# Heterogeneity and Peer Effects in Mutual Fund Proxy Voting

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**Abstract**

Despite its importance, voting in the elections of corporate boards remains relatively unexplored, largely due to the lack of appropriate data. We construct a comprehensive dataset of 2,058,788 mutual fund votes in elections that took place between July 1, 2003 and June 30, 2005. We find systematic heterogeneity in fund voting patterns: some mutual funds are consistently more management friendly than others. We also establish the presence of peer effects: a fund is more likely to oppose management when other funds are more likely to oppose it, all else being equal. To overcome the endogeneity problem in identifying peer effects caused by unobserved director quality, we rely on fund heterogeneity to instrument for expected fund votes. We then construct and estimate a model of voting that incorporates these two features. The supermodular structure of the model allows us to compute the social multiplier due to peer effects. We find that heterogeneity and peer effects among funds are economically as important in shaping the voting outcome as firm and director characteristics.

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*The election of directors is the most important shareholder franchise.*

Larry Sonsini, Chairman, NYSE Proxy Working Group (NYSE 2006a)

## 1 Introduction

Shareholder voting is one of the key mechanisms through which shareholders can affect the policy of a corporation. Through voting, shareholders elect directors, decide on matters of change of control, amend corporations' bylaws, and pass non-binding shareholder resolutions. Among shareholders' voting rights, the right to vote in board of director elections is perhaps the most important. The board of directors plays a central role in corporate governance: it appoints and monitors top management of a company, approves mergers and acquisitions, and participates in other major firm decisions.

Despite its importance, voting in the elections of corporate boards remains relatively unexplored. A major obstacle for detailed analysis of voting is the lack of data on individual votes: until recently, voting in board of director elections was confidential, with only the aggregate voting outcomes reported by the firms. In 2003, however, the SEC introduced a new rule, requiring all US mutual funds to report their votes in every election. In this paper, we present the results of our analysis of mutual fund proxy voting behavior, based on the votes of the funds in the first two years after the SEC rule change took effect. Our comprehensive dataset contains 2,058,788 votes by 2,774 mutual funds in 13,588 director elections of 1,388 companies.

Our first finding is that mutual funds systematically differ in their voting behavior. Some mutual funds are consistently more likely to cast votes in favor of directors sponsored by the management than others. Our second finding is the presence of peer effects in mutual fund voting: a fund is more likely to oppose management when other funds are more likely to oppose it as well. These strategic interactions amplify funds' equilibrium voting responses to factors that affect fund voting. E.g., a negative change in director quality will first have a direct effect: each fund is less likely to support a lower-quality director. But there is also an additional force: knowing that other funds are less likely to support the director, a fund has an additional incentive to withhold its support. Thus, in equilibrium, the direct effect of any policy change will be magnified.

It is instructive to contrast these findings with hypothetical "straightforward" voting behavior. In the hypothetical case, all shareholders have the same incentive: to promote the behavior of directors that serves the best interests of the company. Each fund evaluates each director and then votes accordingly. Of course, even under such "straightforward" behavior, we would expect to see differences in fund voting behavior, simply due to random noise. However, we would not see systematic differences, and the identity or characteristics of the shareholders casting proxy votes would not play a role. In contrast, our results show that they matter. Moreover, the magnitudes of fund heterogeneity and peer effects are comparable economically to the effects of firm and director characteristics on voting outcomes.

Proxy advisory and solicitation firms are aware of the heterogeneity of voting practices among shareholders, and have built their businesses around this notion. Morrow & Co, an advisory and solicitation firm, advertises its services on its website by stating:

> *The final vote on any proposal at your shareholder meeting should never come as a surprise. Our ability to identify your current institutional ownership, combined with our knowledge of institutional voting guidelines and historical voting patterns, allow us to accurately predict the vote outcome on a variety of compensation and governance issues.* (Morrow & Co. 2008)

We take a similar approach to show that some funds are systematically more management-friendly than others. We use a fund's "historical voting pattern" as an estimate of its friendliness, and therefore as a predictor of how it will vote in future elections. For example, we use Fidelity's average vote in director elections in 2004 to predict how it will vote in 2005. To avoid mechanical correlations, when we want to predict how Fidelity will vote in IBM director elections in 2005, we exclude its votes in IBM in 2004 when we estimate its friendliness. We find that among funds who vote on the same director in the same meeting, funds with a higher estimate of friendliness are significantly more likely to vote "for." In other words, we show that the past voting record is a good proxy for a fund's management friendliness and that management friendliness is an important factor in explaining mutual fund voting in board of director elections.

We discuss these findings in much more detail in Section 6.1, but a simple example of voting patterns provides an illustration of both heterogeneity and persistence of fund voting behavior. Table 1 presents the number of "for" (i.e., in support of a management-proposed director) and "withhold" (i.e., against a management-proposed director) votes for ten large, popular mutual funds tracking the S&P 500 index for two voting seasons, July 2003–June 2004 and July 2004–June 2005. While the holdings of these funds are, by construction, very similar, the votes are not. The least management friendly fund, Vanguard 500 Index Fund, withheld support from management-proposed directors 559 times, or in 17.2% of cases, in the first voting season, and 351 times, or in 10.7% of cases, in the second one. The corresponding numbers for the friendliest fund, Dreyfus S&P 500 Index Fund, are 6 (0.2%) and 15 (0.5%)—lower than Vanguard's by a factor of almost 100 in the first voting season and almost 25 in the second. The ten funds' voting policies are also highly persistent: the correlation between their votes in the first voting season and in the second one is equal to 0.93.

One of the reasons why funds may differ in their management friendliness is the degree to which they worry about potential management retaliation. Funds seem to dislike voting against directors who are supported by the management. In its letter to the Securities and Exchange Commission (SEC), Alliance Capital Management opposed the adoption of proxy disclosure rules, fearing "retaliatory actions by corporate management if a fund votes against management" (Pugliese 2006). Management can retaliate by limiting its interaction with the fund to the minimal level required by the law. In its letter to the SEC, Mosaic Funds states that the "retaliation could be in the form of denial of access to company management in the course of our investment research on behalf of our shareholders" (Mason 2006). In addition to denial of access, the firm may terminate all current and potentially future business with the fund, such as managing the assets of their pension plans. It can therefore be costly for a single fund to vote against directors recommended by management. However, if many funds decide to vote against these directors, the power of management to retaliate could be severely limited. It is much harder for management to stop communicating with a large fraction of its institutional investors. Similarly, management may have a hard time severing business relations with many mutual funds holding its shares, since that may severely limit its choice of business partners. In the extreme case, if all funds vote against directors recommended by management, the management may resign and will not be able to retaliate. This "safety in numbers" externality can therefore be a source of peer effects in mutual fund proxy voting. After establishing persistent heterogeneity in fund voting behavior we move on to testing for the presence of these peer effects and evaluating their magnitudes.

Identifying peer effects requires a careful approach, because director quality that is not observed by the researcher but is known to the funds induces a correlation in fund votes. This correlation can be mistaken for funds' strategic interactions.[1] We exploit the heterogeneity in funds' management-friendliness to overcome this issue. Intuitively, suppose Fidelity is voting on two otherwise identical directors, except that the first director will be voted on by management-friendly funds and the second director by unfriendly ones. The first director will get more support from funds other than Fidelity than the second director, even though they are identical. Fidelity should not intrinsically care about how management-friendly other funds are; the management-friendliness of the other funds is of interest only to the extent that it affects their votes. Therefore, if Fidelity's vote is higher for the first director, this indicates that Fidelity raised its vote in response to the higher vote by other funds. This idea forms the basis of our estimation: we use management-friendliness of other funds in an election as an instrument for their expected vote. We discuss this identification approach in more detail in Sections 4.2, 6.2, and 6.3.

Armed with an instrument for the expected votes of other funds, we first estimate a basic linear instrumental variables model to test for the presence of peer effects. We find that, indeed, funds are more likely to vote "for" when their expectations about the number of "for" votes cast by other funds are higher. The linear instrumental variables model is simple and straightforward, and allows us to establish the presence of persistent heterogeneity and peer effects. To analyze the magnitudes of these effects in more detail, we also estimate a structural model of voting in board of director elections. We estimate the model using a modified version of the control function approach, again exploiting the variation in fund friendliness to identify the parameters. The model incorporates our two main findings from the reduced-form analysis: heterogeneity in fund friendliness and payoff complementarities (peer effects).

In order to compare the economic magnitudes of the effects, we simultaneously estimate the effects of management friendliness, strategic complementarities, and firm and director characteristics. We find that the effect of mutual fund friendliness on voting in board of directors elections is of the same order magnitude as the effects of firm and director characteristics. For example, a two

[1] See, e.g., Manski (1993) for an analysis of issues arising in an analogous problem of identifying peer effects.

standard deviation change in the firm's return on assets will increase a director's vote from 80% "for" to 86.8% "for." Similarly, if the director changed from an inside director to an outside director, her expected vote would change from 80% to 84% and if she moved away from the compensation committee, her expected vote would increase from 80% to 85%. We can compare the size of these effects to the effect of a two standard deviation increase in fund friendliness: it would make a fund that voted "for" 80% of the time increase its probability of such vote to 96.8%. This indicates that who votes on a director can potentially be as important as how good this director is.

To evaluate the economic magnitude of peer effects, we compute counterfactual equilibria in which we change director quality of a subset of our directors. For each director, we compare the equilibrium effect of increasing her quality to the direct effect of the same change in the absence of peer effects. This allows us to look at the distribution of director-specific multipliers, instead of just looking at the average multiplier across all directors. For example, in one specification, the median size of the multiplier in the experiment is 1.07, i.e., the impact of increasing director quality is 7% larger in equilibrium than it would be without peer effects. The multiplier, however, is much higher for many directors: e.g., the $75^{th}$ percentile multiplier is 2.13. This magnitude of strategic interactions implies that when considering a change in policy that, e.g., makes it easier to oppose management, a policymaker would need to keep in mind that the size of the direct effect of the policy can be considerably magnified because of funds' interactions.

In addition to the results on proxy voting, our paper offers a methodological contribution to the literature on estimating static games with peer effects. We model voting in director elections as a supermodular game of asymmetric information (Van Zandt and Vives 2007). This structure allows us to compute bounds on counterfactuals even in the presence of multiple equilibria, for each specification of parameters. Also, it allows us to compute director-specific multiplier effects, taking into account director characteristics and shareholder composition. Finally, the computations can be performed using a simple, intuitive, and fast iterative process.

Our paper is most closely related to two strands of corporate governance literature. First, it contributes to the literature on the determinants of board composition. These have been widely studied using outcome variables, such as board composition and director survival rates.[2] In contrast, we look directly at the votes cast in director elections, which provide a more natural test of which characteristics erode director support. Cai, Garner, and Walkling (2008) and Fischer, Gramlich, Miller, and White (2008) also study the effects and determinants of director elections using data on voting outcomes. They, however, only look at aggregate voting results. Looking at individual votes rather than aggregate outcomes allows us to shift focus to individual shareholders and to examine how interactions between them shape the voting outcome.

The second strand of the literature empirically analyzes the effect of mutual fund incentives on their proxy voting behavior, using the data on individual votes that became available after the SEC

[2] See Hermalin and Weisbach (2003) for an excellent survey of the literature on corporate boards. The main questions they discuss are: (i) How are board characteristics, e.g., composition and size, related to profitability? (ii) How do board characteristics affect the observable actions of the board? and (iii) What factors affect the makeup of boards and how do they evolve over time?

rule change. Using a subset of fund families, Davis and Kim (2007) demonstrate that voting on non-binding shareholder proposals by mutual funds does not seem to be influenced by their business ties with individual portfolio firms, although they do find some evidence that it is influenced by the overall level of a fund's business ties. Matvos and Ostrovsky (2007) show that mutual funds' incentives to vote against bad mergers in acquiring companies are blunted because they realize a portion of merger gains in their holdings in the target, and that as a result firms with holdings in both the acquirer and the target are less likely to oppose such mergers than firms with holdings only in the acquirer. Finally, Rothberg and Lilien (2006) provide a variety of descriptive statistics about voting policies and outcomes of a small number of mutual fund families for the first year after the SEC rule change took effect. They study voting on all issues, including director elections. They also find that different funds vote differently; however, they do not show that these differences are persistent. They also do not study interdependencies between funds' voting decisions. Finally, unlike Davis and Kim (2007) and Rothberg and Lilien (2006), we use a comprehensive dataset of proxy votes from a majority of mutual funds rather than a small subsample.

Our paper also contributes to the literature on peer effects and social multipliers. These effects have been found in a variety of settings: crime (Glaeser, Sacerdote, and Scheinkman 1996), education (Sacerdote 2001, Graham 2008, Cooley 2007), stock market participation (Hong, Kubik, and Stein 2004), enrollment in retirement and health plans (Duflo and Saez 2002, Sorensen 2006), mutual fund investment decisions (Hong, Kubik, and Stein 2005), and many others. We show that these effects are important in corporate director elections. To the best of our knowledge, our two-step estimation approach, in which we first establish persistent heterogeneity in funds' behavior and then exploit that heterogeneity to identify peer effects, is novel. We also offer a convenient structural framework for analyzing them.

The remainder of the paper is organized as follows: In Section 2, we provide institutional background on mutual fund voting in board of director elections. In Sections 3 and 4, we present our model of strategic proxy voting and discuss our estimation strategy in detail. We describe our data in Section 5, and then present our results in Section 6. In Section 7, we use the estimated model to evaluate the magnitudes of social multipliers due to peer effects. We conclude in Section 8.

## 2 Institutional Background

A board of directors in the United States is formally both a principal in its relationship to the management, and an agent with respect to the shareholders. The board is responsible for providing guidance and monitoring management on behalf of the shareholders. The nominees for boards of directors in the U.S. are selected for election by the board itself. Ninety-five percent of the boards of large U.S. companies have a nominating committee comprising non-executive directors whose role is to recommend a slate of directors for election to the board, although often the candidates are suggested by the management of the company (Monks and Minow 2003). Once the slate has been confirmed by the board, the company can start soliciting proxy votes for its list of directors.

Shareholders can prepare a competing list of directors by entering into a proxy fight, which they must finance out of their own pocket.

When companies solicit proxy votes, they have to establish the beneficial owner who has the right to vote their shares. Shares are frequently formally held by depositories, which must establish the beneficial owner prior to the shareholder meeting. The recording date is the date on which the beneficial ownership of the security is established by the depository (the difference between the recording and meeting date is typically around two months). The proxy materials are then mailed to the beneficial owners by the corporation.

The beneficial owners generally file their proxies with the secretary of the corporation. An inspector of elections is appointed by the corporation to oversee the count, which is performed by tabulators who can be firm employees. In a proxy contest, the dissidents can have their own representatives present at the count. Unless the corporation explicitly implements confidential voting, the voting decisions of individual shareholders are revealed to management. If voting is confidential, management is in principle informed only of the final tally of the votes, and not the votes of individual shareholders. Confidentiality, however, is not absolute and can be violated in a contested election.[3] Also, after the 2003 policy change by the SEC, confidentiality no longer applies to mutual funds, who are required to annually disclose their votes to the SEC in N-PX filings (SEC 2003b). These filings are subsequently made public by the SEC, and form the basis of our dataset, described in Section 5.

In the *plurality* voting system implemented by most corporations in the U.S., directors with the most "for" votes are elected. If directors run unopposed, shareholders cannot vote "against" a nominee, but can only "withhold" authority to cast the vote. The "withhold" vote therefore cannot prevent a nominee's election, and even a single "for" vote theoretically elects an unopposed director.[4] The "withhold" vote was introduced by the SEC and was later interpreted by it as a mechanism for shareholders to express their dissatisfaction with directors (ISS 2005).

While essentially not binding legally, the withhold votes do have some power in disciplining management. For example, at the Disney shareholder meeting on March 3, 2004, Michael Eisner, then the Chairman and CEO of the company, received a 43% withhold vote. The vote still formally elected him to the board, but it was a clear expression of shareholder dissatisfaction and he resigned as Chairman on the same evening.[5] At the May 9, 2007 shareholder meeting at CVS/Caremark, director Roger Headrick received a 44% withhold vote, with investors expressing their disapproval of his role in the earlier Caremark-CVS merger. Headrick stepped down from the board several weeks later. At the Yahoo! shareholder meeting on June 12, 2007, all three compensation committee members received withhold votes from more than 30% of shareholders, as a signal of dissatisfaction with the compensation of Chairman and CEO Terry Semel, given the company's performance.

[3]See Heard and Sherman (1987), McGurn (1989) and Monks and Minow (2003) for further details about the mechanics of proxy voting and an overview of vote confidentiality issues.

[4]This is not the case in the majority voting system, where "withhold" votes have the weight of an "against" vote and a candidate gets elected only if more than half of the votes cast are "for" (ISS 2005).

[5]Stewart (2005) gives a colorful account of this event.

On June 18, Semel resigned as CEO and then later also resigned as Chairman.[6] In addition to showing that proxy voting does have some power, these examples also give a feel for the relevant range of variation in "withhold" votes: between 0 and 50%. In fact, outcomes with more than 50% "withhold" votes are extremely rare, and even a 20% "withhold" vote is usually viewed as a strong negative signal.[7]

Mutual funds have a fiduciary duty to their shareholders to conduct the fund's business in the shareholders' best interests. This duty has been interpreted by the SEC to extend to the right to vote proxies of shares in their portfolio (Gartman 1999, SEC 2003b).[8] To adhere to their fiduciary duty, mutual funds must provide written policies (guidelines) and procedures to ensure that they act in the best interests of their shareholders. Like the actual votes, after the SEC's 2003 policy change the voting guidelines must also be publicly disclosed (SEC 2003b).

Just as funds differ in their approaches to investing, they also differ in their approaches to proxy voting. Funds vary in how voting policies are set, in the policies themselves, and in who may vote the proxies. Some funds set voting guidelines and voting proxies on the fund level, while others do so at the firm or fund family level. There are also funds that use a mixed approach by organizing voting on the fund level, but setting policies that govern voting at a higher level. Vanguard, for example, has fund-specific guidelines to govern proxy voting by its funds. The oversight of proxy voting is delegated to the fund-level Proxy Oversight Committee, which is ultimately responsible for casting the votes (Vanguard 2006). T. Rowe Price is an example of a fund using a mixed approach. It employs a firm-wide proxy committee, which develops guidelines for portfolio managers, who then cast votes on proposals for companies in their portfolio. If they deviate from the guidelines, they have to provide a written explanation as to why they deviated (T. Rowe Price 2008). Fidelity's proxy guidelines and proxy voting are centralized at the firm level.[9] The guidelines are developed by the Board of Trustees of Fidelity and the votes are cast by FMR Investment & Advisor Compliance Department (Fidelity 2006).

Funds' different approaches to proxy voting can also be seen in the content of their proxy voting guidelines. The guidelines of Vanguard and Fidelity, for example, differ on how director independence should be taken into account when voting in director elections. Vanguard's "factors for approval" of a board of directors place a great deal of weight on director independence. They

[6] Cai, Garner, and Walkling (2008) and Fischer, Gramlich, Miller, and White (2008) show that lower voting outcomes are correlated with higher subsequent CEO and director turnover. They do not, however, prove causality.

[7] A pair of recent initiatives may further strengthen the power of shareholder votes. First, companies are increasingly adopting majority voting rules instead of plurality. Second, the SEC is considering changing the way the votes of small individual shareholders who do not submit their ballots are counted. Currently, such shareholders' brokerage firms vote on their behalf, and they typically vote "for" directors and other routine proposals sponsored by management. Under the new rules, such votes would not be counted, thus making it harder for directors to achieve a majority of "for" votes (NYSE 2006b, NYSE 2007).

[8] The SEC allows the fund not to cast its vote if this is in the shareholders' best interests. However, a policy of abstaining is typically not considered to be in the shareholders' best interests, except in some special circumstances. Proxy voting outside the U.S. is offered as an example of when casting a vote can be expensive and hence abstaining may be in the best interest of shareholders (SEC 2003a).

[9] This, however, does not apply to Fidelity's equity index funds, where the voting authority is held by Geode Capital Management, LLC, the investment adviser for these funds.

consider whether the “nominated slate results in [a] board comprised of a majority of independent directors” and whether “all members of audit, nominating, and compensation committees are independent of management” (Vanguard 2006). Fidelity’s rules, on the other hand, do not require director independence at all. Only insider membership on the compensation committee is a factor in casting a “withhold” vote, which does not rule out outside related directors on the committee (Fidelity 2006).

Guidelines are, as their name suggests, not binding and can leave significant freedom of choice as to how the funds cast their votes. Even where guidelines have a clear recommendation, they do not have to be followed. For example, State Street Global Advisors voted “for” Warren Buffet to serve as a director on the board of Coca Cola, even though he was an affiliated director. Their justification was as follows:

> *We cannot deny an affiliation exists. We feel, however, the question rests in whether we believe his substantial ownership stake mitigates or negates his outside affiliation and that his presence on the audit committee is critical to KO or best serves KO? SSgA does not require but would tend to prefer board members who have skins in the game, aligning their interests with the interests of shareholders. In his case, Mr. Buffet has more than enough skins and his membership on the audit committee is logical given that such a large personal stake will more than ensure he acts in his best interests, which are aligned with overall shareholders best interests. Mr. Buffet is the quintessential stakeholder and his presence on the KO board offers one of the true independent voices in corporate America. SSgA policy currently recommends voting against Mr. Buffet. Based on the analysis above we have identified investment reasons for overriding policy.* (State Street Global Advisors 2006)

In the next section, we present a theoretical model of fund voting behavior, which forms the basis of our empirical estimation procedures. In the model, we assume that these votes are chosen optimally by decision makers, taking into account the costs and benefits of a particular vote. The votes of other funds are taken into account as well, giving rise to strategic interactions that we identify in Section 6.

## 3 The Model of Strategic Proxy Voting

We model voting as a simultaneous-move one-shot game.[10] There are $n_i$ funds, indexed by $j \in \{1, 2, ..., n_i\}$, voting in electing director $i$ to the board of directors.[11] The director has a vector of characteristics $q_i = (q_{i1}, \ldots, q_{im})$, which represent both director-specific characteristics such as

[10] We thus rule out the possibility that a fund observes the votes of others in a given election before making its own decision. We also, in effect, view each election in isolation, assuming away dynamic strategies that funds may play in the repeated game of voting in multiple elections over time. These extensions, while potentially interesting, are beyond the scope of this paper.

[11] For notational convenience, we will sometimes omit index $i$.

age or committee membership and firm-specific characteristics such as size of firm assets, its stock returns, or governance characteristics. All director characteristics are observed by all funds.

Each fund has a certain *management friendliness* parameter $\nu_j$. As mentioned above, funds differ in their approaches to proxy voting. This friendliness parameter $\nu_j$ is intended to capture such systematic differences in fund voting on a scale of how favorable these are to management. One potential source of systematic differences in fund voting is proxy voting guidelines. If fund voting is to a degree determined by guidelines, then funds whose guidelines seem to favor management would vote with management more frequently. From the examples of guidelines described in Section 2, one would expect Fidelity to be more management friendly than Vanguard. Another potential source of systematic differences in fund voting is how proxy voting is organized and monitored. If some portfolio managers have to provide a written explanation of why they deviated from the voting guidelines, as in the T. Rowe Price example, they may be more willing to enforce the guidelines and withhold their vote more frequently than other funds. Funds which rely more on business from their portfolio companies or which hope to attract such business in the future may also be more likely to systematically support management in these firms.[12] Fund managers may also have different disutilities of opposing management and resisting the pressure to support management-nominated directors. All these potential sources may make a fund systematically more or less likely to vote with management.

Formally, friendliness $\nu_j$ induces a systematic difference among funds: some funds, on average, realize higher payoffs from voting for a director than other funds. In particular, more friendly funds, holding all else equal, have a higher relative payoff to voting "for" vs. "withhold" than less friendly funds. The fund's friendliness $\nu_j$ is known to all funds.

The fund also privately observes an idiosyncratic director-specific shock $\varepsilon_{ij}$, which affects the fund's payoffs from voting "for" and "withhold." This shock causes equally friendly funds to vote differently on directors. It could arise, for example, if a fund manager finds it particularly costly to oppose a particular director due to a personal or business connection. These shocks are drawn independently from a zero-mean distribution $G(\varepsilon_{ij})$. Apart from these idiosyncratic shocks, all other characteristics and parameters of the funds and the directors are common knowledge to all funds.

Funds simultaneously cast their votes on director $i$. We denote by $\omega_{ij} \in \{0,1\}$ the vote of fund $j$ on director $i$, with 1 representing a "for" vote and 0 a "withhold" vote. The vector of all votes cast for director $i$ is then $\omega_i = (\omega_{i1}, \ldots, \omega_{in})$; also, let $\omega_{i,-j} = (\omega_{i1}, \ldots, \omega_{i,j-1}, \omega_{i,j+1}, \ldots, \omega_{in})$. After votes are cast, each fund realizes its payoff

$$U(q_i, \nu_j, \omega_{ij}, \omega_{i,-j}, \varepsilon_{ij}). \tag{1}$$

The payoff of the fund depends on director characteristics, the fund's management friendliness,

[12] Davis and Kim (2007) provide some evidence that this is indeed the case when funds vote on shareholder proposals: funds with more business ties to Fortune 1000 companies are on average more management friendly, although there is no evidence that they are particularly friendly when voting in meetings of their business partners.

its own vote, the votes of other funds, and the fund's director-specific shock. Note that we assume that only the fund's own management friendliness enters the payoff function of a fund directly. The fund cares about other funds' management friendliness only to the extent that it affects other funds' votes. This restriction is the basis of our estimation.[13] We also make several additional assumptions, discussed below.[14]

**Assumption 1** *Voting has increasing differences in director characteristics, i.e., for every* $k$*,*

$$\frac{\partial\left(U\left(q_i,\nu_j,1,\omega_{i,-j},\varepsilon_{ij}\right)-U\left(q_i,\nu_j,0,\omega_{i,-j},\varepsilon_{ij}\right)\right)}{\partial q_{ik}}\geq 0.$$

That is, we assume that higher values of characteristics $q_{ik}$ are viewed positively by the funds (e.g., $q_{ik}$ could represent the likelihood that the director will oppose excessive managerial pay), and that all else being equal, the fund is more willing to vote for a director with higher values of these characteristics.

**Assumption 2** *Voting has increasing differences in management friendliness and the idiosyncratic shock, i.e.,*

$$\frac{\partial\left(U\left(q_i,\nu_j,1,\omega_{i,-j},\varepsilon_{ij}\right)-U\left(q_i,\nu_j,0,\omega_{i,-j},\varepsilon_{ij}\right)\right)}{\partial \nu_j}\geq 0.$$

$$\frac{\partial\left(U\left(q_i,\nu_j,1,\omega_{i,-j},\varepsilon_{ij}\right)-U\left(q_i,\nu_j,0,\omega_{i,-j},\varepsilon_{ij}\right)\right)}{\partial \varepsilon_{ij}}\geq 0.$$

This assumption formalizes the notion of the friendliness parameter and the role of the idiosyncratic shock: a more friendly fund has a higher incremental payoff of voting "for," holding director characteristics and votes of other funds fixed. It also states that a higher idiosyncratic shock increases the incremental return to voting with management.

**Assumption 3** *Voting has increasing differences in other funds' votes, i.e.,*

$$U\left(q_i,\nu_j,1,\omega_{i,-j},\varepsilon_{ij}\right)-U\left(q_i,\nu_j,0,\omega_{i,-j},\varepsilon_{ij}\right)\geq U\left(q_i,\nu_j,1,\omega'_{i,-j},\varepsilon_{ij}\right)-U\left(q_i,\nu_j,0,\omega'_{i,-j},\varepsilon_{ij}\right)$$

*whenever, vote by vote,* $\omega_{i,-j}\geq\omega'_{i,-j}$.

This assumption introduces a specific form of inter-fund externalities: voting "withhold" is more costly when few other funds also vote "withhold," for the reasons outlined in the introduction. The presence of these externalities, in turn, implies that in the voting game, funds will behave strategically: all else being equal, a fund is less likely to vote against a director if it expects few other funds to vote "withhold."

[13] In other words, we interpret $\varepsilon$'s as only influencing the private values of the funds from voting and not as private signals about underlying director qualities. The latter interpretation would imply a voting game with information transmission and interdependent valuations, similar to the model of Feddersen and Pesendorfer (1997), which would substantially complicate our estimation methodology.

[14] The implicit differentiability assumptions are made purely for expositional purposes and can easily be omitted.

While this voting game can have multiple equilibria, assumptions 1-3 above imply that they have a special structure: there exists a pure-strategy equilibrium most friendly to management, and a pure-strategy equilibrium most hostile to management. All other equilibria are contained between these two extremes. Proposition 1 states this result formally:

**Proposition 1** *There exist the lowest and the highest pure-strategy Bayesian Nash equilibria of the voting game specified above. (These equilibria may coincide.) In both equilibria, each fund's vote is weakly increasing in the fund's own friendliness parameter $\nu_j$, other funds' friendliness parameters $\nu_k$, $k \neq j$, and the vector of director qualities $q_i$.*

**Proof.** The game satisfies the assumptions of a monotone supermodular game in Van Zandt and Vives (2007):

- Condition 1 requires supermodularity and increasing differences in actions and parameters, which determine a fund's payoff $(q_{i1}, \ldots, q_{im}, \nu_j, \varepsilon_{ij})$, which are satisfied by Assumptions 1 - 3.
- Condition 2 requires that the beliefs of fund $j$ about vectors $(q_{i1}, \ldots, q_{im}, \nu_k, \varepsilon_{ik})$ for all $k \neq j$ are first-order stochastically increasing given its own realization of $(q_{i1}, \ldots, q_{im}, \nu_j, \varepsilon_{ij})$. Given that the idiosyncratic shocks $\epsilon_{ij}$ are independent, management friendliness of funds $\nu$ is commonly known, and the characteristics $q_i$ are common to all funds, this condition is trivially satisfied.

Consequently, Proposition 1 follows directly from Theorem 1 in Van Zandt and Vives (2007) ■

**Remark 1** *In equilibrium, funds play threshold strategies in $q_i, \nu_j$, and $\varepsilon_{ij}$.*

**Remark 2** *The best response function of a fund is increasing in $q_i, \nu_j$, $\varepsilon_{ij}$ and the expected vote of other funds.*

Generally, best response functions in games are specified in terms of strategies of other players, which are not directly observable. Remark 1, however, allows us to express a fund's strategy as a cutoff strategy in $\varepsilon_{ij}$, conditional on commonly known director quality $q_i$ and the fund's friendliness $\nu_j$. Therefore, there is a monotonic one-to-one relationship between a fund's strategy and its expected vote, conditional on $q_i$ and $\nu_j$, and we can replace other funds' strategies with their expected votes when writing down a fund's best response function.

## 4 Estimation

We want to estimate how a fund determines its vote, taking into account its friendliness, the strategies of other funds, and the characteristics of the director and the firm voted on. In the framework of the voting model presented in the previous section, we want to estimate a fund's best response function

$$\omega_{ij}^* = \omega_{ij}^* \left( q_i, \nu_j, E_{\varepsilon_{i,-j}} \omega_{i,-j}, \varepsilon_{ij} \right). \tag{2}$$

Best response $\omega_{ij}^*$ is an increasing function of director characteristics, fund characteristics, other funds' expected votes, and idiosyncratic fund-director shocks (see Remark 2). Ideally, to estimate the function, one would observe all variables that enter it. Then one would directly estimate all the parameters of the model, including the parameter on other funds' expected vote, to test for the presence of strategic interactions. The problem we encounter is that director characteristics observed by the funds are only partially known to the researcher. In the presence of director characteristics unobservable to the researcher, from his or her point of view the fund's vote and the vote of other funds holding the same company would be correlated even in the absence of strategic considerations. For example, suppose Fidelity and Vanguard are voting on electing Bob to the board of IBM. Bob is a good director, but this is not reflected in our measures of director characteristics. Then Fidelity's vote and Vanguard's vote on Bob would be correlated simply because of Bob's quality, which increases their probabilities of voting "for" Bob.

To circumvent this problem, we exploit the heterogeneity in funds' management friendliness. The management friendliness of other funds *does not* enter the payoff function of the fund directly. In other words, funds care about other funds' management friendliness only to the extent that it influences other funds' votes. Because more management friendly funds are more likely to vote for a director *holding all else equal*, we can exploit this variation to generate variation in other funds' expected votes. If a fund is to vote in two identical firms, where one is held by friendly funds and the other by unfriendly funds, it would vote "for" more frequently in the former if there were strategic considerations present.

If our best response function (2) were linear, we would be in a linear instrumental variables setting. We would predict the average vote of other funds using the equilibrium equation, and then use the predicted vote instead of the actual vote of other funds in our main regression. As a robustness check, we do just that in Section 6.2. However, because our outcome variable is binary, our structural equation is inherently non-linear. Hence, the linear instrumental variables approach is not a valid way to test and estimate the parameters of our model. Instead, for our main estimation procedure we use an approach based on the control function methodology.[15] In the remainder of this section, we will first explain how we construct the proxy for funds' management friendliness, and then describe in detail our two-step estimation procedure for the best response function.

## 4.1 Constructing the Proxy for Funds' Management Friendliness

To implement our estimation procedure, we first need to construct a proxy for funds' management friendliness. We construct this proxy by using a fund's historical voting record. To proxy for a

[15] For an overview of the control function methodology, see Imbens and Woodridge (2007) and Navarro (2008).

fund's type in year $t$, we average its votes in year $t-1$. Furthermore, to avoid any mechanical correlation, we calculate the fund's proxy by excluding its votes in the firm whose votes we are trying to explain. For example, when we calculate the proxy for Fidelity's management-friendliness when it votes in IBM's election of directors in 2005, we average its director votes in all elections in year 2004 except for the ones in IBM.

We could obtain a more precise proxy for funds' management friendliness by including firm controls. A fund is more likely to be management unfriendly if it votes "withhold" in firms in which other funds voted "for". Firms in which a majority of funds vote "withhold" are more likely to have worse directors, so voting "withhold" there is less of a signal of unfriendliness and more of a signal of director and firm quality. On the other hand, voting "for" in this situation would be a strong signal of a fund's management friendliness. A potential way to implement such a measure of management friendliness would be to calculate the fixed effects of all funds. We chose instead the approach above because we wanted to avoid using information from future dates $t+s$ when analyzing a vote made at time $t$. For example, in trying to predict Vanguard's vote in IBM in 2004, we would also have to use information on Vanguard's vote in 2005, which we wanted to avoid. An alternative would be to calculate the fixed effect separately for each year. However, the fixed effect calculation takes into account voting in the company in question, which we also wanted to avoid. In this case, our independent variable would potentially still be correlated with the dependent variable, since votes in IBM were used to construct a proxy meant to explain it.

Our proxy for funds' management friendliness is simple and is designed to avoid mechanical correlation; it trades off these two features for precision in measuring management friendliness. In Section 6.1 we show that despite its simplicity, this proxy performs well empirically.

## 4.2 Discussion of the Identification Assumption

Before turning to the two-step estimation procedure for the best response function, we address the basic assumption behind the identification of the strategic voting effect and potential problems with our instrument. The fundamental assumption in our estimation is that funds care only about other funds' friendliness insofar as it affects those funds' expected votes. In particular, a fund would not update its beliefs about director quality from observing which funds are voting on the director. There are several possible sources of heterogeneity in fund friendliness, and they have different implications for the validity of our instrument.

We have mentioned several sources of heterogeneity in Section 3. Differences in proxy guidelines and differences in how proxy voting is organized and monitored within funds are two potential sources of differences in funds' management friendliness. If funds vote proxies differently because of differences in proxy guidelines, then the friendliness of other funds influences a fund's voting only through other funds' votes. Similarly, if some funds are more management friendly than others because of actual or potential business connections or because of personal preferences of mutual fund managers, then we may use fund heterogeneity to instrument for the expected vote of other funds. For example, suppose fund A believes that management friendliness will help it bring more business in the future. Fund B, on the other hand, does not take it into account because of a different marketing strategy. Observing that fund A owns a particular company as opposed to fund B does not say anything about the quality of the directors of those companies. It does, however, allow us to predict how funds A and B will vote.

The main difficulty for our identification strategy is that funds do not purchase stocks randomly. First, suppose that friendly funds tend to hold similar stocks. Other funds' management friendliness then provides additional information on a fund's own management friendliness, beyond the fund's past voting record. In other words, suppose we want to estimate how management friendly BlackRock is. If friendly funds buy similar stock, then looking at other funds who hold the same stock as BlackRock provides us with information on BlackRock's management friendliness. If other funds are friendly, this means that BlackRock is likely to be friendly as well, and if other funds are unfriendly, then BlackRock is likely unfriendly as well. In this scenario, funds who vote on directors in firms owned by other friendly funds are in fact friendlier than their past voting records suggest. Hence they are more likely to vote "for" a director. In Section 6.2, we address this concern by estimating a linear approximation to our model that allows us to include fund-year fixed effects.

The second potentially problematic source of sorting is that friendly funds may tend to hold stock in companies with directors who are good on an unobservable dimension. The following three-fund example demonstrates how this type of sorting would affect our identification. Suppose Fidelity invests only in companies which have "good" directors, and Vanguard invests only in companies which have "bad" directors. To estimate our model, we analyze the behavior of T. Rowe Price in two companies. In the first company, Fidelity is the only other mutual fund, and in the second company, Vanguard is the only other mutual fund. Then T. Rowe Price will be more likely to "withhold" its vote in the company owned by Vanguard. It will do so because the director is a bad director, and not because Vanguard is likely to vote "withhold". If this is the case, the friendliness of funds holding a company is in fact a proxy for how good a director is on the unobservable quality. We will address the concern that this type of sorting is driving our results in Section 6.3.

## 4.3 Estimation of the Voting Model

Armed with a proxy for the friendliness parameter $\nu$, we can estimate how a fund determines its vote, i.e., the best response function. To make the model tractable for empirical analysis, we make several specific functional-form assumptions about the funds' payoff function $U\left(q_i, \nu_j, \omega_{ij}, \omega_{i,-j}, \varepsilon_{ij}\right)$. First, we assume that the votes of other funds enter the utility function in a particular way: a fund cares about the fraction of other funds voting "for", i.e., since each vote can take the value of either 1 or 0, each fund cares about the average vote of other funds, $\overline{\omega}_{i,-j} = \frac{1}{n_i-1}\sum_{k\neq j}\omega_{ik}$, where $n_i$ is the total number of funds voting on director $i$. In other words,

$$U\left(q_i, \nu_j, \omega_{ij}, \omega_{i,-j}, \varepsilon_{ij}\right) = U\left(q_i, \nu_j, \omega_{ij}, \overline{\omega}_{i,-j}, \varepsilon_{ij}\right). \tag{3}$$

Second, we divide the vector of director characteristics $q_i$ into a vector of characteristics observable by both the researcher and the funds, $x_i$, and a scalar representing unobserved director quality, $\zeta_i$, which is known to the funds, but not to the econometrician. Consequently, we rewrite the utility function from voting as

$$U = U\left(x_i, \zeta_i, \nu_j, \omega_{ij}, \overline{\omega}_{i,-j}, \varepsilon_{ij}\right). \tag{4}$$

Third, we normalize a fund's utility from voting "withhold" to zero. For our goal of estimating strategic effects and the impact of various parameters on voting behavior, this is without loss of generality, since this normalization has no effect on the incentives of a fund to vote "for" or "withhold".

$$U\left(x_i, \zeta_i, \nu_j, 0, \overline{\omega}_{i,-j}, \varepsilon_{ij}\right) = 0. \tag{5}$$

Finally, we assume that the utility from voting "for" is additively separable and linear in parameters:

$$U\left(x_i, \zeta_i, \nu_j, 1, \overline{\omega}_{i,-j}, \varepsilon_{ij}\right) = \alpha + \beta_1\nu_j + \beta_2\overline{\omega}_{i,-j} + \beta_3\zeta_i + \Gamma x_i + \varepsilon_{ij}. \tag{6}$$

This assumption precludes nonlinear interactions between various parameters of interest. It is, however, a common restriction in the literature on estimating discrete choice models and discrete games, which makes the estimation problem computationally tractable (See, e.g., Ackerberg, Benkard, Berry, and Pakes (2007)). Also, in Section 6.4, we estimate several more flexible specifications, in which we include quadratic and cubic terms of parameters and their interactions.

When fund $j$ casts its vote on a director, it does not know how the other funds will vote. Those funds' votes depend on the realizations of their idiosyncratic shocks $\varepsilon_{ik}$, $k \neq j$. Let $\varepsilon_{i,-j}$ denote the random vector of these idiosyncratic shocks. Fund $j$ maximizes its expected utility $E_{\varepsilon_{i,-j}}U\left(x_i, \zeta_i, \nu_j, \omega_{i,j}, \overline{\omega}_{i,-j}, \varepsilon_{ij}\right)$. If it votes "withhold", its utility (in every realization, and hence in expectation) is 0:

$$E_{\varepsilon_{i,-j}}U\left(x_i, \zeta_i, \nu_j, 1, \overline{\omega}_{i,-j}, \varepsilon_{ij}\right) = 0. \tag{7}$$

If instead it votes "for", its expected utility is equal to

$$\begin{aligned} E_{\varepsilon_{i,-j}}U\left(x_i, \zeta_i, \nu_j, 1, \overline{\omega}_{i,-j}, \varepsilon_{ij}\right) &= E_{\varepsilon_{i,-j}}[\alpha + \beta_1\nu_j + \beta_2\overline{\omega}_{i,-j} + \beta_3\zeta_i + \Gamma x_i + \varepsilon_{ij}] \\ &= \alpha + \beta_1\nu_j + \beta_2\left(E_{\varepsilon_{i,-j}}\overline{\omega}_{i,-j}\right) + \beta_3\zeta_i + \Gamma x_i + \varepsilon_{ij}. \end{aligned} \tag{8}$$

Let $\overline{\omega}^e_{i,-j}$ denote the average expected vote of other funds, $E_{\varepsilon_{i,-j}}\overline{\omega}_{i,-j}$. Note that this expectation is conditional on the information of fund $j$, i.e., funds' friendliness parameters $\nu$ and director $i$'s characteristics $x_i$ and $\zeta_i$. Equations (7) and (8) imply that the best response function of fund $j$, $\omega^*_{i,j}$, takes the form

$$\omega^*_{ij} = \begin{Bmatrix} 1, \text{ if } \alpha + \beta_1\nu_j + \beta_2\bar{\omega}^e_{i,-j} + \beta_3\zeta_i + \Gamma x_i + \varepsilon_{ij} \geq 0 \\ 0, \text{ if } \alpha + \beta_1\nu_j + \beta_2\bar{\omega}^e_{i,-j} + \beta_3\zeta_i + \Gamma x_i + \varepsilon_{ij} < 0 \end{Bmatrix}. \tag{9}$$

The vote of fund $j$ on director $i$, $\omega^*_{ij}$, is determined by the fund's own management friendliness $\nu_j$, other funds' expected average vote $\bar{\omega}^e_{i,-j}$, director $i$'s observed characteristics $x_i$ and unobserved quality $\zeta_i$, and fund-director random shock $\varepsilon_{ij}$. Variables $\zeta_i$ (unobserved director quality) and $\bar{\omega}^e_{i,-j}$ (expected vote of other funds) are not observed by the researcher, and so we cannot estimate the coefficients in equation (9) directly. Instead, we first estimate these two variables, and then in the second stage estimate the parameters of interest. To separately identify these two variables, we use instruments that affect $\bar{\omega}^e_{i,-j}$ but not $\zeta_i$. The key assumption behind our estimation approach is that other funds' friendliness parameters do not directly enter a fund's best response function (9). Therefore, we can use management friendliness parameters of funds other than $j$, $\nu_{i,-j}$, to instrument for their votes. We can then use variation in $\nu_{i,-j}$ to identify the strategic interaction parameter $\beta_2$ and other coefficients in equation (9).

**First stage.** Fix the equilibrium that the funds are playing. The average expected vote of other funds, $\bar{\omega}^e_{i,-j}$, is then a function of funds' friendliness parameters, $\nu$, and director $i$'s observable and unobservable characteristics $x_i$ and $\zeta_i$, i.e., $\bar{\omega}^e_{i,-j} = \bar{\omega}^e_{i,-j}(\nu_1, \ldots, \nu_n, x_i, \zeta_i)$.[16] In principle, we could have derived the shape of this function for various values of parameters from equilibrium considerations and then applied a moment- or likelihood-based procedure to estimate the parameters of interest by maximizing the likelihood or minimizing the deviations from moment conditions of the observed voting behavior. This, however, would be very demanding computationally, and so we instead use several alternative parametric approximations of function $\bar{\omega}^e_{i,-j}(\cdot)$ and subsequently verify that our results are robust to the choice of the functional form of the approximation. In the most basic approximation that we use, the function is linear and the vector of friendliness parameters of other funds is summarized by their average, $\overline{\nu}_{i,-j} = \sum_{k \neq j} \nu_k$.[17]

$$\bar{\omega}^e_{i,-j} = \delta + \gamma_1 \nu_{ij} + \gamma_2 \overline{\nu}_{i,-j} + \Gamma_1 x_i + \gamma_3 \zeta_i. \tag{10}$$

The actual, observed average vote of other funds is equal to the expected vote plus noise (due to idiosyncratic shocks in the preferences of other funds),

$$\bar{\omega}^*_{i,-j} = \bar{\omega}^e_{i,-j} + \eta_{ij}. \tag{11}$$

Unlike the funds, the researcher does not know the unobserved component of director quality, $\zeta_i$, and hence from his point of view, the expected vote of other funds is equal to

$$\bar{\omega}^r_{i,-j} = \delta + \gamma_1 \nu_{ij} + \gamma_2 \overline{\nu}_{i,-j} + \Gamma_1 x_i. \tag{12}$$

[16] Generally, $\bar{\omega}^e_{i,-j}$ could also depend on which equilibrium is played by the funds, in the case of multiple equilibria. We do not investigate the issue of equilibrium selection here; instead, we assume that the same equilibrium is played in all elections, e.g., the most or the least management-friendly one.

[17] Our more flexible specifications in Section 6.4 allow for quadratic and qubic terms of parameters and their interactions. We also use richer approximations of the distribution of other funds' friendliness parameters by including additional information about it, such as higher moments or percentiles.

We can now rewrite the actual average vote of other funds as

$$\begin{aligned}
\bar{\omega}^*_{i,-j} &= \bar{\omega}^e_{i,-j} + \eta_{ij} && (13)\\
&= \delta + \gamma_1 \nu_{ij} + \gamma_2 \overline{\nu}_{i,-j} + \Gamma_1 x_i + \gamma_3 \zeta_i + \eta_{ij} && (14)\\
&= (\delta + \gamma_1 \nu_{ij} + \gamma_2 \overline{\nu}_{i,-j} + \Gamma_1 x_i) + (\gamma_3 \zeta_i + \eta_{ij}) && (15)\\
&= \bar{\omega}^r_{i,-j} + r_{ij}, && (16)
\end{aligned}$$

where $r_{ij} = \gamma_3 \zeta_i + \eta_{ij}$ is orthogonal to $\nu$ and $x_i$ by construction. Hence, the researcher's expectation $\bar{\omega}^r_{i,-j}$ and parameters $\delta$, $\gamma_1$, $\gamma_2$, and $\Gamma_1$ can be consistently estimated by regressing the realized average vote of other funds, $\bar{\omega}^*_{i,-j}$, on $\nu$ and $x_i$. The estimate of the researcher's expectation that we obtain from this regression is $\widehat{\bar{\omega}}^r_{i,-j} = \hat{\delta} + \hat{\gamma}_1 \nu_{ij} + \hat{\gamma}_2 \overline{\nu}_{i,-j} + \hat{\Gamma}_1 x_i$.

Next, we can also obtain an estimate of unobserved director quality. Namely, we can rewrite the above equations as

$$\gamma_3 \zeta_i = \bar{\omega}^*_{i,-j} - \bar{\omega}^r_{i,-j} - \eta_{ij} \tag{17}$$

and then form the estimate of the unobserved component of director quality as

$$\hat{\zeta}_i = \frac{1}{n_i} \sum_{k \neq j} (\bar{\omega}^*_{i,-k} - \widehat{\bar{\omega}}^r_{i,-k}). \tag{18}$$

Three comments about our estimate $\hat{\zeta}_i$ are in order. First, since $\zeta_i$ is only defined up to a rescaling factor, we need to pick a unit of measurement for it. We do so by explicitly setting $\gamma_3 = 1$. In other words, we set a "unit" of unobserved director quality in such a way that increasing director quality by $z$ units increases the expected average vote of other funds also by $z$: e.g., increasing $\zeta_i$ by, say, .05 increases $\bar{\omega}^e_{i,-j}$ by .05. Second, in our data, we have a median of 107 funds voting on a director, and so our estimates of unobserved director quality are quite precise: they differ from actual qualities by $\frac{1}{n}\sum_{k \neq j} \eta_{ik}$, which becomes small as $n$ becomes large. Finally, the averaging of the residuals is a departure from the standard control function approach. We average the residuals because the unobserved director quality is not specific to every observation; rather, it is specific to a director.[18]

**Second stage.** We now get back to estimating the parameters of a fund's best response function,

$$\omega^*_{ij} = \begin{Bmatrix} 1, \text{ if } \alpha + \beta_1 \nu_j + \beta_2 \bar{\omega}^e_{i,-j} + \beta_3 \zeta_i + \Gamma x_i + \varepsilon_{ij} \geq 0 \\ 0, \text{ if } \alpha + \beta_1 \nu_j + \beta_2 \bar{\omega}^e_{i,-j} + \beta_3 \zeta_i + \Gamma x_i + \varepsilon_{ij} < 0 \end{Bmatrix}. \tag{19}$$

Note that since we set the scale for $\zeta_i$ by setting $\gamma_3 = 1$, we have $\bar{\omega}^e_{i,-j} = \bar{\omega}^r_{i,-j} + \zeta_i$. Hence, we can rewrite the above equation as

$$\omega^*_{ij} = \begin{Bmatrix} 1, \text{ if } \alpha + \beta_1 \nu_j + \beta_2 \bar{\omega}^r_{i,-j} + (\beta_2 + \beta_3)\zeta_i + \Gamma x_i + \varepsilon_{ij} \geq 0 \\ 0, \text{ if } \alpha + \beta_1 \nu_j + \beta_2 \bar{\omega}^r_{i,-j} + (\beta_2 + \beta_3)\zeta_i + \Gamma x_i + \varepsilon_{ij} < 0 \end{Bmatrix}, \tag{20}$$

[18] Cooley (2007) uses a similar modification of the first stage.

In the last step of our estimation procedure, we replace variables $\bar{\omega}^r_{i,-j}$ and $\zeta_i$ in equation (20) with their first-stage estimates $\widehat{\bar{\omega}}^r_{i,-j}$ and $\hat{\zeta}_i$ and run a logistic regression implied by the resulting equation (votes $\omega^*_{ij}$ on the left-hand side and variables $\nu_j$, $\widehat{\bar{\omega}}^r_{i,-j}$, $\hat{\zeta}_i$, and $x_i$ on the right-hand side) to estimate coefficients $\alpha$, $\beta_1$, $\beta_2$, $\beta_3$, and $\Gamma$ in that equation. Note that equation (20) makes explicit the two channels through which unobserved director quality impacts the vote of fund $i$: directly, by changing its utility from voting for a director (measured by coefficient $\beta_3$) and indirectly, by changing the expected votes of other funds (measured by coefficient $\beta_2$), which in turn impacts fund $i$'s incentives.

Like the first stage, the second stage of our estimation procedure also contains a departure from the standard control function approach: we use the expected votes of other funds rather than the actual votes. This is a consequence of modeling voting as a game of private information, in which each fund chooses its action based on the expectation of other funds' behavior rather than the actual realization, which is unknown to the fund at the moment it makes its decision.

# 5 Data

In accordance with the SEC's requirements, every year mutual funds registered in the U.S. must report their votes in all annual and special meetings of their portfolio companies. The deadline for reporting is August 31, and the votes cover the period beginning on July 1 of the previous year and ending on June 30 of the current year. The funds were first required to report their votes in 2004.

For each vote, funds specify the name of the company, its ticker and CUSIP, the date of the meeting and the record date, a brief description of the issue being voted on (director election, merger proposal, shareholder proposal, etc.), the sponsor of the proposal (management or shareholders), management's recommendation, and the vote of the fund. The SEC did not specify a particular format in which this information should be submitted. As a result, funds have complete freedom in how they report their votes, and consequently the information is reported in a variety of different formats. After the funds submit the files to the SEC, their submissions become publicly available on the SEC Filings & Forms website (EDGAR).[19] These submissions are known as "N-PX" filings. Using the list of all submissions available on the SEC's website,[20] we identified all available N-PX filings for two 12-month periods: 7/1/2003–6/30/2004 and 7/1/2004–6/30/2005. We used a script to download all of these submissions, resulting in 7754 text files.[21] A typical submission is the N-PX filing of Vanguard 500 Index Fund for the year 2005.[22] Many of these files contain votes for several mutual funds, because a mutual fund management company is allowed to submit votes for some or all of its funds in a single file.[23] We identified the funds by the Central Index Key (CIK)

[19] http://www.sec.gov/edgar/searchedgar/n-px.htm.

[20] http://www.sec.gov/cgi-bin/edgar_archive_indices.

[21] This number includes 566 "N-PX/A" submissions, which are filed by the funds subsequently to their original filings when they find out that some of the information in those original filings is erroneous or incomplete. We downloaded all N-PX and N-PX/A filings submitted in the 2004 and 2005 calendar years.

[22] http://www.sec.gov/Archives/edgar/data/36405/000093247105001377/0000932471-05-001377.txt.

[23] E.g., http://www.sec.gov/Archives/edgar/data/914775/000091477505000014/0000914775-05-000014.txt.

contained in the header of the file and the fund's name contained in the main body of the file.

We then manually reviewed a large number of these submissions to identify as many different formats as we could find. Reviewing all submissions was not practical, because their total size exceeded 7 gigabytes of data and some filers used several different formats in the same file.[24] However, we ensured that we identified the formats for the 100 largest active mutual funds, and for several popular fund families. In total, we identified 34 different formats.

We then wrote computer scripts to extract data from these formats to a single database, making the data operational. We applied all of these scripts to all files. Then, to filter out the records that were not correctly converted (i.e., when an incompatible script was applied to a file, which for every file occurred 33 or 34 times out of 34 attempts), we only retained the records for which the values of fund vote, management recommendation, and proposal sponsor coincided with one of several options, which we then mapped to the appropriate uniform values. These uniform values, along with the corresponding "raw" variable values, are given in the tables below. If the variable value was not in the table, it was discarded. For example, a record with the vote cast "fo" was discarded and did not count as a "for" vote; only "for" or "yes" counted.

Fund vote and management recommendation coding table

| Against | For | Did Not | Withhold |
|---|---|---|---|
| against; agnst | for; yes | did not; abstain; no vote; non-vote; none; notcast; not voted; did not v; donotvote; not cast; unvoted; null | withhold; withheld; withhold; w'hold; whold |

Sponsor coding table

| Management | Shareholder |
|---|---|
| management; mgmt; mgt; mt; issuer | shareholder; s/h; shldr; shr; shrholdr |

We retained records containing at least one of either the meeting date or record date, a CUSIP or a ticker, a valid fund vote, a valid management recommendation, and a valid sponsor. Next, we used an algorithm to sort out the director votes, and from these, extracted the last name, first name and suffix of directors. The details of these algorithms are available from the authors upon request.

There is an additional complication: some funds do not report their votes on individual directors, reporting instead whether they voted "for" the entire slate of directors or not (if they did not vote for the entire slate, they report either a "withhold" vote for the entire slate or "split" if they voted for some directors and withheld support for others). We dropped such funds.

We then obtained all stock price and stock returns information from the CRSP database. Industry benchmarks are calculated for all stocks with positive prices available on CRSP in the same two-digit SIC code.

[24] E.g., http://www.sec.gov/Archives/edgar/data/1053425/000095013505004942/0000950135-05-004942.txt.

We used Compustat Industrial Annual files to construct accounting and financial company information. For our book value of assets, we use total assets (item 6). We define capex to assets as the ratio of capital expenditures (item 128) to total assets (item 6). We calculate cash flow to assets as income before extraordinary items (item 18) plus depreciation plus amortization (item 14) divided by total assets (item 6). We define leverage as liabilities (item 181) over total assets (item 6) and ROA as income before extraordinary items (item 18) over total assets (item 6).

To calculate q and book-to-market ratios, we had to obtain the market and book values of equity and assets in which we closely followed the variable construction used in Malmendier and Tate (2005). We calculate market equity as common shares outstanding (item 25) times fiscal year closing price (item 199). We calculate book equity as total stockholders' equity (item 216) minus preferred stock liquidating value (item 10) plus deferred taxes and investment tax credit (item 35), when available, minus post retirement assets (item 336), when available. If total stockholders' equity is not available, we calculate it as common equity (item 60) plus preferred stock carrying value (item 130) or, if that is not available, as total assets (item 6) minus total liabilities (item 181). If preferred stock liquidating value is not available, we replace it with preferred stock redemption value (item 56), and if that is not available, we replace it with the preferred stock carrying value. We construct the market value of assets as total assets (item 6) plus market equity minus book equity. We define q as the ratio of market value of assets to book value of assets and book to market as the ratio of book value of equity to market value of equity.

To obtain firm governance characteristics, we use the IRRC Governance database. The governance data are available only for years 2002 and 2004. We assign governance characteristics of a firm in 2003 and 2005 using data from 2002 and 2004, respectively. We obtained director information from the Board Analyst Directors database. We removed any punctuation and standalone letters from first and last names of directors in both databases to make the match with voting data feasible.

The voting data is first matched with CRSP and Compustat data on eight digit CUSIPs. The unmatched data is then merged on six digit CUSIPs, and then on the firm ticker. The IRRC governance data is matched on six digit CUSIPs and then on tickers.

The Board analyst data is then matched using director names directly. If there is no other director sitting on the board of the company (as identified by its ticker) in a particular year, we match the voting data with Board Analyst data using the director's last name, the firm ticker, and the year. If the directors have the same last name, but differ in first name, we match by last name and first name. For the remaining data, we use the ticker, year, first name, last name and the suffix of the director.

In some parts of our analysis, we use the voting recommendations of Institutional Shareholder Services (ISS), a prominent adviser of institutional investors on various matters, including proxy voting. We obtained the recommendations from the ISS Voting Analytics database, and matched them to the dataset using 8-digit CUSIPs.

Finally, we applied various cleaning procedures to remove duplicate and internally inconsistent records from the data.[25] We then restrict the sample to elections in which at least 10 funds cast votes and votes were cast using proxies from ordinary common shares (share codes 10 and 11). Also, we retained only the votes sponsored by the management. We are left with a sample of 2,058,788 director votes.

## 5.1 Summary Statistics

Our dataset covers 13,588 director elections in 2,528 shareholder meetings of 1,388 companies. In these elections, we observe 2,774 mutual funds casting 2,058,788 votes. The summary statistics for director elections are presented in Table 2. The average number of directors elected in a shareholder meeting is 5.38. The variation in the number of directors voted on in a shareholder meeting is substantial, ranging between 2 and 10 for the $10^{th}$ percentile and $90^{th}$ percentile of elections, respectively. In these elections, each director is voted on by an average of 152 funds. A director election at the $10^{th}$ percentile of the number of funds voting has 49 funds casting votes on a director, while the $90^{th}$ percentile election has 300 funds casting their votes on a director.

The average director in our sample receives support from 89.8% of funds. We can see that the distribution of voting outcomes, by director, is very skewed, as 96.5% of funds vote "for" the median director. Notice, however, that the $10^{th}$ percentile of directors obtains only 59.5% support.

The summary statistics of director characteristics in our sample are presented in Panel A of Table 3. Insiders (i.e., employees) represent 16.7% of directors up for election; 70.7% are outside directors, and 12.6% are outside related directors.[26] CEOs comprise 10.1% of our sample. Panel B of Table 3 shows the distributions of some characteristics of the firms in our sample. S&P 500 companies comprise 28.9% of our dataset, but the sample spans a wide range of companies by size, profitability, and other measures.

Simple comparisons of means in Panel A of Table 4 provide the first look at which director characteristics are correlated with voting outcomes. Most characteristics are indeed correlated with voting outcomes: e.g., CEOs get 1.64% more support, on average, than non-CEOs, while Chairmen get 1.14% more support than other directors; these differences are highly statistically significant. Two groups of directors are particularly likely to receive less support from shareholders: founders, who receive only 85.61% of "for" votes (vs. 91.68% for non-founders) and outside related directors, who receive only 83.01% (vs. 91.92% for insiders and 93.18% for unrelated outsiders). Committee membership is also related to voting outcomes. Audit committee members, on average, receive slightly more "for" votes than other directors, while nominating committee, compensation committee, and governance committee members receive fewer "for" votes than others.

[25]Duplicate records may appear in the data because some funds reported the votes for two different share classes separately, even though such voting records are always identical. Inconsistent records appeared when, e.g., the same fund reported its vote on a particular matter twice (e.g., in both the original and the amended N-PX forms filed by BB&T funds in 2004, the votes of BB&T Large Cap Growth Fund on the same director are often reported twice, once as "For" and once as "Did Not Vote"; see http://www.sec.gov/Archives/edgar/data/889284/000009223004000060/npx2004.txt and http://www.sec.gov/Archives/edgar/data/889284/000009223004000064/npxa.txt.)

[26]For a small number of directors, our data do not contain information on whether they are insiders, outsiders, or related outsiders.

Panels B and C of Table 4 present the mean vote cast by firms in a calendar year cut by firm characteristics. Firm size and S&P 500 membership reveal the largest differences in average voting outcomes. Directors in the largest firms receive more shareholder support than directors in the smallest firms. Of votes cast in board of director elections in firms in the largest size quintile, 92.98% are "for", while that numbers drops to 89.28% for the firms in the smallest size quintile. Similarly, directors in S&P 500 firms on average obtain 93.07% of "for" votes, while directors of other firms obtain 89.03% of such votes.

We also look at mean votes in firms with respect to their absolute performance and performance relative to their industry. Somewhat surprisingly, directors in better performing firms seem to receive fewer "for" votes than directors in worse performing firms. Directors in firms which performed in the lowest quintile of absolute returns receive a somewhat higher percentage of "for" votes. Their average support is 92.40%, while that number drops to 89.87% for the firms in the highest quintile of absolute returns. Comparing firms on their returns relative to their industry (as opposed to absolute returns) paints a similar picture. Directors in firms which are in the bottom quartile of their two-digit SIC industry obtain on average 0.42% more "for" votes than other directors.

# 6 Results

## 6.1 Fund Heterogeneity

Our estimation strategy, described in Section 4, relies on the heterogeneity of management friendliness among mutual funds. In this section, we show that the funds do, indeed, differ in their voting behavior and some of them are consistently more friendly toward management than others. If funds' votes responded only to director characteristics and behavior, which may affect the performance of the firm, we would not expect to observe *systematic* differences in fund voting patterns.[27] Of course, even if all funds had identical voting policies and preferences, but their decisions were subject to some random noise or idiosyncratic preferences, we would still observe some of them voting for the management more often than others, simply due to chance. In this section, however, we show that the differences in voting patterns are persistent.

Specifically, our proxy for the friendliness of a fund is the fund's average director vote in the previous calendar year in companies other than the one under observation. For example, to measure Fidelity's friendliness when it votes on a director in IBM in 2005, we average Fidelity's director votes in companies other than IBM in 2004.[28] In this section, our goal is only to show that the past voting record predicts fund voting, and not to focus on the magnitude of the effect, which will be

[27] One notable case in which preferences of mutual funds may differ is mergers and acquisitions: e.g., two funds may have the same stakes in the acquiring company and different stakes in the target company, resulting in different preferences of the funds over the outcome of the proposed acquisition (Matvos and Ostrovsky 2007). However, such differences in preferences seem unlikely for the matter we are considering in the current paper: director elections.

[28] In this example, the purpose of excluding Fidelity's 2004 votes in IBM from the proxy is to avoid potential correlation due to persistent preferences of Fidelity over IBM's directors—if Fidelity did not like a director in 2004 for some reason, it may also not like him or her in 2005 for the same reason. Looking only at Fidelity's votes in other companies allows us to capture Fidelity-specific effects rather than Fidelity-IBM specific ones.

discussed in Sections 6.4 and 7. Hence, we run a simple linear regression to predict a fund's vote using its past voting record as an explanatory variable. We omit strategic interactions between funds and unobservable director quality from the estimation.[29] This simplifies the analysis substantially, but alters the magnitudes of the coefficients, which cannot be interpreted as parameters of the underlying voting model.

The past voting record of a fund in other companies is a highly statistically significant predictor of fund voting. Column 1 in Table 5 shows the results from a basic regression of a fund's vote on a director of company $A$ on the fund's average vote in the previous year on all directors in companies other than $A$.[30] A 10 percentage point decrease in the average vote in other firms in the past year decreases the probability that a fund will vote "for" a director by 5.5 percentage points. From Table 2, the standard deviation of the distribution of the funds' average votes is 14.7%. Hence, a two-standard-deviation increase in fund friendliness corresponds to an increase of 16% in the likelihood of the fund voting "for" a director.

Of course, a fund's past voting record could simply proxy for the characteristics of firms in which the fund invest. For example, suppose Fidelity invested only in firms with high past returns and Vanguard only in firms with low past returns. In response to high returns, Fidelity might then vote "for" directors in the firms it owned last year and this year. Vanguard, on the other hand, might punish the directors of its portfolio firms for their bad returns by withholding its vote in the last calendar year and in the current election. As a result, the past voting record would be correlated with current voting even if there were no differences in friendliness of Fidelity and Vanguard. To control for this possibility, we include measures such as last year return, log book assets and other standard firm characteristics to proxy for the quality of directors and firms. We also include governance characteristics of a firm, measured by the Gompers, Ishii, and Metrick (2003) index. Column 2 in Table 5 presents the results after including these controls: a fund's vote is still correlated with its past voting record in other firms, and the magnitude of the coefficient is virtually unchanged.

An additional source of variation we control for are director characteristics, which are frequently targeted by proxy voting guidelines. For example, funds may look upon outside directors more favorably. Suppose some funds hold shares in firms that have boards stacked with inside directors, while other funds invest in firms whose boards comprise outside directors. This would induce a correlation in funds' votes and their past voting record that would not be the result of differences in funds' attitudes towards management. We control for director characteristics in Column 3 of Table 5. Even after including firm and director characteristics simultaneously in Column 4, a fund's vote is predicted by its average vote in the past calendar year in other firms, and this effect is statistically significant at one percent.

[29]We also repeat the procedure using logits and conditional logits and obtain qualitatively similar results.

[30]Note that the number of observations in this regression is 1,766,982, which is less than the total number of votes in our dataset, 2,058,788. This is because the only votes on the left-hand side of this regression are the ones for which we can estimate the voting fund's management friendliness. Therefore, for every fund, its votes in its first year in our dataset are excluded from the left-hand side of this regression. They are used on the right-hand side, to estimate the fund's management-friendliness.

Up to this point, we have been controlling for observable firm and director characteristics. There is still a possibility that some directors are better than others, but that this quality is not captured by the controls in our data. If Fidelity happens to hold firms with good directors and Vanguard holds firms with bad directors, then their current vote would be correlated with their past vote. To address this issue, we compare funds' voting on the same director in an election, therefore controlling for all director characteristics. Funds whose average vote last year in other firms was higher should be more likely to vote for this director. Columns 5–7 of Table 5 show that this is indeed the case. Columns 5 and 6 report the results of regressions with a separate fixed effect for each shareholder meeting, and in Column 7 there is a fixed effect for each director election (usually, there are votes on multiple directors in each meeting). In all specifications, the past voting record predicts fund voting in an election, and the effect is highly statistically significant. In other words, some funds are more management friendly than others, and their past voting records capture these differences in a meaningful way.

### 6.2 Reduced Form Results

Armed with a proxy for mutual fund management friendliness, we can now show that mutual funds are more likely to vote "for" a director if they think other funds are more likely to vote "for" her as well. We do so by estimating a reduced form linear probability instrumental variables model: we are predicting a fund's (linear) probability to vote "for" a director given the average vote of other funds voting on this director. Note that we cannot simply regress a fund's vote on the votes of other funds in the same election, due to the presence of unobserved director quality: if a director is good, we expect all funds to vote for her even in the absence of strategic interaction. Instead, we use other funds' management friendliness estimates, i.e., their average votes in the previous calendar year in all firms except the one under consideration, as instruments for their votes.

We begin with the most basic specification of the regression (Column 1, Table 6). In that specification, the instrument for the average expected vote of other funds in an election is their average friendliness, i.e., the average of their average votes in the previous year in other firms. We regress a fund's vote on a particular director on the instrumented average vote of other funds, controlling for fund-year fixed effects. The coefficient on our variable of interest (the average vote of other funds) is positive at 0.63 and statistically significant at 1 percent. This reduced form result implies that if the average vote of other funds increases by 10 percentage points, a fund becomes 6.3 percentage points more likely to vote for a director. In Column 2, we add several firm and director characteristics that might influence a fund's vote on a director. These encompass firm performance characteristics, standard financial controls, and information on the director, such as her position in the firm, whether she is an insider, and which committees she is a member of. After adding these controls, the coefficient decreases to 0.32, but it is still statistically significant at 1 percent.

Next, we consider alternative ways of instrumenting for the average vote of other funds. Management friendliness may impact future votes nonlinearly, and so while the average management friendliness of other funds may do a good job of predicting their average vote, other characteristics of the distribution of their friendliness parameters may contain additional useful information. We consider two alternative instruments. First, we instrument for the average vote of other funds with four moments of the distribution of their friendliness: mean, variance, skewness and kurtosis. Second, as an alternative to using moments to approximate that distribution, we use a set of percentiles of the distribution as an instrument. We use the 10th, 25th, 50th, 75th and the 90th percentile of other funds' management friendliness as instruments for their average vote.[31] The results from these two alternative specifications are presented in Columns 3 through 6 in Table 6 (with only the votes of other funds as explanatory variables in Columns 3 and 5 and additional explanatory variables in Columns 4 and 6). The estimated coefficient on the average vote of other funds is higher in these four specifications than in the corresponding specifications that only use the average management friendliness as an instrument, and are highly statistically significant.

Our final set of specifications includes an additional control: voting recommendations of Institutional Shareholder Services (ISS). ISS is a company providing various services, including proxy voting advice, to investment management firms. ISS is the most popular service providing such advice, and so including their recommendation may control for a potentially important part of the mutual funds' information about the quality of directors. This variable, however, has an important drawback for our purposes: one of the key inputs that ISS uses in forming their recommendations about a particular director are discussions with the institutional shareholders of that director's company.[32] Therefore, ISS recommendation may incorporate the expected vote of other funds, thereby acting as a proxy for other funds' vote, rather than simply controlling for director quality and providing exogenous information, and so it is hard to interpret regression coefficients on this variable and the impact of its inclusion on the coefficients on other variables. Nevertheless, it is a useful robustness check, and we include it as such in Columns 7–9 of Table 6, with the three columns corresponding to the three different specifications of instrumental variables described above. In these specifications, coefficients on our variable of interest (the average vote of other funds) are smaller in magnitude than those in Columns 2, 4, and 6, ranging from 0.09 to 0.27, but all of them are still statistically significant: two at the 1% level and one at the 10% level.

### 6.3 Alternative Explanations

Before proceeding to the estimation of our structural model of strategic proxy voting, we first address some alternative explanations of the voting complementarity documented in the previous section and show that they are unlikely to hold. Our main concern is that mutual funds do not randomly select stocks for investment. If friendly funds hold different stocks from unfriendly ones, then holdings could induce a correlation in fund voting that would be mistaken for strategic interaction. In particular, if unfriendly funds hold companies in which directors have a low unobservable

[31] We ran several tests to make sure that our instruments are strong. The tests showed that they are, with a very high degree of confidence. Details are available upon request.

[32] For instance, on its website, ISS advertises "engagement with appropriate company officials, top institutional holders and other parties to gain insight and make informed vote recommendations." http://www.issproxy.com/issgovernance/research/recommendation.html. Accessed April 26, 2008.

quality, our identification assumption would be invalid: A firm held by friendly funds would have better directors than what's predicted by its observable characteristics, and so the positive coefficient on the average vote of other funds in the regressions of the previous section would arise simply because the friendliness of other funds (and hence their predicted average vote) would proxy for unobserved firm or director characteristics. Clearly, stock selection cannot be the only explanation of heterogeneous voting behavior by the funds: as pointed out in the Introduction, even S&P 500 index funds, which have very little choice regarding their investments, exhibit a high degree of heterogeneity in their average votes. However, to show that it is at best a minor driver of voting behavior and is unlikely to explain the strategic effects documented in the previous section, we need to dig a bit deeper.

First, we examine which *observable* firm characteristics are correlated with the average friendliness of funds holding the firm. If unfriendly funds are more likely to acquire shares in lower quality companies, we should expect them to hold firms that are worse on both observable and unobservable characteristics. In fact, observable firm characteristics such as past returns and governance characteristics should be particularly strongly correlated with fund friendliness, if we expect unobservable firm quality, which is neither captured by accounting numbers nor by stock returns, to matter as well. Table 7 presents the correlation of observable firm characteristics with the average friendliness of funds holding shares in the firm. If unfriendly mutual funds acquire shares in lower-quality companies, one would expect these firms to also either exhibit bad past performance. This is not the case. Neither last year stock return nor the firm's accounting return on assets are positively correlated with the average management friendliness of funds holding shares in the firm. Similarly, looking at relative returns, firms in the bottom quartile of their industries are not more likely to be held by unfriendly funds. If anything, the coefficients in these regression (Columns 2 and 4) suggest that worse performing firms are held by friendlier funds, although none of them are statistically significant in the full specification. Combined, these results do not support the view that unfriendly funds hold shares in bad companies. Instead, mutual fund friendliness is correlated with the book size of a firm's assets, its leverage, book to market, membership in the S&P 500, and the industry return. These variables are highly correlated with the determinants of mutual funds' management styles as in Goetzmann and Brown (1997).[33] In other words, the correlation of average mutual fund friendliness and firms' observable characteristics is consistent with the standard determinants of fund style, but not with the hypothesis that unfriendly funds purchase lower-quality companies.

Another way to check whether fund friendliness is correlated with unobservable director quality in the fund's portfolio companies is the following. As we mentioned above, if unfriendly funds hold companies that are bad on an unobservable characteristic, then a fund's past voting record is not only proxying for the fund's management friendliness, but also for the firms' unobservable quality. Suppose that is indeed the case. Then, to predict the quality of a firm, one has to look at both its observable characteristics and at which funds hold the firm. If the funds holding the firm

[33] Goetzmann and Brown (1997) show that mutual funds can be classified in several groups according to their investment style, and some of the determinants of styles are size of the firm, firm's market to book ratio, and S&P 500 membership. Mutual funds also tend to invest in similar industries.

frequently voted against other firms in their portfolio in the past, then this firm is also a part of a portfolio of bad firms and is therefore on average worse than one would predict from its observable characteristics. A fund's past voting record in other firms then contains information both about the fund's actual friendliness and about the quality of the firm in question. When we predict a fund's voting behavior using its past voting record, as we did in Table 5, Column 4, controlling for observable firm and director characteristics, the fund's past voting record is potentially correlated with its current vote because of two different reasons. First, a high past voting record in other firms is correlated with a fund's vote because the fund is management friendly. Second, the past voting record in other firms is correlated with a fund's vote in the firm under consideration because all firms in the portfolio have similar unobserved quality. Now, if instead we run an alternative specification with an election fixed effect, that fixed effect should absorb all firm information that was up to this point contained in a fund's past voting record. Hence, if a fund's past voting record in other companies were proxying for unobserved firm quality, then its effect on a fund's vote should be diminished after the inclusion of the fixed effect. Therefore one would expect the coefficient on the past voting record to disappear or at least to decrease substantially after the inclusion of director fixed effects. When we run this alternative specification, the size of the coefficient is barely affected by the inclusion of the firm effects (Column 7 of Table 5). The coefficient changes from 0.551 in the specification with firm and director characteristics (Column 4), to 0.542 with director election fixed effects (Column 7). The standard error of the noisier coefficient is 0.04, and so the change of 0.009 is statistically indistinguishable from zero. Thus, all our evidence points to the strategic driver of the effect documented in the previous section, with funds incorporating their expectations about other funds' votes into their own decisions, rather than the alternative explanation that the past voting record of a fund in other companies proxies for an unobserved quality of the firm in question.

### 6.4 Estimating the Voting Model

We can now estimate the model of voting presented in Section 3. The object we are estimating is the fund's best response function. In other words, we are estimating how, in equilibrium, a fund's vote changes in response to changes in the expectation of other funds' vote, the type of director that is being voted on, and the fund's own management friendliness.

The naive approach to estimating a voting model, in which we condition a fund's voting on the average vote of other funds, is inappropriate because of unobserved director quality. If a director is a good director, we expect all funds to vote for her even in the absence of strategic interaction. We resolve the endogeneity problem by estimating unobserved director quality in the first stage of our estimation and replacing the actual average vote of other funds with its prediction. We obtain variation in expected voting of other funds using our instrument, the average past voting record of the other funds. Our estimation procedure is explained in detail in Section 4.3.

### 6.4.1 First Stage

Two determinants of fund voting in our model are not directly observable: the expected average vote of other funds and the unobservable dimension of director quality. Because these two characteristics are not directly observable, we must first estimate them. We assume that funds understand the equilibrium they are playing, and form expectations of other funds' voting by extrapolating equilibrium outcomes. Suppose Fidelity tries to predict how Vanguard will vote on director Bob who is nominated for IBM's board of directors. Fidelity first looks at Vanguard's past voting record to determine its management friendliness. Then it looks at whether Bob is an outside director, what committees he sits on, and whether IBM was profitable last year. To predict Vanguard's vote on Bob, it looks at past votes of all funds, and tries to extrapolate how funds such as Vanguard vote on directors such as Bob.

We use an analog of the fictional Fidelity procedure in the first stage of our estimation procedure to generate a fund's expectation of the average vote of other funds. We use a linear regression to predict the average vote of funds other than the one under observation. We regress the average vote of funds other than Fidelity on Bob's characteristics, the characteristics of IBM and on our instruments, different approximations of the distribution of past voting record of funds other than Fidelity. In other words, the dependent variable in the first stage is the average vote of all other funds who are voting on that director in that election. We regress their average vote on firm and director controls, the management friendliness of the fund under observation and our instruments, the moments or percentiles of the distribution of past voting record of these funds.

We are interested in the variation in the average vote of other funds that is caused by the three different specifications of our instruments: the mean; the mean, standard deviation, skewness and kurtosis; and the $10^{th}$, $25^{th}$, $50^{th}$, $75^{th}$ and $90^{th}$ percentile of the management friendliness of other funds on a vote. The results of the first stage are reported in Table 8. The average past voting record of funds voting on the director is strongly correlated with their vote both when included alone and with other moments of the distribution. For example, in the basic specification with firm and director controls (Column 2), the coefficient is 0.77, and it increases to 1.32 when higher moments of the friendliness distribution are included (Column 4). It is highly statistically significant at 1 percent across all specifications. An unconditional 10 percentage point increase in the average past voting record of other funds is associated with a 10.7 percentage point increase in their average vote. From Columns 3 and 4 we can see that the standard deviation, skewness and kurtosis of other funds' friendliness all contain information about the equilibrium vote of other funds, which is not contained in the mean. The F-test for including the other three moments in the first stage is 15.4 and 7.5, for specifications without and with director and firm controls. Similarly, percentiles of the distribution of other funds' friendliness also contain information on the average vote of other funds. The F-test for including percentiles in the first stage is 58.9 and 13.8 for specifications without and with director and firm controls respectively.

To uncover the unobserved director quality, we take the residual from the regression above and average it over the funds voting on a director, as in equation (18). A high residual from the first stage tells us that the director obtained a higher vote than predicted by her characteristics and the characteristics of the funds which voted on her.

### 6.4.2 Second Stage: Estimating the Parameters of the Model

Having estimated the expected average vote of other funds and director unobservable quality, we now have all determinants of a fund's vote from our model. Following equation (20), we estimate it using a simple logistic regression where the dependent variable is the fund vote. The explanatory variables are the fund's own friendliness, the expected average vote of the other funds, the estimate of director unobserved quality, and a set of firm and director controls.

Before we interpret the results of the estimation, we have to remember that a change in firm or director characteristics has two effects on fund voting. The first effect is the direct effect. If IBM's last year returns were higher, Fidelity is more likely to vote "for" directors in IBM, holding all else equal. Fidelity also knows other funds are more likely to vote "for" IBM directors, as a result of higher returns. Therefore it increases Fidelity's probability of voting "for" even higher; this is the indirect effect. We begin by examining the indirect effect and then turn to interpreting the effects of firm, director and fund characteristics on fund voting.

**Strategic complementarity.** Our results show that the expected average vote of other funds is a strong determinant of fund voting. The strategic effect is highly statistically significant across specifications. Table 9 presents specifications where controls enter only linearly. Once we control for firm or director characteristics in these specifications, the coefficient ranges from 1.84 in the specification using only the mean friendliness of other funds as an instrument to 5.44 for the specification using the percentiles of other funds friendliness as instruments.

We also ran more flexible specifications of controls. We allowed controls to enter as a second-order polynomial, i.e., we included a quadratic term for every control and an interaction between each pair of controls, and as a third-order polynomial (using a set of 13 controls instead of all 26, for computational feasibility). The results from these specifications are presented in Table 10. Including non-linear controls increases the magnitude of the strategic complementarity coefficient, which ranges from 5.2 to 7.8. Moreover, in the more flexible specifications the coefficient is less sensitive to the choice of instruments.

The expectation of the average vote of other funds is determined in equilibrium and is therefore endogenous to the model. To shed some light on the economic magnitude of this coefficient, one has to consider an out of equilibrium shock to the expectation of other funds' average vote. In other words, the experiment we are considering is: how would Fidelity's vote change if it made a mistake and overestimated the expected average vote of other funds. First, consider the upper end of the coefficients in the linear model, 5.44. If a fund's expectation of the average vote of other funds increases by 10 percentage points, the log odds of a "for" vote increase by 0.544.

To put this coefficient in context, consider a fund which withheld its vote on a director with a 20% probability. Suppose that in equilibrium the fund expected all other funds to withhold their votes with a 20% probability as well. If this fund instead made a mistake and expected all other funds to withhold their votes with only a 10% probability, its own probability of voting "withhold" would decrease by 7.3 percentage points to 12.7%, i.e., it would decrease by more than a third. Alternatively, if the coefficient is 1.84, then the same change 10 percentage point change in the expectation of other funds average vote would cause a fund to withhold change its probability of withholding by 2.8 percentage points, to 17.2%.

An alternative way of interpreting the coefficients is a back of the envelope calculation of the corresponding social multiplier. Suppose the direct effect of changing a director characteristic decreases all funds' probability of voting "withhold" from 20% to 10%. In addition to that response, each fund now knows that all other funds will lower their vote by 10 percentage points. If the coefficient is 5.44, each fund's best response is to decrease its log odds of a "withhold" vote further by 5.44 * 10% = 0.544, shifting the probability of a "withhold" vote from 10% to 6.1%. But then all funds funds know that as well, so they have an incentive to reduce their vote even further: an additional iteration decreases the log odds by (10% - 6.1%) * 5.44 = 0.21, decreasing the probability of funds voting "withhold" from 6.1% to 4.9%. Due to the structure of the game, by repeating the iterations until convergence, we can compute a new equilibrium. In this equilibrium, each fund votes "withhold" with probability 4.6%. Thus, the 10% direct effect of changing director quality translates to a total effect of 15.4%: the social multiplier is 1.54, and the complete effect of changing a director characteristic is more than 50% larger than it would be in the absence of funds' strategic interactions. Alternatively, with the estimated coefficient of strategic interaction equal to 1.84, the corresponding social multiplier would be equal to 1.18.

In Section 7, we provide additional insight into the economic significance of our estimates of strategic complementarity by analyzing its impact on equilibrium behavior of the funds.

**Fund heterogeneity.** In Section 6.1 we showed that if we compare two funds which are voting on the same director, the fund whose average vote last year in other firms was higher is more likely to vote for this director. In other words, we showed that a fund's voting record from the previous year is a good proxy for how friendly a fund is, and that this friendliness affects fund voting. To understand the magnitude of this effect, however, we have to jointly estimate all factors that determine a fund's vote.

Funds' friendliness remains a statistically significant and economically large determinant of fund voting even when we estimate the full model of voting. From Table 9, we can see that the coefficient on a fund's own management friendliness is remarkably stable across different specifications of controls ranging between 5.81 and 5.96. To understand the economic magnitude of this effect, consider changing a fund's management friendliness by two standard deviations of the fund friendliness distribution. This change increases a fund's log odds of a "for" vote by 1.85. To put this magnitude in perspective, consider the following example. Suppose a fund at one standard deviation under the mean of friendliness were to "withhold" the vote with a 20% probability. If the fund were to change to a one standard deviation above the mean friendly fund, it would withhold with only 3.8% probability. Given the relevant range of voting outcomes, such a change in fund behavior is potentially very large. Furthermore, we have only considered the change in voting of a single fund, ignoring the equilibrium reinforcement that would take place were all funds to become more management friendly at the same time. This example therefore provides a lower bound on the change in director support were all funds voting on a director change by two standard deviations of friendliness.

As we will see below, fund heterogeneity in management friendliness is at least as economically important in determining fund voting as firm performance and director and governance characteristics.

**Firm and director characteristics.** As we mentioned above, a change in firm or director characteristics has a direct and indirect effect. The coefficients of the best response function which we interpret in this section represent the magnitudes of the direct effect, which gives us a lower bound on the equilibrium size of the effect. Furthermore, all direct effects are reinforced by the same mechanism of strategic voting. Therefore if the direct effect of a change in last year's return is economically greater than the direct effect of changing governance characteristics, then the overall effect of increasing last year returns on voting will also be larger than the overall effect of changing governance characteristics on voting.

The firm and director effects are what Manski (1993) calls the exogenous or contextual effects. The first group of exogenous effects we look into are measures of the firm's last year performance. The previous year return on assets seems to be the most robust performance measure that funds respond to: a two standard deviation move in the ROA increases the log odds ratio of a director obtaining a "for" vote by 0.5. Returning to our canonical example, this change in returns would decrease the likelihood of a "withhold" vote of a fund from 20% to 13.2%. Again, one has to keep in mind that this is only the direct magnitude of the effect. We also examine whether funds consider firm performance relative to the industry when casting votes. We find that if a firm manages to switch from the bottom return quartile of its two digit SIC industry, the log odds of a "withhold" vote decrease by 0.06. In our example, this would reduce the probability of a "withhold" vote from 20% to 19.1%.

One of the central interests in corporate governance is the effect of a firm's governance characteristics. The benefit of examining fund voting is that we obtain direct insight into the effect of governance characteristics on the behavior of funds monitoring boards of directors. Two outcomes are possible: funds could "withhold" their vote more frequently in firms with weaker shareholder rights to force the directors to increase shareholder rights. Alternatively, funds may "withhold" their vote more frequently in firms with stronger shareholder rights, where they may be able to exert more pressure on directors. The latter seems to be the case in the data. Funds are more likely to "withhold" their vote from a director in a more dictatorial firm, such as a firm with a higher GIM index. A two standard deviation increase (5 point increase) in the index increases the log odds of a "for" vote by 0.04. The direct effect is economically small: a two standard deviation increase in the GIM index decreases a fund's probability of a "withhold" vote from 20% to 19.4%. A similar phenomenon, where funds seem to vote against directors on whom they may be able to exert more pressure, can also be seen in fund voting on the CEO. The CEO on average realizes fewer "withhold" votes than other inside directors. If we compare a CEO to a similar inside director whose probability of a "withhold" vote is 20%, the CEO is 1.2 percentage points less likely to receive a "withhold" vote.

Funds frequently address a director's relationship with the firm as a reason to "withhold" the vote in their guidelines. Funds are least likely to "withhold" their vote on an outside director. Outside related directors whose employer has a financial relationship with the firm or who are former employees of the firm, however, are more likely to obtain a "withhold" vote than inside directors. A potential explanation is that mutual funds understand that both outside related and inside directors are not free of conflicts of interests. Outside related directors have available substitutes in outside directors. The latter may not be good substitutes for inside directors, who have significantly more information on the company. An outside director's log odds ratio of a "for" vote is 0.27 higher than that of an inside director in the same firm. To put this coefficient in context, consider an inside director that receives a 20% "withhold" vote; the same director as an outsider would obtain a 16% "withhold" vote, leading to a 20 percent decrease in the probability of a withhold vote.

Funds' proxy guidelines also target committee members and specify that funds are to withhold votes if they are dissatisfied with the decisions or the composition of the committee. Compensation committee members receive on average lowest "withhold" votes among committee members; a director whose withhold vote would otherwise be 20% receives on average 5 percentage points fewer votes if she is on the compensation committee. Similar in magnitude is the effect of being the chair of the nominating committee.

As robustness check, we also ran alternative specifications in which we dropped 5% or 10% of directors from each tail of the distribution of unobserved quality. Our results become stronger, and in particular the coefficients on firm and director characteristics become less sensitive to the choice of specification. Further details are available upon request.

**Unobserved director quality.** Unobserved director quality plays an important role in determining fund voting. Note that the coefficient on unobserved director quality obtained from the logistic regression (Table 9) is not the structural coefficient. To compute the latter, we need to adjust the regression coefficient by subtracting from it the coefficient on expected vote of other funds (See Section 4.3 and equation (20) for details). The magnitude of the structural coefficient is economically important. For example, consider the estimates from specification 6, which we also used to illustrate the magnitudes of coefficients on firm and director characteristics. These estimates imply that a two standard deviation change in unobserved director quality increases log odds of a "for" vote by 0.76, which is a slightly larger change than the one following a two standard deviation increase in the return on assets. This result demonstrates the importance of accounting for unobserved director heterogeneity in our estimation of strategic complementarities, which would otherwise be severely biased.

# 7 Equilibrium Impact of Strategic Complementarity

At this point we have estimated all parameters which determine voting in our model. We can now use the model to generate counterfactuals in order to examine the equilibrium consequences that changes in underlying parameters have on the voting outcome. Because of strategic interactions between the funds, factors that directly affect fund voting are amplified in equilibrium. We briefly explored the magnitude of this multiplier implied by our estimates in Section 6.4. In this section we analyze the multiplier in more detail. We first change directors' quality and compute equilibria of our voting game before and after the change. We then compare the resulting change in voting outcomes to the direct effect of changing director quality on fund votes.

We first describe the construction of counterfactuals. Then we test the performance of our model in-sample by comparing the distribution of realized votes to the distribution of votes predicted by the model. We then use counterfactuals to examine the impact of strategic complementarities by evaluating the multiplier amplification of the impact of the direct change in director quality.

## 7.1 Constructing Counterfactuals

To construct counterfactuals, we alter the inputs used in the model we estimated and find a Bayesian Nash equilibrium of the resulting game. The benefit of modeling voting as a monotone supermodular game is that we know that an equilibrium exists. Furthermore, there is a simple algorithm that finds two special equilibria: the most and the least management friendly ones. All other equilibria are contained between these two (Van Zandt and Vives 2007).

Suppose we start at the strategy profile in which all funds vote "for" a director with certainty. Then we check, for every fund, how it would respond if all other funds always voted "for." We then take these responses as given, and ask again how each fund would respond if it believed all other funds played the strategy from the previous iteration. If we reach a profile in which no fund wants to change its strategy given what it believes other funds' strategies are, we have found an equilibrium. This equilibrium exists, and it is the most management friendly one: if a fund withholds its vote on a director in this equilibrium, it will do so in any other equilibrium of this game. Similarly, if we repeat this process, but start at a strategy profile where all funds "withhold" their vote, we will converge to an equilibrium that provides a lower bound on equilibria of this game. Given the realization of a funds' idiosyncratic shock $\varepsilon_{ij}$, if a fund votes "for" a director in this equilibrium, it will vote "for" the director in any other equilibrium.

To obtain our counterfactuals, we first have to specify funds' strategies and beliefs. Using Remark 1, we can specify a strategy of fund $j$, given its own type, director characteristics and other funds' expected average vote, by a cutoff $c_{ij}$. For realizations of the idiosyncratic shock $\varepsilon_{ij}$ below $c_{ij}$, the fund votes "withhold," and for realizations higher than $c_{ij}$, it votes "for." The cutoff for fund $j$

can be obtained from our best response function (9), as $c_{ij} = -\left(\alpha + \beta_1 \nu_j + \beta_2 \bar{\omega}^e_{i,-j} + \beta_3 \zeta_i + \Gamma x_i\right)$. The logistic specification of the best response function allows us to obtain a closed form expression for the expected vote corresponding to fund's strategy $\Pr(\omega_{ij} = 1) = \frac{\exp(-c_{ij})}{1+\exp(-c_{ij})}$. Moreover, from (9) we know that the sufficient statistic for a fund's belief about other funds' strategies is the expected average vote of other funds' $\bar{\omega}^e_{i,-j} = \frac{1}{n_i-1}\sum_{k\neq j}\Pr(\omega_{ik}=1) = \frac{1}{n_i-1}\sum_{k\neq j}\frac{\exp(-c_{ik})}{1+\exp(-c_{ik})}$.

Van Zandt and Vives (2007) show that the highest equilibrium of a monotone supermodular game can be obtained by iterating the best response function from the highest strategy profile. Let $c^t_{ij}$ be the cutoff value for the strategy and $\Pr\left(\omega^t_{ij} = 1\right)$ the expected vote of fund $j$ after the $t^{th}$ iteration of the best response function. In $t^{th}$ iteration we calculate the strategy of every fund by calculating its cutoff, $c^t_{ij}$. The belief of each fund about other funds' strategies is the strategy of the other funds' from the previous iteration, i.e., it is the expected vote of other funds fixed from iteration $t-1$, $\bar{\omega}^{e,t-1}_{i,-j}$. From the strategy, we can calculate the expected vote for each fund $\Pr\left(\omega^t_{ij} = 1\right) = \frac{\exp\left(-c^t_{ij}\right)}{1+\exp\left(-c^t_{ij}\right)}$.

In iteration $t+1$ we recalculate the strategies of every fund. We obtain a funds' belief about other funds strategies $\bar{\omega}^{e,t}_{i,-j}$ by averaging the fund's expected votes from the previous iteration $\bar{\omega}^{e,t}_{i,-j} = \frac{1}{n_i-1}\sum_{k\neq j}\frac{\exp\left(-c^t_{ik}\right)}{1+\exp\left(-c^t_{ik}\right)}$. Holding the expected vote of other funds fixed from the $t^{th}$ iteration, by inserting the average expected vote into the best response function, we calculate a new cutoff. Van Zandt and Vives (2007) show that these iterations converge to the highest equilibrium if we start from the highest strategy profile, where everyone votes "for" with probability 1, $\bar{\omega}^{e,0}_{i,-j} = 1$ for all $i, j$. Equivalently, to find the lowest equilibrium strategies, repeat the iterations above, starting with $\bar{\omega}^{e,0}_{i,-j} = 0$ for all $i, j$.

The following set of equations specifies the iterations of the best response function that lead to the highest and lowest equilibrium of our game. We start by setting the belief of each fund about the strategies of other funds to $\bar{\omega}^{e,0}_{i,-j} = 1$ and iterate the following two equations until convergence.[34] We repeat the procedure by starting with $\bar{\omega}^{e,0}_{i,-j} = 0$ to obtain the lowest equilibrium.

$$
\begin{aligned}
c^t_{ij} &= -\left(\alpha + \beta_1 \nu_j + \beta_2 \bar{\omega}^{e,t-1}_{i,-j} + \beta_3 \zeta_i + \Gamma x_i\right) \\
\bar{\omega}^{e,t}_{i,-j} &= \frac{1}{n_i-1}\sum_{k\neq j}\Pr\left(\omega^t_{ik}=1\right) = \frac{1}{n_i-1}\sum_{k\neq j}\frac{\exp\left(-c^t_{ik}\right)}{1+\exp\left(-c^t_{ik}\right)}
\end{aligned}
$$

The first equation specifies the strategy of a fund, given the expected average vote of other funds in the previous iteration. The second equation computes the summary statistic for a fund's belief about other funds' strategies in period $t+1$.

[34]Define the distance beteen iterations as $\sum_{i,j} \left| \Pr\left(\omega^t_{ij}=1\right) - \Pr\left(\omega^{t-1}_{ij}=1\right) \right|$ for all $i, j$ in our sample. We consider our system of equations to have converged if the distance between iterations is below 0.001. Given that we compute the counterfactual for over 1.7 million votes, this allows on average for a less than $10^{-9}$ change between the probabilities of a vote between iterations.

## 7.2 Performance of the Model

We begin by simulating equilibrium voting behavior under the estimated parameters, and compare it to the actual votes. The highest and lowest simulated equilibria are very close, and so we present the results only for the highest, most management friendly equilibrium. We calculate director support by averaging the probability of a "withhold" vote for all funds voting on a director.

Table 11 describes the distribution of the percentage of funds supporting a director in an election for the actual data and the simulated equilibrium under three different specifications. The model matches the qualitative features of the data. It also matches quantitative features of the data for the distribution of votes for directors who received support above the $10^{th}$ percentile of distribution of support.

While a significant number of directors obtain no "withhold" votes in the data, our model does not replicate this empirical fact. The reason is that we are comparing an actual realization of votes to the average probability of funds supporting a director. Using a logit model, no fund will ever vote for a director with probability 1; therefore, the mean expected support will be lower than 1 by construction. To match this empirical fact, we would have to draw a set of specific idiosyncratic shocks, $\varepsilon_{ij}$, which would then yield a number of directors obtaining no "withhold" votes.

The simulated average votes are very similar to the actual ones for a large part of the distribution of director votes in all three specifications. For example, the median director obtains "withhold" votes from 3.4% of funds in the actual data and 3.5–3.8% of funds in the simulated equilibria. The biggest difference between the realized vote and the predicted vote is in the level of support obtained by the 10% of directors with the highest level of opposition. In the data, the director at the $10^{th}$ percentile of the distribution receives 26.4% "withhold" votes, while in our simulated equilibria he would receive such votes from 14.8–16.5% of funds. For the directors even further out in the tail, our model's quantitative performance deteriorates further, most likely as a consequence of the structural assumptions in our estimation, e.g., the lack of heterogeneity in strategic complementarities among funds. We have to keep this caveat in mind when interpreting the counterfactual results.

## 7.3 Social Multiplier

Suppose the quality of a director increases for an exogenous reason. Then a fund will have an incentive to increase its vote on the director simply because she is a better director. This is the direct effect of increasing quality. Furthermore, the fund will have an additional incentive to increase its vote, because it knows that other funds are also more likely to vote for the director. Thus, the direct effect will be amplified in equilibrium. In this section, we compare the direct effect of changing director quality to the full equilibrium effect. Our counterfactual approach allows us to obtain individual, director-specific multipliers. These multipliers take into account director characteristics and the distribution of friendliness of funds participating in the election.

We take a subset of directors who are in the lowest quartile of the distribution of unobserved quality. For each director, we increase his or her quality by the amount equal to the difference in unobserved quality between the $90^{th}$- and the $10^{th}$-percentile directors. We compute the magnitude of the direct effect of this change and compare it to the magnitude of the full equilibrium effect in the fund voting game. As a baseline for computing the effects of increasing director quality, we use the votes obtained from the simulated equilibria described in the previous section, using the same three specifications. We use the simulated rather than the actual votes as a baseline, because we want to isolate the effects of the multipliers, and do not want to confound the effects with how well our model can replicate the voting distribution.

The distributions of simulated director votes resulting from taking into account only the direct effect of increasing director quality are presented in Panel A of Table 12.[35] The distributions of simulated votes resulting from the full equilibrium change are also presented in the same panel. Even from these aggregate numbers, we can see that the full equilibrium effect is much stronger than just the direct effect. For example, in Specification 4, the mean "withhold" vote drops from 33.9% in the baseline to 22.4% due to the direct effect and to 8.8% under full equilibrium response. This implies an aggregate multiplier of 2.2.

Our framework also allows us to compute individual director multipliers. The distributions of these multipliers, for all three specifications, are presented in Panel B of Table 12. The distribution of multipliers is highly skewed. The median multipliers in our specifications range from 1.03 to 1.12. The multipliers in the $75^{th}$ percentiles of the distributions, however, are much higher, ranging from 1.26 to 6. Given the wide range of multipliers that we get for the same percentile, depending on which specification we use, a natural question is which of these specifications is likely to be the most accurate. While we do not have a formal answer to this question, note that in alternative, more flexible specifications of our model presented in Table 10, the coefficient on the expected vote of other funds is relatively stable, and is always above 5, suggesting that estimates obtained from specifications 4 and 6 (in which that coefficient was estimated as 3.5 and 5.4, respectively) are more accurate than those obtained from specification 2 (in which the coefficient was estimated as 1.8). Hence, for many directors (at least those above the $75^{th}$ percentile), the social multiplier is likely to be large—at least 2, and even higher for many of them. Thus, any analysis of policy changes or improvements in firm or director characteristics has to take into account both the fact that peer effects have an important influence on voting outcomes and the fact that the resulting social multipliers differ widely across directors.

# 8 Conclusion

Voting in board of director elections is one of the main governance tools that shareholders have at their disposal. Prior empirical literature on boards of directors has used outcome variables such as board composition and director survival rates to understand this process. We explore shareholder

[35]Formally, if $\omega_{ij}^e$ is the initial probability of fund $i$ voting for director $j$, $\Delta\zeta$ is the change in director quality, and $\hat{\beta}_3$ is the coefficient on unobserved quality from (9), then the new probability of voting "for" resulting from the direct effect is $\frac{exp\left(\ln\left(\frac{\omega_{ij}^e}{1-\omega_{ij}^e}\right)+\hat{\beta}_3\Delta\zeta\right)}{1+exp\left(\ln\left(\frac{\omega_{ij}^e}{1-\omega_{ij}^e}\right)+\hat{\beta}_3\Delta\zeta\right)}$.

voting more directly, using a novel, comprehensive dataset which includes 2,058,788 mutual fund votes in director elections that took place between July 1, 2003 and June 30, 2005.

Looking at individual fund votes allows us to analyze the behavior of these funds and the interactions among them. We find substantial systematic heterogeneity in fund voting patterns, with some mutual funds being more management friendly and others less so. This heterogeneity among funds has a large economic effect on voting, on par with firm and director characteristics. This indicates that who monitors directors can potentially be as important as the characteristics of the directors monitored.

We then estimate a model of voting in which mutual funds impose externalities on each other: the cost of opposing management decreases when other funds oppose it as well. To estimate the model, we exploit fund heterogeneity. In essence, we compare a fund's votes in two otherwise identical director elections, except that in one election other funds are management friendly and in the other election other funds are unfriendly. Friendlier owners are ceteris paribus more likely to vote for directors. This results in variation in voting of other funds. Using this variation, we show that strategic interaction between funds is an economically and statistically significant factor in determining fund voting. It reinforces the direct effect that director characteristics have on the voting outcome. The magnitude of this social multiplier varies substantially across directors.

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**Table 1**

**Votes in Director Elections by Ten Popular Index Funds**

This table presents sample voting data for 10 popular mutual funds tracking the S&P 500 index in the elections of directors proposed by management. The votes are for the July 2003 - June 2004 and July 2004 - June 2005 voting periods. All votes other than "for" and "withhold" were discarded. Data source: SEC Edgar (N-PX filings).

| | July 1, 2003 - June 30, 2004 | | | July 1, 2004 - June 30, 2005 | | |
|---|---|---|---|---|---|---|
| Mutual fund | # "for" | # "withhold" | % "withhold" | # "for" | # "withhold" | % "withhold" |
| Vanguard 500 Index Fund | 2,686 | 559 | 17.2% | 2,921 | 351 | 10.7% |
| USAA S&P 500 Index Fund | 2,992 | 199 | 6.2% | 3,028 | 223 | 6.9% |
| Schwab S&P 500 Index Fund | 2,791 | 173 | 5.8% | 2,888 | 208 | 6.7% |
| Merrill Lynch S&P 500 Index Fund | 3,200 | 118 | 3.6% | 3,130 | 107 | 3.3% |
| Morgan Stanley S&P 500 Index Fund | 3,183 | 115 | 3.5% | 3,112 | 130 | 4.0% |
| UBS S&P 500 Index Fund | 2,954 | 103 | 3.4% | 2,970 | 80 | 2.6% |
| T Rowe Price Equity Index 500 Fund | 2,942 | 96 | 3.2% | 2,996 | 112 | 3.6% |
| Fidelity Spartan 500 Index Fund | 3,089 | 63 | 2.0% | 3,124 | 38 | 1.2% |
| Smith Barney S&P 500 Index Fund | 2,920 | 53 | 1.8% | 3,182 | 42 | 1.3% |
| Dreyfus S&P 500 Index Fund | 3,176 | 6 | 0.2% | 3,135 | 15 | 0.5% |

**Table 2**

**Election and Fund characteristics**

The sample contains 2,528 board of director elections of directors sponsored by the management between 2003 - 2005. It contains data on 13,588 directors who were up for election to a board. The sample contains 2,774 mutual funds, with 6,136 fund-year observations. Number of directors up for election is the number of directors voted on in a shareholder meeting on a given date. Number of funds voting on a director is the number of funds casting votes on a director in a board of directors election on a given day. The average "for" vote per director is the percentage of funds casting a "for" vote in a given director election. Average "for" vote per fund-year is the percentage of "for" votes cast by a fund in a given year. Data sources: SEC Edgar (N-PX filings), Board Analyst Directors Database.

| Variable | Mean | St. Dev | p10 | Median | p90 | N |
|---|---|---|---|---|---|---|
| Number of directors up for election | 5.38 | 3.19 | 2 | 4 | 10 | 2,528 |
| Number of funds voting on director | 151.52 | 125.08 | 49 | 107 | 300 | 13,588 |
| Average "for" vote per director | 89.8% | 17.3% | 59.5% | 96.5% | 100.0% | 13,588 |
| Average "for" vote per fund-year | 91.0% | 14.7% | 80.3% | 95.1% | 100.0% | 6,136 |

**Table 3**
**Firm and Director Summary Statistics**

Panel A contains data on 13,588 directors who were up for election to a board of directors between 2003 - 2005 and were recommended for election by the management. The sample in Panel B contains 2,528 firm year observations on firms, which held director elections between 2003 - 2005. The industry return is the value weighted return of the firms two digit SIC industry. Data sources: SEC Edgar (N-PX filings), CRSP, Compustat, IRRC Governance, Board Analyst Directors Database.

| *Panel A: Director Meeting characteristics* | | |
|---|---|---|
| Variable | Mean | N |
| CEO | 10.1% | 13,588 |
| Chairman | 9.8% | 13,588 |
| Founder | 1.9% | 13,588 |
| Inside Director | 16.7% | 13,176 |
| Outside Director | 70.7% | 13,176 |
| Outside Related Director | 12.6% | 13,176 |
| Audit Chair | 0.5% | 13,588 |
| Audit Member | 36.9% | 13,588 |
| Compensation Chair | 4.5% | 13,588 |
| Compensation Member | 35.8% | 13,588 |
| Executive Chair | 1.4% | 13,588 |
| Executive Member | 15.3% | 13,588 |
| Governance Chair | 3.6% | 13,588 |
| Governance Member | 30.2% | 13,588 |
| Nominating Chair | 3.9% | 13,588 |
| Nominating Member | 33.9% | 13,588 |

| *Panel B: Firm Year Characteristics* | | | |
|---|---|---|---|
| Variable | Mean | St. Dev | N |
| Last Year Return | 13.0% | 60.9% | 2,504 |
| ROA | 4.0% | 10.1% | 2,528 |
| Assets | 13,855 | 70,712 | 2,528 |
| Q | 1.89 | 1.18 | 2,506 |
| Book to Market | 0.51 | 0.36 | 2,506 |
| Leverage | 0.57 | 0.24 | 2,524 |
| Cash flow to Assets | 0.76 | 1.86 | 2,391 |
| Capex to Assets | 0.21 | 0.15 | 2,232 |
| S&P 500 | 28.9% | | 2,528 |

**Table 4**
**Average Vote by Director and Firm Characteristics**

Panel A presents the percentage of funds which cast "for" votes in director elections by director characteristics. Column (1) presents the percentage of "for" votes cast by funds on directors without the characteristic, and column (2) the percentage of "for" votes cast on directors with the characteristic. Column (2) - (1) presents the difference in the means for the two groups. Panel B presents the percentage of funds which cast "for" votes in director elections by firm characteristics. The columns in Panel B provide the same statistics as those in Panel A. Panel C presents the percentage of votes cast "for" in director elections in the highest and lowest quintile of firms sorted on firm characteristics. Column (2) - (1) presents the difference in the mean of the highest and lowest quintile. Data sources: SEC Edgar (N-PX filings), CRSP, Compustat, IRRC Governance, Board Analyst Directors Database. (***) indicates statistical significance at the 1% level.

*Panel A: Director Characteristics*

| | Statistic | (1)<br>No | (2)<br>Yes | (2) - (1)<br>Difference |
|---|---|---|---|---|
| CEO | Mean Vote "for" | 91.42% | 93.05% | 1.64% |
| | N | 1,859,111 | 199,677 | (***) |
| Chairman | Mean Vote "for" | 91.47% | 92.60% | 1.14% |
| | N | 1,865,170 | 193,618 | (***) |
| Founder | Mean Vote "for" | 91.68% | 85.61% | -6.07% |
| | N | 2,023,205 | 35,583 | (***) |
| Audit Member | Mean Vote "for" | 91.52% | 91.67% | 0.15% |
| | N | 1,309,106 | 749,682 | (***) |
| Compensation Member | Mean Vote "for" | 92.15% | 90.51% | -1.64% |
| | N | 1,339,713 | 719,075 | (***) |
| Executive Member | Mean Vote "for" | 91.59% | 91.51% | -0.08% |
| | N | 1,713,586 | 345,202 | |
| Governance Member | Mean Vote "for" | 91.72% | 91.26% | -0.46% |
| | N | 1,401,004 | 657,784 | (***) |
| Nominating Member | Mean Vote "for" | 91.89% | 90.96% | -0.93% |
| | N | 1,354,773 | 704,015 | (***) |
| Inside Director | Mean Vote "for" | | 91.92% | |
| | N | | 325,724 | |
| Outside Director | Mean Vote "for" | | 93.18% | |
| | N | | 1,444,383 | |
| Outside Related Director | Mean Vote "for" | | 83.01% | |
| | N | | 241,373 | |

**Table 4 (continued)**

*Panel B: Firm Characteristics*

| | Statistic | (1) No | (2) Yes | (2) - (1) Difference |
|---|---|---|---|---|
| S&P 500 | Mean Vote "for" | 89.03% | 93.07% | 4.04% |
| | N | 763,647 | 1,295,141 | (***) |
| Return Below Industry Quartile | Mean Vote "for" | 91.50% | 91.93% | 0.42% |
| | N | 1,661,176 | 390,133 | (***) |

*Panel C: Firm Characteristics (lowest versus highest quintile)*

| | Statistic | (1) Lowest Quintile | (2) Highest Quintile | (2) - (1) Difference |
|---|---|---|---|---|
| Return Quintile | Mean Vote "for" | 92.40% | 89.87% | -2.53% |
| | N | 355,779 | 315,643 | (***) |
| Size Quintile | Mean Vote "for" | 89.28% | 92.98% | 3.71% |
| | N | 155,737 | 886,864 | (***) |
| Book to Market Quintile | Mean Vote "for" | 92.36% | 92.73% | 0.37% |
| | N | 511,885 | 306,066 | (***) |

**Table 5**

**Past Vote as a Measure of Management Friendliness**

The dependent variable is a dummy that takes the value of 1 if the vote is "for" and 0 otherwise. The governance index is the governance index from Gompers, Ishii, Metrick (2003). Standard errors are clustered on fund year in columns 1-4, on the shareholder meeting in columns 5 and 6 and on director election in column 7. The omitted category from Outside Director and Outside Related Director is an Inside Director. Data sources: SEC/Edgar (N/PX), CRSP, Compustat, IRRC Governance, Board Analyst Directors Database.

| | (1)<br>Vote "for" | (2)<br>Vote "for" | (3)<br>Vote "for" | (4)<br>Vote "for" | (5)<br>Vote "for" | (6)<br>Vote "for" | (7)<br>Vote "for" |
|---|---|---|---|---|---|---|---|
| Fund Management Friendliness | 0.554 | 0.551 | 0.553 | 0.551 | 0.542 | 0.543 | 0.542 |
| | [0.0410]*** | [0.0416]*** | [0.0411]*** | [0.0417]*** | [0.0118]*** | [0.0118]*** | [0.0043]*** |
| Last year return | | -0.005 | | -0.006 | | | |
| | | [0.0015]*** | | [0.0014]*** | | | |
| ROA | | 0.173 | | 0.210 | | | |
| | | [0.0368]*** | | [0.0361]*** | | | |
| Industry return | | -0.005 | | 0.001 | | | |
| | | [0.0054] | | [0.0053] | | | |
| Return below industry quartile | | 0.002 | | 0.002 | | | |
| | | [0.0013] | | [0.0013] | | | |
| Log assets | | 0.000 | | -0.001 | | | |
| | | [0.0007] | | [0.0007]* | | | |
| Q | | -0.003 | | -0.003 | | | |
| | | [0.0005]*** | | [0.0005]*** | | | |
| Book to market | | 0.004 | | 0.007 | | | |
| | | [0.0026]* | | [0.0026]*** | | | |
| Leverage | | 0.043 | | 0.037 | | | |
| | | [0.0030]*** | | [0.0030]*** | | | |
| Cash flow to assets | | -0.073 | | -0.131 | | | |
| | | [0.0359]** | | [0.0351]*** | | | |
| Capex to assets | | 0.011 | | 0.082 | | | |
| | | [0.0182] | | [0.0176]*** | | | |
| S&P 500 | | 0.030 | | 0.029 | | | |
| | | [0.0027]*** | | [0.0027]*** | | | |
| Governance index | | 0.001 | | 0.001 | | | |
| | | [0.0002]*** | | [0.0002]** | | | |

**Table 5 (continued)**

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| Outside Director | | | 0.057 | 0.055 | | 0.043 | |
| | | | [0.0020]*** | [0.0020]*** | | [0.0062]*** | |
| Outside Related director | | | -0.058 | -0.054 | | -0.057 | |
| | | | [0.0017]*** | [0.0018]*** | | [0.0075]*** | |
| CEO | | | 0.019 | 0.022 | | 0.014 | |
| | | | [0.0014]*** | [0.0015]*** | | [0.0054]** | |
| Chairman | | | 0.016 | 0.016 | | 0.009 | |
| | | | [0.0008]*** | [0.0008]*** | | [0.0042]** | |
| Founder | | | -0.038 | -0.023 | | -0.004 | |
| | | | [0.0022]*** | [0.0022]*** | | [0.0137] | |
| Audit chair | | | 0.000 | 0.000 | | 0.000 | |
| | | | [0.0000] | [0.0000] | | [0.0000] | |
| Audit member | | | -0.015 | -0.014 | | -0.009 | |
| | | | [0.0006]*** | [0.0006]*** | | [0.0031]*** | |
| Compensation chair | | | 0.003 | 0.003 | | 0.005 | |
| | | | [0.0022] | [0.0019] | | [0.0056] | |
| Compensation member | | | -0.033 | -0.032 | | -0.027 | |
| | | | [0.0020]*** | [0.0020]*** | | [0.0034]*** | |
| Executive chair | | | 0.009 | 0.007 | | 0.006 | |
| | | | [0.0025]*** | [0.0021]*** | | [0.0065] | |
| Executive member | | | -0.003 | -0.010 | | 0.000 | |
| | | | [0.0009]*** | [0.0008]*** | | [0.0047] | |
| Governance chair | | | 0.020 | 0.020 | | -0.004 | |
| | | | [0.0045]*** | [0.0049]*** | | [0.0253] | |
| Governance member | | | 0.012 | 0.003 | | 0.001 | |
| | | | [0.0019]*** | [0.0017]* | | [0.0079] | |
| Nominating chair | | | -0.026 | -0.022 | | -0.006 | |
| | | | [0.0047]*** | [0.0051]*** | | [0.0250] | |
| Nominating member | | | -0.028 | -0.018 | | -0.020 | |
| | | | [0.0019]*** | [0.0017]*** | | [0.0079]*** | |
| Constant | 0.419 | 0.372 | 0.409 | 0.379 | 0.429 | 0.424 | 0.429 |
| | [0.0381]*** | [0.0387]*** | [0.0382]*** | [0.0389]*** | [0.0106]*** | [0.0122]*** | [0.0039]*** |
| Observations | 1766982 | 1530188 | 1726148 | 1493621 | 1766982 | 1726148 | 1766982 |
| R-squared | 0.08 | 0.09 | 0.1 | 0.11 | 0.09 | 0.11 | 0.11 |
| Shareholder Meeting FE | | | | | Y | Y | |
| Director Election FE | | | | | | | Y |

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

**Table 6**

**Reduced Form Linear Fund Fixed Effects IV**

The dependent variable is a vote cast by a fund in a board of directors election; it takes the value of 1 if the vote is "for" and 0 otherwise. The vote of other funds is the average vote of other funds voting on the director. The instrument for the vote is of other funds is: the average management friendliness of other funds in columns 1, 2 and 7; the mean, standard deviation, skewnes and kurtosis of the management friendliness of other funds in columns 3,4 and 8; the 10th, 25th, 50th, 75th and 90th percentile in columns 5,6 and 9. The management friendliness of other funds is calculated as the average vote of a fund in the previous calendar year on firms other than the firm under observation. The industry return is the value weighted return of the firms two digit SIC industry. The governance index is the governance index from Gompers, Ishii, Metrick (2003). The ISS Recommendation is 1 if Institutional Shareholder Services recommended a "For" vote on a director and 0 otherwise. The omitted category from Inside Director and Outside Related Director is an Outside Director. Standard errors are clustered on fund year. Data sources: SEC/Edgar (N/PX), CRSP, Compustat, IRRC Governance, Board Analyst Directors Database.

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| | Vote "for" | Vote "for" | Vote "for" | Vote "for" | Vote "for" | Vote "for" | Vote "for" | Vote "for" | Vote "for" |
| Vote of Other Funds | 0.6324 | 0.3246 | 0.7041 | 0.5857 | 0.7008 | 0.6906 | 0.0947 | 0.1627 | 0.2687 |
| | [0.0331]*** | [0.0386]*** | [0.0316]*** | [0.0336]*** | [0.0355]*** | [0.0383]*** | [0.0486]* | [0.0469]*** | [0.0577]*** |
| *Firm Characteristics* | | | | | | | | | |
| Last Year Return | | -0.0036 | | -0.0016 | | 0.0001 | 0.0014 | 0.0014 | 0.0025 |
| | | [0.0012]*** | | [0.0012] | | [0.0011] | [0.0011] | [0.0011] | [0.0011]** |
| Industry Return | | -0.0121 | | -0.0097 | | -0.008 | 0.0039 | 0.0031 | 0.0023 |
| | | [0.0036]*** | | [0.0034]*** | | [0.0032]** | [0.0033] | [0.0033] | [0.0031] |
| ROA | | 0.1145 | | 0.071 | | 0.0492 | 0.0865 | 0.0801 | 0.066 |
| | | [0.0340]*** | | [0.0325]** | | [0.0317] | [0.0319]*** | [0.0318]** | [0.0309]** |
| Return Below Industry Quartile | | 0 | | -0.0005 | | -0.0001 | 0.0012 | 0.001 | 0.0016 |
| | | [0.0012] | | [0.0012] | | [0.0011] | [0.0012] | [0.0012] | [0.0011] |
| Log Assets | | 0.0012 | | 0.0011 | | 0.0011 | 0.0018 | 0.0017 | 0.0016 |
| | | [0.0005]** | | [0.0005]** | | [0.0005]** | [0.0005]*** | [0.0005]*** | [0.0005]*** |
| Q | | -0.0009 | | -0.0002 | | 0.0002 | 0.0011 | 0.0011 | 0.001 |
| | | [0.0004]** | | [0.0004] | | [0.0004] | [0.0004]** | [0.0004]** | [0.0004]** |
| Book to Market | | 0.0028 | | 0.0012 | | 0.0001 | 0.0022 | 0.0019 | 0.0005 |
| | | [0.0021] | | [0.0020] | | [0.0019] | [0.0020] | [0.0020] | [0.0019] |
| Leverage | | 0.0241 | | 0.0145 | | 0.0106 | 0.0065 | 0.0059 | 0.0056 |
| | | [0.0030]*** | | [0.0028]*** | | [0.0026]*** | [0.0025]** | [0.0025]** | [0.0023]** |
| Cash Flow to Assets | | -0.0601 | | -0.0337 | | -0.0215 | -0.0314 | -0.0284 | -0.0218 |
| | | [0.0314]* | | [0.0301] | | [0.0291] | [0.0296] | [0.0295] | [0.0283] |
| Capex to Assets | | 0.0493 | | 0.0299 | | 0.0252 | 0.0274 | 0.0253 | 0.025 |
| | | [0.0166]*** | | [0.0159]* | | [0.0159] | [0.0158]* | [0.0157] | [0.0153] |
| S&P 500 | | 0.025 | | 0.0132 | | 0.0078 | 0.0052 | 0.0044 | 0.0025 |
| | | [0.0023]*** | | [0.0021]*** | | [0.0018]*** | [0.0017]*** | [0.0017]** | [0.0015] |
| Governance Index | | 0.0004 | | 0.0002 | | 0.0001 | 0.0004 | 0.0003 | 0.0003 |
| | | [0.0002]** | | [0.0002] | | [0.0002] | [0.0002]* | [0.0002]* | [0.0002]* |

**Table 6 (continued)**

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| *Director Characteristics* | | | | | | | | | |
| Inside Director | | 0.0369 | | 0.0228 | | 0.0154 | 0.0103 | 0.0096 | 0.0073 |
| | | [0.0024]*** | | [0.0021]*** | | [0.0023]*** | [0.0015]*** | [0.0015]*** | [0.0014]*** |
| Outside Related Director | | 0.074 | | 0.0457 | | 0.0321 | 0.0124 | 0.0115 | 0.0088 |
| | | [0.0041]*** | | [0.0034]*** | | [0.0038]*** | [0.0016]*** | [0.0016]*** | [0.0014]*** |
| CEO | | 0.015 | | 0.0095 | | 0.0076 | 0.0033 | 0.0031 | 0.0032 |
| | | [0.0013]*** | | [0.0013]*** | | [0.0012]*** | [0.0011]*** | [0.0011]*** | [0.0010]*** |
| Chairman | | 0.0105 | | 0.0062 | | 0.0048 | 0.0019 | 0.0017 | 0.0017 |
| | | [0.0009]*** | | [0.0008]*** | | [0.0009]*** | [0.0007]*** | [0.0007]** | [0.0007]** |
| Founder | | -0.0137 | | -0.0076 | | -0.0045 | 0.0014 | 0.0015 | 0.0019 |
| | | [0.0022]*** | | [0.0020]*** | | [0.0020]** | [0.0018] | [0.0018] | [0.0017] |
| Audit Chair | | -0.0091 | | -0.0056 | | -0.004 | -0.0033 | -0.003 | -0.0023 |
| | | [0.0007]*** | | [0.0006]*** | | [0.0006]*** | [0.0005]*** | [0.0005]*** | [0.0005]*** |
| Audit Member | | 0.0004 | | 0.0004 | | 0 | 0.001 | 0.0009 | 0.0006 |
| | | [0.0019] | | [0.0019] | | [0.0018] | [0.0019] | [0.0019] | [0.0018] |
| Compensation Chair | | -0.0217 | | -0.0137 | | -0.0097 | -0.0114 | -0.0106 | -0.0089 |
| | | [0.0022]*** | | [0.0021]*** | | [0.0020]*** | [0.0021]*** | [0.0021]*** | [0.0019]*** |
| Compensation Member | | 0.004 | | 0.0029 | | 0.0023 | -0.0019 | -0.0016 | -0.0015 |
| | | [0.0016]** | | [0.0016]* | | [0.0015] | [0.0016] | [0.0016] | [0.0015] |
| Executive Chair | | -0.0065 | | -0.0043 | | -0.0034 | -0.0054 | -0.0051 | -0.0044 |
| | | [0.0007]*** | | [0.0007]*** | | [0.0006]*** | [0.0006]*** | [0.0006]*** | [0.0006]*** |
| Executive Member | | 0.0141 | | 0.0087 | | 0.0062 | 0.0106 | 0.0098 | 0.008 |
| | | [0.0045]*** | | [0.0043]** | | [0.0042] | [0.0042]** | [0.0042]** | [0.0041]* |
| Governance Chair | | 0.0021 | | 0.0016 | | 0.0012 | 0.0004 | 0.0004 | 0.0004 |
| | | [0.0015] | | [0.0015] | | [0.0013] | [0.0014] | [0.0014] | [0.0013] |
| Governance Member | | -0.0172 | | -0.0106 | | -0.0077 | -0.0068 | -0.0063 | -0.0051 |
| | | [0.0047]*** | | [0.0045]** | | [0.0044]* | [0.0043] | [0.0043] | [0.0042] |
| Nominating Chair | | -0.0118 | | -0.0076 | | -0.0052 | -0.0009 | -0.0009 | -0.0004 |
| | | [0.0016]*** | | [0.0015]*** | | [0.0014]*** | [0.0014] | [0.0014] | [0.0013] |
| ISS Recommendation | | | | | | | 0.4718 | 0.4364 | 0.3765 |
| | | | | | | | [0.0261]*** | [0.0254]*** | [0.0306]*** |
| Fund Year FE | Y | Y | Y | Y | Y | Y | Y | Y | Y |
| Observations | 1766982 | 1493620 | 1766982 | 1493620 | 1939760 | 1641845 | 1493112 | 1493112 | 1641293 |

Robust standard errors clustered on fund year in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

**Table 7**
**Average Management Friendliness of Funds Holding a Firm**

The dependent variable is average management friendliness of mutual funds holding shares in a firm. A fund's management friendliness is calculated as the average vote of a fund in the previous calendar year on firms other than the firm under observation. The industry return is the value weighted return of the firms two digit SIC industry. The governance index is the governance index from Gompers, Ishii, Metrick (2003). The omitted category from Outside Director and Outside Related Director is an Inside Director. Standard errors are clustered on fund year. Data sources: SEC/Edgar (N/PX), CRSP, Compustat, IRRC Governance, Board Analyst Directors Database.

| | (1) Average Management Friendliness | (2) Average Management Friendliness | (3) Average Management Friendliness | (4) Average Management Friendliness |
|---|---|---|---|---|
| Last Year Return | | -0.002 | | -0.002 |
| | | [0.001]*** | | [0.001] |
| ROA | | | | -0.014 |
| | | | | [0.022] |
| Industry Return | | 0.041 | | 0.038 |
| | | [0.002]*** | | [0.002]*** |
| Return Below Industry Quartile | | | | 0.002 |
| | | | | [0.001] |
| Log Assets | 0.003 | 0.003 | 0.003 | 0.005 |
| | [0.000]*** | [0.000]*** | [0.000]*** | [0.000]*** |
| Q | | | | -0.001 |
| | | | | [0.001]** |
| Book to Market | | | | -0.004 |
| | | | | [0.002]** |
| Leverage | | | | -0.007 |
| | | | | [0.003]*** |
| Cash Flow to Assets | | | | 0.015 |
| | | | | [0.023] |
| Capex to Assets | | | | -0.009 |
| | | | | [0.015] |
| S&P 500 | 0.02 | 0.021 | 0.02 | 0.016 |
| | [0.001]*** | [0.001]*** | [0.001]*** | [0.001]*** |
| Governance Index | | | 0 | 0 |
| | | | [0.000]* | [0.000]** |
| Constant | 0.868 | 0.867 | 0.866 | 0.859 |
| | [0.003]*** | [0.003]*** | [0.004]*** | [0.004]*** |
| Observations | 2348 | 2324 | 2185 | 1926 |
| R-squared | 0.21 | 0.34 | 0.22 | 0.38 |

Robust standard errors in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

## Table 8
## First Stage: Equilibrium Projection

The dependent variable is the average vote of other funds voting on the director in the shareholder meeting, where the "for" vote takes the value of 1 and 0 otherwise. Moments and percentiles of management friendliness of other funds is the moment of management friendliness of funds voting on the director in the shareholder meeting. Own management friendliness is calculated as the average vote of a fund in the previous calendar year on firms other than the firm under observation. The industry return is the value weighted return of the firms two digit SIC industry. The governance index is the governance index from Gompers, Ishii, Metrick (2003). Standard errprs are clustered by director election. The omitted category from Inside Director and Outside Related Director is an Outside Director. Data sources: SEC/Edgar (N/PX), CRSP, Compustat, IRRC Governance, Board Analyst Directors Database.

| | (1) Other Fund's Avg. Vote "for" | (2) Other Fund's Avg. Vote "for" | (3) Other Fund's Avg. Vote "for" | (4) Other Fund's Avg. Vote "for" | (5) Other Fund's Avg. Vote "for" | (6) Other Fund's Avg. Vote "for" |
|---|---|---|---|---|---|---|
| *Moments of Other Funds' Management Friendliness* | | | | | | |
| Average | 1.067 | 0.766 | 1.426 | 1.32 | | |
| | [0.066]*** | [0.101]*** | [0.156]*** | [0.203]*** | | |
| Standard Deviation | | | 0.431 | 0.489 | | |
| | | | [0.102]*** | [0.129]*** | | |
| Skeweness | | | 0.005 | 0.011 | | |
| | | | [0.006] | [0.006]* | | |
| Kurtosis | | | 0.001 | 0.001 | | |
| | | | [0.001]* | [0.001]** | | |
| *Percentiles of Other Funds' Management Friendliness* | | | | | | |
| 10th Percentile | | | | | 0.074 | 0.028 |
| | | | | | [0.021]*** | [0.025] |
| 25th Percentile | | | | | 0.358 | 0.249 |
| | | | | | [0.072]*** | [0.087]*** |
| 50th Percentile | | | | | 0.605 | 0.51 |
| | | | | | [0.184]*** | [0.209]** |
| 75th Percentile | | | | | -0.157 | -0.398 |
| | | | | | [0.154] | [0.168]** |
| 90th Percentile | | | | | 2.153 | 3.466 |
| | | | | | [0.617]*** | [0.865]*** |
| Own Management Friendliness | 0.002 | 0 | 0.005 | 0.004 | -0.003 | -0.003 |
| | [0.001]*** | [0.001] | [0.001]*** | [0.001]*** | [0.000]*** | [0.000]*** |
| *Firm Characteristics* | | | | | | |
| ROA | | 0.195 | | 0.195 | | 0.2 |
| | | [0.088]** | | [0.087]** | | [0.088]** |
| Last Year Return | | -0.005 | | -0.003 | | -0.004 |
| | | [0.005] | | [0.005] | | [0.005] |
| Industry Return | | -0.012 | | 0.002 | | 0.002 |
| | | [0.011] | | [0.011] | | [0.011] |
| Return Below Industry Quartile | | 0.002 | | 0.004 | | 0.002 |
| | | [0.004] | | [0.004] | | [0.004] |
| Log Assets | | -0.003 | | -0.005 | | -0.002 |
| | | [0.002]* | | [0.002]*** | | [0.002] |
| Q | | -0.003 | | -0.003 | | -0.002 |
| | | [0.002] | | [0.002] | | [0.002] |

**Table 8 (continued)**

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| Book to Market | | 0.009 | | 0.012 | | 0.01 |
| | | [0.005]* | | [0.005]** | | [0.005]* |
| Leverage | | 0.04 | | 0.044 | | 0.044 |
| | | [0.010]*** | | [0.010]*** | | [0.010]*** |
| Cash Flow to Assets | | -0.123 | | -0.118 | | -0.133 |
| | | [0.088] | | [0.088] | | [0.088] |
| Capex to Assets | | 0.073 | | 0.073 | | 0.082 |
| | | [0.056] | | [0.056] | | [0.056] |
| S&P 500 | | 0.026 | | 0.027 | | 0.025 |
| | | [0.006]*** | | [0.006]*** | | [0.006]*** |
| Governance Index | | 0.001 | | 0.001 | | 0 |
| | | [0.001] | | [0.001] | | [0.001] |
| *Director Characteristics* | | | | | | |
| Inside Director | | -0.053 | | -0.053 | | -0.053 |
| | | [0.008]*** | | [0.008]*** | | [0.008]*** |
| Outside Related Director | | -0.107 | | -0.107 | | -0.107 |
| | | [0.008]*** | | [0.008]*** | | [0.008]*** |
| CEO | | 0.021 | | 0.021 | | 0.021 |
| | | [0.009]** | | [0.009]** | | [0.009]** |
| Chairman | | 0.016 | | 0.015 | | 0.016 |
| | | [0.008]** | | [0.008]** | | [0.008]** |
| Founder | | -0.023 | | -0.023 | | -0.023 |
| | | [0.017] | | [0.017] | | [0.017] |
| Audit Chair | | 0 | | 0 | | 0 |
| | | [0.000] | | [0.000] | | [0.000] |
| Audit Member | | -0.013 | | -0.013 | | -0.013 |
| | | [0.004]*** | | [0.004]*** | | [0.004]*** |
| Compensation Chair | | 0 | | 0.003 | | 0.002 |
| | | [0.009] | | [0.009] | | [0.009] |
| Compensation Member | | -0.031 | | -0.031 | | -0.031 |
| | | [0.004]*** | | [0.004]*** | | [0.004]*** |
| Executive Chair | | 0.004 | | 0.007 | | 0.006 |
| | | [0.013] | | [0.013] | | [0.013] |
| Executive Member | | -0.009 | | -0.009 | | -0.009 |
| | | [0.005]* | | [0.005]* | | [0.005]* |
| Governance Chair | | 0.02 | | 0.019 | | 0.023 |
| | | [0.027] | | [0.027] | | [0.027] |
| Governance Member | | 0.003 | | 0.005 | | 0.003 |
| | | [0.009] | | [0.009] | | [0.009] |
| Nominating Chair | | -0.025 | | -0.021 | | -0.025 |
| | | [0.026] | | [0.026] | | [0.026] |
| Nominating Member | | -0.017 | | -0.018 | | -0.017 |
| | | [0.009]** | | [0.009]** | | [0.009]** |
| Constant | -0.047 | 0.249 | -0.431 | -0.292 | -2.015 | -2.856 |
| | [0.060] | [0.091]*** | [0.145]*** | [0.188] | [0.587]*** | [0.837]*** |
| Observations | 1766982 | 1493621 | 1766982 | 1493621 | 1766982 | 1493621 |
| R-squared | 0.02 | 0.09 | 0.03 | 0.09 | 0.03 | 0.09 |

Robust standard errors clustered by director election in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

**Table 9**
**Best Response Function**

The dependent variable is a vote cast by a fund in a board of directors election; it takes the value of 1 if the vote is "for" and 0 otherwise. The predicted vote of other funds is the fitted value of the corresponding column in Table 8. Unobserved quality is the average residual from the specification of the corresponding column in Table 8, averaged within a director in a meeting pair. Own management friendliness is calculated as the average vote of a fund in the previous calendar year on firms other than the firm under observation. The industry return is the value weighted return of the firms two digit SIC industry. The governance index is the governance index from Gompers, Ishii, Metrick (2003). The omitted category from Inside Director and Outside Related Director is an Outside Director. Standard errors are clustered by director election. Data sources: SEC/Edgar (N/PX), CRSP, Compustat, IRRC Governance, Board Analyst Directors Database.

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| | Vote "for" | Vote "for" | Vote "for" | Vote "for" | Vote "for" | Vote "for" |
| Predicted Vote of Other Funds | 5.608 | 1.839 | 6.349 | 3.541 | 6.645 | 5.441 |
| | [0.310]*** | [0.650]*** | [0.292]*** | [0.539]*** | [0.273]*** | [0.497]*** |
| Own Management Friendliness | 5.834 | 5.958 | 5.813 | 5.942 | 5.81 | 5.932 |
| | [0.041]*** | [0.047]*** | [0.041]*** | [0.047]*** | [0.041]*** | [0.047]*** |
| Unobserved Quality | 7.824 | 7.85 | 7.817 | 7.849 | 7.814 | 7.843 |
| | [0.032]*** | [0.038]*** | [0.032]*** | [0.038]*** | [0.031]*** | [0.038]*** |
| *Firm Characteristics* | | | | | | |
| ROA | | 3.207 | | 2.867 | | 2.46 |
| | | [0.423]*** | | [0.413]*** | | [0.411]*** |
| Last Year Return | | -0.077 | | -0.066 | | -0.05 |
| | | [0.020]*** | | [0.019]*** | | [0.020]** |
| Industry Return | | 0.077 | | 0.055 | | 0.027 |
| | | [0.045]* | | [0.045] | | [0.045] |
| Return Below Industry Quartile | | -0.058 | | -0.064 | | -0.066 |
| | | [0.024]** | | [0.024]*** | | [0.024]*** |
| Log Assets | | 0.021 | | 0.019 | | 0.017 |
| | | [0.009]** | | [0.009]** | | [0.009]* |
| Q | | -0.026 | | -0.022 | | -0.015 |
| | | [0.009]*** | | [0.009]** | | [0.009]* |
| Book to Market | | 0.123 | | 0.11 | | 0.109 |
| | | [0.034]*** | | [0.034]*** | | [0.034]*** |
| Leverage | | 0.333 | | 0.27 | | 0.2 |
| | | [0.055]*** | | [0.053]*** | | [0.053]*** |
| Cash Flow to Assets | | -1.753 | | -1.544 | | -1.274 |
| | | [0.420]*** | | [0.414]*** | | [0.412]*** |
| Capex to Assets | | 1.217 | | 1.094 | | 0.909 |
| | | [0.249]*** | | [0.245]*** | | [0.246]*** |
| S&P 500 | | 0.212 | | 0.153 | | 0.079 |
| | | [0.034]*** | | [0.032]*** | | [0.032]** |
| Governance Index | | 0.011 | | 0.009 | | 0.007 |
| | | [0.004]*** | | [0.003]*** | | [0.004]** |

**Table 9 (continued)**

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| *Director Characteristics* | | | | | | |
| Inside Director | | -0.273 | | -0.177 | | -0.075 |
| | | [0.053]*** | | [0.049]*** | | [0.049] |
| Outside Related Director | | -0.653 | | -0.468 | | -0.265 |
| | | [0.075]*** | | [0.063]*** | | [0.060]*** |
| CEO | | 0.157 | | 0.116 | | 0.079 |
| | | [0.049]*** | | [0.048]** | | [0.048]* |
| Chairman | | 0.036 | | 0.008 | | -0.023 |
| | | [0.039] | | [0.039] | | [0.039] |
| Founder | | -0.066 | | -0.03 | | 0.01 |
| | | [0.060] | | [0.058] | | [0.059] |
| Audit Chair | | | | | | |
| Audit Member | | -0.107 | | -0.083 | | -0.055 |
| | | [0.021]*** | | [0.021]*** | | [0.020]*** |
| Compensation Chair | | -0.02 | | -0.03 | | -0.039 |
| | | [0.050] | | [0.050] | | [0.050] |
| Compensation Member | | -0.405 | | -0.353 | | -0.293 |
| | | [0.029]*** | | [0.027]*** | | [0.026]*** |
| Executive Chair | | -0.043 | | -0.067 | | -0.085 |
| | | [0.093] | | [0.092] | | [0.092] |
| Executive Member | | -0.071 | | -0.055 | | -0.035 |
| | | [0.026]*** | | [0.026]** | | [0.026] |
| Governance Chair | | 0.23 | | 0.201 | | 0.169 |
| | | [0.119]* | | [0.118]* | | [0.115] |
| Governance Member | | -0.004 | | -0.011 | | -0.018 |
| | | [0.034] | | [0.034] | | [0.034] |
| Nominating Chair | | -0.314 | | -0.288 | | -0.257 |
| | | [0.113]*** | | [0.112]** | | [0.109]** |
| Nominating Member | | -0.084 | | -0.054 | | -0.021 |
| | | [0.035]** | | [0.034] | | [0.035] |
| Constant | -7.006 | -3.922 | -7.667 | -5.436 | -7.935 | -7.148 |
| | [0.282]*** | [0.587]*** | [0.268]*** | [0.496]*** | [0.251]*** | [0.458]*** |
| Observations | 1766982 | 1493621 | 1766982 | 1493621 | 1766982 | 1493621 |

Robust standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

**Table 10**
**Best Response Function**

The estimates in this table are obtained from our estimation procedure described in Section 4.3. In the second stage the predicted vote of other funds enters the logit linearly. All other parameters enter the logit as a polynomial of the 2nd order in specifications 1, 2 and 3 and 3rd order in specification 4. In the first stage all parameters enter as a polynomial of the corresponding order. Specification 4 is estimated on a limited set of controls: Return Below Industry Quartile, Log Assets, Q, Book to Market, Leverage, S&P 500, Governance Index. Inside Director, Outside Related Director, CEO, Chairman. The instruments are: the average management friendliness of other funds in columns 1 and 4; the mean, standard deviation, skewnes and kurtosis of the management friendliness of other funds in column 2; the 10th, 25th, 50th, 75th and 90th percentile in column 3. Standard errors are clustered by director election. Data sources: SEC/Edgar (N/PX), CRSP, Compustat, IRRC Governance, Board Analyst Directors Database.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Vote "for" | Vote "for" | Vote "for" | Vote "for" |
| Polynomial degree | 2 | 2 | 2 | 3 |
| Predicted Vote of Other Funds | 5.241 | 6.48 | 6.674 | 7.759 |
| | [0.251]*** | [0.212]*** | [0.221]*** | [0.278]*** |
| Observations | 1493621 | 1493621 | 1493621 | 1493621 |

Robust standard errors in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

**Table 11**

**Actual and Simulated Distributions of Votes**

The table compares the distribution of director votes in the sample to the distribution of director votes in the simulated equilibria based on parameter estimates in specifications 2, 4 and 6 from Table 9. Director Actual Vote is the average "withhold" vote obtained by directors. Director In-Sample Simulated Vote is the average probability of a "withhold" vote for a director computed using her actual attributes and estimated parameters from specifications 2, 4 and 6 in Table 9 respectively. All simulated equilibria presented are the most management friendly equilibria. The sample is restricted to directors for whom we were able to obtain counterfactuals in all specifications.

| Variable | N | Mean | St. Dev | p10 | p25 | p50 | p75 | p90 |
|---|---|---|---|---|---|---|---|---|
| Director Actual Votes | 7897 | 9.5% | 16.7% | 26.4% | 7.9% | 3.4% | 1.4% | 0.0% |
| Director in-sample Simulated Vote (Spec. 2) | 7897 | 9.9% | 18.9% | 16.5% | 5.5% | 3.8% | 2.8% | 2.2% |
| Director in-sample Simulated Vote (Spec. 4) | 7897 | 11.0% | 22.7% | 15.3% | 5.3% | 3.6% | 2.7% | 2.1% |
| Director in-sample Simulated Vote (Spec. 6) | 7897 | 12.5% | 27.0% | 14.8% | 5.1% | 3.5% | 2.5% | 2.0% |

**Table 12**
**Social Multiplier**

Panel A compares three simulated equilibria for three different specifications of parameters on a subset of directors who were in the lowest quartile of unobservable director quality in that specification. The parameters for the simulation are taken from specifications 2, 4 and 6 in Table 9 respectively. Director In-Sample Simulated Vote is the average vote for a director computed using her actual attributes. Direct Impact Vote is the average vote of directors from the Director in-sample Simulated Vote increased by the odds difference implied by an increase in unobservable quality of 90-10 percentile range in unobservable quality. Equilibrium Impact Vote is the vote computed from our model using the directors actual attributes, but increasing her unobserved quality by the 90-10 percentile range in unobservable quality. Panel B presents the distribution of the multiplier for each specification, which is calculated as (Equilibrium Impact Vote - Director In-Sample Vote)/(Direct Impact Vote - Director In-Sample Vote). All simulated equilibria presented are the most management friendly equilibria.

*Panel A: Simulated Equilibria*

| Variable | N | Mean | St. Dev | p10 | p25 | p50 | p75 | p90 |
|---|---|---|---|---|---|---|---|---|
| Specification 2 | | | | | | | | |
| Director in-sample Simulated Vote | 2300 | 28.6% | 31.0% | 80.9% | 56.6% | 9.1% | 4.4% | 2.9% |
| Direct Impact Vote | 2300 | 13.3% | 18.6% | 43.9% | 21.3% | 2.5% | 1.0% | 0.6% |
| Equilibrium Impact Vote | 2300 | 8.3% | 12.1% | 24.0% | 11.7% | 2.2% | 0.9% | 0.6% |
| Specification 4 | | | | | | | | |
| Director in-sample Simulated Vote | 2302 | 33.9% | 37.5% | 92.2% | 79.9% | 8.7% | 4.3% | 2.9% |
| Direct Impact Vote | 2302 | 22.4% | 29.6% | 72.7% | 48.8% | 2.9% | 1.3% | 0.8% |
| Equilibrium Impact Vote | 2302 | 8.8% | 14.7% | 22.7% | 10.4% | 2.5% | 1.1% | 0.7% |
| Specification 6 | | | | | | | | |
| Director in-sample Simulated Vote | 2305 | 40.2% | 44.0% | 98.0% | 96.1% | 8.0% | 4.2% | 3.0% |
| Direct Impact Vote | 2305 | 35.0% | 42.1% | 93.1% | 87.5% | 3.1% | 1.5% | 1.0% |
| Equilibrium Impact Vote | 2305 | 13.3% | 26.9% | 28.7% | 8.9% | 2.6% | 1.3% | 0.9% |

*Panel B: Social Multiplier*

| Variable | N | Mean | St. Dev | p10 | p25 | p50 | p75 | p90 |
|---|---|---|---|---|---|---|---|---|
| Multiplier (Specification 2) | 2300 | 1.16 | 0.21 | 1.01 | 1.02 | 1.03 | 1.26 | 1.53 |
| Multiplier (Specification 4) | 2302 | 1.64 | 0.92 | 1.02 | 1.04 | 1.07 | 2.13 | 3.33 |
| Multiplier (Specification 6) | 2305 | 3.77 | 4.58 | 1.05 | 1.07 | 1.12 | 6.05 | 11.68 |