Matching Capital and Labor*

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September 26, 2016

Abstract

We establish an important role for the firm by studying capital reallocation decisions of mutual fund firms. The firm's decision to reallocate capital amongst its mutual fund managers adds at least $474,000 a month, which amounts to 30% of the total value added of the industry. We provide evidence that this additional value added results from the firm's private information about the skill of its managers. Investors reward the firm following a capital reallocation decision by allocating additional capital to the firm's funds.

JEL classification: G30, J24, D22

*We thank Anat Admati, Peter DeMarzo, Daniel Ferreira, Francisco Perez-Gonzalez, Paul Pfleiderer, Anamaria Pieschacon, Jonathan Reuter, Michael Roberts, Paulo Volpin, and seminar participants at Georgia State University, the University of Chicago, Stanford University, UCLA, the University of Maryland, Wharton, University of New South Wales, University of Sydney, University of Melbourne, the Adam Smith Workshop, the SFS Cavalcade, and the NBER Corporate Finance Meetings, for helpful comments and suggestions.

We demonstrate that an important role of a firm in the mutual fund sector is to efficiently match capital to skill. In a world with perfectly rational players, no information asymmetries and no other frictions, the role of a mutual fund firm would be irrelevant because investors themselves would efficiently allocate their own capital amongst managers. In reality, what we find, is that mutual fund executives play a very important role in capital allocation. A decision to increase a portfolio manager's assets under management (AUM) leads to an increase in the manager's productivity as measured by value added. Similarly, we find that decisions to reduce managers' responsibilities by taking away assets also lead to increases in subsequent value added. We find that at a minimum, the decision to reallocate capital to a manager adds, on average, \$474,000 per manager per month, implying that the firm is responsible for at least 30% of the total value added of the average manager. Mutual fund firms appear to add substantial value by intermediating between investors and managers and thereby efficiently matching capital to skill.

We further demonstate that investors are unable to match the firm's capital reallocation decision themselves. We hypothesize that the reason why derives from the significant informational advantage mutual fund executives have relative to investors. For example, firm executives know every trade a manager makes, and in addition, trades that the manager chooses not to make. Executives use this information to direct capital away from overfunded managers towards underfunded managers.

We provide supporting evidence in favor of the informational advantage hypothesis: (1) external hires that involve a change in AUM do not lead to a detectable change in future value added, (2) while past performance does explain investor flows, it does not have much power to explain firm capital reallocation decisions and (3) investors respond to these capital reallocation decisions by investing additional capital in the firm's funds. We also find that the capital reallocation decision adds more value for young managers, supporting the hypothesis that the firm's advantage derives from its access to better information about managerial ability. These facts are consistent with the hypothesis, first theorized by Alchian and Demsetz (1972), that firm executives use factors that are not easily observable to people outside the firm to make personnel decisions. They are also consistent with the hypothesis in Gennaioli, Shleifer, and Vishny (2015) that investors trust mutual fund firms to make sound financial decisions on their behalf, and so when they see these firms making a managerial change they respond by investing additional capital.

Although there is a large body of evidence demonstrating the importance of the firm's informational advantage in assigning workers to jobs and thereby determining compensation, there is little evidence demonstrating that firms also use this knowledge to determine the job scope of the employee. Our results imply that by correctly determining how much responsibility to give an employee in a particular job, firms add considerable value. Consequently, the documented wage gains that result from internal job assignments likely not only result from the productivity gains from correctly matching jobs to workers, but also from correctly assigning worker responsibility within a job.

Many of the questions pertaining to the economics of organizations are difficult to study because it is often hard to measure employee output directly. An advantage of our study is that because the performance of a mutual fund is public information, employee output is directly observable. That is, a mutual fund manager has one task — to invest capital on behalf of investors. The return he generates, as well as the amount of capital invested, is public information. The investor's next best alternative investment opportunity, an investment in passively managed index funds, is also observable. By comparing the manager's performance against this alternative, we can directly calculate an individual manager's productivity, that is, the value she adds. A second advantage of our study is that mutual fund firms own little physical capital.[1] Consequently, ownership rights to capital cannot play an important role in why mutual fund companies exist or are valuable. What our results imply is that other factors, such as the informational role of the firm, are also important.

Although we do not find strong evidence for a behavioral explanation of our findings, we cannot definitively rule out the possibility that at least part of our results derive from suboptimal investor behavior. For example, part of the value the firm adds could potentially result from investor inattention. Firms add value by paying attention on investors' behalf. We leave it to future research to determine the possible importance of this explanation for our results.

In the next section we describe how our paper fits into the existing literature. We develop a simple model that formalizes our hypothesis for why firms add value in Section 2. In Section 3 we define the value added of firms, funds and managers. The data set is described in Section 4 and provides summary statistics. In Section 5 we show that we can reject our Null hypothesis that firm capital reallocation decisions do not add value and, more importantly, provide a lower bound estimate of the value firms add. In the following

[1] Although the industry is capital intensive, firms do not own their own capital. Instead, the firms manage capital on behalf of outside investors. That is, capital providers retain full ownership rights to their capital and can call it back at any time.

section, Section 6, we show that investors respond to these capital allocation decisions by investing additional capital with the firm, indicating that investors are aware of the value these decisions add. In Section 7 we present a body of evidence that is consistent with the hypothesis that the value the firm adds by reallocating capital derives from the firm's informational advantage from observing the quality of its own employees.

1 Background

The literature on the economics of organizations has raised several important questions related to the role of firms. What makes a firm successful? Is it a characteristic of the firm itself, or is it simply that a successful firm is a collection of particularly talented employees? Why do people choose to work for firms rather than for themselves? Do personnel decisions within the firm add to overall firm value?

There is now a large theoretical literature designed to answer these questions (see Hart and Moore (1990), Holmstrom and Tirole (1989), Hart (1995) and Rajan and Zingales (1998)). A key aspect of modern theories of the firm is the concept of ownership. In a world with incomplete contracting, incomplete information and bounded rationality, ex post bargaining power is affected by ownership. Asset owners, because they retain the rights of control, have inherently more bargaining power. An important insight of this literature is that firms exist to ensure that ex ante ownership is concentrated to allow for efficient ex post outcomes. Although these theories undoubtedly explain an important component of why modern firms exist, they cannot explain a particular, and increasingly important, type of firm — a firm that consists almost exclusively of human capital. These firms have little physical capital other than perhaps some intangible capital such as the firm's brand name. Hence, a primary reason for the existence of these types of firms cannot be the assignment of ex post bargaining rights through asset ownership.

Our paper relates to an expanding literature, pioneered by Bertrand and Schoar (2003), that seeks to isolate the productive role of the worker (manager) from that of the firm. Bertrand and Schoar (2003) demonstrate the importance of firm managers by studying CEOs. More recently, Ewens and Rhodes-Kropf (2013) separate the value added in venture capital projects into a manager component and a firm component and argue that human capital, rather than organizational capital, accounts for most of the skill in the venture capital world. This research relies on the fact that workers move between firms to identify the separate roles of workers and firms. However, because switching firms is an endogenous decision, this methodology is generally unable to put a quantitative estimate on the contribution of the firm nor is it informative on what precisely the firm does to add value. Instead of focusing on external moves as the identification strategy, we rely on the firm's internal decision to promote and demote its workers and thus we are able to both identify the source of the firm's value added and derive a quantitative bound on the firm's contribution to productivity.

Our paper also relates to the labor literature studying personnel economics and the internal labor market of the firm pioneered by Doeringer and Piore (1971).[2] That literature focuses on how firms establish and end employment relationships and how firms provide incentives to workers through the wage contract. Our focus is different. We do not observe employee wages, but instead observe employee productivity (value added). That allows us to study how firm decisions regarding the scope of the managers' job (the size of their AUM) affects their productivity rather than their wages. We argue that the firm uses its private information about employee skill to efficiently allocate capital and thereby determine the scope of responsibility of the employee.

Finally, our paper is also part of the literature that studies how the intra-firm allocation of capital and labor affects productivity and drives heterogeneity in the quality of firms. Gertner, Scharfstein, and Stein (1994) model the costs and benefits of internal capital allocation versus external capital allocation in the form of bank lending. Stein (1994) studies the comparative advantages of decentralized versus hierarchical firms in efficiently allocating capital to projects. Tate and Yang (2014) show that diversified firms have higher labor productivity and actively redeploy their human capital to business areas with better prospects. Giroud and Mueller (2014) find that firms take resources away from less productive plants and reallocate them to plants with better investment opportunities. Resource allocation (or misallocation) across firms and across industries has also been identified as a major determinant of economic productivity at the macroeconomic level.[3]

A key determinant of a firm's productivity is its management. Bloom, Sadun, and van Reenen (2013) find significant differences in management quality across firms both in the U.S. and abroad. Bloom, Eifert, Mahajan, McKenzie, and Roberts (2013) show,

[2]In more recent work, Abowd, Kramarz, and Margolis (1999) find worker fixed effects to be more important than firm fixed effects in driving heterogeneity in workers' wages. Graham, Li, and Qiu (2011) decompose variation in CEO compensation and show that most of this difference is explained by manager heterogeneity rather than firm heterogeneity. Oyer and Schaefer (2011) and Waldman (2013) are recent surveys of this literature.

[3]For example, see Hsieh and Klenow (2009), Alfaro, Charlton, and Kanczuk (2009) and Bartelsman, Haltiwanger, and Scarpetta (2013).

based on randomized experiments in India, that management practices have a significant impact on firm productivity. Lazear, Shaw, and Stanton (2014) find that hiring better supervisors make workers more productive. Finally, most mutual funds are owned and marketed as part of a fund family, so a number of studies have looked into how the family structure affects the mutual fund industry.[4]

2 Theory

Our underlying hypothesis in this paper is that internal firm decisions about how to allocate capital amongst employees add value, and that this value derives from the fact that firms have better information about their employees' abilities than outside investors in the firm. With that in mind, in this section we will develop a simple model that formalizes this hypothesis.

We assume that there are three types of agents. Outside investors, employees and a firm executive. Both employees and the firm executive have a skill in short supply and receive all the rents for this skill. A firm consists of an executive and I employees. The net present value (NPV) of the value created by each employee, i, using capital q_i is,

$$V_i \equiv q_i \psi_i(q_i),$$

where $\psi_i(q)$ is the average excess return on capital employee i generates when given responsibility for the amount of capital q. In the mutual fund literature, $\psi_i(q)$ is referred to as the *gross alpha* and V_i corresponds to what Berk and van Binsbergen (2015) refer to as *value added*. We will maintain the realistic assumption throughout the paper that $\psi_i'(q) < 0$. In words, there are decreasing returns to scale so that the excess return on capital decreases in the amount of responsibility an employee is assigned.[5] Employee i receives a wage (compensation) W_i. The firm executive determines the amount of capital employees are given responsibility for.

[4]Massa (2003) argues that having fund families reduces investors' cost of switching between funds. Gaspar, Massa, and Matos (2006) and Bhattacharya, Lee, and Pool (2013) find evidence that mutual fund families transfer performance from one group of funds to another group of funds through coordinated trades. Kempf and Ruenzi (2008) show that intra-firm competition has important effects on managers' appetite for risk. Chen, Hong, Jiang, and Kubik (2013) find that funds outsourced to advisory firms underperform funds managed in-house. Fang, Kempf, and Trapp (2014) show that a firm allocates its skilled managers to funds targeting inefficient markets.

[5]There is a growing body of empirical evidence documenting decreasing returns to scale in the mutual fund industry, see Chen, Hong, Huang, and Kubik (2004), Pollet and Wilson (2011), and Pastor, Stambaugh, and Taylor (2015).

2.1 Coasian Benchmark

First we derive the equilibrium level of capital in a frictionless market with no asymmetric information (the null hypothesis in this paper). In such a world, there is no role for a firm executive because the executive does not add any value over the value added of individuals working for themselves. To see this formally, consider the case where each employee works for herself but needs to raise money from outside investors. The outside investors maximize the NPV of their investment, subject to the condition that the NPV is not negative:

$$\max_{q_i} \left[q_i \psi_i(q_i) - W_i \ , \ 0 \right]. \tag{1}$$

The solution to this problem for each employee $i = 1, \ldots, I$, is

$$\psi_i(q_i^*) + q_i^* \psi_i'(q_i^*) = 0. \tag{2}$$

Each employee chooses his wage by maximizing his compensation taking into account the outside investor's participation constraint, implying

$$W_i = q_i^* \psi_i(q_i^*). \tag{3}$$

Now assume employees work for a firm. In this case the firm executive's maximization problem, taking employees' wages as given, is

$$\max_{\{q_i\}} \left[\sum_{i=1}^{I} q_i \psi_i(q_i) - W_i \ , \ 0 \right]. \tag{4}$$

The solution to this problem, $\{q_1^*, \ldots, q_I^*\}$, uniquely satisfies the following I first order conditions:

$$\psi_i(q_i^*) + q_i^* \psi_i'(q_i^*) = 0, \qquad i = 1, \ldots, I, \tag{5}$$

which is identical to (2). The employees can always choose to work for themselves, which implies that, in equilibrium, the firm must pay at least (3). The investor participation constraint implies the firm cannot pay more, so we have

$$W_i = q_i^* \psi_i(q_i^*). \tag{6}$$

At this wage the NPV of investing in the firm is zero, so we can assume that outside investors will be willing to provide capital $\sum_{i=1}^{I} q_i^*$ and so the two equilibria are identical.

2.2 Asymmetric Information

The alternative hypothesis in this paper is that the firm executive can better observe the quality of her employees than the providers of capital. We assume that employees cannot credibly communicate their ability and so the providers of capital cannot differentiate between employees.[6] This model is observationally equivalent to a model in which investors can observe employee ability but nevertheless choose to ignore this information for behavioral reasons. Under these assumptions the providers of capital believe employee excess return on capital is

$$\psi(q) \equiv E[\psi_i(q)]. \tag{7}$$

If the employees work for themselves, the outside investors maximize the NPV of their investment subject to their participation constraint:

$$\max_{q_i} \left[E[V_i] - W_i \ , \ 0 \right] = \max_{q_i} \left[q_i \psi(q_i) - W_i \ , \ 0 \right], \tag{8}$$

where we are assuming that employee productivity risk is idiosyncratic and so does not command a risk premium. The first order condition is:

$$\psi(\hat{q}) + q_i \psi'(\hat{q}) = 0, \qquad i = 1, \ldots, I. \tag{9}$$

As before, each employee maximizes his wage subject to the participation constraint:

$$\bar{W} = \hat{q} \ \psi(\hat{q}). \tag{10}$$

The solution does not depend on i and so all employees manage the same amount of capital, $\hat{q}$, and earn the same wage, $\bar{W}$. The total amount of capital invested is therefore:

$$\bar{Q} \equiv I\hat{q}.$$

Next we turn to the firm's optimization problem. The firm executive has a competitive advantage because she has private information that allows her to allocate capital better.

[6] That is, for ease of exposition, we normalize the information set of outside investors by assuming that the publicly available information for all employees is the same. This model is easily generalizable to the case where outside investors can partially differentiate between employees and we thus we allow outside investors to partially differentiate in the empirical work that follows.

For a given level of capital invested by outside investors, Q, they add value by efficiently allocating capital, and because this skill is in short supply, they are able to capture this value, ΔV. That is, the NPV of the additional value added by the firm is the solution to

$$\Delta V = \max_{\{q_i\}} \sum_{i=1}^{I} q_i \psi_i(q_i) - I\bar{W} \quad s.t. \quad \sum_{i=1}^{I} q_i = Q. \tag{11}$$

The employee wage is set subject to the constraint that employees can choose to work for themselves, implying that each employee earns $\bar{W}$, and so total wage expenses are $I\bar{W}$. As before, in equilibrium, the NPV of outside investors' investment is zero, implying that they are indifferent to the choice of Q, so the firm executive can assume that outside investors will provide the level of Q that maximizes her value added, that is,

$$\Delta V = \max_{\{q_i, Q\}} \sum_{i=1}^{I} q_i \psi_i(q_i) - I\bar{W} \quad s.t. \quad \sum_{i=1}^{I} q_i = Q. \tag{12}$$

At the optimal allocation of capital, $\{\tilde{q}_1, \ldots, \tilde{q}_I, \tilde{Q}\}$,

$$\Delta V = \sum_{i=1}^{I} \tilde{q}_i \psi_i(\tilde{q}_i) - I\bar{W} \geq 0, \tag{13}$$

where the inequality follows because $q_i = \hat{q} \; \forall i$ and $Q = \bar{Q}$ is feasible.

For most firms neither q_i nor $\psi_i(q_i)$ are directly observable and so measuring ΔV is challenging. The mutual fund industry is exceptional because both quantities are directly observable at the employee level. In the next subsection we illustrate this explicitly in the context of a simple example.

2.3 A Simple Mutual Fund Example

Our objective is to measure the contribution of mutual fund firms, ΔV. In this regard, we are departing from the conventional approach in the mutual fund literature. In that literature researchers have used ψ, that is, alpha, to measure skill. Consequently, some readers have questioned our approach arguing that to correctly measure the contribution of the firm, we should be measuring $\Delta\psi$ rather than ΔV. For that reason, we will illustrate, in the context of a simple example, why $\Delta\psi$ does not measure the contribution

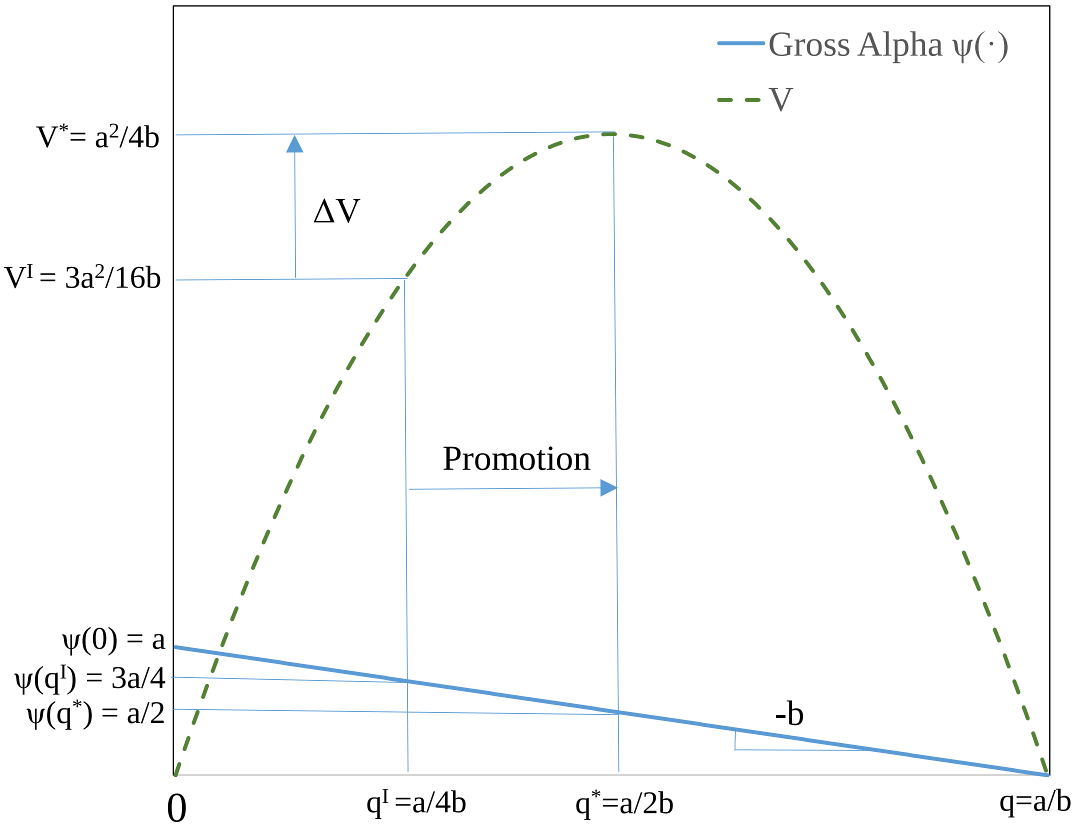

Figure 1: **Value Added and Gross Alpha**: The blue (solid) line plots gross alpha as a function of the size of the fund: $\psi(q) = a - bq$. The green (dashed) curve is the value added of the fund as a function of fund size, $q\ \psi(q)$.

of the firm.[7] Suppose

$$\psi(q) = a - bq,$$

that is, a fund manager's excess return on capital (gross alpha) on the first dollar she manages is a and it decreases at a rate b, plotted in blue in Figure 1. Assume that the parameters a and b are both known to firm executives. The optimal amount the manager should be managing is found by maximizing the total value added over q (the green dashed line in the figure):

$$\max_q q\psi(q) = q(a - bq).$$

[7]Berk and van Binsbergen (2015) prove (based on the arguments in Berk and Green (2004)), in a world that features competitive capital markets, that alpha measures do not measure skill.

The solution, which is illustrated in the figure, is

$$q^* = \frac{a}{2b},$$

implying that gross alpha at the optimum is

$$\psi(q^*) = \frac{a}{2}$$

and the maximum value added is

$$V^* = \frac{a^2}{4b}.$$

Now suppose that outside investors do not know the true parameters and instead believe that the manager's a is half as big as it really is. As a consequence they invest half as much as what is optimal, implying that the fund size is

$$q^I = \frac{a}{4b}.$$

At this level of capital the gross alpha is

$$\psi\left(\frac{a}{4b}\right) = \frac{3a}{4},$$

implying a value added of

$$V^I = \frac{3a^2}{16b}.$$

If the firm gives the manager the money she needs to get to her optimum (the firm promotes the manager by giving her the additional $\frac{a}{4b}$ dollars), the value added will go up from $\frac{3a^2}{16b}$ to $\frac{a^2}{4b}$, but the gross alpha will go *down* from $\frac{3a}{4}$ to $\frac{a}{2}$ (as illustrated in Figure 1). That is, the value the firm adds by giving the manager the optimal amount of money to manage can only be measured by comparing V^I to V^*. If we would mistakenly use $\Delta\psi = -\frac{a}{4}$ (the change in gross alpha) as the measure to evaluate the effectiveness of the promotion, we would come to the wrong conclusion that the promotion was a mistake, because the gross alpha went down. Consequently, interpreting a drop in gross alpha as a drop in employee skill is incorrect. It is true that the amount of value the employee adds on the marginal dollar has dropped, but that does not imply that the overall value she adds has dropped. To determine what happens to overall employee skill when an employee is assigned greater responsibility, one has to measure the change in overall employee value added. Section 8 of this paper undertakes an empirical investigation of what would happen had we mistakenly used gross alpha instead of value added to measure employee skill.

3 Data Definitions

The mutual fund industry is characterized by a large number of firms that market multiple funds to investors. Managers can manage multiple funds within a firm and funds can be managed by more than one manager. Because of SEC reporting requirements, we are able to observe detailed information on each fund. We know the fund's performance (i.e., realized returns), fees charged, total assets under management and importantly, the identity of its manager(s).

Customers provide the capital to mutual fund firms by investing in the firms' funds. That is, investors invest in funds, not firms. A firm cannot arbitrarily move capital from one of its funds to another fund. However, what firms can, and do, do is decide which manager gets to manage which fund. For that reason, the amount of capital a particular manager has under her control is affected by two things: (1) outside investors' decisions to put capital in or take capital out of the funds the manager manages, and (2) the firm executives' decisions to either give the manager responsibility for managing an additional fund or taking away that responsibility. By observing the second mechanism we will be able to infer whether the firm adds value by assigning capital to labor.

Let R_{it}^g be the gross return of fund i between time $t-1$ and t, that is, the realized return before management fees and expenses are taken out. Let R_{it}^B be the cost of capital of fund i between time $t-1$ and t, that is, the return from investing in the next best alternative opportunity of equal risk. Then the gross alpha of the fund is

$$\alpha_{it} \equiv E_t[R_{it+1}^g - R_{it+1}^B],$$

and so the expected value added of a fund at time t is $q_{it}\alpha_{it}$. Consequently, realized value added is observable at the fund level as:

$$V_{it} \equiv q_{it-1}\left(R_{it}^g - R_{it}^B\right), \tag{14}$$

where q_{it-1} is the amount of assets under management of fund i at $t-1$.

Some readers' initial reaction to the value added measure is to look at (14) and conclude that any increase in AUM automatically leads to an increase in value added. This initial reaction is incorrect as can easily be seen from Figure 1. If the manager is currently managing the optimal amount of capital, q^*, then if he is given additional capital to manage, and he chooses to actively manage this capital, his value added will go down. More generally, the argument ignores the budget constraint that requires that management fees must come from one of two sources (1) financial markets (through outperformance by stock picking) or (2) investors' pockets (by underperforming after fees). Notice that if the manager managing the fund has no skill, on average, the fund cannot make more than the benchmark return before fees. In this case, on average, value added cannot be positive. For the value added measure to be positive on average, the fund's manager must have some skill, that is, the fund must outperform the benchmark before fees. Therefore, if a manager is assigned additional capital to manage, the only way the value added of a fund can increase is if those additional funds are put to productive use by extracting more value from markets. When they are not, the value added of the manager (or fund) cannot increase. It is important to appreciate that this last observation relies exclusively on the aforementioned budget constraint. It does not rely on the assumption of decreasing returns to scale.

We will follow Berk and van Binsbergen (2015) and calculate the cost of capital by assuming that the next best alternative investment opportunity is the set of index funds offered by The Vanguard Group (see Table 10 in the Appendix for the specific funds used). If R_t^j is the return of the j'th Vanguard index fund at time t, then the benchmark return for fund i is given by:

$$R_{it}^B \equiv \sum_{j=1}^{n(t)} \beta_i^j R_t^j, \tag{15}$$

where $n(t)$ is the total number of index funds offered by Vanguard at time t and β_i^j is obtained from the appropriate linear projection, as described in Berk and van Binsbergen (2015), of the i'th active mutual fund onto the set of orthogonalized Vanguard index funds. By using Vanguard index funds as benchmarks, we can be certain that these portfolios include transaction costs and reflect the dynamic evolution of active strategies.

The realized value added by firm f at time t is the sum of all value created by its funds:

$$V_{ft} \equiv \sum_{i \in \Omega_{ft-1}} V_{it} \tag{16}$$

where Ω_{ft} is the set of all funds in firm f at time t. Funds are managed by at least one manager in the firm and managers can manage multiple funds. So we define the value added by manager m at time t as the sum of the value added of all the funds he manages. When a fund is managed by multiple managers, we divide the fund's value added equally across its managers. Let n_{it} be the number of managers managing fund i at time t. Then manager m's value added is,

$$V_{mt} \equiv \sum_{i \in \Omega_{mt-1}} \frac{V_{it}}{n_{it-1}}, \tag{17}$$

where Ω_{mt} is the set of all funds managed by m at time t. Using the same logic, the manager's AUM is:

$$q_{mt} \equiv \sum_{i \in \Omega_{mt}} \frac{q_{it}}{n_{it}}. \tag{18}$$

That is, a fund's AUM is divided equally amongst its managers so that every manager in a comanaged fund is attributed an equal fraction of that fund's AUM.

Although we can measure the total value added, what we are really interested in is ΔV, the value added of the firm in excess of the value that would have been created had the employees worked for themselves. Usually this quantity is difficult to measure because usually we cannot observe the counterfactual in which the firm's employees work for themselves. What is unique about mutual fund companies is that under mild assumptions, we can bound this counterfactual. The reason is that investors can effectively invest directly with an employee by investing in the fund. That is, if we assume that the amount of capital investors choose to invest with a particular manager (through the funds he manages) is the same as the amount of capital that they would have invested were the managers in those funds self employed, then any change to a manager's value added that results because of a firm decision to change the manager's AUM represents ΔV, the value added of the firm in excess of the value that would have been created had the employees worked for themselves. Of course, if moral hazard concerns are not very high, one would expect that investors would actually invest more capital when the fund is part of a firm because they know that the firm can use its private information to optimally assign managers. So under these conditions our measure represents a lower bound on ΔV.

4 Data Set

In this study, we build on the data set in Berk and van Binsbergen (2015). That data set, which covers the period from January 1977 to March 2011 is comprised of monthly observations compiled from combining two databases, the CRSP survivorship bias free mutual fund database and the Morningstar Principia database. We augment that data with the manager information provided by both data sources. Although both CRSP and Principia have information on fund managers and firms, this information is not consistently recorded in both databases.[8] For this reason, we make use of a third data source: Morningstar Direct. The Morningstar Direct database supposedly contains a clean and complete list of managers and firms for each fund in Principia that is still in existence, merged, or closed. However, there are examples of funds in Principia that are not in Morningstar Direct, especially early in the sample. This suggests that the Morningstar Direct database is not survivorship bias free. To make sure that we do not inadvertently introduce a survivorship bias into our data, we only use Morningstar Direct to augment our existing database. That is, we update the manager names on our existing database with information from Morningstar Direct, but, importantly, still keep and use the data in the original database that we could not update. For those funds for which we cannot identify a match in Morningstar Direct, we employ an automated algorithm as well as manual screening to clean up the manager information.[9]

Following Berk and van Binsbergen (2015), we drop all observations without an identifier, as well as observations with missing returns, AUMs, expense ratios or information on holding composition. We also remove all bond and money market funds[10] as well as index funds, by using the Principia *special criteria* indicator and screening fund names. To adjust for the effect of inflation, we restate all AUM observations in January 1, 2000 dollars. Mutual fund companies often market the same fund by offering different share classes that have diferent fees. We aggregate the different share classes of the same fund into one fund. Table 1 provides summary statistics of the remaining dataset. It consists of 601 firms, 10,423 managers, and 5542 funds. The average mutual fund exists in our data sample for about 95 months, whereas the average manager has a tenure of only 59 months before leaving our data sample.

Firms make capital reallocation decisions when they either give a fund to a manager

[8] In many cases, individual manager names are replaced with the words "Team Managed" and often manager names are not consistently recorded. In addition to examples of inconsistent spelling of a manager's name, there are other inconsistencies that we need to address. For example, sometimes the full name is spelled out, sometimes only the manager's initials are used, and sometimes his/her middle name is included.

[9] For a detailed description, see the Online Appendix to this paper.

[10] Consistent with Berk and van Binsbergen (2015), a money market fund is defined to be a fund with, on average, over 20% of its assets in cash. A bond fund is defined as a fund with, on average, over 50% of its assets in either bonds or cash.

	Total Number of			Average Number of				Average AUM per (Y2000 $ Billion)		
				Managers per		Funds per				
Year	Firms	Managers	Funds	Firm	Fund	Firm	Manager	Firm	Manager	Fund
1978	39	76	69	1.95	1.23	1.77	1.12	0.69	0.36	0.39
1981	49	108	99	2.20	1.29	2.02	1.19	0.76	0.34	0.38
1984	69	174	157	2.54	1.37	2.28	1.24	0.93	0.37	0.41
1987	116	332	292	2.89	1.44	2.52	1.27	1.26	0.44	0.50
1990	161	552	471	3.48	1.53	2.93	1.30	1.44	0.42	0.49
1993	290	1083	894	3.80	1.57	3.08	1.30	1.53	0.41	0.50
1996	356	1789	1395	5.23	1.77	3.92	1.38	2.99	0.60	0.76
1999	445	2739	2124	6.64	1.95	4.77	1.51	4.93	0.80	1.03
2002	501	3436	2672	7.83	2.12	5.33	1.65	4.74	0.69	0.89
2005	486	3651	2883	9.17	2.32	5.93	1.83	6.27	0.84	1.06
2008	510	4388	3621	11.6	2.77	7.10	2.28	8.76	1.02	1.23
2011	523	4455	3880	11.6	2.84	7.42	2.47	7.42	0.87	1.00

Table 1: **Characteristics of Mutual Fund Firms and Managers:** This table reports characteristics of mutual fund firms and managers for selected years in our dataset. When a fund is comanaged by N managers, we attribute $\frac{1}{N}$th of the fund's AUM to each of its managers.

to manage and thereby increase the manager's AUM, hereafter a promotion, or take away a fund from a manager and thereby decrease the manager's AUM, hereafter a demotion.[11] Of the 10,423 managers in our data sample, 2,769 have been promoted at least once in their careers, 2,024 have been demoted at least once, and 1,521 have been both promoted and demoted at different points in their careers. Of the 601 firms, 366 have engaged in some form of internal capital reallocation. Figure 2 shows at what point in her career a manager is most likely to be either promoted or demoted. Although capital reallocations can happen throughout a manager's career, most reallocations occur within the first three years of a manager's tenure.

As Figure 3 shows, the mutual fund industry is dominated by a few large firms. As of January 2011, the 5 largest mutual fund firms, which make up less than 1% of the total number of firms, hire 13% of all mutual fund managers and manage 46% of all assets in the industry. That 13% of managers manage 46% of the assets is suggestive that larger firms have better managers. Consequently, it is perhaps not surprising that 2,743 managers in our sample switched firms at least once in their careers.

[11]In cases in which a firm both adds and takes away a fund at the same time, we use the net change in assets due to the capital reallocation decision to determine whether the decision was a promotion or demotion.

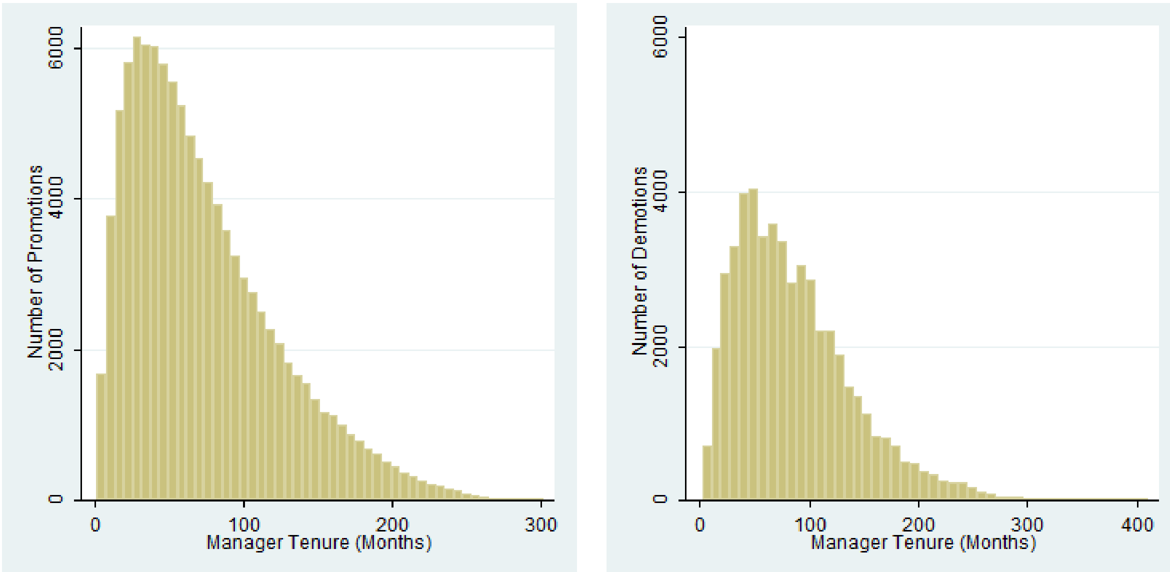

Figure 2: **Timing of Promotions and Demotions**. For every promotion (demotion), we compute the tenure of the promoted (demoted) manager as the number of months the manager has appeared in our database up to the point of that promotion (demotion). We pool all promotions (demotions) in our database, and then count and plot the number of promotions (demotions) that occur at each manager tenure. Multiple promotions (demotions) of the same manager are recorded as multiple observations in the plot.

5 Matching Capital with Skill

At first glance, it might seem that the most direct way to study the role of the firm would be to estimate an attribution model. Managers move frequently enough between firms to form a very well-connected network. So the most obvious approach to studying the role of the firm is to estimate a panel regression that includes fixed effects for firms and managers. Unfortunately, the results of such an approach would be difficult to interpret because manager moves are endogenous.

We see two issues. First, our objective is to quantify the contribution of the firm. We have instances of self employed managers,[12] so the firm fixed effect coefficient in a panel regression containing firm and manager fixed effects should measure the contribution of the firm. Our discomfort with this approach stems from the fact that we do not know why self employed managers choose to not work for firms. Since most managers choose to work for firms, there is likely something exceptional about a manager who chooses to work for himself. If the reason that managers choose self employment is correlated to skill, our estimates will be biased.

[12]When a firm consists of only one manager, that manager is considered self employed.

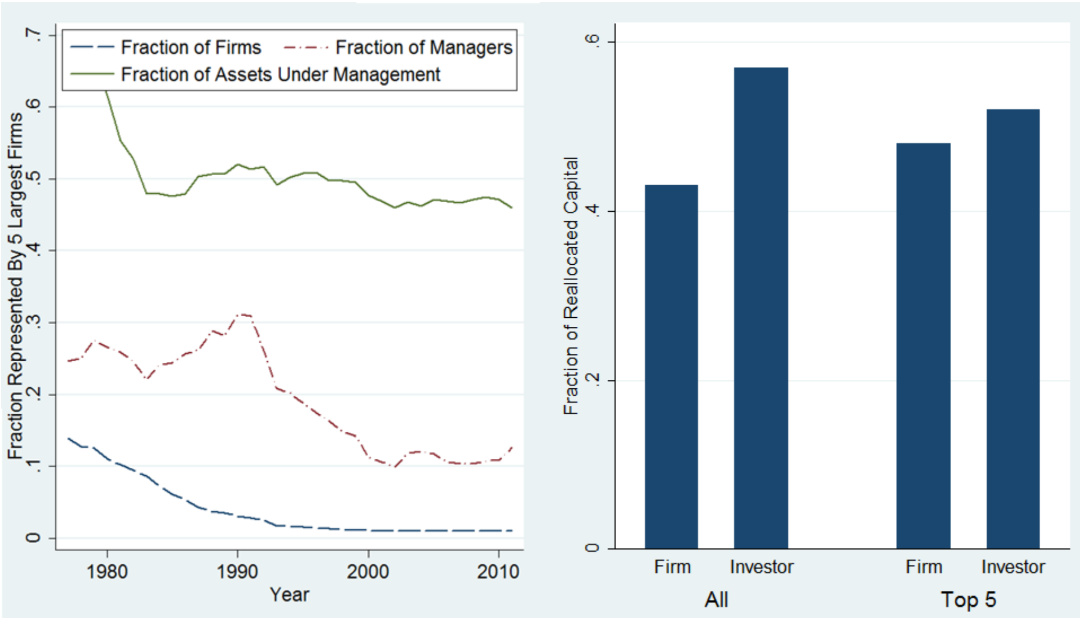

Figure 3: **Summary Statistics**: The graph on the left plots the share of all firms that the top five firms represent. The three measures are used: AUM (green solid line), number of managers employed (red dash-dotted line) and number of firms (blue dashed line). The bar chart on the right reports the fraction of the total reallocation of capital (i.e., the sum of the absolute value of capital changes) that results from investor fund flow and firm capital reallocation, both for all firms and the five largest families.

Our second concern derives from the fact that managers choose which firms they work for. Conceivably a firm could merely be a coordination device for managers to work together. If there is any aspect of managerial skill that is unobservable to anybody other than the manager herself, then in such a situation an attribution model could falsely attribute managerial skill to the firm.

We avoid both of these endogeneity issues by instead measuring the value added by the firm following a managerial move *within* the same firm. Because the promotion and demotion decisions are the purview of the firm alone, these internal firm moves cannot be driven by manager self selection. To illustrate the importance of firms' capital reallocation decisions, the bar chart in Figure 3 compares the magnitude of firm reallocation decisions to investor capital allocation decisions. That is, over the entire sample we sum up the absolute value of all AUM changes that result from promotions and demotions. We then do the same thing for the flow of investor funds — we sum up the absolute value of all investor inflows and outflows. The figure plots the result as a fraction of the total from both sources. Firm capital reallocation decisions are similar in magnitude to investor capital reallocation decisions, and are more important for the top five firms than other firms.

5.1 Formulating the Null Hypothesis

We take as the Null hypothesis the Coasian benchmark, a neoclassical world with no frictions and informational asymmetries. In this world investors already invest the optimal amount of capital in funds and therefore the firm cannot add value by assigning more or less capital to its fund managers.

We estimate a panel regression that includes a dummy that captures the internal capital reallocation decision. Specifically, we run:

$$V_{mt} = \lambda_t + \lambda_m + \lambda_f + \beta \cdot \mathbb{1}_{mt}^{\text{reallocated}} + \epsilon_{mt}, \tag{19}$$

where V_{mt} is the estimated value added of manager m at time t (defined in (17)); $\mathbb{1}_{mt}^{\text{reallocated}}$ is an indicator variable that takes on the value of 1 if manager m is internally promoted or demoted *before* time t; λ_m are manager fixed effects; λ_f are firm fixed effects and λ_t are time fixed effects. Under the Null, the firm's capital reallocation decision does not add value so β is not positive. The alternative is that the firm's reallocation decision does add value, so β is positive. Stated formally:

$$H_0\colon\ \beta \leq 0, \qquad H_a\colon\ \beta > 0.$$

5.2 Results

The results are reported in the first column of Table 2.[13] The firm adds \$681,000 per month when it makes a decision to either promote or demote one of its managers. This point estimate is statistically different from zero at the 99% confidence level.

Estimates of (19) may be biased if the capital reallocation decisions are correlated with past performance. If a manager is promoted (demoted) after superior (poor) performance, and if past performance has a component that is due to good (bad) luck, then in expectation the manager's future performance will mean revert. Consequently, past bad luck will be measured as future value added and past good luck will be measured

[13]Standard errors of the estimates in Table 2 are two-way clustered by manager and comanagement block. Recall that if a fund is comanaged we assign equal shares of the fund's value added to all of its managers, so two managers have correlated value added by construction if a fund exists that is managed by both managers. Consequently, we cluster standard errors by comanagement block, which is defined so that two observations of the same year are assigned to the same block if their managers comanage a fund during that year. Standard errors do not further increase if we instead assume all observations of the same year belong to the same comanagement block (i.e. we find no correlation across comanagement blocks). See Thompson (2011), Gameron, Gelbach, and Miller (2006) and Petersen (2009) for details on multi-way clustering.

Capital Reallocation	0.681**					
	(0.197)					
• Promotion		0.756**	0.879**	0.880**	0.868**	0.789**
		(0.250)	(0.258)	(0.259)	(0.263)	(0.261)
• Demotion		0.513	0.504	0.510	0.507	0.499
		(0.432)	(0.408)	(0.418)	(0.414)	(0.412)
Comanager					0.576**	
					(0.221)	
AUM			-0.436	-0.433	-0.434	
			(0.442)	(0.444)	(0.448)	
Manager Tenure				-0.083	-0.091	
				(0.110)	(0.107)	
Fixed Effects						
• Firm	Yes	Yes	Yes	Yes	Yes	Yes
• Manager	Yes	Yes	Yes	Yes	Yes	Yes
• Yearmonth	Yes	Yes	Yes	Yes	Yes	Yes
Observations	609,932	609,932	609,932	609,932	609,932	609,932

Table 2: **Internal Reallocation of Capital:** The dependent variable in the table is V_{mt}, as defined in (17), each managers return in excess of the benchmark times that managers AUM, measured in $ millions/month. The first column of the table reports the panel regression specification that uses the capital reallocation dummy from (19). The next column reports the specification where we split reallocations into promotions and demotions, that is, the estimates from (20). The following two columns add lagged AUM (q_{mt-1}) and manager tenure (measured in years since entry into the database) as additional regressors. The fifth column includes, as an additional regressor, a dummy variable that equals one after a comanager is added to a fund that the manager under consideration manages and remains on until the manager under consideration is either promoted or demoted. The final column defines promotions and demotions based on the change in the total dollar fees collected, rather than just the change in AUM. Manager, firm and yearmonth fixed effects are included in all regression specifications. Standard errors, heteroskedastic-robust and two-way clustered by manager and by comanagement block, are provided in parentheses. * (**) indicates that the estimate is significantly different from zero at the 95% (99%) confidence level.

as value destroyed by the manager. To examine the importance of this issue, we split the reallocation dummy $\mathbb{1}_{mt}^{\text{reallocated}}$ into two dummies, one for a promotion $\mathbb{1}_{mt}^{\text{promoted}}$, and one for a demotion $\mathbb{1}_{mt}^{\text{demoted}}$. The promotion dummy takes on a value of 1 if the most recent capital reallocation decision resulted in a net increase in the manager's AUM and zero otherwise. Similarly, the demotion dummy takes on the value of 1 if the most recent capital reallocation decision resulted in a net decrease in the manager's AUM and zero otherwise. So, for example, if for a particular manager, the first capital reallocation decision is a promotion at time t_1 and the second decision is a demotion at time t_2, then both dummies will be zero up to time t_1, the promotion dummy will be 1 until time t_2 and zero afterwards and the demotion dummy will be zero up to time t_2 and 1 afterwards. We then run the following panel regression:

$$V_{mt} = \lambda_t + \lambda_m + \lambda_f + \beta_p \cdot \mathbb{1}_{mt}^{\text{promoted}} + \beta_d \cdot \mathbb{1}_{mt}^{\text{demoted}} + \epsilon_{mt} \qquad (20)$$

where the definitions of all other variables are consistent with those from (19). The second column of Table 2 reports the results. The coefficients on the promotion and demotion dummies are positive, and importantly, the promotion dummy is \$756,000 dollars per month and statistically significantly different from zero. Because the mean reversion effect biases the coefficient on the promotion dummy downwards, this estimate underestimates the value created by the promotion decision. We can therefore confidently reject the Null hypothesis.

We next include lagged AUM (q_{mt-1}) as an additional explanatory variable and report the results in the third column of Table 2.[14] The coefficient estimate on AUM is insignificant, the point estimate has a negative sign, and the promotion dummy remains highly significant, indicating that a change in the manager's AUM, by itself, does not change the manager's value added. Value added is only increased when that change results from a firm promotion or demotion decision.

It is likely that a manager's value added rises with experience and so the firm's promotion decisions might be partially based on manager tenure.[15] To decompose the capital reallocation decision into the portion that is driven by experience and the portion driven by other factors, we control for managerial experience by including the number of prior years the manager has managed money (at the current firm as well as any prior firms

[14]The end of period AUM is mechanically positively correlated with performance because it is partially determined by the fund's return over the period.

[15]See Pastor, Stambaugh, and Taylor (2015) for analysis on the relationship between skill and manager tenure.

she might have worked for). As reported in the fourth column of Table 2, the coefficient is not statistically significantly different from zero and including tenure does not change the magnitude of the coefficient on the promotion dummy. Firms use factors other than tenure to make promotion decisions.

The fifth column of Table 2 examines the effect of a promotion decision on existing managers. That is, what happens to the value added of an existing manager when another manager is added to one of his funds? To answer this question, we include a new dummy (termed "comanager") that switches on whenever a new comanager is added to a fund that the manager under consideration manages, and remains on until the manager under consideration experiences a capital reallocation decision. The coefficient estimate is positive and significant, implying that the addition of the new manager has positive spillovers. Either the new manager's value added is above the average value added of existing managers, or there are positive synergistic effects, so the addition of a new manager increases the value added of existing managers. In either case, the implication is that the coefficient on the promotion dummy underestimates the value of the firm's decision to increase its manager's AUM.

We have defined promotions (and demotions) based on the change in AUM. But from the firm's perspective, what is arguably more important is the dollar fees the manager generates for the firm. To address this issue, we redefine promotion and demotion based on the change in the manager's revenue. That is, a promotion is a capital reallocation decision that increases the dollar fees collected (AUM $\times$ expense ratio), and a demotion decreases the dollar fees collected. We then re-estimate (20) using this definition in the sixth column of Table 2. A comparison between the second and sixth columns reveals that using this alternative definition of a promotion and a demotion does not change our results. Based on the evidence in Table 2 we can confidently reject the Null that firm capital reallocation decisions do not add value.

The point estimate of the coefficient on the demotion dummy is positive, as one would expect if the decision to demote is optimal. If the manager was managing too much money and thereby destroying value (perhaps by trading too much) the decision to demote will increase the manager's value added. The estimate is not statistically significantly different from zero. The power to reject is lower for demotions than for promotions because our data set is censored. When a manager is demoted and fired at the same time we do not observe his subsequent value added. One way to address this issue is to explicitly recognize that once a manager leaves a firm his contribution to the firm's value added is zero. The problem with this approach is that the decision to leave is not necessarily the firm's decision, so not all separations are also demotions. To distinguish voluntary separations (retirement decisions) from firings (demotions), we infer whether the manager was fired based on the firm's earlier capital reallocation decisions and the manager's subsequent actions. We assume that if the most recent capital reallocation decision was a demotion and the manager does not get another job with a different firm, then the separation decision was a firing. That is, we set all subsequent value added observations to zero when a manager leaves the database and his demotion dummy is on at the time of the separation. Table 3 presents the results of rerunning the above analysis in this augmented database. The demotion dummy remains positive and is now statistically significantly different from zero in all specifications, consistent with the hypothesis that the decision to demote is optimal. Managers who are dismissed were destroying value prior to the dismissal. However, caution in interpreting these results is still in order. First, our decision rule separating voluntary separations from firings is unlikely to work perfectly, and second, the coefficient on the dismissal dummy is potentially upward biased because of the aforementioned tendency for value added to mean revert. We will provide further evidence on the second concern in Section 7.

The value added numbers reported in Table 2 indicate that the value created from a capital reallocation decision is large. However, it is important to appreciate that we don't know what would have happened had the firm not reassigned the capital. That is, these numbers quantify the total value created, but do not necessarily quantify the value created by the firm. Had the firm not reassigned the capital, potentially, investors could have done the reassignment themselves. That is, to interpret our estimates as solely the value created by the firm, one has to assume that no capital adjustment would have occurred through the flow of funds. In the short term, this implicit assumption is not unrealistic; in months in which the firm reallocates capital, the magnitude of the firm's capital allocation decisions dwarfs the magnitude of inflows and outflows. However, over longer periods of time, inflows and outflows accumulate and eventually lead to an overall change in AUM that is commensurate with the magnitude of promotions and demotions. So to quantitatively assess the magnitude of the additional value added of the firm, we must construct a counterfactual. To be conservative, we will focus on promotions because, as we argued above, our estimate of the value added of a promotion is an underestimate.

To construct a realistic counterfactual, we assume that the manager's subsequent inflows would match the inflows, over the same time period, of a comparable set of managers.

Capital Reallocation	0.712**		
	(0.198)		
• Promotion		0.703**	0.695**
		(0.225)	(0.228)
• Demotion		0.720*	0.731*
		(0.335)	(0.337)
Fixed Effects			
• Firm	Yes	Yes	Yes
• Manager	Yes	Yes	Yes
• Yearmonth	Yes	Yes	Yes
Observations	707,926	707,926	707,926

Table 3: **Internal Reallocation of Capital (Adjusted for Firings):** The dependent variable in the table is V_{mt}, as defined in (17), each managers return in excess of the benchmark times that managers AUM, measured in $ millions/month. If a manager drops off the database when his demotion dummy is on we fill in a value added of zero for that manager for all subsequent firm observations. The first column of the table reports the panel regression specification that uses the capital reallocation dummy from (19). The next column reports the specification where we split reallocations into promotions and demotions, that is, the estimates from (20). The final column defines promotions and demotions based on the change in the total dollar fees collected, rather than just the change in AUM. Manager, firm and yearmonth fixed effects are included in all regression specifications. Standard errors, heteroskedastic-robust and two-way clustered by manager and by comanagement block, are provided in parentheses. * (**) indicates that the estimate is significantly different from zero at the 95% (99%) confidence level.

Rather than construct a single counterfactual from one set of comparables, we construct a range of counterfactuals. We construct the first counterfactual by assuming the promoted manager would have experienced the same percentage increase in her AUM due to flows as the weighted average percentage increase due to flows of all managers in that month. We then construct the other counterfactuals by narrowing the set of comparable managers. We eliminate all managers whose past two-year net return over the benchmark was below a particular quantile and then assume that the manager's percentage inflow would have been the same as the weighted average percentage inflow of the remaining managers in the counterfactual. For example, the second counterfactual eliminates managers whose two-year return over the benchmark is in the bottom 1% and computes the flow of funds by taking the weighted average of the remaining 99%. The third counterfactual eliminates the bottom 2% and we continue this process up to the extreme counterfactual which eliminates the bottom 99%, and thus computes the flows by taking the weighted average flows of managers with performance in the top 1%.

Using the percentage increases computed under the counterfactual flows, we recompute what the AUM of the manager would have been. We do this until the counterfactual AUM either grows to the manager's actual AUM or the manager is demoted. Once either event occurs, we use the actual AUM from then onwards. We then re-estimate the value added of a promotion using the counterfactual AUM.

To formally define how we calculate the counterfactuals, first define the manager's gross return as follows:

$$R^g_{mt} = \frac{1}{q_{mt-1}} \sum_{i \in \Omega_{mt-1}} \frac{q_{it-1}}{n_{it-1}} R^g_{it}. \tag{21}$$

Next define fund i's net return (the return after the expense ratio, ϕ_{it-1}, is taken out) as $R^n_{it} = R^g_{it} - \phi_{it-1}$. Then the manager's net return, R^n_{mt}, is calculated by weighting the net return across the funds he manages:

$$R^n_{mt} = \frac{1}{q_{mt-1}} \sum_{i \in \Omega_{mt-1}} \frac{q_{it-1}}{n_{it-1}} R^n_{it}. \tag{22}$$

Similarly, the manager's benchmark return is constructed from the benchmark returns of the funds he manages:

$$R^B_{mt} = \frac{1}{q_{mt-1}} \sum_{i \in \Omega_{mt-1}} \frac{q_{it-1}}{n_{it-1}} R^B_{it}. \tag{23}$$

Next, let q_{*t} and R^n_{*t} be the weighted average AUM and net return of the comparable managers under the counterfactual. Then, for a promotion that occurs at time τ, we define q^C_{mt} for $t \geq \tau$ (the manager's AUM under the counterfactual) as follows:

$$q^C_{mt} = \begin{cases} q_{mt-1}\left(1 + \frac{q_{*t} - q_{*t-1}(1+R^n_{*t})}{q_{*t-1}(1+R^n_{*t})}\right)(1 + R^n_{mt}) & \text{if } t = \tau \\ q^C_{mt-1}\left(1 + \frac{q_{*t} - q_{*t-1}(1+R^n_{*t})}{q_{*t-1}(1+R^n_{*t})}\right)(1 + R^n_{mt}) & \text{if } t > \tau \end{cases}.$$

Now, after a promotion at time τ, the value added of the manager can be expressed as follows:

$$\begin{aligned} V_{mt} &= \left(q_{m\tau-1} + \left(q^C_{mt-1} - q_{m\tau-1}\right) + \left(q_{mt-1} - q^C_{mt-1}\right)\right)\left(R^g_{mt} - R^B_{mt}\right) \\ &= \underbrace{q_{m\tau-1}\left(R^g_{mt} - R^B_{mt}\right)}_{\{1\}} + \underbrace{\left(q_{mt-1} - q^C_{mt-1}\right)\left(R^g_{mt} - R^B_{mt}\right)}_{\{2\}} + \underbrace{\left(q^C_{mt-1} - q_{m\tau-1}\right)\left(R^g_{mt} - R^B_{mt}\right)}_{\{3\}}. \end{aligned}$$

The first term, {1}, measures the manager's value added without the promotion and without future inflows or outflows. The second term, {2}, measures the contribution to the manager's value added of the promotion. The last term, {3}, measures the contribution to value added through investor flows under the counterfactual. To measure just the contribution of the promotion, we need to drop the third term. Thus, define the adjusted value added as:

$$\begin{aligned}\hat{V}_{mt} &\equiv \left(q_{m\tau-1} + \left(q_{mt-1} - q^C_{mt-1}\right)\right)\left(R^g_{mt} - R^B_{mt}\right) \\ &= V_{mt} \cdot \frac{q_{m\tau-1} + q_{mt-1} - q^C_{mt-1}}{q_{mt-1}}.\end{aligned}$$

To estimate the magnitude of the value added of just the promotion, we replace V_{mt} with $\hat{V}_{mt}$ over the time period from the promotion until the first time $q^C_{mt} > q_{mt}$ or the manager is demoted (whichever comes first). We then repeat the previous test, that is, we estimate (20), using the counterfactually computed value added. Figure 4 plots the coefficient on the promotion dummy over the range of counterfactuals discussed above. Even under the extreme assumption that the counterfactual is computed solely from managers in the top 1% of the performance distribution, the firm's contribution to value added is still very large ($\$474,000$ per month).

We can interpret the values in Figure 4 as a lower bound on the average value a firm adds to its manager upon promotion. From these numbers we can also compute a lower bound on the fraction of value added that is attributable to the existence of mutual fund firms. Taking the estimate for the value added of a promotion reported in Figure 4, we multiply by the fraction of months in which the promotion dummy is equal to one (17%) to get the average value of a promotion decision. Figure 5 reports this number, for all the counterfactuals, as a fraction of the average total value added in the sample (which is $\$274,000$ per month).[16] Even for the extreme counterfactual where flows are assumed to be equivalent to the flows of the top 1% of managers, the firm still contributes about 30% of total value added.

Another way to assess the overall impact of promotions (demotions) is to ask how long it would have taken for investors to achieve the reallocation of funds the promotion (demotion) decision achieved. To answer this question for promotions, under each counterfactual, we compute how many years it would have taken for investors to provide the equivalent amount of additional AUM through the flow of funds alone. If this date does

[16]That is, the average V_{mt} across all managers at all points in time.

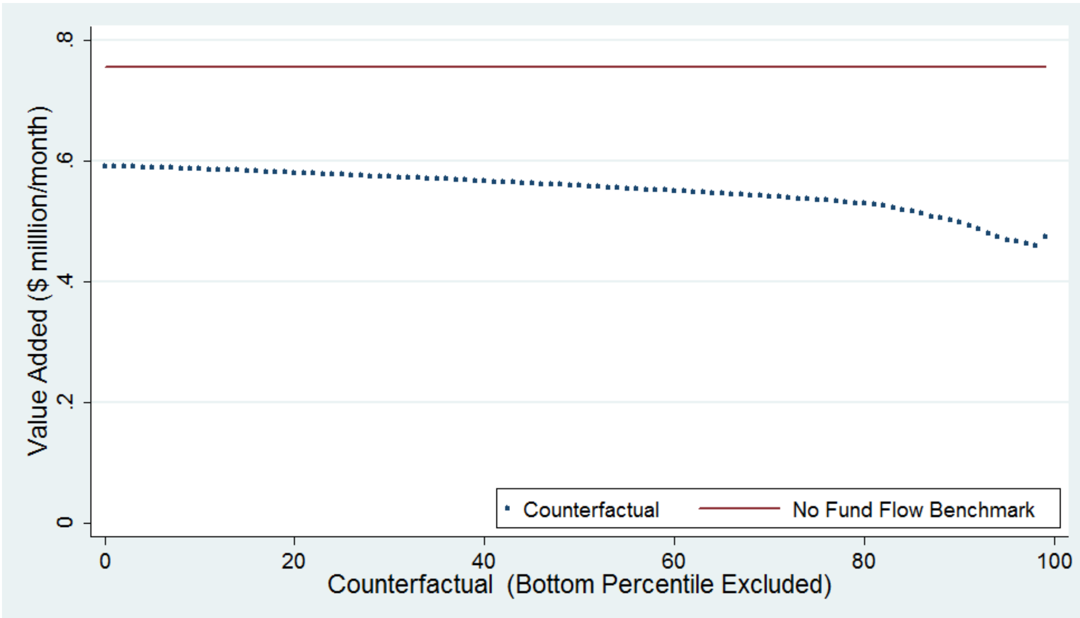

Figure 4: **Firm Value Added Under a Range of Counterfactuals**: We re-estimate (20) using only the promotion dummy and the counterfactual value added, $\hat{V}_{mt}$ as defined in (24), instead of V_{mt} . The counterfactual value added is computed by excluding all funds with performance below the indicated percentile and then assuming that under the counterfactual a manager would have experienced the same inflow of funds as the weighted average inflow of all remaining managers in that month.

not occur by the last date of our sample, we assume that capital will continue to flow at a rate equal to the flow of funds, under the counterfactual, in the average month of our entire sample. That is, fund flow after March 2011 is assumed to be equal to the average historical fund flow under the counterfactual. We then average the time taken across all promotions for a given counterfactual. We conduct a similar exercise for demotions, except that we redefine the counterfactuals. In this case instead of dropping the worst performing managers, we drop the best performing managers. That is, we eliminate all managers whose monthly net return over the benchmark was above a particular quantile and then assume that the manager's percentage inflow would have been the same as the weighted average percentage inflow in that month of the remaining managers. For example, the most extreme counterfactual eliminates the top 99% of funds and computes the flow of funds by taking the weighted average of the remaining 1%.

Figure 6 plots the average time it would have taken for investors to achieve the same change in AUM for both promotions and demotions under each counterfactual. For promotions, even under the most extreme counterfactual, it would have taken 6 years for investors to achieve what the firm achieved in a single month. For demotions the effect is less extreme. Under the most extreme counterfactual, it would take 2 years for investor

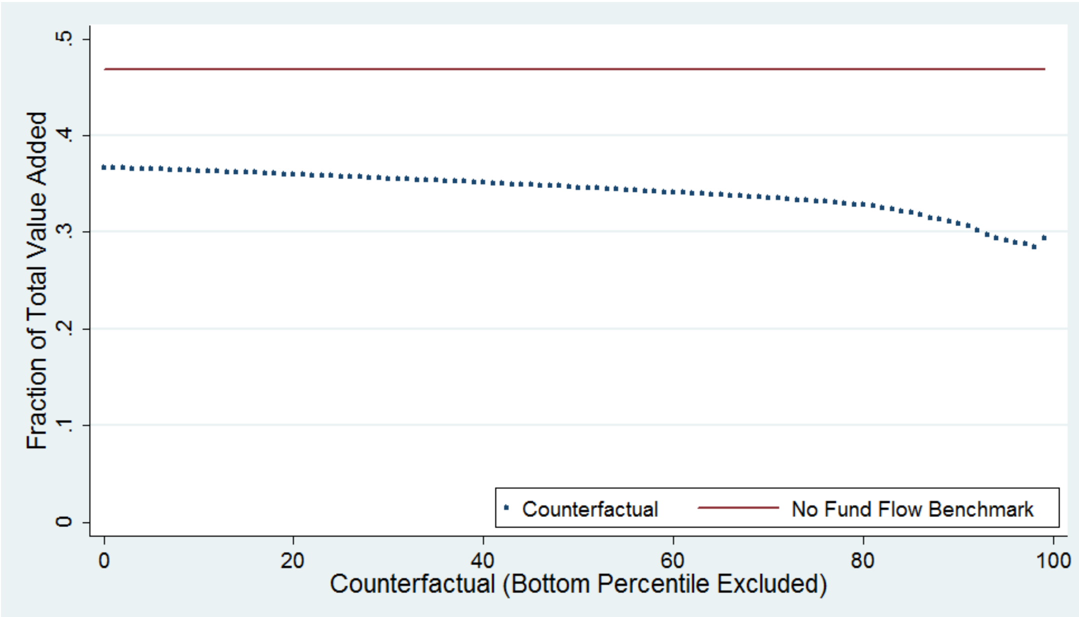

Figure 5: **Firm Contribution as a Fraction of Total Value Added**: We compute a lower bound on the firm's contribution as a fraction of total value added by multiplying the value of a promotion under each counterfactual by the fraction of periods in which the promotion dummy is equal to one. We then divide this estimate by the average value added per manager per month. We plot this fraction for each of the 100 counterfactuals considered.

outflows to achieve the same effect as the demotion decision. However, in this case, the fact that we ignore demotions that are associated with firings is likely to materially impact our estimates. The reason is that when a manager is fired, the magnitude of the demotion is large (the manager loses all of his funds). Thus, by ignoring those observations we are restricting attention to the smaller demotion decisions, and so it is not surprising that investors can match the firm's demotion decision in a shorter amount of time than for promotions.

6 Investor Response to Capital Reallocation

In the previous section we demonstrated that the firm's capital reallocation decisions add significant value. But for firms to capture this value, it is important that investors are aware of this, and respond to capital reallocation decisions by investing additional capital with the firm. In this section we show that, indeed, this is the case.

Investors pay firms a fixed fraction (the expense ratio) of assets under management. Because firms rarely change the expense ratios of their funds, what drives changes in

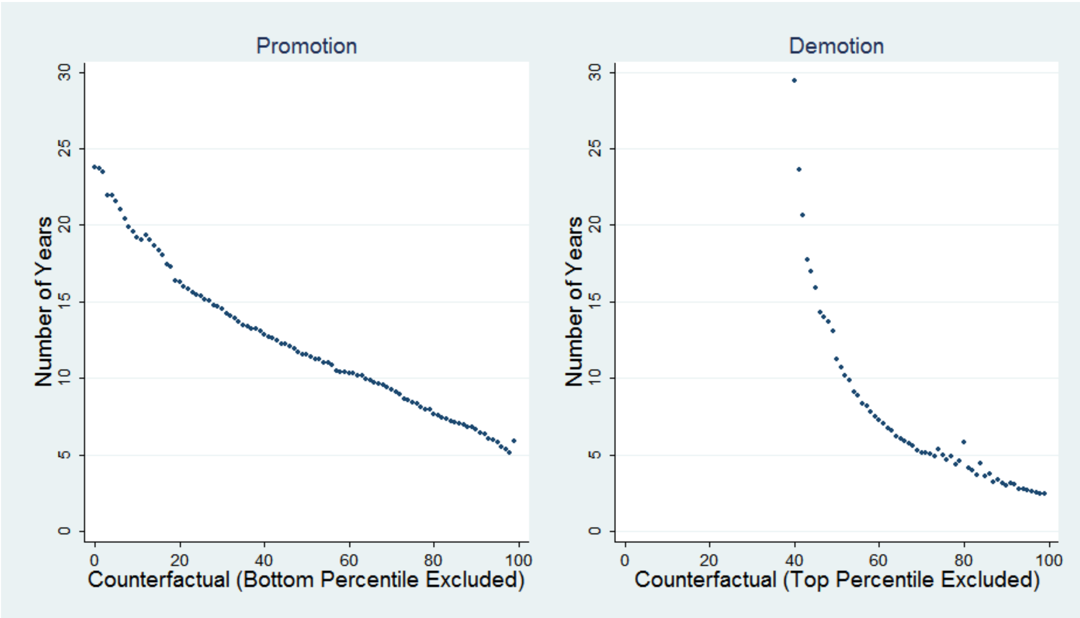

Figure 6: **Time Taken to Reach Same AUM Under a Range of Counterfactuals**: Under each counterfactual, we compute the number of years it would have taken for investors (through the flow of funds) to match the equivalent change in AUM as the promotion (demotion) decision.

firm compensation is changes in AUM. Thus, if investors understand the importance of capital reallocation decisions, in response to observing a reallocation of capital, one would expect them to invest additional capital in the firm, thereby increasing the firm's overall compensation.

To determine whether or not investors react in this way, we first define firm compensation as the sum of the total compensation it receives managing its funds, that is,

$$\Pi_{ft} \equiv \sum_{i \in \Omega_{ft}} q_{it} \phi_{it}, \tag{24}$$

where ϕ_{it} is the expense ratio fund i charges between time t and $t+1$. We then collapse our data into quarterly observations[17] and run the following regression:

$$\Delta\Pi_{ft} = \lambda_f + \lambda_t + \beta \cdot \mathbb{1}_{ft}^{\text{reallocate}} + \delta \cdot \text{tenure}_{ft} + \sum_{s=0}^{1} \gamma_s \cdot (R_{ft-s}^{n} - R_{ft-s}^{B}) + \epsilon_{ft} \tag{25}$$

where $\Delta\Pi_{ft} \equiv \Pi_{ft} - \Pi_{ft-1}$ denotes the change in firm f's overall compensation in quarter t; the dummy $\mathbb{1}_{ft}^{\text{reallocate}}$ equals one if firm f promotes or demotes (or both) at least one of

[17]Expense ratios are only reported quarterly for most funds.

its managers during quarter t, and zero otherwise; λ_f and λ_t are firm and time fixed effects; tenure_{ft} denotes the number of years firm f has been in our database; and $(R^n_{ft} - R^B_{ft})$ is the firm's overall abnormal return in quarter t, that is, $R^n_{ft} \equiv \sum_{i \in \Omega_{ft-1}} q_{it-1} R^n_{it}$ and $R^B_{ft} \equiv \sum_{i \in \Omega_{ft-1}} q_{it-1} R^B_{it}$. Current and one-quarter lagged abnormal returns are included in the regression to ensure that our results are not driven by the firm and investors responding simultaneously to superior (or poor) performance of managers.

We report estimated coefficients of (25) in the first two columns of Table 4. Results from the table show that the total fees a firm is able to collect from investors increase significantly when it makes a capital reallocation. Interestingly the coefficient on the capital reallocation dummy is not affected by whether abnormal returns are included in the regression, even though abnormal returns do explain changes in firm compensation. What the table implies is that investors do not only use returns to infer future fund performance. They also use capital reallocation decisions. By comparing the coefficients in Table 4 it is possible to assess the relative importance of the information contained in a capital allocation decision versus a realized abnormal return. To generate an equivalent flow of funds of a capital reallocation decision, the abnormal return over the quarter would have to exceed 24% on an annualized basis.

We also examine investors' response to promotions and demotions at the firm level separately. To do so, we replace the firm reallocation dummy $\mathbb{1}^{\text{reallocate}}_{ft}$ with a dummy that equals one whenever the firm promotes (demotes) at least one of its managers during quarter t, and zero otherwise. The regressions are re-run and estimated coefficients are reported in the third and fourth columns of Table 4. We find that investors react to both promotion and demotion decisions by investing more capital in the firm's funds.[18]

Next, we decompose change in total fees into two components: (1) change in the firm's weighted average expense ratio, and (2) change in the firm's overall AUM (i.e. flow of funds). We then re-run (25) replacing the change in compensation on the left-hand-side of the equation with each of these components. Estimated coefficients are reported in the fifth and sixth columns of Table 4. We find no noticeable change in expense ratio accompanying a reallocation decision. Instead, the change in firm compensation derives almost exclusively from investors providing the firm with additional capital whenever it

[18]The demotion result is consistent with Gervais, Lynch, and Musto (2005) and Dangl, Wu, and Zechner (2008). In the former paper the firm's decision to fire managers communicates information to investors. In the latter paper managers, firms and investors are symmetrically informed so the result is not driven by information differences, but instead derives from the objective function the firm maximizes (which is not the same as investors' objectives).

	Change In					
	Compensation				Expense Ratio	AUM
Capital Reallocation	0.121**	0.121**			-0.004	0.137**
	(0.038)	(0.038)			(0.003)	(0.038)
• Promotion			0.107**			
			(0.042)			
• Demotion				0.189**		
				(0.053)		
Firm Tenure	0.008	0.008	0.009	0.008	-0.002**	0.011
	(0.012)	(0.012)	(0.012)	(0.012)	(0.001)	(0.012)
Abnormal Return		1.920**	1.900**	1.918**	0.031	1.910**
		(0.288)	(0.324)	(0.282)	(0.019)	(0.326)
Lagged Abnormal Return		0.610*	0.641*	0.606*	0.043*	0.656*
		(0.295)	(0.278)	(0.281)	(0.019)	(0.279)
Fixed Effects						
• Firm	Yes	Yes	Yes	Yes	Yes	Yes
• Yearmonth	Yes	Yes	Yes	Yes	Yes	Yes
Observations	151,807	151,807	151,807	151,807	151,807	151,807

Table 4: **Change in Firm Compensation from Capital Reallocation Decisions:** The first two columns of the table report the panel regression specification described in (25), where the change in firm f's overall compensation in quarter t, $\Delta\Pi_{ft}$, is regressed on a dummy variable for whether the firm made a capital reallocation decision, a measure of managerial tenure, past abnormal returns as well as firm and time fixed effects. The next two columns replace the reallocation dummy with a promotion (demotion) dummy that equals one if the firm has promoted (demoted) at least one manager during the time period. For the fifth and sixth columns, the dependent variable is replaced with the change in the firm's weighted average expense ratio and overall AUM respectively. Standard errors, heteroskedastic-robust and two-way clustered by firm and by date, are provided in parentheses. All numbers are reported in $ millions/month. * (**) indicates that the estimate is significantly different from zero at the 95% (99%) confidence level.

reallocates funds to managers.

The results in Table 4 paint a remarkable picture of labor market efficiency. By correctly allocating managers, firms increase managerial productivity. Investors recognize this important role of the firm, and so they react to capital reallocations by investing additional capital in the firm. These additional capital inflows allow firms (using the logic outlined in Berk and Green (2004)) to capture the additional rents associated with the capital reallocation decision.

7 Source of Firm Skill

The results in Section 5 imply that by changing the amount of capital under management the firm can affect a manager's ability to generate value. Although such a result might seem obvious, it is in fact not consistent with the standard neoclassical assumptions in Berk and Green (2004). In that model, investor fund flows are always sufficient to ensure that managers have enough capital to extract the maximum amount of value from markets. If, in fact, the manager was managing the optimal amount of capital before being promoted, she would not be able to put the new capital to productive use, resulting in no increase in value added. The fact that adding capital creates value implies that, for whatever reason, the manager was not managing the optimal amount of capital prior to the promotion, and, more importantly, this misallocation was corrected by a decision made by the firm (rather than by investors).

A key assumption in Berk and Green (2004) is that investors and managers have the same information about the manager's ability. Thus, one possible explanation for our results is an asymmetry of information between investors, managers and firms. As a consequence of this asymmetry, firms have a role intermediating between managers and investors. Capital reallocation decisions add value because firms have more information than investors about managerial ability and firm executives use this information to direct capital away from overfunded managers towards underfunded managers. For example, firm executives know every trade a manager makes, and in addition, trades that the manager chooses not to make. Note that if managers know their own ability and are able to borrow (or go short) the firm would not need to intermediate. This explanation for our results therefore requires that one or both of these conditions are not satisfied.

A concern that one might have interpreting the value added by the firm as rents for private information, is that investors might rationally anticipate the firm's capital reallocation decisions in determining their own investment decisions. That is, it is conceivable that investors have the same information as the firm, but knowing that firms will reallocate capital for them, investors rationally choose not to reallocate capital amongst the firm's funds themselves. In this case our estimate of value added by the firm measures a transfer of duty from investors to firms, but does not represent additional value creation by the firm that would not otherwise occur. Of course, since it is costly to run a firm, this hypothesis begs the question of why an investor would pay somebody else to do something they could do themselves. Nevertheless, we can use the existence of single manager firms to test the plausibility of this hypothesis. For such managers, the only mechanism that adjusts AUM is investor flows. Thus, if investors are letting firms do something they could do themselves, we should observe a much stronger flow of funds relation for self-employed managers than for those that work for firms.

The percentage change in AUM for a manager due to the flow of funds from investors is:

$$flow_{mt} = \frac{1}{q_{mt-1}\left(1 + R^n_{mt}\right)} \sum_{i \in \Omega_{mt-1}} \frac{q_{it} - q_{it-1}\left(1 + R^n_{it}\right)}{n_{it-1}}. \tag{26}$$

Using this measure, we test for differences in the flow of fund performance relation between self-employed managers and other managers by running the following regression over horizons of $\tau = 1$, 3, 6, 12 and 24 months:

$$flow_{mt} = \lambda_t + \delta \cdot \text{tenure}_{mt} + \left(\beta + \gamma \cdot \mathbb{1}^{\text{self-employed}}_{mt}\right) \sum_{s=0}^{\tau-1} \frac{1}{\tau}\left(R^n_{mt-s} - R^B_{mt-s}\right) + \epsilon_{mt}, \tag{27}$$

where λ_t are time fixed effects and tenure_{mt} is the number of years the manager has been in the database at time t. The dummy variable $\mathbb{1}^{\text{self-employed}}_{mt}$ takes on the value of 1 if manager m is self-employed at time t and 0 otherwise, so the coefficient γ in (27) compares the sensitivity of the flow performance relation of self-employed managers with all other managers. In line with the existing literature, we winsorize the flow of funds at the 1st and 99th percentiles.[19] Table 5 reports the coefficient estimates.

For both types of managers, investor fund flow responds significantly to performance. But more importantly, for our purposes, the estimated γ is never significantly positive and the point estimate is almost always negative. There is no evidence that the flow of funds performance relation is stronger for self-employed managers than for other managers. For

[19] See Chen, Hong, Jiang, and Kubik (2013), Kacperczyk, Sialm, and Zheng (2008), and Huang, Sialm, and Zhang (2011).

	1-Month	3-Months	6-Months	12-Months	24-Months
β	0.009	0.345**	0.676**	1.198**	1.612**
	(0.059)	(0.051)	(0.055)	(0.066)	(0.073)
γ	0.035	-0.101	-0.184	-0.434*	-0.522
	(0.064)	(0.076)	(0.119)	(0.205)	(0.318)
Manager Tenure	-0.024**	-0.025**	-0.026**	-0.027**	-0.027**
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Yearmonth Fixed Effect	Yes	Yes	Yes	Yes	Yes
Adjusted R^2 (%)	0.08	1.40	2.82	4.75	4.86
Observations	409,873	409,873	409,873	409,873	409,873

Table 5: **Sensitivity of Fund Flow to Performance:** This table reports the coefficient estimates of (27). The dependent variable is the change in the manager's AUM that results from capital flows from investors. Each column in the table reports the results of regressing this measure onto the manager's realized return in excess of the benchmark (with coefficient β) as well as an interaction term (with coefficient γ) for whether the manager is self employed over the past 1, 3, 6, 12 and 24 months. Manager tenure (length of time the manager has been in the database) and yearmonth fixed effects are included in all the regression specifications. Adjusted R^2 values are also reported. Standard errors, in parentheses, are two-way clustered by manager and by comanagement block. * (**) indicates that the estimate is significantly different from zero at the 95% (99%) confidence level.

these results to be consistent with an inattention story, investors would not only need to be inattentive, they would also need to not realize they are being inattentive (and so treat self employed managers similarly to managers who work for firms). Although the choice of employment is endogenous it is hard to see how this endogeniety could explain this result because that would require that whether or not a manager chooses to be self employed affects investor attention.

Presumably the firm's informational advantage results from its unique ability to observe its own employees. Consequently, if private information plays an important role in the firm's decisions, we should expect internal capital allocation decisions to add more value than capital reallocations that result from managers changing firms. To test this hypothesis, we define an external promotion as a change in the firm a manager works for that is also accompanied by an increase in the manager's AUM. Similarly, an external demotion is a job change that is accompanied by a decrease in the manager's AUM. We repeat the same tests as we did for internal capital changes using these two definitions. The results are reported in Table 6. None of the coefficients are significantly different from zero.

Capital Reallocation	0.051		
	(0.194)		
• Promotion		-0.028	-0.023
		(0.257)	(0.256)
• Demotion		0.212	0.198
		(0.403)	(0.397)
Fixed Effects			
• Manager	Yes	Yes	Yes
• Yearmonth	Yes	Yes	Yes
Observations	609,932	609,932	609,932

Table 6: **External Reallocation of Capital:** This table repeats a subset of regression specifications in Table 2 using external promotions and demotions. The dependent variable in the table is V_{mt}, as defined in (17), each manager's return in excess of the benchmark times that manager's AUM. An external promotion (demotion) is defined to be a change in the firm the manager works for that is also accompanied by an increase (decrease) in the manager's AUM. The first column of the table reports the panel regression specification in (19) using as the capital reallocation dummy, an external capital reallocation decision (that is, either an external promotion or demotion, or more simply, a job change). The next column repeats the specification where we split external reallocations into external promotions and external demotions. The final column defines promotions and demotions based on the change in the total dollar fees collected, rather than just the change in AUM. Manager and yearmonth fixed effects are included in all regression specifications. Standard errors, heteroskedastic-robust and two-way clustered by manager and comanagement block, are provided in parentheses. * (**) indicates that the estimate is significantly different from zero at the 95% (99%) confidence level.

If one were willing to assume that the investor's information set contains no more information than what is available in past returns, then an alternative way to measure the importance of the firm's informational advantage, is to measure how much of the capital reallocation decision can be explained by past performance alone. To do this, we run a probit model where we regress the promotion (or demotion) event, expressed as a dummy in that period, on the manager's net return in excess of the benchmark over the previous 6 months, 7-18 months and the entire history, T. Writing this out formally, first define

$$\hat{\alpha}^6_{mt} \equiv \sum_{s=0}^{5} \frac{R^n_{mt-s} - R^B_{mt-s}}{6}, \quad \hat{\alpha}^{18}_{mt} \equiv \sum_{s=6}^{17} \frac{R^n_{mt-s} - R^B_{mt-s}}{12}, \quad \hat{\alpha}^T_{mt} \equiv \sum_{s=18}^{T-1} \frac{R^n_{mt-s} - R^B_{mt-s}}{T-18},$$

where managers with fewer than 24 months of experience are excluded so that all three performance measures are meaningful. We then run the following probit panel regression:

$$\Pr[\mathbb{1}_{mt}^{\text{reallocation event}} = 1] = \Phi\left(\beta_0 + \beta_6 \hat{\alpha}_{mt}^{6} + \beta_{18} \hat{\alpha}_{mt}^{18} + \beta_T \hat{\alpha}_{mt}^{T}\right), \tag{28}$$

where the indicator function $\mathbb{1}_{mt}^{\text{reallocation event}}$ equals one if the reallocation event under consideration (i.e., either a promotion or a demotion) occurs to manager m at time t. Estimates of the coefficients of (28) and pseudo-R^2 values are reported in Table 7. The pseudo-R^2 of the regressions are 0.20% for promotions and 0.11% for demotions.

Because the pseudo-R^2 values are difficult to interpret, we repeat the same analysis for investor flows, and use the relative difference in the pseudo-R^2's to infer the importance of past performance in capital reallocations. Consequently, we define an investor promotion (demotion) dummy which takes on the value 1 in months when a manager receives a net inflow (outflow) of funds from investors, and 0 otherwise and report the results in Table 7. The pseudo-R^2 is 3.70% for investor promotions and demotions. The pseudo-R^2 values for firm reallocations of capital are an order of magnitude smaller, consistent with the hypothesis that firm executives use factors other than past performance in making their decisions. This result explains why the coefficient estimate on capital reallocation in Table 4 is not affected by the inclusion of abnormal returns and also implies that the mean reversion bias mentioned in Section 5 is likely to be small.

Another way to assess the relative importance of firms' capital reallocation decisions and investor fund flows, is to use (28) and the estimates of the beta coefficients reported in Table 7 to compute the marginal effect of observing a change of one percentage point to the regressors. Panel B of Table 7 reports the results. Observing a 1% increase in the estimated alpha has a large effect on the flow of investor funds, but hardly changes the probability of being promoted. For example, observing an 1% increase in the estimated alpha in the past 6 months, increases the probability of an investor promotion (an inflow of funds) by 8.9%, from 48.1% to 57.0%. The same event does not change the probability of a firm promotion.

Finally, an alternative way to ascertain whether investors themselves could have reallocated capital that the firm reallocated is to see whether the firm's capital reallocation decisions are predictable using publicly available information other than past returns. To test for this possibility we run the probit regression specified by (28) with the following additional publicly observable variables: fund flows in and out of the manager's funds (over the last 6 months, 7-18 months prior and the total flow before that point), fund

Panel A: β Estimates

	pseudo-R^2	1-6 Months	7-18 Months	19+ Months	Observations
Promotion					
• Firm (Internal)	0.20%	0.349	6.566**	5.875**	396,398
		(1.035)	(1.149)	(1.473)	
• Investor	3.70%	22.42**	30.97**	10.77**	396,398
		(1.981)	(1.191)	(1.316)	
Demotion					
• Firm (Internal)	0.11%	-3.418**	-3.962	-0.433	396,398
		(1.252)	(2.359)	(2.203)	
• Investor	3.70%	-22.42**	-30.97**	-10.77**	396,398
		(1.981)	(1.191)	(1.316)	

Panel B: Marginal Effects

	Prob.	1-6 Months	7-18 Months	19+ Months
Promotion				
• Firm (Internal)	0.88%	0.008%	0.167%	0.150%
• Investor	48.1%	8.901%	12.23%	4.291%
Demotion				
• Firm (Internal)	0.65%	-0.060%	-0.069%	-0.008%
• Investor	51.9%	-8.901%	-12.23%	-4.291%

Table 7: **Predictability of Promotions and Demotions:** The dependent variable in Panel A is either a "firm" promotion (demotion) or an "investor" promotion (demotion) dummy variable. A "firm" promotion (demotion) dummy is the standard definition we have used throughout the paper, an increase (decrease) in a manager's AUM that results from a change in the funds he manages. An "investor" promotion (demotion) dummy is equal to one when there is an inflow (outflow) of investor funds and zero otherwise. Panel A of this table reports estimated coefficients and the pseudo-R^2 value for a probit regression of these promotion (or demotion) dummy variables on historical realized alpha (over the past 1-6 months, 7-18 months, and the remaining history (19+)). Provided in parentheses are standard errors, clustered by comanagement block. * (**) indicates that the estimate is significantly different from zero at the 95% (99%) confidence level. The first column of Panel B of this table reports the fraction of the time each dummy variable is equal to one, that is, it can be interpreted as the unconditional probability of a promotion (or demotion). The other columns use the estimates in Panel A and (28) to compute the effect on the unconditional probability of a 0.01 (1%) increase in each regressor while keeping the other regressors fixed.

	Promotion		Demotion	
Realized Alpha (1-6 M)	0.346	0.344	-3.333**	-3.332**
	(1.032)	(1.033)	(1.333)	(1.329)
Realized Alpha (7-18 M)	6.446**	4.333**	-3.879	-3.879
	(1.236)	(1.241)	(2.498)	(2.493)
Realized Alpha (19+ M)	5.698**	5.774**	-0.533	-0.528
	(1.521)	(1.528)	(2.006)	(2.005)
Fund Flow (1-6 M)	0.282	0.287	0.297	0.299
	(1.484)	(1.486)	(1.371)	(1.374)
Fund Flow (7-18 M)	-0.556	-0.241	0.241	0.237
	(1.461)	(1.469)	(1.228)	(1.222)
Fund Flow (19+ M)	0.688	0.684	0.359	0.361
	(1.312)	(1.322)	(1.455)	(1.458)
Turnover	-0.003	-0.003	0.058	0.058
	(0.455)	(0.456)	(0.509)	(0.513)
Expense Ratio	0.002	0.002	0.001	0.001
	(0.008)	(0.008)	(0.008)	(0.009)
Manager Tenure		-0.021*		-0.040**
		(0.010)		(0.010)
Pseudo-R^2	0.26%	0.49%	0.16%	0.64%
Observations	609,932	609,932	609,932	609,932

Table 8: **Predicting Promotions and Demotions from Publicly Available Information:** The table implements (28), a probit regression of a promotion (demotion) dummy on the following publicly observable variables: historical realized alpha (over the last 6 months, 7-18 months, and the remaining history (19+ months), fund flow in/out of the manager's funds over the last 6 months (1-6 M), 7-18 months prior (7-18 M), the total flow before that point (19+ M), manager turnover, expense ratio and tenure (the length of time (in months) since the manager first entered our data sample). Manager turnover and expense ratio are computed as the AUM weighted average of turnover and expense ratio of all funds under that manager's management. Provided in parentheses are standard errors, clustered by comanagement block. * (**) indicates that the estimate is significantly different from zero at the 95% (99%) confidence level.

turnover (minimum of aggregated sales or aggregated purchases, divided by the average 12-month AUM of the fund), expense ratio (weighted average expense ratio of the manager's funds) and manager tenure (the length of time (in months) since the manager first entered our data sample). Table 8 reports the results. With the exception of management tenure, none of the additional variables significantly predict either promotions or demotions. The fact that the flow variables are not significantly different from zero suggests that, on average, investors correctly update based on their own information. If they systematically under reacted, the flow variables would enter with a positive sign, and if they over reacted, the sign would be negative.

The only variable that affects the probability of a firm capital reallocation decision is management tenure. This result is consistent with the private information explanation of our results. The longer a manager stays in the mutual fund industry, the more accurately her skill can be assessed. Thus, if the firm's ability to assign capital to labor derives from private information about employee skill, then the firm's informational advantage should be more apparent for newer employees. Consequently, the probability of observing a reallocation decision should decrease in manager tenure. Consistent with this hypothesis, Table 8 confirms that both promotions and demotions are less likely the longer the employee has been in the database.

Further evidence that the firm does not base its capital allocation decisions on publicly available information is evident in the pseudo-R^2 numbers. When management tenure is excluded from the probit regression, the reported pseudo-R^2 is essentially the same as when the additional variables are excluded from the probit regression (see Table 7, Panel A), indicating that these variables have almost no explanatory power for predicting firm reallocation decisions. Taken together, the evidence in Table 8 is consistent with the hypothesis that the firm's capital reallocation decisions are based on private information and hence are not easily replicable by investors.

8 Gross Alpha

In Section 3 we argued that gross alpha cannot be used to measure the value of a firm's capital reallocation decisions. Nevertheless, some readers of this article have requested that we investigate how a capital reallocation decision affects the manager's gross alpha. Table 9 repeats the analysis in Table 2 using $R_{it}^g - R_{it}^B$, the manager's realized gross alpha in place of value added.

Capital Reallocation			
• Promotion	-0.036**	-0.032*	-0.031*
	(0.013)	(0.013)	(0.013)
• Demotion	0.031*	0.032*	0.033*
	(0.016)	(0.016)	(0.016)
AUM		-0.017**	-0.016**
		(0.003)	(0.003)
Manager Tenure			-0.012*
			(0.006)
Fixed Effects			
• Firm	Yes	Yes	Yes
• Manager	Yes	Yes	Yes
• Yearmonth	Yes	Yes	Yes
Observations	609,932	609,932	609,932

Table 9: **Gross Alpha and Capital Reallocation:** This table repeats the analysis reported in Table 2 with return outperformance, $R^g_{it} - R^B_{it}$, as defined by (21) and (23), replacing value added as the dependent variable. The first column of the table reports the specification where reallocations are split into promotions and demotions, that is, the estimates from (20) with return outperformance instead of value added on the left hand side. The following two columns add lagged AUM (q_{mt-1}) and manager tenure (measured in years since entry into the database) as additional regressors. Standard errors, heteroskedastic-robust and two-way clustered by manager and by comanagement block, are provided in parentheses. All numbers are in %/month. * (**) indicates that the estimate is significantly different from zero at the 95% (99%) confidence level.

Table 9 shows that, on average, a manager's alpha falls after promotion and rises after demotion. To the extent that a manager's AUM prior to the promotion and demotion decision is not endogenously determined, these results are consistent with the theory in Section 3. As Figure 1 shows, all else equal, a promotion (an increase in AUM) leads to a decrease in gross alpha, and a demotion (a decrease in AUM) leads to a increase in gross alpha. But caution is in order here. The evidence in this paper is that capital reallocation decisions result from optimal decision making from both firms and investors. Because realizations in gross alpha are public information, this information should be used by investors in their capital reallocation decisions. Consequently firm capital allocation decisions should not depend on gross alpha realizations, implying that capital reallocation decisions should not predict future gross alpha realizations. So our results leave open the possibility that investors are not fully using the information in gross alpha realizations, and because of that, the firms make the remaining capital reallocation on their behalf. That is, the insignificant coefficients on past returns in Tables 7 and 8 are in fact not zero but actually reveal a weak relation between past returns and firm promotion and demotion decisions. That said, the main message in those tables remains unchanged. Most of what actually determines firms' capital reallocation decisions is not explained by readily available public information.

9 Conclusion

Arguably one of the most important questions in economics is why firms exist. A large literature has addressed this question both from a theoretical and an empirical point of view. That literature has identified the important role of capital in determining why firms exist. In recent years, however, the importance of firms with little or no capital has increased. This growth raises the question of why such firms exist. In this paper we identify another important role of the firm — the efficient allocation of capital to labor.

To identify reasons for firm existence that do not rely on the ownership of capital, we study the mutual fund industry because firms in this industry do not own most of their capital. Another advantage of this industry is that we can directly measure employee output. Furthermore, we can accurately predict what the return on capital would be were it not invested in the firm. Using this information, we are able to bound the value added by a mutual fund firm by reallocating capital. We find that the role of the firm is important. At least 30% of the value added of a manager can be attributed to the firm's decision to efficiently allocate capital to its managers.

We have provided evidence that efficiently allocating capital to labor is one important reason for why mutual fund firms exist. While we expect the same dynamics to hold in other industries, we have not provided evidence to that effect in this paper. We consider the verification of these results in other industries a fruitful topic for future research.

Appendix

Fund Name	Ticker	Asset Class	Inception Date
S&P 500 Index	VFINX	Large-Cap Blend	08/31/1976
Extended Market Index	VEXMX	Mid-Cap Blend	12/21/1987
Small-Cap Index	NAESX	Small-Cap Blend	01/01/1990*
European Stock Index	VEURX	International	06/18/1990
Pacific Stock Index	VPACX	International	06/18/1990
Value Index	VVIAX	Large-Cap Value	11/02/1992
Balanced Index	VBINX	Balanced	11/02/1992
Emerging Markets Stock Index	VEIEX	International	05/04/1994
Mid-Cap Index	VIMSX	Mid-Cap Blend	05/21/1998
Small-Cap Growth Index	VISGX	Small-Cap Growth	05/21/1998
Small-Cap Value Index	VISVX	Small-Cap Value	05/21/1998

Table 10: **Benchmark Vanguard Index Funds:** This table lists the set of Vanguard Index Funds used as the alternative investment opportunity set. Vanguard index funds that are offered but not in this set are spanned by the funds in this set. The listed ticker is for the Investor class shares which we use until Vanguard introduced an Admiral class for the fund, and thereafter we use the return on the Admiral class shares (Admiral class shares have lower fees but require a higher minimum investment.)

*NAESX was introduced earlier but was originally not an index fund. It was converted to an index fund in late 1989, so the date in the table reflects the first date we included the fund in the benchmark set.

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