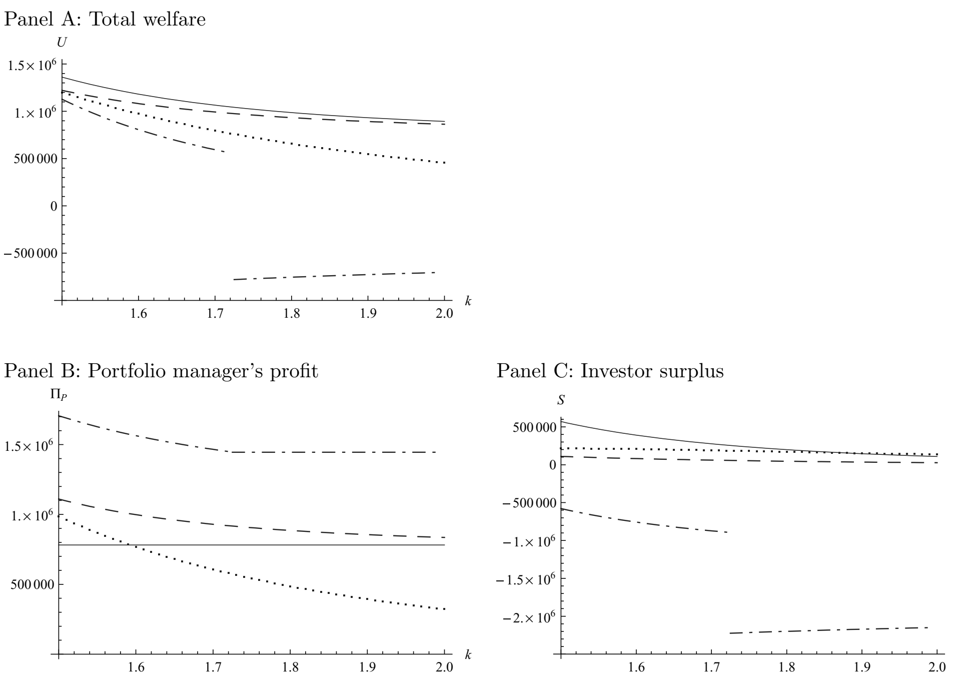

Figure 2. Welfare comparison across equilibria. This figure compares welfare in four different equilibria. Solid lines correspond to the equilibrium with independent advisers (in Panel A, it also corresponds to the equilibrium with subsidized advisers), dashed lines correspond to the equilibrium with subsidized advisers, and dotted lines correspond to the equilibrium without advisers. The parameter η is smaller than one in these three cases. The values of parameters other than k are as follows: $R_m = 1.04$, $\alpha = 1.08$, $\gamma = 2 \cdot 10^{-10}$, $A_m = 5 \cdot 10^7$, $C_0 = 5 \cdot 10^6$, and $c_A = 0.015$. The dashed-dot lines correspond to the case of unsophisticated investors, in which two additional parameters are specified: η = 1.6, and $\bar{\delta}$ = 0.015.

Proof: See the Internet Appendix. Q.E.D.

Panel A of Figure 2 plots the total welfare in the four equilibria under the same parameter values used to plot Figure 1. Consistent with Proposition 8, total welfare in the independent adviser equilibrium (the solid line) is always higher than that in the equilibrium with subsidized advisers (the dashed line). When kickbacks are permitted, the equilibrium features excessive use of investment advisers. This occurs as some clients are induced to use the proportional cost technology of the advisers when the fixed cost technology, that is, the direct channel, would be more efficient. Importantly, the figure also shows that both of these equilibria dominate the no-adviser equilibrium: total welfare in the equilibrium without advisers (the dotted line) is lower than those in the other two equilibria for all values of k we consider. This provides a rationale for the existence of advisory services in facilitating capital investment through active funds.

Total welfare is lowest in the case with unsophisticated investors. First, marketing effort is an additional *deadweight* loss. Second, investors who expend the search cost do so without obtaining any benefits in equilibrium because the net return of the active fund is either equal to or below that of the passive fund. Within the unsophisticated investor case, the underperformance equilibrium, which occurs when k is high, is substantially worse than the equal performance equilibrium. This is because marketing is more aggressive in that scenario, and more indirect investors are affected.

Panel B of Figure 2 compares the profits of the portfolio manager in four equilibria for various values of k. In the independent adviser equilibrium, the profit of the portfolio manager is independent of the wealth distribution parameter k, and thus it is a horizontal line in the diagram. The portfolio manager is strictly better off in the equilibria with kickbacks. She benefits more from paying kickbacks when k is smaller. This is because she extracts more surplus from the high net worth investors when there are many such investors in the economy. In the unsophisticated investor case, the low net worth investors are also expropriated, thereby leading to the highest level of profit.

For most reasonable values of k, the portfolio manager benefits from the presence of financial advisers, even when kickbacks are forbidden. This is because the existence of financial advisers allows the portfolio manager to provide her services to small investors, who will otherwise not participate in the active portfolio. Interestingly, this is not always the case. When k is small, the portfolio manager's profit is higher in the no-adviser equilibrium than in the independent adviser equilibrium, indicating that when there are many wealthy investors, the portfolio manager may be better off by declining investment through an indirect channel.

Panel C of Figure 2 plots the investor surplus in different equilibria, derived in the Internet Appendix. Consistent with our analytical results, kickbacks always reduce investor welfare. Clearly investors are at a severe disadvantage when they are unsophisticated, even more so when there are fewer high net worth investors and rebates are at the maximum level. The figure also shows that from the investors' point of view, subsidized advisers are worse than no advisers at all. More subtly, when k is sufficiently large, even independent advisers can reduce investor welfare. This is consistent with the shape of the net return of the active portfolio plotted in Panel D of Figure 1.

In summary, our analysis shows that as long as investors are sophisticated, the presence of financial advisers improves total welfare with or without the use of rebates. Most of the benefit, however, accrues to the portfolio manager. The use of rebates is optimal from the portfolio manager's perspective, whether investors are sophisticated or unsophisticated. Investors are worse off from the use of rebates, especially when they are susceptible to marketing efforts and are unable to anticipate this.

VII. Conclusions

The market for financial products and services is expanding rapidly as corporations and financial institutions package cash flows and contingent claims in increasingly sophisticated ways. As the number of alternative investment opportunities placed before investors increases, financial advisers play an increasingly more prominent role in allocating assets. Investment advisory services are employed by many types and categories of investors, including retail investors, corporate pension funds, university endowment committees, and many other institutional investors. The purpose of this paper is to investigate the effect of such financial intermediaries and their compensation schemes on investors' portfolio decisions, fund returns, management fees, and welfare.

A unique feature of our model is that the decision to use an adviser is endogenously determined. Advisory services provide an opportunity for smaller investors to participate in an actively managed portfolio, consisting for instance of alternative investments that would not be economical without the use of an adviser. As long as investors are rational and the advisory industry is competitive, the presence of advisers improves the total welfare of the portfolio manager and investors even when they are subject to potential conflicts of interest. Investors' welfare alone may increase or decrease due to the existence of financial advisers. Consistent with the widespread use of rebates as part of financial advisers' compensation in practice, our model shows that it is optimal for the portfolio manager to subsidize advisers via kickbacks. Depending on the degree of investor sophistication, rebates are used by the portfolio manager either as a price discrimination mechanism or to support aggressive marketing of the active fund. In both cases, kickbacks strictly reduce investors' welfare. Nevertheless, they increase the use of advisory services.

Consistent with the existing empirical finding that brokered funds underperform direct channel funds, our model predicts that underperforming active funds can only be sold via financial advisers to unsophisticated investors. By contrast, outperforming funds are generally sold simultaneously through direct and indirect channels. Funds with the highest gross performance are likely to be those sold directly and exclusively to a small subset of high net worth investors. We also predict that funds distributed by intermediaries that are more heavily subsidized by the portfolio managers, such as insurance mutual funds, high-load funds, and funds paying abnormally high soft-dollars to improve fund distribution, underperform other funds. Furthermore, we show that competition between active portfolio managers lowers the equilibrium rebate, which results in a lower kickback-based component in the adviser's compensation scheme. Therefore, recent trends toward more independent advisory services may be due to enhanced competition among portfolio managers. Our model also generates some empirical predictions that have not been tested yet. For example, we predict that the incentive of the portfolio manager to subsidize the adviser increases when the fraction of large investors in the economy increases. Also, our model implies that the importance of indirect sales through financial advisers increases with fund size. Ceteris paribus, large funds sell a larger fraction through advisers whereas small funds feature proportionally more direct investors.

Several potential policy implications emerge from our analysis. Investor education that decreases the susceptibility of investors to marketing activities will imply less use of fee rebates for promotion and higher investor welfare. Adequate disclosure of the magnitude of fee rebates and the extent to which this is passed on to investors can also be important. Moreover, it would be better to allow the portfolio manager to subsidize the adviser via general purpose monetary transfers than earmark fund-specific marketing support. It may be tempting to draw the conclusion that banning rebates entirely may be optimal; however, such interpretation must be made with caution. Even though investors are worse off with subsidized advisers, the portfolio manager and investors, taken together, are better off compared to not having financial advisers, as long as investors are sophisticated. Furthermore, in a more general model, the value created by active portfolio managers would be endogenous. If their potential profit is curtailed by regulation, they are less likely to make the investment necessary to attain high levels of expertise.

Appendix

A. Proof of Proposition 2

Proof: Substituting out A_D and A_I in the objective function using the constraints, we have

$$\Pi_P = \frac{f_P(R_m + c - \delta)[\alpha(1 - f_P) - (R_m + c - \delta)]}{(1 - f_P)^2\gamma} - \left(\frac{\alpha(1 - f_P) - (R_m + c - \delta)}{(1 - f_P)\gamma} - \frac{kA_m^k(c - \delta)^{k-1}}{(k - 1)(C_0 R_m)^{k-1}}\right)\delta.$$

The first-order condition for the optimal fee is

$$f_P = \frac{\alpha - R_m - c_A + 2\delta}{\alpha + R_m + c_A}. \tag{A.1}$$

Taking the partial derivative of Π_P with respect to δ, and substituting out f_P from the resulting expression using equation (A.1), we have

$$\frac{\partial \Pi_P}{\partial \delta} = \frac{kA_m^k(c_A - \delta)^{k-2}}{(k - 1)(C_0 R_m)^{k-1}}(c_A - k\delta).$$

Setting this partial derivative equal to zero, we get the optimal rebate stated in Proposition 2.[25] Equation (21) is obtained by substituting the optimal rebate into (A.1).

The second-order conditions can be verified in straightforward fashion. Q.E.D.

[25] If $k > 2$, $\delta = c_A$ also satisfies the first-order condition. However, in this case, $A_D = 0$; the portfolio manager's profit is not maximized. Therefore, $\delta = c_A$ is not optimal.

B. Proof of Proposition 6

Proof: Substituting out f_P and δ in the objective function using the two constraints, we have

$$\Pi_{Pi} = \left\{\alpha - R_m - c_A - \gamma\left[(A_{Di} + A_{Ii}) + \rho\left(A_{Dj} + A_{Ij}\right)\right]\right\}(A_{Di} + A_{Ii}) + A_{Di}\left(c_A - \frac{C_0 R_m}{\left[\frac{K A_m^k}{(k-1)A_D}\right]^{1/(k-1)}}\right).$$

The first-order conditions are

$$\frac{\partial \Pi_{Pi}}{\partial A_{Ii}} = \{\alpha - R_m - c_A - \gamma[(A_{Di} + A_{Ii}) + \rho(A_{Dj} + A_{Ij})]\} - \gamma(A_{Di} + A_{Ii}) = 0, \tag{A.2}$$

$$\frac{\partial \Pi_{Pi}}{\partial A_{Di}} = \{\alpha - R_m - c_A - \gamma[(A_{Di} + A_{Ii}) + \rho(A_{Dj} + A_{Ij})]\} - \gamma(A_{Di} + A_{Ii}) + \left(c_A - \frac{C_0 R_m}{\left[\frac{K A_m^k}{(k-1)A_D}\right]^{1/(k-1)}}\right) - \frac{A_{Di}}{A_D(k-1)} \frac{C_0 R_m}{\left[\frac{K A_m^k}{(k-1)A_D}\right]^{1/(k-1)}}. \tag{A.3}$$

Substituting equation (A.2) into (A.3), the latter reduces to

$$c_A = \left[1 + \frac{A_{Di}}{A_D(k-1)}\right] \frac{C_0 R_m}{\left[\frac{K A_m^k}{(k-1)A_D}\right]^{1/(k-1)}}, \quad i = 1, 2. \tag{A.4}$$

Note that the total size of each individual fund, $A_i = A_{Di} + A_{Ii}$, is fully determined by equation (A.2). It is unique, symmetric, and independent of the kickback payments. Therefore, equation (27) continues to hold. Equation (A.4) shows that the direct channel choice is also unique and symmetric across portfolio managers. Therefore, $A_{Di} = A_D/2$ in equation (A.4). Notice further that from (31) we have

$$\frac{C_0 R_m}{\left[\frac{K A_m^k}{(k-1)A_D}\right]^{1/(k-1)}} = c_A - \delta.$$

Thus, we end up with

$$c_A = \left(1 + \frac{1}{2(k-1)}\right)(c_A - \delta)$$

at optimum. The optimal rebate is therefore given in equation (32). Substituting the optimal fund size and optimal rebate into equation (30), we obtain equation (33). Q.E.D.

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Internet Appendix to "Intermediated Investment Management"

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This note presents the proofs of several propositions in "Intermediated Investment Management."

I. Proof of Proposition 4 and Corollary 1

Proof. Equation (24) in the paper shows that the portfolio manager's profit is maximized either at $\delta = c_A/\eta$ or $\delta = \bar{\delta}$ in the case $\eta > 1$. Consider first the scenario $\delta = c_A/\eta$, in which the active fund and the passive fund have the same expected return. From equation (24) we see Π_P is maximized at

$$A_I = \frac{1}{2\gamma}[\alpha - R_m - c_A + (\eta - 1)\delta] - A_D = \frac{1}{2\gamma}[\alpha - R_m - c_A/\eta] - A_D,$$

where $A_D = \frac{kA_m^k c_A^{k-1}}{(k-1)(C_0 R_m)^{k-1}}$. Substituting this result and $\delta = c_A/\eta$ into the second case of equation (18) in the paper yields the optimal management fee f_P^* stated in the proposition.

In the second scenario $\delta = \bar{\delta}$, the active fund underperforms the passive fund, and $A_D = 0$. Π_P is maximized at

$$A_I' = \frac{1}{2\gamma}[\alpha - R_m - c_A + (\eta - 1)\bar{\delta}].$$

Substituting this back into the second case of equation (18) and noting that $A_D = 0$ and $\delta = \bar{\delta}$, we have the optimal management fee, $f_P^{*'}$, for this scenario.

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To prove Corollary 1, note that the portfolio manager's profit in the first scenario is

$$\Pi_P = \frac{(\alpha - R_m - c_A/\eta)^2}{4\gamma} + \frac{A_D c_A}{\eta},$$

and in the second scenario it is

$$\Pi_P^{'} = \frac{[\alpha - R_m - c_A + (\eta - 1)\bar{\delta}]^2}{4\gamma}.$$

The difference between the portfolio manager's profits under these two scenarios is then

$$\begin{aligned} \Delta\Pi_P &= \Pi_P - \Pi_P^{'} \\ &= \frac{c_A^2/\eta^2 - [c_A - (\eta - 1)\bar{\delta}]^2 - 2(\alpha - R_m)[c_A/\eta - c_A + (\eta - 1)\bar{\delta}]}{4\gamma} + A_D c_A/\eta. \end{aligned}$$

If $\Delta\Pi_P > 0$, the portfolio manager chooses the first (equal performance) equilibrium with $\delta = c_A/\eta$. Otherwise she chooses the second (underperformance) equilibrium with $\delta = \bar{\delta}$. To see which equilibrium is more likely to occur, we take the partial derivative of $\Delta\Pi_P$ with respect to various model parameters. A negative partial derivative means the second equilibrium is more likely to occur as the parameter value increases.

First, note that

$$\frac{\partial \Delta\Pi_P}{\partial \bar{\delta}} = -\frac{1}{2\gamma}[\alpha - R_m - c_A + (\eta - 1)\bar{\delta}](\eta - 1) < 0,$$

where the inequality follows from our assumptions $\alpha > R_m + c_A$, $\eta > 1$, and $\bar{\delta} > c_A/\eta$. Therefore, when $\bar{\delta}$ is high, it is more likely that the portfolio manager prefers the underperformance equilibrium.

Second, note that C_0 and k affect $\Delta\Pi_P$ only through A_D. From the expression of A_D, it is easy to see that A_D is decreasing in both C_0 and k:

$$\frac{\partial log(A_D)}{\partial C_0} = -(k-1)/C_0 < 0,$$

$$\frac{\partial log(A_D)}{\partial k} = (\frac{1}{k} - \frac{1}{k-1}) + log(\frac{A_m c_A}{C_0 R_m}) = (\frac{1}{k} - \frac{1}{k-1}) + log(\frac{A_m}{A^*}) < 0.$$

Since $\Delta\Pi_P$ increases in A_D, it follows that $\Delta\Pi_P$ decreases in both C_0 and k.

Third, note that

$$\frac{\partial \Delta\Pi_P}{\partial \alpha} = -\frac{1}{2\gamma}[c_A/\eta - c_A + (\eta-1)\bar{\delta}] < 0,$$

where the inequality follows from our assumptions $\eta > 1$ and $\bar{\delta} > c_A/\eta$.

Finally, we have

$$\begin{aligned}
\frac{\partial \Delta\Pi_P}{\partial \eta} &= \frac{1}{2\gamma}\{(\alpha - R_m - c_A/\eta)c_A/\eta^2 - [\alpha - R_m - c_A + (\eta-1)\bar{\delta}]\bar{\delta}\} - A_D c_A/\eta^2 \\
&< \frac{1}{2\gamma}\{(\alpha - R_m - c_A/\eta)\bar{\delta} - [\alpha - R_m - c_A + (\eta-1)\bar{\delta}]\bar{\delta}\} - A_D c_A/\eta^2 \\
&= \frac{1}{2\gamma}[(-c_A/\eta + c_A - (\eta-1)\bar{\delta})]\bar{\delta} - A_D c_A/\eta^2 \\
&< -A_D c_A/\eta^2 \\
&< 0,
\end{aligned}$$

where the first inequality follows from the assumptions $\alpha > R_m + c_A$, $\eta > 1$, and $\bar{\delta} > c_A/\eta$, and the second inequality follows from the assumptions $\eta > 1$ and $\bar{\delta} > c_A/\eta$.

II. Proof of Proposition 7

Proof. Combining the two constraints in problem (34) in the paper we immediately obtain equation (36). Substituting this expression back into the objective function and differentiating, we have

$$\begin{aligned}\frac{\partial \Pi_P}{\partial A_D} &= \alpha - R_m - 2\gamma A_D - \frac{\lambda k}{k-1} A_D^{1/(k-1)}, \\ \frac{\partial^2 \Pi_P}{\partial A_D^2} &= -2\gamma - \frac{\lambda k}{(k-1)^2} A_D^{(2-k)/(k-1)} < 0.\end{aligned}$$

Equation (35) in the paper is obtained by setting the first-order condition above equal to zero. Since Π_P is strictly concave when $A_D > 0$, the first-order condition is both a necessary and sufficient condition for the solution to this maximization problem; furthermore, the optimal A_D is unique. To prove the existence of an interior solution, $0 < A_D < W - C_0$, to the first-order condition, note that $\frac{\partial \Pi_P}{\partial A_D} > 0$ if $A_D = 0$. Due to the monotonicity of the first derivative, it suffices to show this derivative becomes negative as $A_D \to W - C_0$, that is, as A_D converges to the aggregate wealth of the economy net of the search cost C_0. This is guaranteed by condition (6) in the paper.

III. Proof of Proposition 8

Proof. In the case without financial advisers, the number of direct investors is the same as the number of investors investing in the active portfolio. Denote the total surplus of the (direct) investors, relative to the default of passive investment, by S^0. We have

$$\begin{aligned} S^0 &= \int_{A_0^*}^{+\infty} [x(\alpha - \gamma A_D^0)(1 - f_P) - (x + C_0)R_m] f(x) dx \\ &= [(\alpha - \gamma A_D^0)(1 - f_P) - R_m] A_D^0 - \theta^0 C_0 R_m, \end{aligned}$$

where A_0^* is the threshold level of wealth (net of C_0) that makes the marginal investor indifferent between the passive fund and the active portfolio, $A_D^0 = \int_{A_0^*}^{+\infty} x f(x) dx = \frac{k A_m^k}{(k-1)(A_0^*)^{k-1}}$, $\theta^0 \equiv \int_{A_0^*}^{+\infty} f(x) dx = (\frac{A_m}{A_0^*})^k$.

In the equilibrium with independent advisers, the net return of the active fund is equal to $R_m + c_A$. Therefore, the (direct) investor's surplus, S^1, is given by

$$\begin{aligned} S^1 &= \int_{\frac{C_0 R_m}{c_A}}^{+\infty} [x(R_m + c_A) - (x + C_0)R_m)]f(x)dx \\ &= A_D^1 c_A - \theta^1 C_0 R_m, \end{aligned}$$

where $A_D^1 = \frac{kA_m^k c_A^{k-1}}{(k-1)(C_0 R_m)^{k-1}}$, and $\theta^1 \equiv (\frac{c_A A_m}{C_0 R_m})^k$.

Similarly, since the net return of the active portfolio in the case with subsidized advisers equals $R_m + c_A - \delta$, the total surplus of the (direct) investors in the subsidized adviser equilibrium is given by

$$S^2 = A_D^2 (c_A - \delta) - \theta^2 C_0 R_m,$$

where $A_D^2 = \frac{kA_m^k (c_A - \delta)^{k-1}}{(k-1)(C_0 R_m)^{k-1}}$, and $\theta^2 \equiv (\frac{(c_A - \delta) A_m}{C_0 R_m})^k$.

In the unsophisticated investor case, high net worth investors have a deadweight loss of C_0. The fraction of investors who pay this cost is the same as in the case without rebate, that is, θ^1. The indirect investors earn an expected return that is $\eta\delta$ lower than the passive return, where δ equals either c_A/η or $\bar{\delta}$. Therefore, the total investor surplus in this case is

$$S^3 = -A_I^3 * \eta\delta - \theta^1 C_0 R_m < 0.$$

Note that investor surplus S^0, S^1, and S^2 must all be strictly positive, otherwise no rational investors will pay the search cost. Therefore $S^3 < 0$ is lowest among all the four equilibria. To prove $S^1 > S^2$, note that

$$S^1 - S^2 = A_D^2 \delta + (A_D^1 - A_D^2) c_A - (\theta^1 - \theta^2) C_0 R_m = A_D^2 \delta + \int_{\frac{C_0 R_m}{c_A}}^{\frac{C_0 R_m}{c_A - \delta}} x f(x) [c_A - \frac{C_0 R_m}{x}] dx > 0.$$

This equation indicates that investors' welfare loss due to the existence of kickbacks can be decomposed into two parts: investors who remain in the direct channel lose $A_D^2\delta$, and investors who would originally choose the direct channel but are forced to switch to the indirect channel because of kickbacks lose $(A_D^1 - A_D^2)c_A - (\theta^1 - \theta^2)C_0R_m$. Both components are strictly positive.

Adding the portfolio manager's profit to investors' surplus, we get total welfare U^0, U^1, U^2, and U^3 in Proposition 8. To prove $U^1 > U^2$, recall that allowing kickbacks increases the portfolio manager's profit by $A_D^2\delta$ (equation (23)), and thus the first component of the investor welfare loss described above is exactly offset by the gain of the portfolio manager. However, the second component is a deadweight loss.

To prove $U^1 > U^3$, we first compare the independent adviser equilibrium with the unsophisticated investor equilibrium with $\delta = c_A/\eta$. Using the expressions for investor surplus and the portfolio manager's profit for both cases, we derive

$$U^1 - U^3 = \frac{c_A^2}{4\gamma}(1 - \frac{1}{\eta^2}) + \frac{A_I^1 c_A}{\eta} > 0,$$

where A_I^1 denotes the amount of indirect investment in the independent adviser equilibrium. Similarly, comparing the independent adviser equilibrium with the unsophisticated investor equilibrium with $\delta = \bar{\delta}$, we have

$$U^1 - U^3 = A_D^1 c_A + (A_D^1 + A_I^1)\bar{\delta} + \frac{(\eta - 1)(\eta + 1)\bar{\delta}^2}{4\gamma} > 0.$$

This completes our proof of Proposition 8.