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Matching Capital and Labor

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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 among its mutual fund managers adds at least $474,000 a month, which amounts to over 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. The firm captures this value because investors reward the firm following a capital reallocation decision by allocating additional capital to the firm's funds.

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 among managers. In reality, mutual fund executives play a very important role in capital allocation. We find that 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, a decision to reduce a manager's responsibilities by taking away assets also leads to an increase in value added. Indeed, 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 therefore appear to add substantial value by intermediating between investors and managers and thereby efficiently matching capital to skill.

We further find that investors are unable to match the firm's capital reallocation decisions themselves. We hypothesize that this is due to the significant informational advantage that mutual fund executives have relative to investors.

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In particular, firm executives know every trade a manager makes, as well as trades that the manager chooses not to make. Executives can use this information to direct capital away from overfunded managers toward underfunded managers.

We find support for 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, in line with the hypothesis that the firm's advantage derives from its access to superior information about managerial ability. These results are consistent with the view that firm executives use factors not easily observable to people outside the firm to make personnel decisions (Alchian and Demsetz (1972)). They are also consistent with investors trusting mutual fund firms to make sound financial decisions on their behalf (Gennaioli, Shleifer, and Vishny (2015)), and so when they see these firms making a managerial change, they respond by investing additional capital.

Although a large body of evidence demonstrates the importance of the firm's informational advantage in assigning workers to jobs and (thereby) determining compensation, there is little evidence on whether firms also use their superior information to determine an employee's job scope. 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 questions pertaining to the economics of organizations are difficult to address 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. 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 are 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, value added. 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. Our results therefore imply that other factors, such as the informational role of the firm, are also important.

[1] Although the industry is capital-intensive, firms do not own their own capital. Instead, 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.

Although we do not find strong evidence for a behavioral explanation of our findings, we cannot definitively rule out the possibility that our results derive at least in part from suboptimal investor behavior. For example, part of the value that the firm adds could 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 Section I, we describe how our paper relates to the existing literature. We develop a simple model that formalizes our hypothesis for why firms add value in Section II. In Section III, we define the value added of firms, funds, and managers. We describe the data set and provide summary statistics in Section IV. In Section V, 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 on the value firms add. In Section VI, 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. Section VII presents evidence 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 employees. In Section VIII, we discuss the importance of using value added instead of gross alpha as our main variable of interest. Finally, in Section IX we provide concluding remarks.

I. Background

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

A large theoretical literature attempts to shed light on these questions (see, for example, Holmstrom and Tirole (1989), Hart and Moore (1990), Hart (1995), and Rajan and Zingales (1998)). A key component of modern theories of the firm is ownership. In a world with incomplete contracting, incomplete information, and bounded rationality, ex post bargaining power is affected by ownership. In particular, because they retain control rights, asset owners 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. However, while these theories undoubtedly help explain why modern firms exist, they cannot explain the existence of an increasingly important type of firm, namely, 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. As a result, 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 a growing 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 (2015) separate the value added of 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 movements of workers 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 can it say what precisely the firm does to add value. In this paper, rather than focus on external moves as the identification strategy, we rely on the firm's internal decisions to promote and demote workers and thus we are able to identify the source of the firm's value added as well as derive a quantitative bound on the firm's contribution to productivity.

Our paper also relates to the labor literature pioneered by Doeringer and Piore (1971) that studies personnel economics and the internal labor market of the firm.[2] This 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). This allows us to study how firm decisions regarding the scope of managers' jobs (the size of their AUM) affects their productivity. We argue that the firm uses its private information about employee skill to efficiently allocate capital and thereby determine the scope of the employee's responsibility.

Finally, our paper also relates to the literature that studies how the intrafirm allocation of capital and labor affects productivity and drives heterogeneity in firm quality. 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 (2015) show that diversified firms have higher labor productivity and actively redeploy their human capital to business areas with better prospects. Giroud and Mueller (2015) 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 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

[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) provide recent surveys of this literature.

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

across firms both in the United States and abroad. Based on randomized experiments in India, Bloom et al. (2013) show that management practices have a significant effect on firm productivity. Lazear, Shaw, and Stanton (2015) further show that hiring better supervisors makes workers more productive. Because most mutual funds are owned and marketed as part of a fund family, a number of studies examine how the family structure affects the mutual fund industry.[4]

II. Theory

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

We assume that there are three types of agents: outside investors, employees, and a firm executive. Employees and the firm executive have a skill that is 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 that 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 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 wage compensation equal to W_i. The firm executive determines the amount of capital that employees are given responsibility for.

A. Coasian Benchmark

We first 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

[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 intrafirm competition has important effects on managers' appetite for risk. Chen et al. (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] A growing body of empirical evidence documents decreasing returns to scale in the mutual fund industry. See Chen et al. (2004), Pollet and Wilson (2011), and Pastor, Stambaugh, and Taylor (2015).

add any value over the value added of individuals working for themselves. To see this formally, consider the case in which each employee works for herself but needs to raise money from outside investors. Outside investors maximize the NPV of their investment, subject to the condition that the NPV is not negative:

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

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

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

Each employee chooses his wage by maximizing his compensation, taking into account outside investors' participation constraints, which implies

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

Now assume that 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 I first-order conditions

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

which is identical to (2). 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

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

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 hence the two equilibria are identical.

B. 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

[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 in which outside investors can partially differentiate between employees and thus we allow outside investors to partially differentiate in the empirical work that follows.

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 that employee excess return on capital is

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

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

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

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

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

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

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

We next turn to the firm's optimization problem. Firm executives have a competitive advantage because they have private information that allows them to allocate capital better. 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

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

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,

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

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.

C. A Simple Mutual Fund Example

Our objective is to measure the contribution of mutual fund firms, ΔV. In doing so, we are departing from the conventional approach in the mutual fund literature of using ψ, that is, alpha, to measure skill. Some readers have therefore questioned our approach, arguing that, to correctly measure the contribution of the firm, we should be measuring $\Delta\psi$ rather than ΔV. Here, we illustrate in the context of a simple example why $\Delta\psi$ does not measure the contribution of the firm.[7] Suppose

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

that is, a fund manager's excess return on capital (or gross alpha)—the blue solid line in Figure 1—is equal to a on the first dollar she manages and decreases at a rate b. 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 Figure 1:

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

The solution, which is illustrated in the figure, is given by

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

implying that the gross alpha at the optimum is

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

and the maximum value added is

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

[7] Berk and van Binsbergen (2015) prove (based on the arguments in Berk and Green (2004)) that gross and net alpha measures do not measure skill.

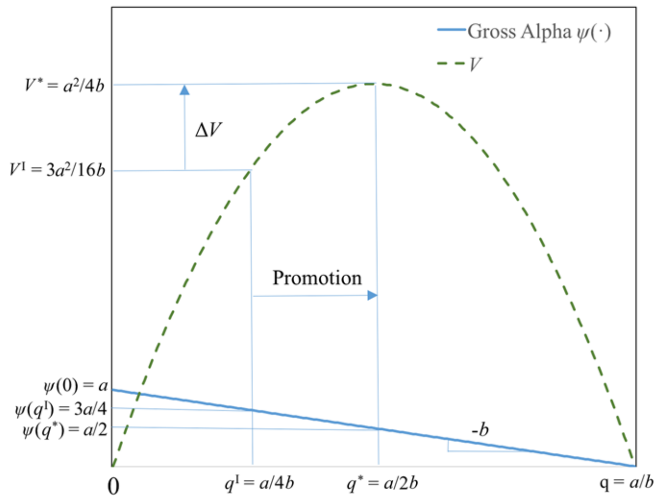

Figure 1. Value added and gross alpha. The blue solid line plots gross alpha as a function of the size of the fund: $\psi(q) = a - bq$. The green dashed curve is the value added of the fund as a function of fund size, $q\,\psi(q)$. (Color figure can be viewed at wileyonlinelibrary.com)

Now suppose that outside investors do not know the true parameters and instead believe that the manager's a is half as large as it really is. As a result, they invest half as much as is optimal, and hence 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 increase from $\frac{3a^2}{16b}$ to $\frac{a^2}{4b}$, but the gross alpha will *decrease* from $\frac{3a}{4}$ to $\frac{a}{2}$ (as illustrated in Figure 1). Thus, the value the firm adds by giving the manager the optimal amount of money to manage can be measured only by comparing V^I to V^*. If we were to mistakenly use $\Delta\psi = -\frac{a}{4}$ (the change in gross alpha) to evaluate the effectiveness of the promotion, we would incorrectly conclude that the promotion was a mistake because the gross alpha went down. Consequently, interpreting a decrease in gross alpha as a decline in employee skill is incorrect. It is true that the amount of value the employee adds on the marginal dollar has decreased, but that does not imply that the overall value she adds has decreased. 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. In Section VIII, we empirically investigate what would happen if we were to mistakenly use gross alpha instead of value added to measure employee skill.

III. 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. In particular, we know the fund's performance (that is, realized returns), fees charged, and total AUM, as well as the identity of its manager(s).

Customers provide financial 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, firms can (and do) decide which manager gets to manage which fund. The amount of capital that a particular manager has under her control is therefore affected by: (1) outside investors' decisions to add capital to or take capital out of the funds the manager manages, and (2) firm executives' decisions to give the manager responsibility for managing an additional fund or to take away that responsibility. By observing the second mechanism, we are able to infer whether the firm adds value by assigning capital to labor.

Let R^g_{it} 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^B_{it} 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. Then the gross alpha of the fund is

$$\alpha_{it} \equiv \mathrm{E}_t\left[R^g_{it+1} - R^B_{it+1}\right],$$

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

$$V_{it} \equiv q_{it-1}\left(R^g_{it} - R^B_{it}\right). \tag{14}$$

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 be easily 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 decrease. 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, then on average the fund cannot make more than the benchmark return before fees. In this case, 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, before fees the fund must outperform the benchmark. 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. If 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 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 A.1 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 of 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 of 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 among 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 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 is the same as the amount of capital that they would have invested were the managers self-employed, then any change to a manager's value added that results from a firm decision to change the manager's AUM represents ΔV. Of course, if moral hazard concerns are not very high, one would expect investors to 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.

IV. 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, comprises monthly observations that are obtained by combining two databases, the CRSP survivorship-bias-free mutual fund database and the Morningstar Principia database. We augment these 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 these databases.[8] Therefore, we make use of a third data source: Morningstar Direct. The Morningstar Direct database is purported to contain a clean and complete list of managers and firms for each fund in Principia that is still in existence, has merged, or has 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 free of survivorship bias. To ensure

[8] In many cases, individual manager names are replaced with the words "Team Managed" and manager names are not consistently recorded. In addition to 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 the manager's middle name is included.

Table I
Characteristics of Mutual Fund Firms and Managers

This table reports characteristics of mutual fund firms and managers for selected years in our data set. When a fund is comanaged by N managers, we attribute $\frac{1}{N}^{\text{th}}$ of the fund's AUM to each of its managers.

	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	1,083	894	3.80	1.57	3.08	1.30	1.53	0.41	0.50
1996	356	1,789	1,395	5.23	1.77	3.92	1.38	2.99	0.60	0.76
1999	445	2,739	2,124	6.64	1.95	4.77	1.51	4.93	0.80	1.03
2002	501	3,436	2,672	7.83	2.12	5.33	1.65	4.74	0.69	0.89
2005	486	3,651	2,883	9.17	2.32	5.93	1.83	6.27	0.84	1.06
2008	510	4,388	3,621	11.6	2.77	7.10	2.28	8.76	1.02	1.23
2011	523	4,455	3,880	11.6	2.84	7.42	2.47	7.42	0.87	1.00

that we do not inadvertently introduce survivorship bias into our data, we only use Morningstar Direct to augment our existing database. More specifically, we update the manager names in our existing database with information from Morningstar Direct, but, importantly, we 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 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 different fees. We aggregate the different share classes of the same fund into one fund. Table I provides summary statistics for the remaining data set, which consists of 601 firms, 10,423 managers, and 5,542 funds. The average mutual fund in our data sample exists for about 95 months, whereas the average manager has a tenure of only 59 months before leaving our sample.

[9] For a detailed description, see the Internet Appendix, available in the online version of this article.

[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.

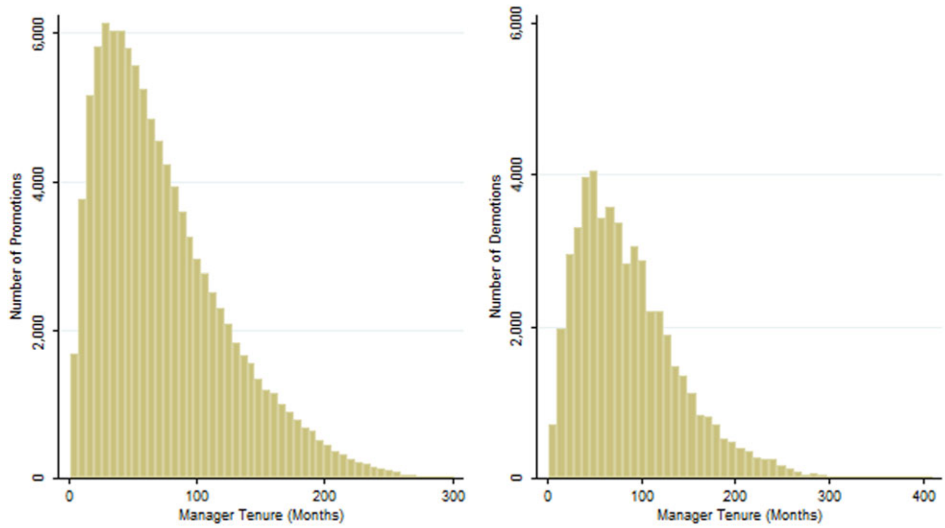

Figure 2. Timing of promotions and demotions. For every promotion (demotion), we compute the tenure of the promoted (demoted) manager as the number of months the manager has appeared in our database up to the point of that promotion (demotion). We pool all promotions (demotions) in our database, and 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. (Color figure can be viewed at wileyonlinelibrary.com)

Firms make capital reallocation decisions when they give a fund to a manager to manage and thereby increase the manager's AUM (hereafter a promotion), or when they 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 sample, 2,769 have been promoted at least once, 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 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 five 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 industry's assets suggests that larger firms have better managers. Consequently, it is perhaps not surprising

[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.

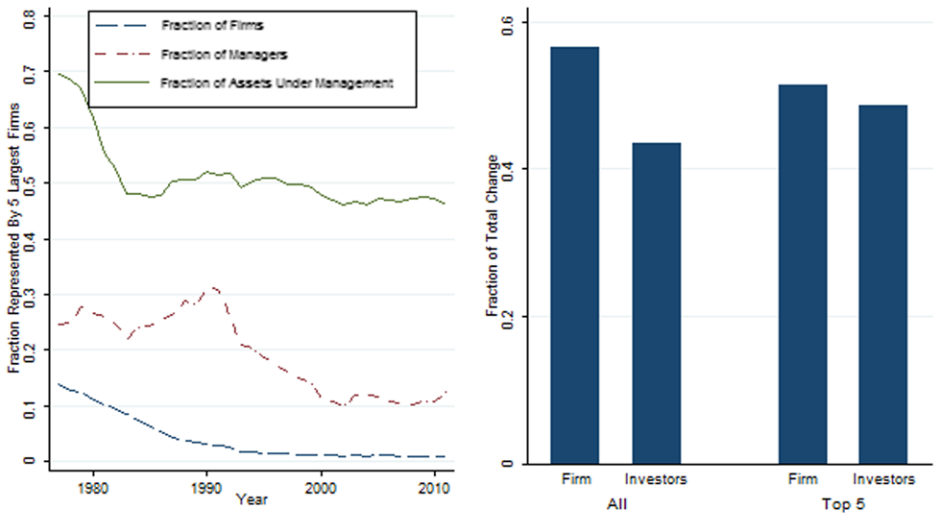

Figure 3. Summary statistics. The graph on the left plots the share of all firms that the top five firms represent. Three measures are used: AUM (green solid line), number of managers employed (red dash-dotted line), and number of firms (blue dashed line). The bar chart on the right reports the fraction of the total reallocation of capital (that is, 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 firms. (Color figure can be viewed at wileyonlinelibrary.com)

that 2,743 managers in our sample switched firms at least once in their career.

V. 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 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, recall that 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 concern with this approach stems from the fact that we do not know why self-employed managers choose not to 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 managers choose self-employment is correlated with skill, our estimates will be biased.

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

Our second concern stems from the fact that managers choose which firms to work for. It is possible that a firm is merely a coordination device for managers to work together. If any aspect of managerial skill is unobservable to anybody other than the manager herself, then an attribution model could falsely attribute managerial skill to the firm.

To avoid both of these endogeneity issues, we instead measure the value added of a firm by following managerial moves *within* the firm. Because 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 that of investor capital allocation decisions. In particular, the figure illustrates the relative importance of the cumulative absolute value of all AUM changes that result from promotions and demotions and the cumulative absolute value of all investor flows. We find that, on average, firm capital reallocation decisions are similar in magnitude to investor capital reallocation decisions, and that they are more important for the top five firms than other firms.

A. Formulating the Null Hypothesis

We take as the null hypothesis the Coasian benchmark, which is 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 capturing the internal capital reallocation decision. Specifically, we run

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

where V_{mt} is the estimated value added of manager m at time t (defined in (17)), $\mathbb{1}_{mt}^{reallocated}$ is an indicator variable that takes the value of one 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

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

B. Results

The results are reported in the first column of Table II.[13] The firm adds \$681,000 per month when it makes a decision to either promote or demote one

[13] Standard errors of the estimates in Table II 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 is

Table II

Internal Reallocation of Capital

The dependent variable in the table is V_{mt} defined in (17) as the manager's return in excess of the benchmark times that manager's 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 the change in AUM. Manager, firm, and year-month fixed effects are included in all regression specifications. Standard errors, 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.

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
• Year-month	Yes	Yes	Yes	Yes	Yes	Yes
Observations	609,932	609,932	609,932	609,932	609,932	609,932

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 driven by 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 as value destroyed by the manager. To examine the importance of this issue, we split the reallocation dummy $\mathbb{1}_{mt}^{reallocated}$ into

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 that all observations of the same year belong to the same comanagement block (that is, we find no correlation across comanagement blocks). See Thompson (2011) and Cameron, Gelbach, and Miller (2011) for details on multiway clustering.

two dummies, one for a promotion $\mathbb{1}_{mt}^{promoted}$ and one for a demotion $\mathbb{1}_{mt}^{demoted}$. The promotion dummy takes a value of one 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 the value of one 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 one until time t_2 and zero afterward, and the demotion dummy will be zero up to time t_2 and one afterward. We then run the following panel regression

$$V_{mt} = \lambda_t + \lambda_m + \lambda_f + \beta_p \cdot \mathbb{1}_{mt}^{promoted} + \beta_d \cdot \mathbb{1}_{mt}^{demoted} + \epsilon_{mt}, \tag{20}$$

where the definitions of all other variables are the same as those from (19). The second column of Table II reports the results. The coefficients on the promotion and demotion dummies are positive. Importantly, the promotion dummy of \$756,000 dollars per month is statistically significantly different from zero. Because the mean-reversion effect biases the coefficient on the promotion dummy downward, this estimate underestimates the value created by the promotion decision. We 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 II. The estimated coefficient on AUM is negative and insignificant, while the promotion dummy remains highly significant, indicating that a change in the manager's AUM in and of itself does not change the manager's value added. Value added is only increased when the change in AUM results from a firm promotion or demotion decision.

It is likely that a manager's value added increases with experience, in which case the firm's promotion decisions might be based in part on manager tenure.[14] To decompose the capital reallocation decision into the portion that is driven by experience and the portion that is 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 she might have worked for). As reported in the fourth column of Table II, 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 II examines the effect of a promotion decision on existing managers. This regression sheds light on what happens to the value added of an existing manager when another manager is added to one of his funds. To do so, we include a new dummy (*Comanager*) that takes the value of one when a new manager is added to a fund that the manager under consideration manages, and remains one until the manager under consideration

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

experiences a capital reallocation decision. The coefficient estimate is positive and significant, implying that the addition of the new manager has positive spillover effects. It may be the case that the new manager's value added is above the average value added of existing managers. Alternatively, the addition of a new manager may have positive synergistic effects that increase 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.

Above we define 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. In our next analysis, we redefine promotions and demotions based on the change in a manager's revenue. In particular, a promotion (demotion) is a capital reallocation decision that increases (decreases) the dollar fees collected (AUM $\times$ expense ratio). We then reestimate (20) using these definitions in the sixth column of Table II. Comparing the second and sixth columns reveals that using the alternative definitions of promotions and demotions does not change our results. Taken together, the evidence in Table II leads us to confidently reject the null that firm capital reallocation decisions do not add value.

Note that the estimated coefficient on the demotion dummy is positive, as one would expect if the decision to demote is optimal. If the manager were managing too much money and thereby destroying value (perhaps by trading too much), the decision to demote would 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 equal to one at the time of the separation. Table III presents the results of rerunning the above analysis on 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 is still in order in interpreting these results. First, our decision rule separating voluntary separations from firings is unlikely to work perfectly, and second, the coefficient on the dismissal dummy may be biased upward because of the aforementioned tendency for value

Table III

Internal Reallocation of Capital (Adjusted for Firings)

The dependent variable in the table is V_{mt}, defined in (17) as the manager's return in excess of the benchmark times that manager's AUM, measured in $ millions/month. If a manager drops off the database when his demotion dummy is equal to one, 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 year-month fixed effects are included in all regression specifications. Standard errors, 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.

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
• Year-month	Yes	Yes	Yes
Observations	707,926	707,926	707,926

added to mean-revert. We provide further evidence on the second concern in Section VII.

The value added numbers reported in Table II indicate that the value created from a capital reallocation decision is large. However, it is important to acknowledge that we do not know what would have happened had the firm not reassigned the capital. That is, while these numbers quantify the total value created, they do not necessarily quantify the value created by the firm. Had the firm not reassigned the capital, potentially, investors may have reassigned the capital themselves. To interpret our estimates as the value created by the firm alone, one therefore 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. Over longer periods of time, however, 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 firm's additional value added, we must construct a counterfactual. To be conservative, we focus on promotions because, as we argue 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. Rather than construct a single counterfactual from one set of comparables, we construct a range of counterfactuals. We construct the first counterfactual by assuming that 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 construct the other counterfactuals by successively narrowing the set of comparable managers. In particular, 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 so on. We continue this process up to the extreme counterfactual in which we eliminate the bottom 99% and thus compute 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 grows to the manager's actual AUM or the manager is demoted. Once either event occurs, we use the actual AUM from then onward. We then reestimate the value added of a promotion using the counterfactual AUM.

The formal calculation of the counterfactuals proceeds as follows. We first define the manager's gross return as

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

Next, we define fund i's net return (the return after the expense ratio, ϕ_{it-1}, is taken out) as $R^n_{it} = R^g_{it} - \phi_{it-1}$. The manager's net return, R^n_{mt}, is then 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:

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

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

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

After a promotion at time τ, the value added of the manager can now be expressed as

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

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 of the promotion to the manager's value added. The last term, $\{3\}$, measures the contribution of investor flows under the counterfactual to the manager's value added. To isolate the contribution of the promotion, we need to drop the third term. Accordingly, we 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 the promotion alone, we replace V_{mt} with $\hat{V}_{mt}$ over the period from the promotion to 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 managers 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 of the counterfactuals

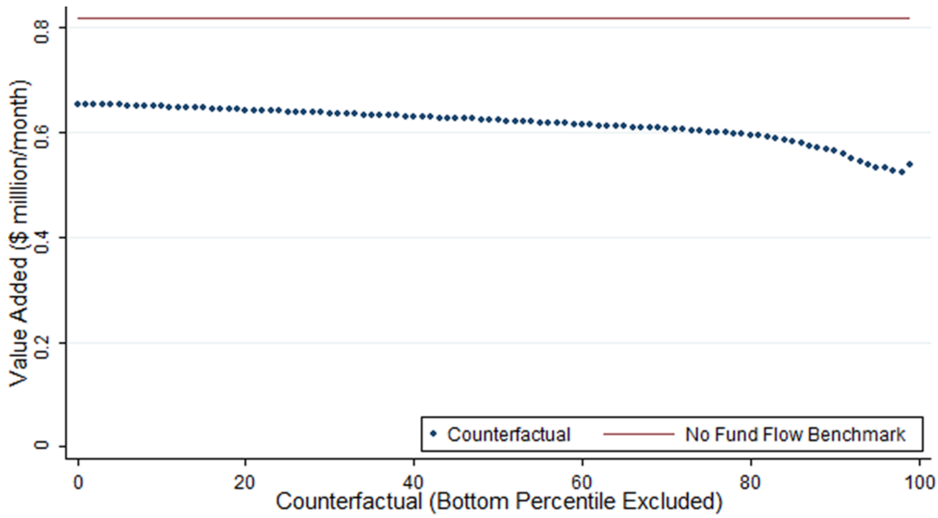

Figure 4. Firm value added under a range of counterfactuals. We reestimate (20) using only the promotion dummy and the counterfactual value added, $\hat{V}_{mt}$ as defined in (24), instead of V_{mt}. The counterfactual value added is computed by excluding all funds with performance below the indicated percentile. We then assume, under the counterfactual, that a manager would have experienced the same inflow of funds as the weighted average inflow of all remaining managers in that month. (Color figure can be viewed at wileyonlinelibrary.com)

as a fraction of the average total value added in the sample (which is $274,000 per month).[15] Even for the extreme counterfactual in which 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 that the promotion (demotion) decision achieved. To address 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 not occur by the end 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 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: instead of dropping the worst-performing managers, we drop the best-performing managers. In particular, 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

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

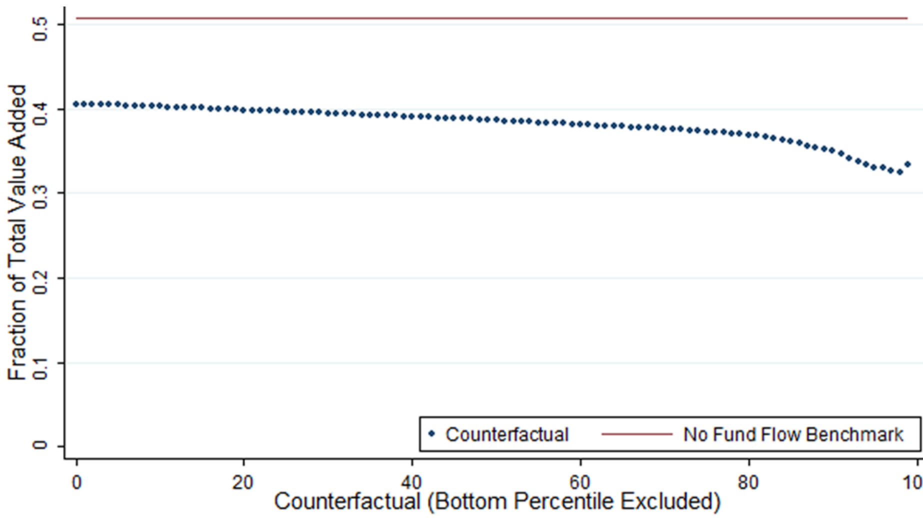

Figure 5. Firm contribution as a fraction of total value added. We compute a lower bound on the firm's contribution as a fraction of total value added by multiplying the value of a promotion under each counterfactual by the fraction of periods in which the promotion dummy is equal to one. We then divide this estimate by the average value added per manager per month. We plot this fraction for each of the 100 counterfactuals considered. (Color figure can be viewed at wileyonlinelibrary.com)

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 six years for investors to achieve what the firm achieved in a single month. For demotions, under the most extreme counterfactual, it would take two years for investor outflows to achieve the same effect as the demotion decision. However, 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 these observations, we are restricting attention to the smaller demotion decisions. It is therefore not surprising that investors can match the firm's demotion decisions in a shorter amount of time than for promotions.

VI. Investor Response to Capital Reallocation

In the previous section, we demonstrate that the firm's capital reallocation decisions add significant value. But for firms to capture this value, it is important that investors understand this effect and, as a result, respond to capital

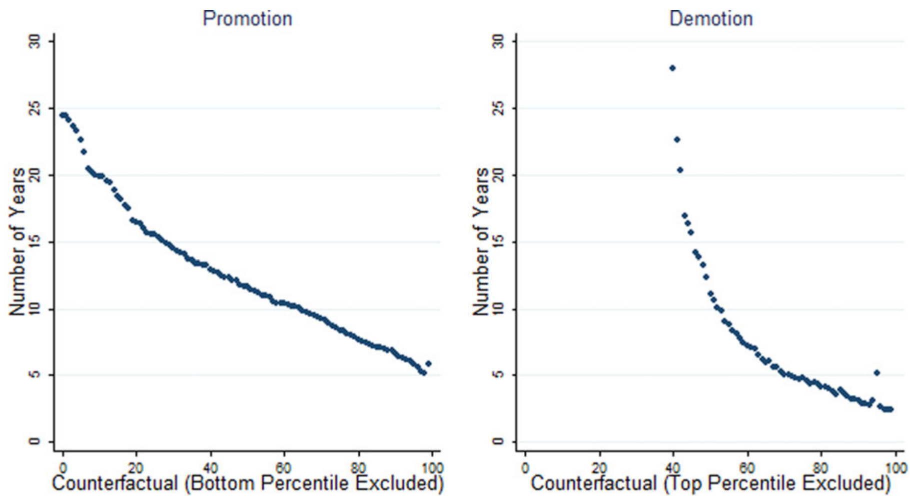

Figure 6. Time taken to reach same AUM under a range of counterfactuals. Under each counterfactual, we compute the number of years it would have taken for investors (through the flow of funds) to match the equivalent change in AUM as the promotion (demotion) decision. (Color figure can be viewed at wileyonlinelibrary.com)

reallocation decisions by investing additional capital with the firm. In this section, we show that this is indeed the case.

Investors pay firms a fixed fraction (the expense ratio) of AUM. Because firms rarely change the expense ratios of their funds, changes in firm compensation are driven by changes in AUM. Thus, if investors understand the importance of capital reallocation decisions, they should respond to a reallocation of capital by investing additional capital in the firm, which increases the firm's overall compensation.

To determine whether 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[16] and run the regression

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

where $\Delta \Pi_{ft} \equiv \Pi_{ft} - \Pi_{ft-1}$ denotes the change in firm f's overall compensation in quarter t, the dummy $\mathbb{1}_{ft}^{reallocate}$ equals one if firm f promotes or demotes (or both) at least one of its managers during quarter t and zero otherwise, λ_f and λ_t

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

Table IV
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 promotes (demotes) at least one manager during the time period. In 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, two-way clustered by firm and 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.

	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
• Year-month	Yes	Yes	Yes	Yes	Yes	Yes
Observations	51,807	51,807	51,807	51,807	51,807	51,807

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 contemporaneous response of the firm and investors to superior (or poor) manager performance.

We report the estimated coefficients of (25) in the first two columns of Table IV. The results show that the total fees a firm collects 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. The results thus imply that investors use not only returns to infer future fund performance, but also capital reallocation decisions. By comparing the coefficients in Table IV it is possible to assess the relative importance of the information contained in a capital allocation decision against 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.

Next, we separately examine investors' response to promotions and demotions at the firm level. To do so, we replace the firm reallocation dummy $\mathbb{1}_{ft}^{reallocate}$ with a dummy that equals one whenever the firm promotes (demotes) at least one of its managers during quarter t and zero otherwise. We rerun the regressions and report the estimated coefficients in the third and fourth columns of Table IV. We find that investors react to both promotion and demotion decisions by investing more capital in the firm's funds.[17]

We also decompose the change in total compensation into two components: (1) the change in the firm's weighted average expense ratio and (2) the change in the firm's overall AUM (that is, flow of funds). We then rerun (25) replacing the change in compensation on the left-hand side of the equation with each of these components. The estimated coefficients are reported in the fifth and sixth columns of Table IV. We find no noticeable change in the expense ratio accompanying a reallocation decision. Instead, the change in firm compensation comes almost exclusively from investors providing the firm with additional capital whenever it reallocates funds to managers.

The results in Table IV paint a remarkable picture of labor market efficiency. By correctly allocating managers, firms increase managerial productivity. Investors recognize this role of the firm and react to capital reallocations by investing additional capital in the firm. These additional capital inflows allow firms to capture the additional rents associated with the capital reallocation decision.

VII. Source of Firm Skill

The results in Section V 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 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 the manager were 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).

[17] 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 driven not by information differences but instead by the objective function the firm maximizes (which is not the same as investors' objective function).

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—for example, firm executives know every trade a manager makes, and in addition, trades that the manager chooses not to make—and firm executives use this information to direct capital away from overfunded managers toward underfunded managers. 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 is not satisfied.

A concern that one might have in interpreting the value added of the firm as rents for private information is that investors might rationally anticipate the firm's capital reallocation decisions in making 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 among the firm's funds themselves. In this case, our estimate of a firm's value added measures a transfer of duty from investors to firms rather than 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 investors 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 make allocation decisions that 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 a manager's AUM 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 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:

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

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 $\mathbb{1}^{\textit{self-employed}}_{mt}$ takes the

Table V

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 on 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 year-month fixed effects are included in all the regression specifications. Adjusted R^2's are also reported. Standard errors, in parentheses, are two-way clustered by manager and comanagement block. * (**) indicates that the estimate is significantly different from zero at the 95% (99%) confidence level.

	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)
Year-month 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

value of one if manager m is self-employed at time t and zero 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 existing literature, we winsorize the flow of funds at the 1^{st} and 99^{th} percentiles.[18] Table V reports the coefficient estimates.

For both types of managers, investor fund flow responds significantly to performance. More importantly, however, the estimated γ is never significantly positive and the point estimate is almost always negative. There is no evidence that the flow performance relation is stronger for self-employed managers than for other managers. For 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 such endogeniety could explain this result because that would require that investor attention be affected by whether or not a manager chooses to be self-employed.

The firm's informational advantage presumably 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

[18] See Chen et al. (2013), Kacperczyk, Sialm, and Zheng (2008), and Huang, Sialm, and Zhang (2011).

Table VI

External Reallocation of Capital

This table repeats a subset of regression specifications in Table II using external promotions and demotions. The dependent variable in the table is V_{mt}, defined in (17) as the manager's return in excess of the benchmark times that manager's (lagged) 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, 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 the change in AUM. Manager and year-month fixed effects are included in all of the regression specifications. Standard errors, 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.

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
• Year-month	Yes	Yes	Yes
Observations	609,932	609,932	609,932

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 for internal capital changes using these two definitions. The results are reported in Table VI. None of the coefficients are significantly different from zero.

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 so, 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 to 18 months, and entire history, T. More formally, first define

$$\hat{\alpha}^{6}_{mt} \equiv \sum_{s=0}^{5} \frac{R^{n}_{mt-s} - R^{B}_{mt-s}}{6}, \qquad \hat{\alpha}^{18}_{mt} \equiv \sum_{s=6}^{17} \frac{R^{n}_{mt-s} - R^{B}_{mt-s}}{12}, \quad \text{and}$$

$$\hat{\alpha}^{T}_{mt} \equiv \sum_{s=18}^{T-1} \frac{R^{n}_{mt-s} - R^{B}_{mt-s}}{T-18},$$

Table VII

Predictability of Promotions and Demotions

The dependent variable in Panel A is either a "firm" promotion (demotion) or an "investor" promotion (demotion) dummy variable. As before, a "firm" promotion (demotion) is defined as an increase (decrease) in a manager's AUM that results from a change in the funds he manages. The "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 coefficient estimates and the pseudo-R^2's for a probit regression of these promotion (or demotion) dummy variables on historical realized alpha (over the past 1 to 6 months, 7 to 18 months, and the remaining history (months 19+)). Standard errors, clustered by comanagement block, are provided in parentheses. * (**) 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. It can thus 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.

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%

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:

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

where the indicator function $\mathbb{1}_{mt}^{\mathit{reallocation\ event}}$ equals one if manager m experiences the reallocation event under consideration (that is, either a promotion or a demotion) at time t. Coefficient estimates and pseudo-R^2's are reported in Table VII. The pseudo-R^2 is 0.20% for promotions and 0.11% for demotions.

Because the pseudo-R^2's are difficult to interpret, we repeat the analysis for investor flows using the relative difference in the pseudo-R^2's to infer the importance of past performance in capital reallocations. To do so, we define an investor promotion (demotion) dummy that takes the value of one in months when a manager receives a net inflow (outflow) of funds from investors and zero otherwise. We report the results in Table VII. The pseudo-R^2 is 3.70% for investor promotions and demotions. The pseudo-R^2's for firm reallocations of capital are an order of magnitude smaller, consistent with the view 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 IV is not affected by the inclusion of abnormal returns. It also suggests that the mean-reversion bias mentioned in Section V 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 VII to compute the marginal effect of observing a one-percentage-point change in the regressors. Panel B of Table VII reports the results. Observing a 1% increase in the estimated alpha has a large effect on the flow of investor funds but little effect on the probability of being promoted. For example, observing a 1% increase in the estimated alpha in the past six months increases the probability of an investor promotion (an inflow of funds) by 8.9%, from 48.1% to 57.0%, but does not change the probability of a firm promotion.

Finally, an alternative way to ascertain whether investors themselves could have reallocated the 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 do so, we run the probit regression specified in (28) with the following additional publicly observable variables: fund flows in and out of the manager's funds (over the 6 months, the 7 to 18 months, and the total flow prior to that point), fund 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 sample). Table VIII reports the results. With the exception of management tenure, none of the additional variables significantly predict 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 underreacted, the flow variables would enter with a positive sign, while if they overreacted, 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

Table VIII

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, the prior 7 to 18 months, and the remaining history (months 19+), fund flow in/out of the manager's funds over the last 6 months (1–6 M), the prior 7 to 18 months (7–18 M), and 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 sample). Manager turnover and expense ratio are computed as the AUM-weighted average of turnover and expense ratio of all funds under the manager's management. Standard errors, clustered by comanagement block are provided in parentheses. * (**) indicates that the estimate is significantly different from zero at the 95% (99%) confidence level.

	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

for newer employees. The probability of observing a reallocation decision should therefore decrease in manager tenure. Consistent with this hypothesis, Table VIII 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's. When we run the regression without management tenure, the reported pseudo-R^2 is essentially the same as when the additional variables are excluded from the probit regression (see Table VII, Panel A), indicating that these variables have almost no explanatory power for predicting firm reallocation decisions. Taken together, the evidence in Table VIII is consistent with the view that the firm's capital reallocation decisions are based on private information and hence are not easily replicable by investors.

Table IX

Gross Alpha and Capital Reallocation

This table repeats the analysis reported in Table II 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, two-way clustered by manager and 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.

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
• Year-month	Yes	Yes	Yes
Observations	609,932	609,932	609,932

VIII. Gross Alpha

In Section III, we argue that gross alpha cannot be used to measure the value of a firm's capital reallocation decisions. Nevertheless, some readers of this paper have requested that we investigate how a capital reallocation decision affects the manager's gross alpha. Table IX repeats the analysis in Table II using $R^g_{it} - R^B_{it}$, the manager's realized gross alpha in place of value added.

Table IX shows that, on average, a manager's alpha decreases after a promotion and increases after a 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 III. As Figure 1 shows, all else equal, a promotion leads to a decrease in gross alpha, and a demotion leads to an increase in gross alpha. But caution is in order here. The evidence in this paper shows 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 as a result, firms make the remaining capital reallocations on their behalf. That is, the insignificant coefficients on past returns in Tables VII and VIII are not zero but rather 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.

IX. Conclusion

Arguably one of the most important questions in economics is why do firms exist. A large literature addresses this question from both a theoretical and an empirical point of view. That literature identifies capital as an important factor that helps explain why firms exist. In recent years, however, the prevalence of firms with little or no capital has increased. This pattern raises the question of why such firms exist. In this paper, we identify the efficient allocation of capital to labor as another factor explaining why firms exist.

To identify reasons for firm existence that do not rely on the ownership of capital, we study the mutual fund industry as 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 that a mutual fund firm adds by reallocating capital. We find that the role of the firm is important. At least 30% of the value added of managers can be attributed to the firm's decision to efficiently allocate capital to its managers.

Our evidence shows 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 do not provide evidence to that effect in this paper. We consider verification of these results in other industries a fruitful topic for future research.

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Appendix

Table A.1

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 that 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).

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[a]

(*Continued*)

Table A.1—*Continued*

Fund Name	Ticker	Asset Class	Inception Date
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

[a]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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Supporting Information

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Appendix S1: Internet Appendix.