

When do proxy advisors improve corporate decisions?

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Abstract

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Keywords: Proxy advisors, strategic voting

JEL Classifications: G23, D72, D83

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1 Introduction

Shareholders vote on a variety of important issues, including director elections, executive compensation, and certain aspects of mergers and acquisitions. During the past two decades, shareholders' decision making has changed due to the rise of a new business: Proxy advisory firms (such as ISS and Glass Lewis) provide voting recommendations to shareholders. These recommendations have substantial impact on shareholder voting outcomes.¹ There is an ongoing public and scientific debate about the effects of proxy advisors (PAs in what follows) on the quality of decision making in shareholder meetings. The regulation of PAs is highly contentious, as evidenced, for example, by frequent and substantial changes of rules applied by the U.S. Securities and Exchange Commission (SEC) within the last few years.²

A key point of contention is that PAs may crowd out shareholders' incentives to invest in own research. Shareholders who rely on a PA's recommendation as a substitute for own research save costs individually, but negatively affect the collective by not contributing new information into the decision-making process. This intuition has been probed and developed in the influential analysis of Malenko and Malenko (2019).

In this paper, we show that under two arguably practically relevant assumptions the presence of a PA actually leads to either more shareholders who invest in research or at least not less. The presence of a PA hence (weakly) improves corporate decision quality.

We theoretically analyze the strategic interaction surrounding shareholder decisions in a firm. There are three types of agents: Shareholders, the firm's board of directors, and a PA.

¹See, for example, Alexander et al. (2010); Choi, Fisch, and Kahan (2010); Ertimur, Ferri, and Oesch (2013); Iliev and Lowry (2015); Larcker, McCall, and Ormazabal (2013, 2015); Li (2018); Malenko and Shen (2016); McCahery, Sautner, and Starks (2016); Matsusaka and Shu (2021). PAs can also have an impact by increasing shareholder engagement with firms (Dey, Starkweather, and White, 2022).

²Spatt (2021) provides a recent survey of the literature with a focus on regulatory issues.

Shareholders and the board both care about firm value, whereas the PA cares for its profit. Agents are imperfectly informed about the correct decision on a given issue, i.e., about which decision will increase firm value most. The board and the PA receive a private imperfect and independently distributed signal about the correct decision. The board proposes a decision based on its own signal. Then, each shareholder individually decides whether to buy the PA's vote recommendation, i.e., the PA's signal, and whether to invest in own research, i.e., to obtain a private signal.³ The simple majority rule determines the outcome.

Two key assumptions are critical for our analysis. Our first key assumption, “BIB” (for better-informed board), is that the board is better-informed than any single shareholder alone. This is in line with a long tradition of studies in corporate governance arguing that insiders (the board and management) have information about the company that may be superior to that of shareholders (Jensen and Meckling, 1976).

The second key assumption, “PAF” (for proxy advice first), is that the PA moves first in the following sense: *after* receiving proxy advice, a shareholder can decide upon additional research about the issues at hand. This assumption is more likely to hold if shareholders are given sufficient time to conduct research (and if “robo-voting”, that is, the practice of simply automatically converting the advice received by PAs into a vote, is forbidden). In Sections 4 and 6, we discuss explicitly how relaxing these two assumptions affects the results.

We solve this game-theoretic model for pure Perfect Bayesian Nash equilibria and mainly focus on symmetric equilibria that are not Pareto-dominated by other symmetric equilibria.⁴

³Hence, the PA sells information directly in the sense of Admati and Pfleiderer (1990).

⁴Pareto-dominated equilibria are based on coordination failure. We summarize the extension to asymmetric equilibria in Section 5.1. The intuition remains similar and some additional results obtain, but because the analysis involves a large number of cases, in the interest of brevity the main text considers symmetric equilibria.

We find that the presence of a PA positively affects the shareholders' incentives to invest in own research or leaves these incentives unchanged, and we determine the corresponding parameter spaces. The underlying intuition for this finding is as follows: Begin with the situation without a PA. Consider a board's proposal and a shareholder who is interested in the firm value. This shareholder only needs to consider the case in which her vote decides whether the board's proposal passes or not, i.e., where the shareholder is pivotal. This shareholder realizes that in this case the other shareholders' votes in favor and against the proposal offset each other. Hence, the pivotal shareholder cannot infer from pivotality whether the other shareholders' signals tend to support or go against the board's proposal in the aggregate. In this situation, only her own information and the board's information are crucial. Now, even if this shareholder has invested into own research and this signal is not in favor of the board's proposal, it is still better to vote for the proposal since the board, by assumption, is better informed than the shareholder. Therefore, shareholders would not invest into own research in the first place and generally prefer to follow the board's proposal. This result holds as long as shareholders do not anticipate the board's proposal to be so conflicted as to be uninformative. Hence, our first leading assumption, BIB, leads to correlated votes and a lack of own investment incentives, even without any PA. The argument shows that PAs per se are not the root cause of insufficient incentives for shareholders.

This baseline result has a critical consequence for the potential value effects of a PA. Specifically, the presence of a PA leads to a different equilibrium behavior. If both the PA's recommendation and the shareholder's own research point against the board's proposal, it can be better for the shareholder to reject it. Therefore, investments into own research are beneficial *after* the PA's recommendation is against the proposal. Intuitively, a profit-

maximizing PA can improve corporate decisions by pointing to the critical issues that deserve further investigation. Thus, PA and shareholder research efforts are complementary. At worst, the outcome with a PA is the same as without a PA; this obtains when the PA is either much less or much more informed than the board. However, when the board and the PA are similarly well informed, a PA strictly increases decision quality.

This positive result hinges on our two assumptions, BIB and PAF. These two assumptions distinguish our approach from the existing literature. We discuss in detail the implications of relaxing them. Most importantly, when neither of them is satisfied, then proxy advice and own research are substitutes, such that the presence of a PA undermines the shareholders' research incentives. However, both BIB and PAF appear plausible in practice, and together they yield a simple reason for PAs to exist.

Although our model is necessarily stylized, it provides important perspectives on some recent regulatory developments, which we discuss in Section 6, especially changes in rules that might affect how much time investors have for own research and on proxy advisor competence. It is helpful to consider how investors use the services of PAs in reality. Shu (2021) documents that in 2017, about a quarter of ISS customers and a small fraction of Glass Lewis customers appear to have “robo-voted” (followed a PA “blindly”).⁵ It is not clear why the other investors -- which constitute the large majority -- chose differently. Some may have different general policies. However, it appears quite plausible that at least some investors use the PA advice as a signal to conduct their own research on a contentious issue, as found in our model. Indeed, survey evidence indicates that at least sophisticated investors

⁵Rose (2021) additionally highlights issues regarding the disclosure by investors regarding the extent to which they “robo-vote”.

use PAs in the way our equilibrium analysis suggests. For example, a survey (Swipra, 2018) containing responses of 44 asset managers including 24% of world-wide assets under management found that almost all international asset managers purchase proxy advisory services, and that 70% of them mainly use the PA for obtaining vote-related governance materials and other information in comparable form (rather than merely looking for the actual vote recommendation). By contrast, 90% of the 30 pension funds that participated in the survey primarily care for the binary recommendation and little for the underlying materials. They are effectively “robo-voting.” Notice that these investor types differ ex ante in their skills. Thus, different behavior is to be expected. In our asymmetric equilibria, by contrast, shareholders are ex ante identical but can still end up playing different strategies.

Our paper contributes to the literature on voting, and in particular to voting in corporations. Seminal works in this literature, elucidating in particular the role of strategic voting, include Maug (1999), Maug and Yilmaz (2002), and Maug and Rydqvist (2009). More broadly, our model relates to the literature on strategic voting in a common interest setting that started with Austen-Smith and Banks (1996) and Feddersen and Pesendorfer (1996). In particular, our analysis contributes to the study of informational efficiency of such votes.⁶ Informational inefficiencies occur when symmetry assumptions of the standard Condorcet model are violated, either with regard to the signal technology (Austen-Smith and Banks, 1996) or with regard to the information-transmission process (Gerardi and Yariiv, 2007; Iaryczower, Shi, and Shum, 2018; Buechel and Mechtenberg, 2019). Inefficiencies are also generated when private information becomes costly (Persico, 2004; Gershkov and

⁶For studies of informational efficiency in games with strategic complements and strategic substitutes, see Angeletos and Pavan (2007) and Hellwig and Veldkamp (2009).

Szentes, 2009), or when public information is provided that is not of sufficiently high quality (Kawamura and Vlaseros, 2017; Jeong, 2019; Liu, 2019).⁷ In the corporate finance context, a relatively recent innovation, starting with Malenko and Malenko (2019), has been to enhance the analysis by considering the presence of proxy advisors.⁸

We contribute to the literature in four different respects: First, we show that muted shareholders’ incentives to conduct their own research are not solely due to a PA acting as a substitute informer, but also occur *without* a PA if the board’s proposal is based on sufficiently valuable information. Second, we show that proxy advice given early enough can foster shareholders’ own investments in research. This has the major policy implication that shareholders need to have sufficient time to conduct such research *after* receiving the advice from PAs. Under these conditions, PAs are likely to improve decision quality and social welfare, while maximizing their profits.⁹ Third, we provide the conditions for the beneficial and detrimental effects of PAs by covering all qualities of information for board, PA and shareholders. Fourth, there may be applications to other areas. For example, Sangiorgi and Spatt (2017) argue that credit rating agencies can “crowd out” independent information production by investors. Future work might analyze under which conditions credit rating

⁷Generally speaking, inefficiencies can be generated by correlation of private beliefs across voters, either through public information or through information-transmission processes between voters that are not optimally tailored to the signal (quality) distribution. Accordingly, Levy and Razin (2015) show that correlation neglect can enhance informational efficiency.

⁸Other work on (strategic) voting in the corporate finance context includes Brav and Mathews (2011), Levit and Malenko (2011) and Van Wesep (2014), among others.

⁹In our analysis, the goal of the decision-making is to maximize firm value and the PA provides unbiased recommendations. Related papers explore deviations from these assumptions: Matsusaka and Shu (2020) show how a PA profitably caters to the preferences of investors. Malenko, Malenko, and Spatt (2021) analyze how a PA can enhance profits by biasing its recommendations. In Ma and Xiong (2021), a PA skews its recommendation either because of a conflict of interest or according to a bias on the side of the shareholders. Levit and Tsoy (2020) show how an advisor may adopt one-size-fits-all recommendations in order to obscure its biases. Overall, a theme of this line of research is that biasing recommendations may increase the fraction of shareholders who subscribe to the PA’s service. We see our approach as complementary by establishing that (and why) PAs can add value to corporate decision-making in the absence of these frictions.

agencies positively contribute to information production.¹⁰

The paper proceeds as follows. Section 2 sets up the model. Section 3 provides the main results, which are then illustrated in Section 4. Section 5 shows robustness of the results, in particular with respect to asymmetric equilibria. Regulatory implications are discussed in Section 6. Section 7 concludes.¹¹

2 Model Setup

2.1 Basic Ingredients

We model voting on corporate decisions as strategic voting under uncertainty (Austen-Smith and Banks, 1996; Feddersen and Pesendorfer, 1996, 1997, 1998). Thus, we follow frameworks such as Malenko and Malenko (2019), Bar-Isaac and Shapiro (2020) and Ma and Xiong (2021).

A firm is owned by $N > 1$ shareholders, where N is odd. The firm faces uncertainty with respect to a binary decision.¹² Making the ex post correct decision will increase firm value by an amount normalized to 1, while the wrong decision leaves it unchanged.

More formally, there are two states of the world $\theta \in \{A, B\}$ with equal prior probability.

¹⁰Apart from the concern regarding crowding-out of shareholder incentives to conduct research, conflicts of interest may exist. Some PAs do not only sell recommendations to shareholders, but also effectively sell consultancy services to the firms. Thus, a concern is that a PA can be “captured” by a firm’s management such that the recommendation to shareholders is biased in favor of acceptance of proposals. In this paper, we abstract from this problem because we wish to establish when a PA can potentially be value-increasing. This motivation is similar in spirit to Boot, Milbourn, and Schmeits (2006) who establish a reason for credit rating agencies to exist in the absence of conflicts of interest.

¹¹All propositions of the main text are proven in Appendix A in this document. Further arguments used in the discussion in the main text are formally shown in the Supplementary Online Material (SOM), which is available here: <https://bit.ly/proxySOM>.

¹²Examples vary by jurisdiction and include but are not restricted to director elections, dividends, shareholder proposals, compensation-related matters, etc.

Slightly abusing notation, we assume that the firm has to decide on a binary issue $\{A, B\}$ that yields value 1 if and only if the decision matches the true state.

The board of directors receives a binary signal s_B regarding the issue to be voted on. The signal takes on values a or b . The signal quality is $q_B \in (\frac{1}{2}, 1)$, i.e., $Pr[s_B = a | \theta = A] = Pr[s_B = b | \theta = B] = q_B$. Again slightly abusing notation, we assume that the board then proposes either action A or B .

A profit-maximizing proxy advisor (PA) offers advice to shareholders at fee $f > 0$. The PA receives a signal about the true state as well. The quality of that signal is $q_P \in (\frac{1}{2}, 1)$. The PA provides a vote recommendation *for* or *against* the board's proposal to subscribing shareholders.

Shareholders decide whether to subscribe to the PA's offer. If a shareholder subscribes, she receives the PA's recommendation. A shareholder *then* decides whether to invest $c > 0$ in own research about the issue at hand. If a shareholder expends own research costs, this leads to a private signal of quality $q_S \in (\frac{1}{2}, 1)$. When the shareholder meeting is held, each shareholder votes *yes* or *no*. Abstentions are excluded.¹³ For simplicity, each shareholder holds one share of the firm and each share provides one vote. The decision that receives a majority of votes is implemented. Conditional on state θ , all signals are independent, and precision levels q_B , q_P , and q_S are common knowledge.

Our first leading assumption is that the board knows better than any single shareholder what is good for the company.

¹³Practically, shareholders may also abstain. However, according to most institutional settings abstentions are counted (either as *yes* or *no*) and hence shareholders' voting action is essentially binary.

Assumption 1 (BIB). *The board is at least as well informed as a single shareholder, i.e.,*

$$q_S \leq q_B.$$

“BIB” stands for better-informed board. For the quality of the PA q_P we do not make an assumption that restricts it to be above or below the other agents’ qualities.

In the course of the analysis it will come in handy to transform signal qualities $q \in (0.5, 1)$ into log-odds $\log(\frac{q}{1-q}) \in (0, \infty)$. We denote the log-odds of the board being correct as $\ell_B := \log(\frac{q_B}{1-q_B})$ and likewise $\ell_S := \log(\frac{q_S}{1-q_S})$ for the shareholders and $\ell_P := \log(\frac{q_P}{1-q_P})$ for the PA. Then Assumption BIB reads $\ell_S \leq \ell_B$.¹⁴ This notation is convenient since it allows us to aggregate signal qualities by summation. To see this, consider the board’s signal b and assume, for instance, that both the PA and one shareholder have received signals a and that there is no further information. Then, the board’s signal is rather correct than not if and only if $q_B(1 - q_P)(1 - q_S) \geq (1 - q_B)q_Pq_S$, which is equivalent to $\ell_B \geq \ell_P + \ell_S$.

Our second leading assumption is that shareholders can condition their research investment on the PA’s recommendation.

Assumption 2 (PAF). *Subscribing shareholders decide upon own research investment after they have received the PA’s recommendation.*

“PAF” stands for “proxy advice first”. Shareholders may conduct a bulk of their general research about a company independent of the proxy advice and also before receiving the PA’s recommendation. Our assumption PAF is that the information relevant for deciding on

¹⁴Nitzan and Paroush (1982) show that among voters with idiosyncratic signal precision the optimal voting weights would be according to these log-odds.

a specific issue can be conditioned on the PA’s recommendation.¹⁵

2.2 Simplification and Timeline

It turns out that we can substantially simplify the exposition without losing substance of the analysis by fixing the signal and behavior of the board and the behavior of the PA. The board receives a signal and then makes a proposal. We let the board’s signal be always b (for board).¹⁶ We fix the board’s behavior by assuming it makes the proposal according to its signal, i.e., it has received signal b and now proposes action B .¹⁷ Likewise, we fix the PA’s behavior to set fee $f > 0$ and recommend according to its signal, i.e., it recommends *for* if it has received signal b (for board) and it recommends *against* if it has received signal a (against board).

The timeline, which is illustrated by Figure 1, summarizes the simplified setup. At $t = 0$ nature draws a state of the world and signals for all potential recipients of signals. At $t = 1$ each shareholder decides whether to pay the fee for the PA’s report. Those who pay the fee receive the truthful vote recommendation which is equivalent to learning the PA’s signal. At $t = 2$ each shareholder decides whether to invest costs c to receive an own independently and identically distributed signal of quality q_S . At $t = 3$ shareholders vote. At $t = 4$ the proposal passes if a majority approves it and payoffs are realized.

¹⁵Relaxing this assumption would change the timing of our model such that shareholders have to decide simultaneously about subscribing to the PA and about investing in own research. That is the assumption in Malenko and Malenko (2019). We show the consequences of making this assumption in our model in Supplementary Online Material (SOM) Section 1.3 and discuss it in the main text.

¹⁶This will exclude strategies that depend on the label of the alternative, such as always voting *yes* for alternative A and *no* for alternative B independent of which alternative the board has proposed.

¹⁷In Section 5, we discuss to which extent, and with which implications, a re-interpretation of our model covers conflicts of interest between board and shareholders.

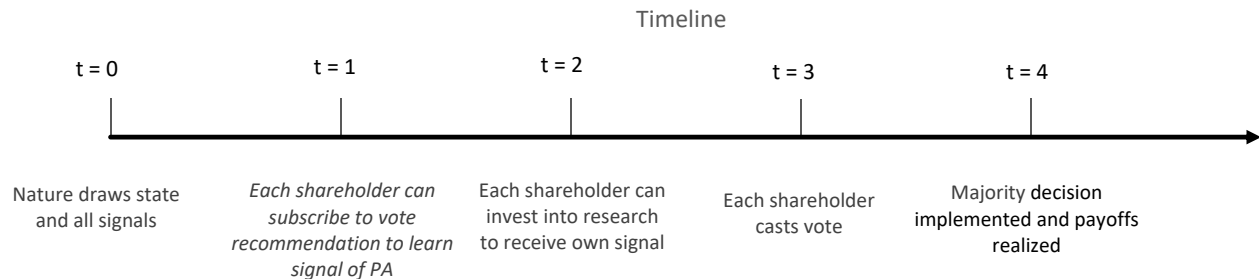


Figure 1: Timeline. For simplicity, the board’s and PA’s behavior is fixed. In particular, the PA’s recommendation strategy is fixed to be truthful such that subscribing shareholders learn the PA’s signal. (Actions in italics only apply if there is a PA.)

2.3 Strategies

The most important strategic aspects concern the shareholders. They have several strategies both on the information acquisition stages ($t = 1$ and $t = 2$, respectively) and on the voting stage ($t = 3$). On the information acquisition stages, there are six strategies: A shareholder who does not subscribe may invest in own research (NotSubscribe-Invest) or not (NotSubscribe-NotInvest); a shareholder who does subscribe may unconditionally invest in research (Subscribe-Invest) or not (Subscribe-NotInvest) or, else, may invest in research only if the recommendation is *for* (Subscribe-InvestIFF*for*) or only if the recommendation is *against* (Subscribe-InvestIFF*against*).

In the voting stage, any shareholder chooses *yes* or *no*. The set of voting strategies depends on the acquired information which may include the PA’s signal and the own signal. For instance, for a shareholder who acquired both kinds of information (e.g., with Subscribe-Invest), a voting strategy is a mapping $v_i : \{for, against\} \times \{a, b\} \rightarrow \{yes, no\}$. Slightly abusing notation, we write σ_i for the information acquisition and voting strategy of a shareholder i , and we use $\sigma = (\sigma_1, \dots, \sigma_N)$ to denote a strategy profile of shareholders.

We study Perfect Bayesian Nash equilibria in pure strategies, i.e., players best respond to

their beliefs and update their beliefs according to Bayes' rule wherever possible.¹⁸

To analyze the model we take the perspective of a regulator. The regulator compares a market with a PA, as in the game defined above, with a market in which no PA is admitted. We will assume that costs of information acquisition, be it fee f or costs c , are relatively small compared to benefits on decision quality. Hence, when shareholders have to trade off costs of information acquisition with benefits of higher firm value, we will assume that the latter dominates. When there are two strategies with the same decision quality, then shareholders strictly prefer the one with lower costs, as we assume that costs are strictly positive. The quality of corporate decisions is measured by $\Pi(\sigma)$, the ex ante probability that the decision will match the true state.¹⁹ In what follows, all proofs are relegated to Appendix A.

3 Main results

Benchmark Setting without Proxy Advisor. Consider first the benchmark case that no PA is admitted. Thus, posit that in the timeline of Figure 1 actions at $t = 1$ are suppressed. Then a shareholder's information acquisition decision reduces to whether to acquire an own signal or not in $t = 2$. Suppose for a moment that all shareholders do acquire such a signal and vote according to it. We call this strategy profile *UNIS*, for "UNconditional

¹⁸Technically our focussing on pure strategies is a difference to Malenko and Malenko (2019) and Ma and Xiong (2021), who study equilibria in mixed strategies, but focus on symmetric equilibria in the sense that all shareholders must play the same strategy. In spirit, the difference is not so big: One interpretation for mixed strategies is that only a fraction of the population plays a certain pure strategy, which we admit when studying asymmetric strategy profiles. When there are multiple equilibria in some area, we exclude those that are Pareto-dominated by other equilibria. This eliminates equilibria due to miscoordination, as we will explain.

¹⁹This is also called *informational efficiency*, which can be distinguished from *economic efficiency* (see, e.g., Buechel and Mechtenberg, 2019). Economic efficiency means welfare, which here can be defined as $\Pi(\sigma)$ net of the investment costs in own research since the prices paid to the PA are transfers. When investment costs c become arbitrarily small, the two concepts coincide.

Investment in own Signal,” where the term “unconditional” will be justified later, when shareholders could potentially condition their investment in own research on the PA’s vote recommendation.²⁰ In this strategy profile the decision quality amounts to $\Pi(\sigma^{UNIS}) = \pi(N)$, where $\pi(N) := \sum_{i=\frac{N+1}{2}}^N \binom{N}{i} q_S^i (1 - q_S)^{N-i}$ is the probability that a majority decision of N shareholders is correct.

While the decision quality of such voting behavior is usually very high (De Caritat, 1785), it is unfortunately not an equilibrium under Assumption BIB. The intuition is straightforward once spelled out. A single shareholder i can improve by deviating to not acquire a signal and vote *yes*. When this shareholder i is pivotal, the signals of all $N - 1$ other shareholders are split: there are as many a -signals as there are b -signals among them. Now, even if i ’s signal points against the board’s proposal, Assumption BIB, i.e., the assumption that the board is at least as well informed as i , makes it beneficial to vote *yes*, i.e., for the board’s proposal, and not to acquire own information in the first place. We call this latter strategy and its corresponding strategy profile “*Rubber-stamping*”.²¹

Proposition 1 (SYM without PA). *Suppose no PA is admitted. If Assumption BIB holds, then there does not exist a symmetric equilibrium in which shareholders invest in own research. Hence, decision quality in symmetric equilibria is bounded by: $\Pi(\sigma) \leq q_B$. The Pareto-efficient²² symmetric equilibrium is Rubber-stamping and leads to decision quality*

²⁰For simplicity, we use the same labels for strategies as for the symmetric strategy profiles composed of these strategies, e.g., we speak of UNIS both to denote the strategy to invest in an own signal and to vote according to it and to denote the strategy profile in which all shareholders do so. The precise meaning of these labels will be obvious from the context.

²¹Assumption BIB, $q_S \leq q_B$, is in fact necessary and sufficient for Proposition 1. Since we have Assumption BIB as a leading assumption, we only show sufficiency in the proof of Proposition 1.

²²Recall that the criterion of Pareto-efficiency is applied within the set of symmetric equilibria. Within the set of all strategy profiles, there might well be strategies that Pareto-dominate the Pareto-efficient symmetric equilibrium.

$$\Pi(\sigma^{Rubber}) = q_B.$$

Including Proxy Advice. The presence of a PA substantially increases a shareholder’s set of information-acquisition strategies. One of them, *Subscribe-InvestIFFagainst*, gives rise to the following symmetric strategy profile, which we denote by $\hat{\sigma}$ and call “*CAIS* (Conditional on Advice Invest in Signal):” All shareholders subscribe to proxy advice; if the recommendation is *for*, they vote *yes*; if the recommendation is *against*, they invest in own research and vote according to their own signal, i.e., vote *yes* if the signal is *b* and *no* if it is *a*.

In this strategy profile shareholders use the PA’s recommendation as a filter: *for* recommendations are followed without being challenged; *against* recommendations trigger further investigation of the issue. CAIS is illustrated in Table 1.

		Own Signal	
		<i>b</i> (for board)	<i>a</i> (against board)
PA’s recommendation	<i>for</i>	yes	
	<i>against</i>	yes	no

Table 1: Strategy CAIS: Invest in research if and only if vote recommendation is *against*; after *for* recommendation vote *yes*, after *against* recommendation vote *yes* if and only if signal is for board.

It turns out that based on this strategy profile the negative result of Proposition 1 can be mitigated by the presence of a PA, as Proposition 2 shows.

Proposition 2 (SYM with PA). *Let Assumptions BIB and PAF hold. Let costs c be arbitrarily small and let fee f be sufficiently smaller. Suppose there is a PA with $\ell_P \in (\ell_B - \ell_S, \ell_B + \ell_S)$. Then there exists a symmetric equilibrium in which shareholders conditionally*

invest in own research. The Pareto-efficient equilibrium is CAIS and leads to decision quality $\Pi(\sigma^{CAIS}) > q_B$. Otherwise (i.e., if $\ell_P \notin (\ell_B - \ell_S, \ell_B + \ell_S)$), the Pareto-efficient equilibrium is Rubber-stamping with $\Pi(\sigma^{Rubber}) = q_B$.

Comparing Proposition 2 with Proposition 1, we conclude that the presence of a PA either strictly improves decision quality or leaves it unchanged, compared to the setting without a PA. The condition for the strict improvement can be rewritten as $|\ell_B - \ell_P| < \ell_S$, which has the following interpretation: the difference in quality of board and PA is smaller than the information quality of one shareholder. If this condition is satisfied there is no equilibrium with information acquisition without a PA, while we have a new equilibrium (CAIS) with a PA in which all shareholders conditionally invest in own research.

The first intuition for the conditions of the PA being beneficial as stated in Proposition 2 can be seen from their violations. Consider the symmetric strategy profile CAIS. If $\ell_P \leq \ell_B - \ell_S$, we have $\ell_S + \ell_P \leq \ell_B$, i.e., the board is better informed than the PA and one shareholder together. Then there is a deviation from CAIS to Rubber-stamping. Intuitively, the board is sufficiently well informed that it does not individually pay off to acquire any information, even if it were costless. If $\ell_P \geq \ell_B + \ell_S$, i.e., the PA is better informed than the board and one shareholder together, then there is a deviation from CAIS to not investing and to voting against the board's proposal. Indeed, the deviating shareholder's vote is only pivotal if board and PA disagree and voting *no* improves decision quality, given that the PA is so well informed. If costs c or f are not small enough, there is again a beneficial deviation, e.g., to Rubber-stamping, which saves costs. Finally, if the PA's fee f is not sufficiently smaller than the costs c , then deviating to UNIS saves costs without affecting the outcome.²³

²³The assumption c small enough assures that shareholders who can improve decision quality by investing

Most importantly, the two key assumptions Assumption BIB and PAF are also necessary for the conclusion, as we will discuss below.²⁴

4 Illustration and Discussion of BIB

Illustration. To get a better understanding of Propositions 1 and 2, consider Example 1.

Example 1 (Symmetric Equilibria). *Let $q_B = 0.75$, $q_P = 0.7$, and $q_S = 0.6$. Then $\ell_B = 0.477$, $\ell_P = 0.368$, and $\ell_S = 0.176$ such that the condition $\ell_P \in (\ell_B - \ell_S, \ell_B + \ell_S)$ of Proposition 2 is satisfied, as $0.368 \in (0.477 - 0.176, 0.477 + 0.176)$. Table 2 illustrates the implications of Propositions 1 and 2 for decision quality. First, not admitting a PA leads to Rubber-stamping and hence to a decision quality of $q_B = 0.75$, independent of the number of shareholders N (Proposition 1). Second, when a PA is admitted, CAIS is the Pareto-efficient symmetric equilibrium, which delivers a strictly higher decision quality (by Proposition 2). Its decision quality is further increasing in the number of shareholders N and approaching $0.925 < 1$ for large N . Finally, Table 2 shows the hypothetical case in which all shareholders play UNIS, i.e., invest in own research. This is not an equilibrium but a classic benchmark capturing the quality of majority decisions by N sincere voters, as already pointed out by the Marquis de Condorcet (De Caritat, 1785). In this benchmark case, decision quality may start low, but becomes larger than in equilibrium for a sufficiently large number of voters.*

We now turn to illustrating Propositions 1 and 2 graphically, while at the same time

in own research would not shy away due to the high costs. The assumption that the costs are larger than zero matters when deviations that do not affect decision quality are considered. The assumption that fees f are sufficiently smaller than c means that the results answer the question whether there is a fee f such that a PA can profitably be active in the market.

²⁴In the Supplementary Online Material (SOM) Section 1, we extend the analysis to the complete characterization of all symmetric equilibria in pure strategies, with and without Assumptions BIB and PAF.

Setting	Decision quality	$N = 3$	$N = 5$	$N = 21$	$N = 101$	$N = 1,001$
No PA	$\Pi(\sigma^{Rubber}) = q_B$	0.75	0.75	0.75	0.75	0.75
With PA	$\Pi(\hat{\sigma}) = q_B q_P + p^{dis} \pi(N)$	0.784	0.798	0.855	0.917	0.925
Hypothetical	$\Pi(\sigma^{UNIS}) = \pi(N)$	0.648	0.683	0.826	0.979	1.0

Table 2: Decision quality in Example 1. The table considers the two Pareto-efficient symmetric equilibria, Rubber-stamping and CAIS, and strategy profile UNIS, which is not an equilibrium. Illustration of Propositions 1 and 2 for $q_B = 0.75$, $q_P = 0.7$, and $q_S = 0.6$. $p^{dis} := (1 - q_B)q_P + q_B(1 - q_P)$ is the probability that the board’s and the PA’s signal differ.

extending our analysis to the entire parameter space. That is, we now move on to relaxing Assumption BIB. This will help explain the relevance of this key assumption and bridge our findings and those from the existing literature.

Relevance of BIB. Figure 2 illustrates the full parameter space, including the areas where Assumption BIB is violated.²⁵ An entry (x, y) in this coordinate system has the simple interpretation that the board is equally well informed as x shareholders, while the PA is equally well informed as y shareholders.²⁶

In the upper panel of Figure 2, no PA is admitted. By Proposition 1, Rubber-stamping is the Pareto-efficient equilibrium under Assumption BIB, i.e., $q_S \leq q_B$. This is illustrated in the area $\frac{\ell_B}{\ell_S} \geq 1$. Assumption BIB is necessary and sufficient for this conclusion as UNIS is the Pareto-efficient equilibrium for $\frac{\ell_B}{\ell_S} < 1$. Hence, when there is no PA, information acquisition occurs if and only if the board is less well informed than a single shareholder, i.e., when Assumption BIB is violated.

In the lower panel of Figure 2, there is a PA and Assumption PAF is satisfied. Proposition 2 has shown that under Assumption BIB, i.e., for $\frac{\ell_B}{\ell_S} \geq 1$, we have either CAIS or Rubber-

²⁵The additional results, due to the violation of Assumption BIB, are provided in the Supplementary Online Material (SOM) Section 1.

²⁶“Equally well informed” means here that if x shareholders have received a signal a (against the board) then both states A and B are equally likely. Hence, if more than x shareholders have received a signal a and there is no other information, then the board should be overruled.

stamping as Pareto-efficient symmetric equilibrium. Moreover, by Proposition 2 the parameter space in which CAIS is an equilibrium is given by the condition $\ell_P \in (\ell_B - \ell_S, \ell_B + \ell_S)$, which defines a corridor around the 45-degree line.²⁷ On the 45-degree line the board and the PA are exactly equally well informed, i.e., $\frac{\ell_P}{\ell_S} = \frac{\ell_B}{\ell_S}$ (or $q_B = q_P$). Note that this corridor is not bounded from the upper right. Hence, for arbitrarily well-informed board and PA, there is still an equilibrium with conditional information acquisition of all shareholders, as long as the board and the PA are roughly equally-well informed.

The comparative-static effects of changing information quality are easy to understand using this figure. Assume $\frac{\ell_B}{\ell_S} > 1$ and start with an uninformed PA: $q_P \approx 0.5$ i.e., $\frac{\ell_P}{\ell_S} \approx 0$. Decision quality remains unaffected by the PA's information quality q_P (or $\frac{\ell_P}{\ell_S}$) at first, then discontinuously increases from q_B to $\Pi(\hat{\sigma})$. Within the region where CAIS is an equilibrium, decision quality further improves as $\Pi(\hat{\sigma})$ is continuously increasing in q_P . Finally, it returns to the level q_B when Rubber-stamping is played again. Hence, there is a non-monotonic effect of a PA's information quality on the corporate decision quality with the latter being highest for a PA that is slightly better informed than the board.²⁸ Comparative-static effects of the board's information quality are analogous if $\frac{\ell_P}{\ell_S} > 1$, i.e., the PA is better informed than a single shareholder. Finally, increasing signal quality of the shareholders, q_S , reduces $\frac{\ell_B}{\ell_S}$ and $\frac{\ell_P}{\ell_S}$, which means graphically moving towards the origin. This improves decision quality of CAIS as shareholders base their decision on their own information when the PA's

²⁷When studying asymmetric equilibria, we show that CAIS can be played by a majority of shareholders far beyond this corridor. The corridor only restricts the area in which *all* shareholders play CAIS.

²⁸A non-monotonic effect of the PA's recommendation quality on the corporate decision quality is also predicted by the analysis of Malenko and Malenko (2019). In their model, higher PA quality always weakly reduces the shareholders' investment in private signals such that maximal research incentives are obtained for the lowest PA quality. In our model, maximal research incentives are obtained for intermediate PA quality, namely when it equals the board's quality.

recommendation is *against*.

Assumption BIB, i.e., $\frac{\ell_B}{\ell_S} \geq 1$, rules out UNIS, the strategy profile in which all shareholders acquire information. Violating BIB while satisfying PAF, UNIS is the Pareto-efficient symmetric equilibrium in the lower left corner of the parameter space (in the lower panel of Figure 2), which is defined by the condition $\ell_S > \ell_B + \ell_P$. Hence, in the presence of a PA, UNIS requires that one single shareholder must be better informed than board and PA together. Interestingly, this is an even stronger condition than the condition for UNIS when no PA is admitted ($\ell_S > \ell_B$).

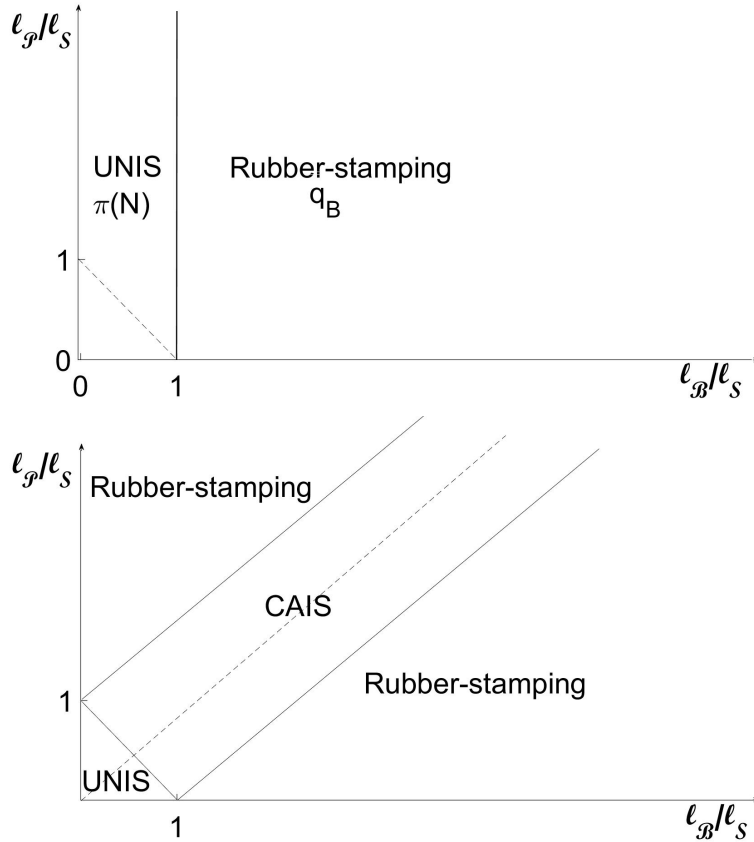


Figure 2: Parameter space with Pareto-efficient symmetric equilibria. Upper panel: without a PA; lower panel: with a PA

Let us now compare the upper panel with the lower panel. Under Assumption BIB, i.e., for

$\frac{\ell_B}{\ell_S} \geq 1$, the presence of a PA weakly improves decision quality, as it replaces Rubber-stamping with CAIS if anything. When Assumption BIB is violated, there can be a different effect. Suppose that the quality of the board is not much better than a coin flip, i.e., $q_B \approx 0.5$. Then $\frac{\ell_B}{\ell_S} \approx 0$ and there is the equilibrium with full information acquisition (UNIS) and high decision quality, as long as no PA is admitted. The presence of a PA who is better informed than a single shareholder ($\frac{\ell_P}{\ell_S} > 1$) destroys this equilibrium and reduces decision quality from $\pi(N)$ to $q_B \approx 0.5$. The reason is that conditional on pivotality a shareholder prefers to follow the PA's recommendation over acquiring and using the own signal. This is the substitution effect already established for well-informed PAs (Malenko and Malenko, 2019). Hence, Assumption BIB dramatically changes how admission of a PA affects decision quality when studying symmetric equilibria.

5 Robustness

5.1 Asymmetric Equilibria

The main text characterizes the (Pareto-efficient) symmetric equilibria. We can drop the symmetry assumption. Since the characterization of all (Pareto-efficient) asymmetric equilibria is quite cumbersome and involves many case distinctions, we relegate it to the Supplementary Online Material (SOM) Section 2 and provide only the main result and the essence of the other findings here. Interestingly, although we model shareholders as ex ante homogeneous, there is specialization on different strategies in the Pareto-efficient equilibria, e.g., in one typical equilibrium, some shareholders play CAIS, some shareholders play UNIS,

while others play Rubber-stamping. Our basic results remain similar. In particular, we can first show that without PA, the number of shareholders who invest in own research is bounded from above. That is, in the equilibrium without a PA there are always some shareholders not investing in research, given that Assumption BIB is satisfied. Second, when admitting a PA whose signal quality is not too far from the board's, the number of shareholders who invest or conditionally invest weakly increases. Again, the basic idea is that the PA's recommendation is used as a condition to invest in own research like in information-acquisition strategy *Subscribe-InvestIFF* *against*, which constitutes CAIS. While this was true for all shareholders in Proposition 2 in a certain parameter range, we now find this in much larger areas of the parameter space, while no longer all shareholders use this strategy. More precisely, if we have $\frac{|\ell_B - \ell_P|}{\ell_S} < \frac{N+1}{2}$, then $N - \frac{|\ell_B - \ell_P|}{\ell_S}$, i.e., more than half of all shareholders, invest into information, either conditionally as in CAIS or even unconditionally as in UNIS. The above condition means that the difference between the information quality of the PA and the information quality of the board must not exceed the aggregated information quality of about half of all shareholders together, which graphically widens the corridor in the lower panel of Figure 2 from starting at 1 to starting at $\frac{N+1}{2}$ on both axes.²⁹ Moreover, the number of investing shareholders, $N - \frac{|\ell_B - \ell_P|}{\ell_S}$, is decreasing in this difference of information quality. Hence, as in the analysis of symmetric equilibria, we find the strongest research incentives for shareholders when the PA is as well informed as the board.³⁰ Finally, the question remains how the effects of a PA on equilibrium behavior translates into decision quality. Proposition 3 provides the answer.

²⁹Observe that the larger the number of shareholders N , the less demanding this assumption is.

³⁰Other comparative-static effects might be different for asymmetric equilibria than for symmetric, see Supplementary Online Material (SOM) Section 2.

Proposition 3 (ASYM). *Let costs c and f be sufficiently small. For any setting of signal qualities $q_B, q_P, q_S \in (\frac{1}{2}, 1)$, decision quality in any Pareto-efficient equilibrium with a PA under Assumption PAF, $\Pi(\sigma^*)$, is weakly higher than decision quality in any strategy profile without a PA (including their Pareto-efficient equilibria), i.e., $\Pi(\sigma^*) \geq \bar{\Pi}^{no-PA}$, where $\bar{\Pi}^{no-PA}$ is the maximal decision quality for any strategy profile in the game without a PA.*

The proof of Proposition 3 considers all Pareto-efficient strategy profiles and shows that each of them is an equilibrium with maximal decision quality. It then uses the insight that any decision quality without a PA can be replicated with a PA who is ignored. As a consequence, decision quality cannot be reduced.³¹ In sum, the novel type of equilibrium behavior that we find in this paper exists in a broad range of the parameter space. The main insight, that PAs weakly improve decision quality, holds even for the whole parameter space when considering asymmetric strategy profiles.

5.2 One Dominant Shareholder

We have thus far assumed that $N > 1$ and odd which means that we have at least three shareholders. Let us now consider the case of only one shareholder $N = 1$, which applies to any company with a shareholder who holds a decisive majority of shares. We can show that both main results carry over to this case. First, without a PA, there is no incentive to invest in research under Assumption BIB, i.e., for $q_S \leq q_B$. Second, the presence of a PA with appropriate information quality improves decision quality, as it leads to a Pareto-efficient equilibrium in which the shareholder conditionally invests in research.

Interestingly, since one single shareholder is always pivotal, the Assumption PAF is not

³¹This simple line of argumentation does not apply to symmetric equilibria.

necessary for research investment in that special case. That is, even when the subscription decision and the information acquisition decision are made simultaneously, there is an equilibrium with investment in own research for $N = 1$. In this equilibrium strategy the shareholder subscribes to the vote recommendation and invests in own research (Subscribe-Invest) and votes *yes* if and only if at least one of the two supports the board's proposal. Hence, for the case of only one shareholder, there is a complementarity between proxy advice and own research, independently of the timing of the two decisions.

5.3 Conflicts of Interest

In a re-interpretation of our model the board has a partial conflict of interest with the shareholders. Suppose the effect of conflicted interests is that this reduces the likelihood that the board's proposal is correct from $q_B > 0.5$ to some $\tilde{q}_B > 0.5$. More technically, suppose the board's bias is a random variable that is drawn and private information. Shareholders know the distribution of the bias, but not its realization. The distribution of the bias is such that either the board's proposal is determined by the bias or that it is determined by the signal. Moreover, suppose that the board's bias is symmetrically distributed around zero.³² This introduces noise into the informativeness of the board's proposal as shareholders put positive probability on the case that the proposal is independent of the signal. Then the assumption of a high quality board $\tilde{q}_B \geq q_S$ thus means that the board is not only better informed, but also that the board's agency problem is limited. Conversely, a low \tilde{q}_B means either that the board has a low signal quality or that it has a high agency problem such that its proposal is not very informative.

³²Asymmetry of the bias distribution would make one type of proposal more informative than the other.

Reconsidering the comparative-statics on q_B (cf., e.g., Figure 2), we can thus also address how the agency problem affects the decision quality. Start with a very well informed board and a small agency problem: $q_B > \tilde{q}_B > q_P > q_S$. Reducing \tilde{q}_B first fosters the shareholders' research incentives up to the point $\tilde{q}_B \approx q_P$, then reduces them. This non-monotonicity makes it possible that agency problems may even increase the quality of corporate decision making, as boards whose proposals are less informative may incentivize shareholders to (conditionally) invest in own research.

6 Regulatory Implications

6.1 Regulation of Timing of Proxy Advice

To discuss recent policy developments related to the timing of proxy advice, we first summarize how a different timeline would affect our results. Consider the situation when proxy advice arrives *after* the shareholders' decision to invest in own research, i.e., when Assumption PAF is violated. All actions occur as illustrated in the timeline (Figure 1), but proxy advice arrives at the end of period $t = 2$. We consider the cases where Assumption BIB holds and where it does not hold. If Assumption BIB holds, the Pareto-efficient symmetric equilibrium is Rubber-stamping and hence decision quality is bounded by q_B . Hence, there is no positive effect of having a PA, as decision quality with or without a PA is bounded by the quality of the board.

If Assumption BIB does not hold, that is, if the board does not have the best information regarding what is good for the company, we find that UNIS is an equilibrium and Pareto-

efficient if and only if $\ell_S \geq \ell_B + \ell_P$; otherwise, Rubber-stamping is the Pareto-efficient equilibrium. This condition is the same as in our model with early proxy advice (see bottom right corner of Figure 2 lower panel). It is more demanding than the condition in the setting without a PA, which was $\ell_S > \ell_B$. Specifically, the condition $\ell_S \geq \ell_B + \ell_P$ means that a single shareholder has to be better informed, not only than the board, but than both the board and the PA together. Hence, the introduction of a PA whose information arrives late, if anything, weakens the shareholders' research incentives.

In sum, introducing a PA whose advice does not arrive sufficiently early does not induce equilibria with higher decision quality, but may even reduce decision quality. The positive effects of proxy advice in our model are hence indeed restricted to having both Assumption BIB and Assumption PAF satisfied.³³

These insights are important in light of recent policy developments. In August 2019, the U.S. Securities and Exchange Commission (SEC) issued guidance for investment advisors, stating that investment advisors satisfy their own fiduciary duties of care and loyalty and obligations to act in their clients' best interests in part through careful oversight of proxy advisory firms. Such oversight involves monitoring and analyzing the methodology and processes of proxy advisory firms, including their processes for engagement with companies and procedures to address errors.³⁴ In other words, blindly following the vote recommendation is seen to violate an investment advisor's fiduciary duties to its clients. The rule implies that indeed investors need to have (and take) enough time to conduct their own research.

A later proposed SEC rule from November 2019 instead would presumably have left

³³The sole exemption is $N = 1$ when a PA can improve decision quality even if PAF is violated; see Section 5.2.

³⁴<https://www.sec.gov/rules/interp/2019/ia-5325.pdf>

little time for shareholders to do independent research after receiving the proxy advisors' recommendations.³⁵ In particular, under that rule, companies would have had typically three to five days to respond to the initial recommendation of the proxy advisor, so that proxy advisor clients would have received recommendations only later. This would in turn have substantially shortened the time available to investors. (For example, there are on average 13 trading days between the date ISS issues its voting recommendation and the meeting date (Li, Maug, and Schwartz-Ziv, 2022).) The rule adopted in July 2020, however, addressed this issue to some extent.³⁶ It stated that proxy advisors have to provide their clients with a mechanism by which they can reasonably be expected to become aware of any written statements regarding the voting advice by the companies that are the subject of that advice in a timely manner before the shareholder meeting. In fact, in November 2021, the SEC, under a new chairman, went even further in a new proposal.³⁷ Under the new rule, proxy advisors would now not be required to engage with the companies that are the subjects of their advice. SEC Chairman Gary Gensler motivated this rule by saying that proxy advisor clients “deserve to receive independent proxy voting advice in a timely manner.”³⁸

The requirement for investors to have enough time for own research is in line with the model's prediction that in such a case high decision-quality can arise. However, we also note that in the novel equilibrium behavior that we find (CAIS), *for* recommendations are rubber-stamped, while only *against* recommendations trigger further research. It remains to be seen whether such partial own research fulfills the fiduciary duties in the eyes of the SEC.

³⁵<https://www.sec.gov/rules/proposed/2019/34-87457.pdf>

³⁶<https://www.sec.gov/rules/final/2020/34-89372.pdf>

³⁷<https://www.sec.gov/rules/proposed/2021/34-93595.pdf>

³⁸<https://www.sec.gov/news/press-release/2021-236>

6.2 Regulation of Proxy Advisor Competence

In parallel with issuing the guidance for investment advisors discussed above, in August 2019, the SEC also issued guidance and interpretation on the role of PAs.³⁹ The guidance includes recommendations on disclosure of the sources of information and methodology used by PAs and information regarding conflicts of interests. Similarly, the EU has also adopted disclosure rules for PAs in the new EU Shareholder Rights Directive (Directive (EU) 2017/828 amending Directive 2007/36/EC).⁴⁰ Such disclosure regimes may support the enhancement of proxy advisor competence through market discipline.

While the August 2019 SEC guidance focuses on disclosure requirements, the July 2020 rule mentioned above presumably more directly enhanced pressure on PAs to produce high-quality reports. Specifically, as noted above, that rule would have required PAs to provide their clients with a mechanism by which they can reasonably be expected to become aware of any written statements regarding its proxy voting advice from the subject companies, in a timely manner before the shareholder meeting. Moreover, the SEC reaffirmed that it considers PAs to be under SEC regulation governing solicitation and also defined instances where omitting information in a PA report could constitute fraud. The purpose was not to get PAs to file proxy statements; rather, by fulfilling certain actions, they would be granted an exemption from doing so, an indirect way of regulating their activities. Under the above-mentioned draft of a new rule from November 2021, in order to be exempt from

³⁹<https://www.sec.gov/rules/interp/2019/34-86721.pdf>

⁴⁰PAs are required to publish a code of conduct which they apply and to report the application of the code (or explain why they do not have a code or deviate from it). Member states shall require PAs to publicly disclose certain information, such as, the main features of a PA's methodology, the main information sources used and the procedures put in place to ensure the quality of research, advice and voting recommendation. Finally, member states must ensure that PAs identify and disclose actual or potential conflicts to their clients. Disclosure itself is limited to the client, i.e., the institutional investors.

the proxy rules, PAs would need to comply only with the disclosure requirements regarding conflicts of interest. Besides not requiring proxy advisors to engage with the companies that are the subjects of their advice, the SEC also proposes to remove the examples of situations in which the failure to disclose certain information in proxy voting advice may be considered misleading.⁴¹

Arguably, the July 2020 rules would have implied a higher signal quality for the PA. In our model, this implies the following effects: Better informed PAs up to a certain level may encourage information acquisition by the shareholders and improve decision quality; for even higher information quality of the PA, substantially beyond the board's, the effect is reversed. This holds if proxy advice is early enough for shareholders to condition their research investment on it. If instead proxy advice does not arrive sufficiently early, a competence-increasing regulation of the PA affects decision quality either negatively or not at all.

7 Conclusion

In this paper we analyze the effects of proxy advisory firms (PAs) on corporate decisions. As a benchmark PAs are not admitted. When the board's proposals are sufficiently informative, then shareholders do not have incentives to conduct their own research and simply rubber-stamp the board's proposals. Hence in the absence of PAs, decision quality is bounded by the quality of the board. Introducing a PA whose information level is not too far from the board's alters this result and leads to a higher decision quality. This only holds if the vote

⁴¹See Cooley (2021) for a non-technical summary of the background and the most recent ruling.

recommendation of the PA arrives sufficiently early such that shareholders can respond to *against* recommendations with an own investigation of the issue.

A Appendix: Proofs

A.1 Proof of Proposition 1

To prove Proposition 1 Lemma A.1 is helpful.

Lemma A.1 (SYM without PA: All Equilibria). *Let Assumption BIB hold. Suppose no PA is admitted.*

- i. Define Protest as the strategy profile in which no shareholder invests in research and all shareholders vote no. Protest is a symmetric equilibrium for any $q_B, q_S \in (0.5, 1)$. Its decision quality is $1 - q_B$.*
- ii. Rubber-stamping (i.e., no shareholder invests in research and all shareholders vote yes) is a symmetric equilibrium for any $q_B, q_S \in (0.5, 1)$. Its decision quality is q_B .*
- iii. There are no other symmetric equilibria.*

Proof. We address each part separately.

- i. We have $N \geq 3$ shareholders (because $N > 1$ and odd). When all shareholders vote *no*, a single shareholder is never pivotal. Hence, there is no way to increase decision quality. Deviations can thus only affect costs. Since no information is acquired in this information-acquisition strategy (NotSubscribe-NotInvest), costs are minimal. Hence, there is no unilateral improvement.

Decisions always implement the opposite of the board's proposal. By assumption of the simplified model, the board's proposal corresponds to its signal (B). Hence, the ex ante probability that the true state matches the decision equals the probability that the board's signal does not match the true state, which is $1 - q_B$.

- ii. The proof that Rubber-stamping is an equilibrium is fully analogous to part i. of Lemma A.1. With Rubber-stamping, the decision quality equals the ex ante probability that the board's signal matches the true state, which is q_B .
- iii. There are only two information-acquisition strategies. For not investing in an own signal both strategies are symmetric equilibria (see part i. and ii.). Consider now investment in an own signal: Since agents pay c they must condition on their own signal. Otherwise, they could improve their utility by voting the same and not investing c . Conditioning on their signal leaves two pure strategies: vote *yes* if b and *no* if a (i.e., UNIS) or the opposite (vote *yes* if a and *no* if b). If voting *yes* after a (against) was optimal, then voting *no* after a would also be so. Hence, agents could profitably deviate to unconditionally voting A .

We finally show that UNIS is not an equilibrium under Assumption BIB, i.e., $q_S \leq q_B$.⁴² Consider shareholder i deviates to Rubber-stamping. The deviation changes the outcome

⁴²In fact, UNIS is a symmetric equilibrium if and only if $q_S > q_B$.

only if i is pivotal and the own signal is a : Under UNIS i would vote *no*, under Rubber-stamping i would vote *yes*. Pivotality implies that among the $N - 1$ other shareholders the signals are split in $\frac{N-1}{2}$ a -signals and $\frac{N-1}{2}$ b -signals. Conditional on that case, B is more likely to be true than A (such that Rubber-stamping weakly improves decision quality) if and only if

$$\begin{aligned} q_B(1 - q_S) \binom{N-1}{\frac{N-1}{2}} q_S^{\frac{N-1}{2}} (1 - q_S)^{\frac{N-1}{2}} &\geq (1 - q_B) q_S \binom{N-1}{\frac{N-1}{2}} (1 - q_S)^{\frac{N-1}{2}} q_S^{\frac{N-1}{2}} \\ q_B(1 - q_S) &\geq (1 - q_B) q_S \\ \frac{q_B}{1 - q_B} &\geq \frac{q_S}{1 - q_S} \\ \ell_B &\geq \ell_S. \end{aligned}$$

Hence, Rubber-stamping weakly improves decision quality for $q_S \leq q_B$, which is Assumption BIB. Moreover, Rubber-stamping saves costs c . Therefore, it strictly improves utility of the deviating shareholder i . □

Now, we use Lemma A.1 to prove Proposition 1. Under Assumption BIB there are only two equilibria. Equilibrium Rubber-stamping leads to the same costs as the Protest equilibrium. Rubber-stamping Pareto-dominates Protest because it leads to higher decision quality $\Pi(\sigma^{Rubber}) = q_B > 0.5 > 1 - q_B = \Pi(\sigma^{Protest})$.

A.2 Proof of Proposition 2

To prove Proposition 2 Lemma A.2 is helpful.

Lemma A.2 (SYM with PA: All Equilibria). *Let Assumptions BIB and PAF hold. Let costs c be arbitrarily small and let fee f be sufficiently smaller.*

- i. Protest (i.e., no shareholder invests in research and all shareholders vote no) is a symmetric equilibrium for any $\ell_B, \ell_S \in (0, \infty)$. Its decision quality is $1 - q_B$.*
- ii. Rubber-stamping (i.e., no shareholder invests in research and all shareholders vote yes) is a symmetric equilibrium for any $\ell_B, \ell_S \in (0, \infty)$. Its decision quality is q_B .*
- iii. CAIS is a symmetric equilibrium if and only if $\ell_P \in (\ell_B - \ell_S, \ell_B + \ell_S)$. Its decision quality is: $\Pi(\sigma^{CAIS}) = q_B q_P + [(1 - q_B) q_P + q_B(1 - q_P)] \pi(N)$, with $\pi(N) := \sum_{i=\frac{N+1}{2}}^N \binom{N}{i} q_S^i (1 - q_S)^{N-i}$.*
- iv. CAIS-2 is a symmetric equilibrium if and only if $\ell_P \in (\ell_B - \ell_S, \ell_B + \ell_S)$. Its decision quality is: $\Pi(\sigma^{CAIS-2}) = (1 - q_B)(1 - q_P) + [(1 - q_B) q_P + q_B(1 - q_P)] \pi(N)$.*
- v. There are no other symmetric equilibria. In particular, there is no equilibrium in which all shareholders subscribe to proxy advice and unconditionally invest in own signal (Subscribe-Invest).*

Proof. We address each part of Lemma A.2 separately.

- i. The proof is identical to the proof of Lemma A.1, part i.
- ii. The proof is identical to the proof of Lemma A.1, part ii.
- iii. CAIS is illustrated in Table 1. We show that CAIS is an equilibrium if and only if $\ell_P \in (\ell_B - \ell_S, \ell_B + \ell_S)$.

Suppose first that $\ell_P \notin (\ell_B - \ell_S, \ell_B + \ell_S)$, i.e., either $\ell_P \leq \ell_B - \ell_S$ or $\ell_P \geq \ell_B + \ell_S$. We show that CAIS cannot be an equilibrium. In CAIS pivotality implies that the vote recommendation is *against* and that among the $N - 1$ other shareholders the signals are split in $\frac{N-1}{2}$ *a*-signals and $\frac{N-1}{2}$ *b*-signals. (Indeed, after recommendation *for* no shareholder is pivotal.)

Let $\ell_P \leq \ell_B - \ell_S$. Consider a shareholder i who deviates to Rubber-stamping. This deviation alters the decision in comparison to CAIS if the vote recommendation is *against*, all other shareholder's signals are split, and i 's signal is *a*: In CAIS, i would vote *no*, in the deviation i would vote *yes*. This deviation weakly improves decision quality if $\ell_B \geq \ell_P + \ell_S$, which holds by assumption. Since, the deviation saves costs c , it increases i 's expected utility.

Let $\ell_P \geq \ell_B + \ell_S$. Consider a shareholder i who deviates to voting *no* without information acquisition (as in Protest). This deviation alters the decision in comparison to CAIS if the vote recommendation is *against*, all other shareholders' signals are split, and i 's signal is *b*: In CAIS, i would vote *yes*, in the deviation i would vote *no*. This deviation weakly improves decision quality if $\ell_P \geq \ell_B + \ell_S$, which holds by assumption. Since the deviation saves costs c , it increases i 's expected utility.

Hence, if $\ell_P \notin (\ell_B - \ell_S, \ell_B + \ell_S)$, CAIS is not an equilibrium.

Now suppose that $\ell_P \in (\ell_B - \ell_S, \ell_B + \ell_S)$. In order to show that CAIS is an equilibrium, we demonstrate that there is no individual deviation that improves utility. We use the following principle: if a deviation is more attractive than an other deviation in terms of utility, then excluding the former is sufficient to exclude the latter. We organize the potential deviations by information-acquisition strategy. There are six information-acquisition strategies to consider. Pivotality always implies that the vote recommendation is *against* and that among the $N - 1$ other shareholders the signals are split in $\frac{N-1}{2}$ *a*-signals and $\frac{N-1}{2}$ *b*-signals.

- (1) NotSubscribe-NotInvest. Deviating to NotSubscribe-NotInvest and voting *yes* as in Rubber-stamping is not an improvement for low enough costs given $\ell_S + \ell_P > \ell_B$. This deviation only changes the outcome if the PA has recommended *against*, i has received signal *a* (against), and all other shareholders' signals are split. It would

weakly improve decision quality iff

$$\begin{aligned}
q_B(1 - q_P)(1 - q_S) \binom{N-1}{\frac{N-1}{2}} q_S^{\frac{N-1}{2}} (1 - q_S)^{\frac{N-1}{2}} &\geq (1 - q_B)q_Pq_S \binom{N-1}{\frac{N-1}{2}} (1 - q_S)^{\frac{N-1}{2}} q_S^{\frac{N-1}{2}} \\
q_B(1 - q_P)(1 - q_S) &\geq (1 - q_B)q_Pq_S \\
\frac{q_B}{1 - q_B} &\geq \frac{q_P}{1 - q_P} + \frac{q_S}{1 - q_S} \\
\ell_B &\geq \ell_P + \ell_S.
\end{aligned}$$

By assumption $\ell_P > \ell_B - \ell_S$, this deviation strictly decreases decision quality. It does save costs f always and c with probability $q_B(1 - q_P) + (1 - q_B)q_P$. For low enough costs f and c , Rubber-stamping does not increase utility because of its lower decision quality.

Deviation to vote *no* without information acquisition (as in Protest) is not an improvement for low enough costs given $\ell_P < \ell_B + \ell_S$.

- (2) NotSubscribe-Invest. Deviation NotSubscribe-Invest and voting according to the own signal as in UNIS does not change the outcome. Indeed, after a *for* recommendation i is not pivotal, after an *against* recommendation i votes under her deviation as she does under CAIS. Hence, this deviation is an improvement only if it saves costs. It is not an improvement if $f \leq c[q_Bq_P + (1 - q_B)(1 - q_P)]$, which is satisfied if f is sufficiently lower than c .
- (3) Subscribe-NotInvest. The deviation to buying the PA's recommendation and following it is not an improvement given $\ell_P < \ell_B + \ell_S$ and low enough c .
- (4) Subscribe-Invest. Deviation to buy both recommendation and signal. Case 1, illustrated in Table A.2, is outcome equivalent, but more costly. Case 2, illustrated in Table A.3, is not an improvement given $\ell_P < \ell_B + \ell_S$.
- (5) Subscribe-InvestIFF*for*. Consider the deviation to buying the PA's recommendation and investing in an own signal iff the recommendation is *for*. The case illustrated in Table A.4 is not an improvement given $\ell_P < \ell_B + \ell_S$. The alternative case, which differs by voting *yes* after the *against* recommendation, is not an improvement given $\ell_S + \ell_P > \ell_B$.
- (6) Subscribe-InvestIFF*against*. Consider the deviation to applying the same information-acquisition strategy as in CAIS, but a different voting strategy. The most attractive deviation is to vote *no* after the *for* recommendation. This is outcome equivalent and equally costly and, hence, not an improvement.

Hence, under the conditions assumed in part iii. of the Lemma CAIS is an equilibrium.

Finally, concerning decision quality, notice that if board and PA receive the same signal, this signal determines the decision, and if they receive a different signal, the signal that is received by a majority of shareholders determines the decision. Therefore, decision quality in CAIS is $(q_Bq_P) * 1 + (1 - q_B)(1 - q_P) * 0 + [(1 - q_B)q_P + q_B(1 - q_P)]\pi(N) * 1$, as q_Bq_P is the probability that the board and the PA both receive the same and correct

signal, and $[(1 - q_B)q_P + q_B(1 - q_P)]$ is the probability that the two receive signals that are different from each other.

iv. CAIS-2 is illustrated in Table A.1.

		Own Signal	
		b (for board)	a (against)
PA	for	no	
	$against$	yes	no

Table A.1: CAIS-2: Invest in research iff vote recommendation is *against*; after *for* recommendation vote *no*, after *against* recommendation vote *yes* iff the own signal is b .

The proof that CAIS-2 is an equilibrium if and only if $\ell_P \in (\ell_B - \ell_S, \ell_B + \ell_S)$ is identical to the proof that CAIS is an equilibrium under these conditions (cf. Proof of Lemma A.2, part iii.).⁴³

Concerning decision quality, notice that if board and proxy advisor receive the same signal, the decision is contrary to this signal, and if they receive different signals, the signal that is received by a majority of shareholders determines the decision. Therefore, decision quality in CAIS-2 is $(q_B q_P) * 0 + (1 - q_B)(1 - q_P) * 1 + [(1 - q_B)q_P + q_B(1 - q_P)]\pi(N) * 1$.

v. To show that there are no additional equilibria, we exhaustively discuss all pure strategies. Again, we organize the discussion by information-acquisition strategy.

- (1) NotSubscribe-NotInvest. There are only voting strategies *yes* or *no*. Both lead to equilibria as shown in parts i and ii.
- (2) NotSubscribe-Invest. Since agents pay c they must condition on their own signal. Otherwise, they could improve their utility by voting the same and not investing c . Conditioning on the own signal leaves two pure strategies: vote *yes* if the signal is b and *no* if the signal is a (i.e., as in UNIS) or the opposite (vote *yes* if the signal is a and *no* if the signal is b). If voting *yes* after a (*against*) was optimal, then voting *no* after a would also be optimal. Hence, agents could improve their utility by unconditionally voting A . Only UNIS remains. Under Assumption BIB, NotSubscribe-NotInvest and voting *yes* as in Rubber-stamping is a profitable deviation from UNIS.
- (3) Subscribe-NotInvest. Since agents pay f they must condition on the PA's recommendation. For instance, they vote *yes* after *for* and *no* after *against*; or they do the opposite. In either case, no shareholder is pivotal since all vote for the same, given a particular recommendation.

A shareholder can improve her utility by not paying f and voting, e.g., *yes*. Hence, there is no symmetric equilibrium with this information-acquisition strategy.

⁴³This is not surprising, as both strategies have the same information-acquisition strategy, Subscribe-InvestIFF*against*, and they only differ in a voting action, where no player is pivotal.

- (4) *Subscribe-Invest*. Since shareholders pay both f and c they must condition their voting strategy on both the PA's vote recommendation and the own signal. Otherwise, they could improve their utility with the same voting behavior, but saving costs. This means that in fact only two voting strategies remain.

Case 1: vote *yes* except if the PA's recommendation is *against* and the own signal is a , as in Table A.2. In this case no shareholder is pivotal if the PA recommends *for*. Hence, shareholder i can only be pivotal if the recommendation is *against*. If so, i would vote according to her signal. Hence, deviating to unconditionally investing in an own signal and voting accordingly, as in UNIS, would not change the outcome because either i is not pivotal or i would also vote according to the signal. However, acting as in UNIS saves fee f . Thus, this is a profitable deviation, and the strategy profile of case 1, illustrated in Table A.2, cannot be an equilibrium.

		Own Signal	
		b (for board)	a (against)
PA	<i>for</i>	yes	yes
	<i>against</i>	yes	no

Table A.2: A strategy profile based on acquiring both proxy advice and own signal, case 1: *Subscribe-Invest* and vote *yes*, except if PA's recommendation is *against* and the own signal is a .

Case 2: vote *no* except if both the PA's recommendation is *for* and the own signal is b , as in Table A.3. The analogous argument as above for case 1 applies, as follows: In this case no shareholder is pivotal if the PA recommends *against*. Hence, shareholder i can only be pivotal if the recommendation is *for*. If so, i would vote according to signal. Hence, deviating to unconditionally investing in an own signal as in UNIS would not change the outcome because either i is not pivotal or i would also vote according to the signal. Acting as in UNIS, however, saves fee f . Thus, strategy profile of case 2 cannot be an equilibrium.

		Own Signal	
		b (for board)	a (against)
PA	<i>for</i>	yes	no
	<i>against</i>	no	no

Table A.3: A strategy profile based on acquiring both proxy advice and own signal, case 2: *Subscribe-Invest* and vote *no*, except if PA's recommendation is *for* and the own signal is b .

Therefore, there cannot be a symmetric equilibrium with this information-acquisition strategy (*Subscribe-Invest*), in which shareholders unconditionally buy both the PA's recommendation and an own signal.

- (5) *Subscribe-InvestIFFfor*. Since shareholders pay f and sometimes c they must condition their voting strategy on the recommendation and the own signal when

they acquire them. In particular, after having bought the own signal on top of the recommendation *for*, shareholders must vote according to their signal in equilibrium. Voting the opposite is dominated, and not conditioning as well. This leaves two cases, which we address as Cand. 5a and Cand. 5b. We show that none of them is an equilibrium under Assumption 1.⁴⁴ Consider first Cand. 5a: shareholders vote *yes* except if the PA's vote recommendation is *for* and the own signal is *a* (against) as in Table A.4.

		Own Signal	
		<i>b</i> (for board)	<i>a</i> (against)
PA	<i>for</i>	yes	no
	<i>against</i>	yes	

Table A.4: Cand. 5a. A strategy profile based on acquiring an own signal iff the recommendation is *for*: Subscribe-InvestIFF*for* and vote *yes*, except if PA's recommendation is *for* and the own signal is *b*.

Consider shareholder *i* who deviates to NotSubscribe-NotInvest and voting *yes*, as in Rubber-stamping. This deviation only alters the outcome when the vote recommendation is *for*, all other shareholders' signals are split, and *i*'s signal is *a* (*against*): Under Cand. 5a, *i* would vote *no*, but under her deviation she votes *yes*. Decision quality improves by this deviation if $\ell_B + \ell_P > \ell_S$. This condition is satisfied by Assumption 1. Moreover, the costs are lower under this deviation than under Cand. 5a. Hence, Cand. 5a cannot be an equilibrium.

Now consider Cand. 5b. Shareholders vote *no* except if the PA's vote recommendation is *for* and the own signal is *b*. Again, no shareholder is pivotal after recommendation *against*. Hence, deviating to NotSubscribe-NotInvest and voting *yes* as in Rubber-stamping is an improvement, identical to the case of Cand. 5a above.

- (6) Subscribe-InvestIFF*against*. Since shareholders pay f and sometimes c they must condition their voting strategy on the recommendation and the own signal when they acquire them. In particular, after having bought the own signal on top of the recommendation *against*, shareholders must vote according to their signal in equilibrium. Voting the opposite is dominated, and not conditioning as well. This leaves two cases: CAIS and CAIS-2, which we have addressed. Hence, there are no further equilibria.

□

Now we can turn to the proof of Proposition 2. Suppose there is a PA with $\ell_P \in (\ell_B - \ell_S, \ell_B + \ell_S)$. To show that CAIS is an equilibrium and Pareto-efficient, we use Lemma A.2, which shows that besides CAIS there are three further equilibria in this parameter space: Rubber-stamping, Protest, and CAIS-2. It remains to show that CAIS Pareto-dominates in this area.

⁴⁴In fact, each of these strategy profiles is a symmetric equilibrium if and only if $\ell_S > \ell_B + \ell_P$.

First, CAIS has the same costs as CAIS-2 and decision qualities are: $\Pi(\sigma^{CAIS}) = q_B q_P + [(1 - q_B)q_P + q_B(1 - q_P)]\pi(N)$. $\Pi(\sigma^{CAIS-2}) = (1 - q_B)(1 - q_P) + [(1 - q_B)q_P + q_B(1 - q_P)]\pi(N)$. CAIS has higher decision quality iff $q_B q_P > (1 - q_B)(1 - q_P)$, which always holds as $q_B, q_P > 0.5$. Hence, CAIS Pareto-dominates CAIS-2.

Second, decision quality of Rubber-stamping is q_B and decision quality of Protest is $1 - q_B < q_B$. CAIS has strictly higher decision quality than both iff

$$\begin{aligned}
\Pi(\sigma^{CAIS}) &> q_B \\
q_B q_P + [q_B(1 - q_P) + (1 - q_B)q_P]\pi(N) &> q_B \\
q_B(1 - q_P)\pi(N) + (1 - q_B)q_P\pi(N) &> q_B(1 - q_P) \\
(1 - q_B)q_P\pi(N) &> q_B(1 - q_P)[1 - \pi(N)] \\
\frac{\pi(N)}{1 - \pi(N)} \cdot \frac{q_P}{1 - q_P} &> \frac{q_B}{1 - q_B} \\
\log\left(\frac{\pi(N)}{1 - \pi(N)}\right) + \log\left(\frac{q_P}{1 - q_P}\right) &> \log\left(\frac{q_B}{1 - q_B}\right) \\
\ell_N + \ell_P &> \ell_B, \tag{A.1}
\end{aligned}$$

where $\ell_N := \log\left(\frac{\pi(N)}{1 - \pi(N)}\right)$.

Since $\ell_N > \ell_S$ and by assumption $\ell_P > \ell_B - \ell_S$, we have $\ell_N + \ell_P > \ell_S + \ell_P > \ell_B$. Hence, CAIS leads to strictly higher decision quality than both Rubber-stamping and Protest. It induces higher costs f and c . Thus, for low enough costs, CAIS Pareto-dominates them.

Now, suppose that $\ell_P \notin (\ell_B - \ell_S, \ell_B + \ell_S)$. To show that the Pareto-efficient equilibrium is Rubber-stamping, we use again Lemma A.2. Under Assumption BIB and for $\ell_P \notin (\ell_B - \ell_S, \ell_B + \ell_S)$, only two equilibria remain: Rubber-stamping and Protest. Rubber-stamping Pareto-dominates because it leads to higher decision quality $\Pi(\sigma^{Rubber}) = q_B > 0.5 > 1 - q_B = \Pi(\sigma^{Protest})$, while it induces the same costs.

A.3 Proof of Proposition 3

Suppose there is a PA and Assumption PAF holds.⁴⁵ Let S be the set of all pure strategy profiles.⁴⁶ Let $\Pi : S \rightarrow [0, 1]$ be the decision quality. Let $S^{max} \subset S$ be the set of all strategy profiles that maximize Π . As S is finite, S^{max} is non-empty.

A player's strategy is called *minimal* if the voting strategy conditions on all pieces of information that are acquired. For instance, consider information-acquisition strategy *Subscribe-InvestIFFagainst*: When an own signal has been acquired after vote recommendation *against*, the voting behavior must differ between signal realization a and signal realization b to be part of a minimal strategy. Observe that for any strategy that is not minimal, the voting behavior can be mimicked by a strategy with lower costs, saving c or

⁴⁵We are particularly thankful to Maximilian Janisch and Thomas Lehéricy who suggested this proof idea for this proposition. Interestingly, it can be applied to asymmetric equilibria, but not to symmetric equilibria. The reason is that when studying symmetric equilibria, the space under consideration changes because deviations to strategies that thus form an asymmetric strategy profile are admitted.

⁴⁶Then there are 16 strategies for each agent.

f or both. A strategy profile(!) is called *minimal* if all players' strategies are minimal *and* if any player's reduction of information acquisition (not subscribing and/or not acquiring an own signal) changes the outcome with positive probability.⁴⁷ Now let $S^* \subset S^{max}$ be the strategy profiles that are minimal and lead to maximal decision quality.

We first show, as Claim 1, that all $\sigma^* \in S^*$ are equilibria. An agent can only achieve higher utility than in σ^* by higher decision quality or lower costs. Higher decision quality is impossible per definition. Lower costs reduce decision quality because σ^* is minimal and decision quality is maximal.

Second, we show, as Claim 2, that any Pareto-efficient strategy profile must belong to S^* . Suppose first that σ' is Pareto-efficient, but not in S^* . Then it is either not maximizing decision quality or not minimal. If it does not maximize decision quality, take another strategy profile, say σ^* , that does and every agent is better off. The reason is that any difference in decision quality is always larger than the difference in costs, which are by assumption sufficiently small; formally: $\Pi(\sigma^*) - \Pi(\sigma') > c + f \implies u_i(\sigma^*) > u_i(\sigma')$ for all i . If σ' is not minimal, there is a player who can save costs without affecting decision quality and utility of other agents.

By Claim 1 and 2 together, each Pareto-efficient strategy profile is an equilibrium with maximal decision quality. Clearly, there exists an equilibrium, say σ^* , with maximal decision quality. Now consider any Pareto-efficient equilibrium σ , i.e., an equilibrium that is not Pareto-dominated by any other equilibrium. This equilibrium must also maximize decision quality, i.e., $\sigma \in S^{max}$. Otherwise, it would be dominated by σ^* , as higher decision quality means strictly higher utility for every agent (again due to the small cost assumption). Therefore, *every Pareto-efficient equilibrium must maximize decision quality.*

Let us now turn to the model without a PA.⁴⁸ Let T be the set of all pure strategy profiles (without a PA). In full analogy to above, we define T^* as the set of strategy profiles that are maximizing decision quality and that are minimal. Now observe that any strategy profile in T (without a PA) corresponds to a strategy profile in S (with a PA) where simply no player subscribes to the PA's vote recommendation. Consequently, any decision quality obtained with a strategy profile in T can also be obtained with a strategy profile in S . Let $\tilde{\sigma} \in S$ be a strategy profile that mimicks the maximal decision quality obtainable without a PA. Let $\bar{\Pi}^{with-PA}$, respectively $\bar{\Pi}^{no-PA}$, denote the maximal decision quality in the framework with a PA, respectively without a PA (for any strategy profile in the corresponding games). Since in the Pareto-efficient Nash equilibria with a PA, decision quality is maximal, we have $\Pi(\sigma^*) = \bar{\Pi}^{with-PA} \geq \Pi(\tilde{\sigma}) = \bar{\Pi}^{no-PA}$ for any Pareto-efficient equilibrium σ^* in the game with a PA.

⁴⁷Indeed, there are strategy profiles where all strategies are minimal, but still some players can reduce their information-acquisition without affecting the decision. For instance, when $N - 1$ players play NotSubscribe-NotInvest and vote *yes* as if in Rubber-stamping and one player does not subscribe to the PA but unconditionally invests into an own signal, as in UNIS. If the latter player stops acquiring an own signal, decisions are unaffected because she is never pivotal. By our definition, such strategy profiles are not minimal.

⁴⁸There are only four strategies for each player: as in Rubber-stamping, as in Protest, as in UNIS, and voting contrary to the own signal.

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Supplementary Online Material (SOM) for “When do proxy advisors improve corporate decisions?”

by Berno Buechel, Lydia Mechtenberg and Alexander F. Wagner

1 All Symmetric Equilibria

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These Supplementary Online Materials are available at <http://bit.ly/proxySOM>.

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