

# Biased is best: Merger advisors and dialectical Bayesian persuasion

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## Abstract

Advisors to bidding firms are rewarded if bids for target firms are successful irrespective of the value created by the transactions. The use of this success-fee compensation is puzzling since it biases bidder advisors toward pitching deals even when they are value destroying. In a Bayesian persuasion setting, we show that when bidder advisors and their incentives are viewed as one part of a M&A ecology that also includes bidding firms, target firms, and target advisors, success-fee compensation for bidder advisors' will, in fact, yield desirable outcomes for target and bidder firms. We show that the dialectic between biased bidder and biased target advisors produces information that provides a fairly accurate characterization of the value-add potential of the merger. Compensating target advisors simply for blocking acquisitions without producing viable alternatives can be optimal. Making target-advisor compensation sensitive to the bidder's offer can reduce welfare.

**Keywords:** Advisors, mergers, acquisitions, Bayesian persuasion

**JEL classification:** D83, D86, G34

# 1 Introduction

M&A activity is important. In North America alone, the annual count of M&A transactions averaged over 20,000 between 2014 and 2023, and the annual average aggregate value of these transactions was well over \$2 trillion. Advisors, typically investment banks, play important roles in M&A and the effect of their advice on the efficiency of the transactions is a controversial topic.<sup>1</sup> While few question the ability of the advisors to generate information that can enable target and bidder firms to make better decisions, many question whether advisory contracts are structured in a way that encourages the provision of such advice.

The most impugned feature of advisor compensation is the nearly universal practice of making bidder advisor compensation contingent only on success, i.e., on whether the bid succeeds, and not on the value the acquisition creates (Edmans, 2024). Since this success-fee structure give bidder advisors an incentive to opportunistically pitch deals even if they believe that the deals will destroy value, some finance researchers believe that the use of this fee structure is “rather odd” (Edmans, 2024). What makes the reliance on the success-fee structure even more puzzling is that researchers argue that the long-run reputation costs associated with bidder advisors pitching value-destroying mergers are negligible and cannot constrain advisor opportunism encouraged by advisory contracts (Bao and Edmans, 2011). However, despite these concerns about success-fee compensation for bidder advisors in the academic literature, many empirical studies (e.g., McLaughlin, 1992; Hunter and Jagtiani, 2003; Calomiris and Hitscherich, 2007; Cain and Denis, 2013) have been unable to confirm the hypothesis that the fee structures generate significant inefficiencies.

In this paper, we show that, although, when viewed from the perspective of principal/agent theory, many features of M&A advisory contracts, like success-based fees for bidder-advisors, engender severe incentive distortions, these features need not substantially reduce the efficiency of the M&A market. We reach our conclusions by stepping out of the principle/agent framing and considering the “ecology of M&A” in which bidder advisors are only one part. Three other agents also have parts to play: the bidding firm, the target firm, and the target advisor. Thus, changes in one advisor’s actions, engendered by changes in the advisor’s compensation, change the equilibrium strategies of the other agents. Because of this indirect effect of advisor compensation, increasing alignment between an advisor’s compensation and its principal’s (bidder or target firm) welfare can actually reduce a principal’s welfare.

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<sup>1</sup>Advising activity is, in turn, important for investment banks, especially, bulge bracket banks, which derive much of their revenue from advisory fees. For example, from 2021 to 2023, advisory fees accounted for 9% of total revenue and 10% of non-interest revenue at Goldman Sachs, a market-leading M&A advisor. Boutique banks like Lazard and Evercore depend even more heavily on advisory fees.

We pick a setting in which bidder advisors do prefer providing deal evaluations that maximize the probability that the bidder and target make a deal, regardless of the effect of the merger on the bidder's welfare. However, bidder advisors also know that such self-serving evaluations can be countered by evaluations provided by target advisors. We show that, the ensuing rivalry between bidder and target advisors forces them to produce informative evaluations and, by synthesizing these evaluations, target and bidder firms can form a fairly accurate picture of the value-add potential of their mergers. Consequently, even if bidder advisors receive only success-fee compensation, for a wide variety of target advisor compensation structures, the dialectic between advisors significantly mitigates, and sometimes eliminates, inefficiencies caused by distorted advisor incentives. The degree of mitigation depends not so much on the structure of the target advisor's contract as on the target advisor's capability.

We develop these insights by specifying a formal model of the M&A ecology. In this model, a firm (called the *bidder*) attempts to acquire another firm (called the *target*). In some states of nature, the acquisition destroys value and in others it increases value. Absent information production, the expected value-add of the acquisition is negative. So, in order for the acquisition to succeed, credible information must be produced. The bidder and target can engage advisory firms (called the *advisors*), using advisory contracts that set each advisor's compensation, to produce information. Each advisor acts strategically to maximize its expected payoff under its advisory contract.

Before they are hired, the advisors have no private information about the target or bidder. Once hired, the bidder advisor investigates the value-add potential from the acquisition and submits a publicly observable report about the target's expected value following the acquisition, which we will refer to as *acquisition value*. Next, the target advisor investigates the value-add potential for the target from alternatives to acquisition. An alternative could be a combination with another firm or staying independent with some restructuring. After investigating, the target advisor makes a publicly observable report about the target's value under the alternative, which we will refer to as *alternative value*. After observing both advisors' reports, the bidder makes an offer and the target decides whether to accept the offer, accept the alternative, or except neither the bidder's offer nor the alternative, i.e., maintain the status-quo.

Real-world advisors are constrained by the fact that talk is not cheap. Mergers, and the valuations/opinions that advisors supply to support them, are frequently scrutinized by courts. Arbitrary opinions or valuations that are incapable of withstanding expert scrutiny can result in significant financial penalties for advisors and

hurt their reputations.<sup>2</sup> Therefore, we model advisor information production using the Bayesian persuasion framework (e.g., Kamenica and Gentzkow, 2011; Dworzak and Martini, 2019; Kamenica, 2019). Thus, in our setting, when hired, each advisor commits to an investigation and to providing a *credible* report of the result of its investigation. These reports consist of valuation signals conditioned on the results of the investigation.

Each advisor strategically chooses the informativeness of its investigation. A more informative investigation of an option—takeover value for the bidder advisor, the alternative value for the target advisor—conveys more information about that option.<sup>3</sup> A fully informative investigation reveals all the information produced by an investigation. A totally uninformative investigation simply reports the unconditional expectation of value. A partially informative investigation might simply reveal whether or not value exceeds some threshold. Rational expectations implies that signal distributions satisfy the *expectancy condition*: the unconditional expectation of each advisor’s signal distribution equals the ex ante expected value of the advisor’s option.

Consistent with practice, the bidder advisor’s compensation takes the form of a *success fee* that is paid only if the acquisition attempt succeeds. Reflecting real-world practice, we consider a more varied menu of compensation structures for the target advisor. Consistent with the legal obligations of target firm boards to explore alternatives to an attempted acquisition, we consider payments to target advisors to explore alternatives. We first consider target advisor fees conditioned only on acquisition failure. Later we consider fee structures sensitive to the bid price and whether the alternative is accepted when the offer fails. As is the case with bidder-advisor success fees, viewed in isolation, this compensation structure does not align the interest of the target advisor and its principal, the target firm. We demonstrate that, despite the obvious principal-agent conflicts that these fee structures create, the dialectic between the rival advisors can lead to M&A outcomes that approach first-best outcomes.

To see this, first consider the bidder advisor’s optimal investigation when the target *does not* have an advisor. The bidder advisor wants to maximize the probability that the takeover succeeds. In order for the takeover to succeed, the bidder advisor must send a *persuasive signal*, i.e., a signal that convinces the target and bidder that acquisition value at least equals the target’s status-quo value.

The expectancy condition implies that (a) increasing the value signaled by the persuasive signal reduces

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<sup>2</sup>The consulting firm Cornerstone estimates that between 71% and 90% of M&A deals involving public companies were challenged in the courts between 2009 and 2018 (Research, 2018).

<sup>3</sup>Investigation A is more informative than investigation B if the signal distribution produced by A is a mean-preserving spread of the signal distribution produced by B, i.e., A dominates B in the convex order (Chapter 3.A: Shaked and Shanthikumar, 2007).

the probability of sending the persuasive signal and that (b) the bidder advisor cannot always send a persuasive signal (because ex ante expected takeover value is less than the status-quo value). Thus a bidder advisor aiming to maximize probability of receiving the success fee, will never send a signal greater than the status-quo value,  $w_o$ .

When the bidder advisor sends the status-quo signal, i.e., the signal that equals the status-quo value, the takeover attempt succeeds. When the bidder advisor sends a signal  $s_B < w_o$ , the attempt fails. The target receives its status-quo value after both signals, and the bidder's profit is zero. Thus, the M&A transaction creates no value for the bidder or target. Yet, the bidder advisor always profits in expectancy from sometimes capturing the success fee. This outcome, which we will call the “pitch the deal” outcome, matches the results of success-fee bidder advisor compensation predicted by its critics.

Now consider the effect of introducing a target advisor. In our setting, the bidder advisor knows that the target advisor will try to “top” a status-quo signal from the bidder advisor by sending, with positive probability, a signal that the alternative value exceeds the status-quo value. Will this change the bidder advisor's signaling strategy? Yes, provided that target advisor is capable of finding alternatives that exceed status-quo value with a sufficiently large probability.

When the target advisor is capable, the threat of being topped by a capable target advisor, leads the bidder advisor to signal acquisition values higher than the status-quo value. The dialectic between advisors leads the target advisor to send a fully revealing signal, and leads the bidder advisor, when sending a persuasive signal, to signal that acquisition value equals the alternative value. Thus, the target's payoff in the Bayesian persuasion game equals its first-best payoff when information is common knowledge. As the target advisor's capability increases, the bidder's payoff also approaches its common-knowledge upper bound. Hence, not only does the target firm benefit from hiring a capable target advisor, the bidding firm benefits as well because a capable target advisor forces the bidder advisor to conduct a more informative investigation that yields better acquisition decisions.

In contrast, if the target advisor is incapable, the bidder advisor accepts a small probability of being topped by the target advisor and continues to use the strategy of sending the status-quo signal. Thus, while there may be a small probability that the target might find a valuable alternative to the acquisition, the pitch the deal outcome is quite likely.

Compensation schemes that make target advisor payoffs more sensitive to the target advisor's capability, by compensating the target advisor only when the alternative is accepted, do not dominate our baseline

scheme, compensation based on takeover failure. Conditioning the target advisor's fee on the alternative being accepted leads to less informative target advisor investigations. However, it does increase the bidder's offer by an amount equal to the target advisor's fee. Hence, so long as the magnitude of advisor fees falls within the parameters of real-world advisor fees, the target prefers the improved advice from its advisor to the savings that would result from scrapping the fee payment conditioned on maintaining the status-quo.

Schemes that make the target advisor's compensation more sensitive to the bidder's offer have a limited and not always positive effect on target welfare. In some situations, such schemes increase the target's welfare. However, when the target advisor is capable enough to force the bidder advisor to match the target advisor's fully informative persuasive signal, even absent offer-sensitive rewards, the target advisor fully reveals its information about the alternative. So, the only effect of offer-sensitive compensation is indirect: the effect offer-sensitive compensation has on the bidder advisor's strategy. Because of this indirect effect, offer-sensitive compensation sometimes has a negative overall impact.

When compensation is highly offer sensitive (otherwise the baseline characterizations hold), the target advisor adopts the fully informative signaling strategy regardless of the bidder advisor's strategy. The expectancy condition implies that the persuasive fully informative signal is sent with lower probability than a persuasive signal that just tops a status-quo signal from the bidder advisor. So, target advisor adoption of the fully revealing signaling strategy reduces the probability that the bidder advisor's status-quo signal will be topped. This encourages the bidder to switch to the status-quo signaling strategy. If this occurs, the increase in the information produced by the target advisor is more than compensated by the decrease in the information produced by the bidder thereby reducing aggregate welfare.

Finally, we consider the robustness of our result to various perturbations of the model assumptions, e.g., different sequencings of advisor reports and different allocations of bargaining power between the target and the bidder. These perturbations do change the range of model parameters that support the different equilibrium configurations identified in the baseline analysis. However, the alternative settings do not yield any qualitatively different equilibrium configurations.

### *Related literature*

Our model is built on the Bayesian persuasion paradigm developed by Kamenica and Gentzkow (2011), which is well suited to modeling advice that must be credible and capable of withstanding expert scrutiny. Applications of this paradigm are growing rapidly in fields as diverse as grading in schools, law enforcement, and medical testing (Kamenica, 2019). Applications in finance speak to disclosure by regulators (Goldstein

and Leitner, 2018; Pavan and Inostroza, 2021), over-the-counter market benchmarks (Duffie, Dworczak, and Zhu, 2017), and firm financing policy (Szydlowski, 2021).

Our application of the Bayesian persuasion paradigm is novel in two respects. First, ours is the only application that investigates the role of this form of persuasion in M&A. Second, we embed Bayesian persuasion in a rather novel market environment. The basic Bayesian persuasion model has one (signal) sender and one receiver. Extensions of the basic model typically allow for either multiple senders, often to study the effect of competition between advisors (e.g., Gentzkow and Kamenica, 2016, 2017), or multiple receivers, often to study receiver coordination (e.g., Bergemann and Morris, 2019).<sup>4</sup> In contrast, in our model, there are multiple senders (advisors), who send signals to multiple receivers (firms).

Our analysis is also related to a large empirical literature on the role of M&A advisors and the impact of their fees. Many researchers have investigated the impact of advisor rankings, which tend to be viewed as measures of advisor capability. Their findings are mixed, with some supporting the notion that higher-ranked advisors produce better outcomes for their client firms (e.g., Kale, Kini, and Ryan, 2003; Golubov, Petmezas, and Travlos, 2012), others concluding the opposite (e.g., Rau, 2000), and some arguing that advisor performance may not be related to their ranking (Bao and Edmans, 2011). Our model provides insights into the root of this disagreement. It shows that, while retaining more capable advisors can improve acquisition outcomes, the positive effect of advisor capability depends on the context of each acquisition, and there are situations in which more capable bidder advisors will deliver worse outcomes. Moreover, our analysis demonstrates why both bidder and target firms can benefit from target firms retaining more capable advisors.

Empirical studies have also looked for evidence that the fees, success fees in particular, result in conflicted advice/valuations or inefficient outcomes (e.g., McLaughlin, 1992; Hunter and Jagtiani, 2003; Calomiris and Hitscherich, 2007; Golubov, Petmezas, and Travlos, 2012; Cain and Denis, 2013). In many cases, the researchers have concluded that the fee structures do not result in adverse outcomes or poor advice. A common argument proffered to explain this benign conclusion is that reputation incentives mitigate incentive problems between firms and their advisors created by the structure of advisory contracts. Our analysis offers a completely different and overlooked explanation for these results: the dialectic between biased advisors employed by firms on opposite sides of the transaction actually results in fairly efficient information production.

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<sup>4</sup>Gul and Pesendorfer (2012) model both multiple senders and receivers to study how competing political parties can influence voter coordination.

## 2 Base Model Setup

We model acquisitions of firms. There are two firms. We refer to one as the *bidder* and the other as the *target*. The bidder seeks to acquire the target. All agents are risk neutral and maximize their expected payoffs. They are patient and do not discount future payoffs.

The status-quo value of the target is  $w_o > 0$ . If the target is acquired by the bidder, its value is  $\tilde{w}_B$ , where  $\tilde{w}_B$  is a random variable that can take one of two possible values, 0, or  $\bar{w}_B > w_o$ . The target's value under an alternative to acquisition by the bidder,  $\tilde{w}_T$ , is also random variable that can take one of two values, 0, or  $\bar{w}_T > w_o$ . The alternative to the acquisition may be the acquisition of the target by a different firm, the acquisition by the target of another firm, a joint venture involving the target, or a restructured target firm. The value under acquisition,  $\tilde{w}_B$ , is independent of value under the alternative,  $\tilde{w}_T$ . We denote the expectations of  $\tilde{w}_B$  and  $\tilde{w}_T$  by  $w_B$  and  $w_T$  respectively.

### 2.1 Advisors and the information structure

Before initiating the acquisition, the bidder first chooses whether to conduct an investigation that costs  $C_0$  and will indicate if there is any potential for synergy. Specifically, the investigation reveals whether the probability of  $\tilde{w}_B$  is indeed positive,  $w_B/\bar{w}_B$ , or zero. We let  $\pi$  denote the prior probability of the investigation indicating a positive potential for synergy, which we will also call a “successful initial investigation”.

Upon completing the initial investigation, the bidder decides whether to hire an advisor; if the bidder hires an advisor, the target observes that and also hires an advisor. The advisor hired by the bidder (target) is called the *bidder (target) advisor*. The advisors produce public information. The bidder advisor produces information about the post-acquisition value of the target firm,  $\tilde{w}_B$ . The target advisor produces information about the target's value under an alternative to acquisition by the bidder,  $\tilde{w}_T$ .

Information production by the advisors in our model is Bayesian persuasion (e.g., Kamenica and Gentzkow, 2011; Dworczak and Martini, 2019). Specifically, the advisors, who are ex ante uninformed, launch investigations. When launching an investigation into  $\tilde{w}_j$ ,  $j = B, T$ , the advisor chooses a data generation function that, for each possible realization of  $\tilde{w}_j$  assigns a probability distribution over some set of reports. The realized report is then verifiably conveyed to other agents. Every report realization generates a posterior probability distribution for  $\tilde{w}_j$ , which agents use to form a conditional expectation.

For example, consider the bidder advisor. Suppose that 0 and  $\bar{w}_B$  are equally likely and the advisor chooses the following reporting strategy: when  $\tilde{w}_B = \bar{w}_B$ , report  $\rho_1$  with probability 1. When  $\tilde{w}_B = 0$  report  $\rho_0$  with probability 1/2 and report  $\rho_1$  with probability 1/2. After observing report  $\rho_0$ , Bayes rule implies



that agents will know that  $\tilde{w}_B = 0$ . After observing report  $\rho_1$ , Bayes rule implies that

$$\mathbb{P}[\tilde{w}_B = \bar{w}_B | \tilde{\rho} = \rho_1] = \frac{\mathbb{P}[\tilde{\rho} = \rho_1 | \tilde{w}_B = \bar{w}_B] \mathbb{P}[\tilde{w}_B = \bar{w}_B]}{\mathbb{P}[\tilde{\rho} = \rho_1 | \tilde{w}_B = \bar{w}_B] \mathbb{P}[\tilde{w}_B = \bar{w}_B] + \mathbb{P}[\tilde{\rho} = \rho_1 | \tilde{w}_B = 0] \mathbb{P}[\tilde{w}_B = 0]} = \frac{2}{3}.$$

So, after observing  $\rho_1$ , agents will believe that  $\tilde{w}_B = \bar{w}_B$  with probability  $2/3$  and  $0$  with probability  $1/3$ .

Thus, agents' posterior distribution of conditional expectations is

$$\mathbb{E}[\tilde{w}_B | \tilde{\rho}] \stackrel{\text{dist}}{=} \begin{cases} \frac{2}{3} \bar{w}_B & \text{with probability } \frac{3}{4}, \\ 0 & \text{with probability } \frac{1}{4}. \end{cases}$$

This example provides two important insights about information production by the advisors in our model. First, because the advisors choose the investigation they will conduct before collecting information and they send verifiable reports of the investigations' results, the advisors' choices of data generation functions and their subsequent reports convey no private information. This stands in stark contrast to cheap talk models which capture situations where agents are *ex ante* informed and send unverifiable messages (e.g., Crawford and Sobel, 1982).

Second, the specific set of possible reports used by the data generation process, *per se*, is irrelevant. In the example,  $\rho_0$  and  $\rho_1$  could well represent two distinct imaginary numbers. The only thing that matters is the posterior distribution of  $\tilde{w}_B$  conditioned on the report. In fact, as we shall see, in our setting, the only relevant statistics produced by the investigations are the distributions of conditional expectations  $\mathbb{E}[\tilde{w}_j | \tilde{\rho}_j]$ ,  $j = B, T$ . We use  $\tilde{s}_j$  to denote these conditional expectations and call them the *signaling strategies* of advisors  $j = B, T$ . We denote the realized value of  $\tilde{s}_j$  by  $s_j$ ,  $j = B, T$  and refer to it as the *signal* or the *signal sent*. We use  $F_j$  to represent the distribution of  $\tilde{s}_j$ , and call  $F_j$  the *signal distribution*.

## 2.2 Feasible advisor signals

The feasible set of signaling distributions for advisor  $j \in \{B, T\}$  equals the set of all distributions that can be produced from  $\tilde{w}_j$  by a data generating process. Although, at first glance, identifying the set of feasible signaling distributions seems challenging, Blackwell (1953) and Kamenica and Gentzkow (2011) provide a necessary and sufficient condition for identifying the feasible set: The set of feasible signal distributions given random variable  $\tilde{x}$  equals the set of all distributions that are mean-preserving contractions of the distribution of  $\tilde{x}$ .<sup>5</sup>

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<sup>5</sup>Mean-preserving contractions of the distribution of a random variable are sometimes called “garblings” of the distribution in the economics literature (Kleiner, Moldovanu, and Strack, 2021), and “fusions” of the distribution in the mathematics literature (Elton and Hill, 1992). There are many equivalent definitions of mean preserving contractions. One such definition is as follows:

In our setting, where  $\tilde{w}_j$ ,  $j = B, T$ , places probability weight on just two points 0 and  $\bar{w}_j$ , the set of mean-preserving contractions of  $\tilde{w}_j$  includes all distributions supported by the interval  $[0, \bar{w}_j]$ , with expectation equal to  $w_j := \mathbb{E}[\tilde{w}_j]$ .<sup>6</sup> Hence, the sets of feasible signal distributions for the advisors is defined as follows:

**Definition 1.** The *feasible signal distribution set* for advisor  $j = B, T$  equals the set of all distributions,  $F$ , satisfying the

- (a) *support condition:* The support of  $F_j$  is a subset of  $[0, \bar{w}_j]$ , and the
- (b) *expectancy condition:*  $\int_0^\infty s dF_j(s) = w_j$ .

It's obvious that, for any mean-preserving contraction of a random variable, its support is going to be a subset of the original distribution, and thus satisfy condition (a) of Definition 1. Expectancy condition (b) of Definition 1 is also always satisfied by a mean-preserving contraction. Thus, the restrictions on the signal distribution imposed by our value distributions, both of which have two-point supports, are the weakest possible restrictions. As we verify later, the rich set of possible signals these weak restriction permit can generate all of the equilibrium configurations that could be produced by other value distributions.

As is common in Bayesian persuasion models, in our baseline model, and in most of the extensions of the baseline model, optimal signal distributions have two-point supports. For this reason, the following definition economizes on notation and simplifies our discussions:

**Definition 2.** We refer to all signal distributions for advisor  $j = B, T$  that are supported by two points,  $a$  and  $b$ , and are feasible for  $j$  as *simple signal distributions* and use  $F_j^{a,b}$  to represent such distributions, i.e.,

$$F_j^{a,b}(s) := \left( \frac{b - w_j}{b - a} \right) \mathbf{1}_{s \geq a}(s) + \left( \frac{w_j - a}{b - a} \right) \mathbf{1}_{s \geq b}(s), \quad 0 \leq a < w_j < b \leq \bar{w}_j, \quad j \in \{B, T\},$$

where  $\mathbf{1}$  is an indicator function.<sup>7</sup>

### 2.3 Actions, sequencing, and equilibrium

The actions available to the agents in our baseline model are presented below in the sequence with which agents can act.

0. *Bidder:* The bidder chooses whether to investigate,  $i \in \{\text{yes}, \text{no}\}$ . The investigation will reveal if the

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$F_X$  is a mean preserving contraction of  $F_Y$  if whenever  $\tilde{X} \stackrel{d}{\sim} F_X$  and  $\tilde{Y} \stackrel{d}{\sim} F_Y$ ,  $\mathbb{E}[g(\tilde{X})] \leq \mathbb{E}[g(\tilde{Y})]$ , for all convex functions  $g$ , i.e.,  $F_X$  is dominated by  $F_Y$  in the convex order (Definition 3.A.1 Shaked and Shanthikumar, 2007).

<sup>6</sup>For a derivation, see, for example Proposition 3.13 in Elton and Hill (1992).

<sup>7</sup>An indicator function,  $\mathbf{1}_K(s)$  for a set  $K$  equals 1 if  $s \in K$  and 0 otherwise.

support of the signal  $\tilde{w}_B$  is  $\{0\}$  or  $\{0, \bar{w}_B\}$ . If the support is  $\{0\}$ , the game ends. If the support is  $\{0, \bar{w}_B\}$ , the bidder hires an advisor, so does the target, and we proceed to the following stages.

1. *Bidder Advisor*: The bidder advisor chooses a feasible signal distribution  $F_B$ . Nature draws a realization of the signal from the distribution. The realization is publicly observed.
2. *Target Advisor*: The target advisor chooses a feasible signal distribution  $F_T$ . Nature draws a realization of the signal from the distribution. The realization is publicly observed.
3. *Bidder*: The bidder chooses an offer price,  $P \geq 0$  which, if accepted, requires the target shareholders to exchange all of their shares for a cash payment of  $P$ . The price is publicly observed.
4. *Target*: The target chooses a response,  $r \in \{o, T, B\}$ . Response  $o$  represents choosing the status-quo;  $T$  represents accepting the alternative put forth by the target advisor, and  $B$  represents accepting the bidder's offer.
5. *Payoffs realized*: Payoffs to the advisors, the target, and the bidder are realized.

Note that, in some situations, any offer,  $P$ , that the target might accept generates a loss for the bidder. In practice, bidders would simply refrain from making offers in such situations. In our setting, offers that will be rejected with probability 1 are payoff equivalent to refraining to make an offer. So, to reduce the need for introducing new notation, we adopt the convention that the bidder always makes an offer.<sup>8</sup>

#### 2.4 Advisor compensation and incentives

The advisors choose information generating processes to maximize their expected payoffs which, in turn, depend on the advisors' compensation contracts. In the baseline scenario, the bidder advisor's fee is contingent on the offer being accepted and the target advisor's fee is contingent on the bidder's offer being rejected. Thus, the advisors' objectives are completely antithetical: the bidder advisor aims to maximize the probability of offer success; the target advisor aims to minimize the probability of success.

In practice, in the vast majority of acquisitions, bidder advisor compensation takes the form of a success fee that is paid if and only if the target firm accepts an offer from the bidder. This success-fee based structure for bidder advisors is the source of academic and practitioner critiques of advisor compensation detailed in the introduction. In all scenarios we consider, bidder advisor compensation is in the form of success fees.

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<sup>8</sup>Note also that, because all information is public information, the medium of exchange, e.g., stock vs. cash, is not informative. Thus, one can interpret the bidder's offer of a cash payment of  $P$  as offering financial assets with a market value of  $P$ .

In contrast, in practice, target advisor compensation is more varied. Target advisors are typically charged with investigating alternatives to bidder offers. However, target advisors' can be paid fees that are contingent on the outcome of a bidder offer, whether the target chooses an alternative, and the price of an offer it accepts. The fee structure we adopt in the baseline scenario maximizes the target advisor's incentive to investigate alternatives. Later we will consider other fee structures for the target advisor that match common practice and demonstrate the robustness of the results we drive in the baseline scenario.

Because fixed payment that are not contingent on outcome have no effect on advisors' incentives, such payments are irrelevant in our setting. Hence, we normalize fixed payments received by the advisors to zero. Also, note that only differences between outcome-contingent payoffs determine advisors' incentive. So, without loss of generality, we assume that minimum outcome-contingent payment equals zero.

To simplify the exposition of the baseline model, we assume that the fee is the same for both bidder and target advisors. The fee is represented by  $f$ . Heterogeneous fees will affect the equilibrium outcomes but these effects are proportional to the size of fees relative to firm value. Thus, under the reasonable assumption that fees are small relative to firm value, fee effects are second order and have no qualitative effects. We will defer further discussion of fees to later sections of the paper where we consider other scenarios featuring different target advisor compensation structures.

## 2.5 Assumptions and equilibrium

The importance of data generation by advisors also depends on the ex ante expected value of control transfer. If the highest possible value of firm under bidder control,  $\bar{w}_B$ , were less than the status-quo value,  $w_o$ , then the bidder advisor could never persuade the target to accept a bidder offer. If  $\bar{w}_T$  were less than the status-quo value, the target advisor could never persuade the target firm to adopt the alternative option, etc. In our baseline setting, we impose the parameter restrictions that maximize the importance of advisors in acquisitions:

### Assumption 1.

$$w_T \in (0, w_o), w_B \in (0, w_o), w_o < \bar{w}_T - f < \bar{w}_B - f.$$

Assumption 1 implies that  $w_T < w_o$  and  $w_B < w_o$ . Thus, Assumption 1 the expectancy constraint on feasible signals (Definition 1) implies that some realizations of signals sent by the advisors must be less than  $w_o$ . Thus, both bidder and target advisor must sometimes send *unpersuasive* signals, signals that cannot

result in the advisors' favored outcome being realized. We call signals greater than or equal to status-quo value,  $w_o$ , *persuasive* signals. Note that a persuasive signal makes the advisors' favored outcome possible, but does not guarantee it will be realized.

Our assumptions result in a sequential game of perfect information (with Nature being one of the players). So we employ the standard equilibrium concept in such settings: subgame perfect Nash equilibrium (SPNE) described by the following set of equilibrium strategies,  $(i^*, F_B^*, F_T^*, P^*, r^*)$ . In the few situations where applying a refinement is required to identify the outcome of the game, we refine the equilibrium set using Pareto dominance criterion, frequently termed in the game-theory literature as the *payoff dominance criterion*.<sup>9</sup> An SPNE is payoff dominated, if there exists another SPNE that yields a weakly higher payoff to all agents (the advisors, the bidder, and the target) and a strictly higher payoff to at least one of the agents. Payoff dominance is sometimes called the Pareto criterion.

### 3 Analysis of the baseline model

To benchmark the effects of endogenous signal generation by advisors on bidder and target welfare, we first consider the two limiting exogenous information environments: no advisors to generate information and advisors who generate fully informative signals. Welfare without advisors to generate information is easy to analyze: Assumption 1 ensures that the unconditional expected value of the firm under both bidder control and under the alternative is less than the status-quo value. Thus, the status-quo will prevail if there are no advisors to generate information signals, the payoff to the bidder is zero, and the payoff to the target is  $w_o$ .

At the other extreme, a “full information” environment prevails when both advisors' signaling strategies are fixed at the full-information strategy, i.e.,  $\tilde{s}_j = \tilde{w}_j$ ,  $j = B, T$ . The expectancy condition ensures that the signal  $\tilde{w}_j$ ,  $j \in \{B, T\}$ , is produced with probability  $w_j/\tilde{w}_j$ . Under the full-information strategies, our model reduces to a simple first-and-final offer model of acquisitions. The acquisition is viable if and only if  $\tilde{w}_B = \bar{w}_B$ . In any equilibrium, the bidder offers the target price,  $P$ , that equals the target's full information reservation value, which is  $\bar{w}_T - f$  if  $\tilde{w}_T = \bar{w}_T$  and  $w_o - f$  if  $\tilde{w}_T = 0$ .

The bidder's payoff equals the expected value of the firm when it is acquired,  $\bar{w}_B$ , net of the bidder advisor's fee,  $f$ , and the target's reservation value. The target advisor's fee lowers the target's reservation value, and thus the offer price, by  $f$ , and the bidder advisor's fee imposes a cost of  $f$  on the bidder. So, for

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<sup>9</sup>Payoff dominance is the most plausible equilibrium refinement in our setting. For games of complete information like ours, risk dominance and symmetry are the most commonly advanced rival refinements. Since we model a perfect information game, i.e., the information sets of the agent at nodes at which they make decisions, are singletons, there is no strategic uncertainty and thus risk dominance is irrelevant (See Carlsson and Van Damme, 1993, for a discussion of risk dominance). Symmetry is irrelevant because our game has no symmetries.

the bidder, advisor fees net out and the bidder's expected payoff equals

$$\text{Bidder}^{\text{FI}} = w_B - \frac{w_B}{\bar{w}_B} \left( \frac{w_T}{\bar{w}_T} \bar{w}_T + \left( 1 - \frac{w_T}{\bar{w}_T} \right) w_o \right). \quad (1)$$

The target's payoff equals its expected reservation value, i.e.,

$$\text{Target}^{\text{FI}} = \overbrace{\frac{w_T}{\bar{w}_T} \bar{w}_T + \left( 1 - \frac{w_T}{\bar{w}_T} \right) w_o}^{\text{Target's Gross Payoff - FI}} - f. \quad (2)$$

The advisory fee  $f$  lowers the target's payoff by  $f$  regardless of the outcome. The target pays the fee directly when the offer is rejected and indirectly, when the offer is accepted, through the reduction in reservation value engendered by the fee. The total payoff to the bidder and the target is given by

$$\text{Total}^{\text{FI}} := \text{Target}^{\text{FI}} + \text{Bidder}^{\text{FI}} = w_B + \left( 1 - \frac{w_B}{\bar{w}_B} \right) \left( \frac{w_T}{\bar{w}_T} \bar{w}_T + \left( 1 - \frac{w_T}{\bar{w}_T} \right) w_o \right) - f.$$

Note that the target's full information gross payoff can be expressed as  $\mathbb{E}[\max[\tilde{w}_T, w_o]]$ . Because all signaling strategies are mean-preserving contractions of the distribution of  $\tilde{w}_T$  and the map  $s_T \rightarrow \max[s_T, w_o]$  is convex,  $\mathbb{E}[\max[\tilde{s}_T, w_o]] \leq \mathbb{E}[\max[\tilde{w}_T, w_o]]$ . Thus, the target's gross payoff is less than the full-information payoff when the target advisor's signaling strategy is not perfectly informative.<sup>10</sup>

### 3.1 Preliminary results

Now we consider endogenous information production. Our model grafts an M&A bidding problem into a Bayesian persuasion model. So, unsurprisingly, our approach to solving the model initially develops on lines very similar to other auction, bidding, and persuasion models. As in many other persuasion settings, simple signaling distributions are optimal in our setting. As in auction settings, in our setting, actions spaces are continua and there arise discontinuity points in agents' payoffs functions that depend on the action of the other agents. Since an SPNE requires non-empty best reply sets for all agents in all subgames, the need to ensure non-empty best reply sets, as in auction/bidding models, constrains the set of SPNEs. Our first three results, Lemmas 1–3, verify these properties of SPNEs in our setting. Following these results, Proposition 1 initiates our analysis of information production by the advisors.

Lemma 1 characterizes bidder and target behavior in Stages 3 and 4 of our model (stages detailed in Section 2.3), conditioned on the signals sent by the bidder and target advisors in Stages 1 and 2.

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<sup>10</sup>Because  $\max[\tilde{s}_T, w_o] = w_o + \max[\tilde{s}_T - w_o, 0]$ , the target's gross payoff under signaling strategy  $\tilde{s}_T$  can be interpreted as the status-quo value of the firm,  $w_o$ , plus a call option on the alternative. Less than fully informative signaling strategies reduce the call option's volatility and thereby reduce the target's payoff.

**Lemma 1.** *In any SPNE  $(i^*, F_B^*, F_T^*, P^*, r^*)$ ,*

- (a) *if  $s_B > \max[s_T, w_o]$ , then  $r^* = B$ , i.e., the target accepts the bidder's offer,*
- (b) *if  $s_B < \max[s_T, w_o]$ , the target rejects the bidder's offer, i.e.,  $r^* \neq B$ ,*
- (c) *if  $r^* = B$ , then the bidder offer is  $P^* = \max[s_T, w_o] - f$ .*

Parts (a) and (b) of Lemma 1 simply state that the acquisition always fails if the signal sent by the bidder advisor is less than status-quo value or the signal sent by the target. This follows because the bidder's payoff from an offer price  $P$  that the target accepts is  $s_B - f - P$ . If the offer is rejected, the bidder's payoff is 0. The stand alone-value of the target conditioned on the signals, gross of the fee payment to the target advisor, is  $\max[s_T, w_o]$ . Because the target advisor receives the fee  $f$  whenever the offer is rejected, the reservation value of the target is  $\max[s_T, w_o] - f$ . When  $s_B - \max[s_T, w_o] > (<) 0$ , offering a price that is acceptable to the target produces a (larger) (smaller) payoff to the bidder than offering an unacceptable price,  $P < \max[s_T, w_o] - f$ . Thus, the acquisition will occur (not occur) when  $s_B - \max[s_T, w_o] > (<) 0$ . Part (c) simply states that when the target is acquired, the bidder offers the target its reservation value.

Now consider the target advisor's problem in Stage 2. The target advisor has observed the bidder advisor's signal and thus knows the acquisition value. If the bidder advisor signals an acquisition value higher than the status-quo, by signaling an even higher alternative value, the target advisor can block the acquisition and earn its fee. If the target advisor signals a lower alternative value, it receives nothing. Lemma 2 describes the target advisor's equilibrium behavior and what it implies for the acquisition.

**Lemma 2.** *Suppose that  $(i^*, F_B^*, F_T^*, P^*, r^*)$  is an SPNE. Then in any subgame with history  $s_B$ , when the target advisor replies to  $s_B$  with  $s_T$*

- (a) *If  $w_o \leq s_B < \bar{w}_T$ ,  $s_B \leq s_T \implies r^* = T$  and  $s_B > s_T \implies r^* = B$ .*
- (b) *If  $s_B < w_o$ ,  $w_o \leq s_T \implies r^* = T$  and  $w_o > s_T \implies r^* = o$ .*
- (c) *Whenever,  $s_B \in [w_o, \bar{w}_T]$ , the target advisor's persuasive signal matches the bidder advisor's persuasive signal, and the equilibrium signaling distribution of the target advisor thus satisfies  $F_T^* = F_T^{0, s_B}$ .*

The target advisor faces a straightforward problem when the acquisition value signaled by the bidder advisor is less than the status-quo value  $w_o$ , i.e.,  $s_B < w_o$ . Lemma 1 shows that the acquisition cannot occur. The target will choose the alternative when the alternative value signaled by the target advisor at least equals  $w_o$  and will opt for the status-quo otherwise. Thus, when  $s_B < w_o$ , the target advisor is guaranteed the fee,  $f$ , regardless of the signal it produces.

The target advisor's problem is more complex when the bidder advisor's signal  $s_B \in [w_o, \bar{w}_T)$ . The target advisor's choice can be viewed as a capacity allocation problem: The expectancy condition, which ensures that the unconditional expectation under a signal distribution equals the ex ante value of the alternative acts as the capacity constraint. Capacity is allocated across signals by the signal distribution. The capacity used by a given signal,  $s_j$ ,  $j = T$  or  $B$  equals the probability of sending the signal times the signal. The target advisor objective is to allocate capacity to minimize the probability that the acquisition occurs.

The target advisor can send a "topping" signal,  $s_T > s_B$ , with positive probability. Such a signal ensures that the acquisition is blocked and the target advisor receives the fee,  $f$ . Among all topping signals  $s_T > s_B$ , ever smaller signals use up ever less capacity while achieving the same outcome of blocking the acquisition and ensuring the payment  $f$  to the target advisor. Thus, as  $s_T$  approaches  $s_B$  from above, the target advisor's expected payoff increases. In any SPNE, the target advisor must have a best response, so the supremum must be attained by a feasible strategy. This "closure-from-above" condition implies that, when  $s_T = s_B < \bar{w}_T$ , the acquisition is blocked in an SPNE

Any signal  $s_T < s_B$  produces the same outcome as sending  $s_T = 0$ : the acquisition occurs and the target advisor is not paid a fee. Since any signal  $s_T \in (0, s_B)$  uses up more capacity than the signal  $s_T = 0$  but yields no fee payment, it is never optimal for the target advisor to send a signal  $s_T \in (0, s_B)$ . Hence, as stated in Lemma 2, in response to  $s_B \in (w_o, \bar{w}_T)$ , the target advisor uses the simple signal distribution  $F_T^{0, s_B}$ .

In other words, in response to a persuasive signal less than  $\bar{w}_T$  from the bidder advisor, the target tries to match the signal, and the takeover attempt is blocked when the target advisor is able to send a persuasive signal. Matching by the target advisor is robust to several model extensions that we consider below as is the use of the simple signaling strategy  $F_j^{0, \bar{w}_T}$  by advisors. Hence, to ease the exposition, we define the following terms.

**Definition 3.** In any subgame with history  $s_B$ , we will refer to the target advisor strategy of choosing the simple signal distribution  $F_T^{0, s_B}$  in response to  $s_B$  as the *matching strategy*. Further, in any history, we will refer to the simple signal distribution  $F_j^{0, \bar{w}_T}$ , for  $j \in \{B, T\}$ , as the  $\bar{w}_T$ -strategy. We will refer to simple bidder signal distributions  $F_j^{0, s_B}$ ,  $s_B \in (w_o, \bar{w}_T)$  as *toppable strategies*.

Now consider the bidder advisor's Stage 1 signaling problem. The bidder advisor must consider the risk of its signal being topped or matched. Lemma 3 describes the bidder advisor's optimal strategy and equilibrium payoff.



**Lemma 3.** *In any SPNE  $(i^*, F_B^*, F_T^*, P^*, r^*)$ , (i)  $F_B^* = F_B^{0, s_B}$  for some  $s_B \in [w_o, \bar{w}_T]$ , (ii) The equilibrium payoff of the bidder advisor equals  $\max\{\frac{w_B}{s_B} u_{BA}^*(s_B) : s_B \in [w_o, \bar{w}_B]\}$ , where*

$$u_{BA}^*(s_B) := f \times \begin{cases} 0 & s_B < w_o, \\ 1 - w_T/s_B & s_B \in [w_o, \bar{w}_T], \\ 1 & s_B \geq \bar{w}_T. \end{cases} \quad (3)$$

Part (i) of Lemma 3 shows that, just like the target advisor, the bidder advisor also uses a simple signal distribution. Because of the expectancy condition, the bidder advisor also faces a capacity allocation problem. However, because of the topping threat, the bidder advisor's capacity utilization problem is different: A larger persuasive signal from the bidder advisor reduces or may even eliminate the probability of being topped and the acquisition being blocked. However a larger persuasive signal uses more capacity. There is always a unique signal size threshold in the interval  $[w_o, \bar{w}_T]$  that achieves an optimal balance between these two opposing forces. Persuasive signals that do not equal this threshold represent an inefficient use of the bidder advisor's capacity relative to a persuasive signal that matches the threshold. Hence, the bidder advisor always adopts a simple signaling strategy  $F_B^{0, s_B}$  for some  $s_B \in [w_o, \bar{w}_T]$ .

Part (ii) the lemma shows that  $u_{BA}^*(\bar{w}_T) = f$ , which implies that the acquisition succeeds with probability 1 when the bidder advisor's persuasive signal is  $\bar{w}_T$ . This result follows from the fact that the bidder advisor can guarantee that it will receive the fee  $f$  and the acquisition will occur with a signal  $s_B > \bar{w}_T$ . A closure-from-above condition ensures that the bidder advisor must be able to attain the same payoff if  $s_B = \bar{w}_T$  in an SPNE. It also ensures that the target firm accepts the bidder's offer when  $s_B = \bar{w}_T$  regardless of the signal sent by the target advisor. Hence, even when both bidder and target advisors' signals are  $\bar{w}_T$ , the acquisition occurs.

In summary Lemmas 1–3 show that, in any SPNE, the bidder advisor adopts a simple signal distribution that is supported by two signals, the unpersuasive signal, 0, and some persuasive signal,  $s_B \in [w_o, \bar{w}_T]$ . When the bidder advisor sends the unpersuasive signal 0, the acquisition attempt fails, the target advisor adopts a simple signal distribution, and the alternative is adopted if and only the signal sent by the target advisor at least equals status-quo value,  $w_o$ . When the bidder advisor sends any persuasive signal  $s_B < \bar{w}_T$ , the target advisor plays the matching strategy and the acquisition occurs only when the target advisor fails to produce the matching signal. When the bidder advisor sends the persuasive signal  $\bar{w}_T$ , the acquisition occurs with

probability 1.

**Lemma 4.** *In any SPNE  $(i^*, F_B^*, F_T^*, P^*, r^*)$ , the bidder will investigate,  $i^* = \text{yes}$ , only if, following the investigation result  $\{0, \bar{w}_B\}$ , the acquisition is expected to generate a strictly positive payoff and the cost of the investigation  $C_0$  is sufficiently small.*

### 3.2 Equilibrium information production

The bidder advisor chooses between two types of signaling strategies: a toppable strategy, or the  $\bar{w}_T$ -strategy. The  $\bar{w}_T$ -strategy effects the acquisition with certainty when it produces the persuasive signal, while persuasive toppable signals only result in the acquisition when the target advisor fails to match. However, the  $\bar{w}_T$  signal uses more capacity than a toppable signal. In the following proposition, we describe the bidder advisor's optimal choice and its implications when model parameters satisfy the hypothesis

$$4w_T > \bar{w}_T. \quad \text{Hyp-P1}$$

In essence, this hypothesis limits the coefficient of variation for the target's value under the alternative,  $\bar{w}_T$ .<sup>11</sup> We defer further interpretation of this condition to the next section, Section 4, where we examine all equilibrium configurations consistent with Assumption 1

**Proposition 1.** *Suppose that hypothesis Hyp-P1 is satisfied. Advisors are hired and thus there is a positive probability of an acquisition, only if the initial investigation is sufficiently likely to indicate that a profitable acquisition is possible,*

$$C_0 < \pi \left( w_B - \frac{w_B}{\bar{w}_T} \left( \frac{w_T}{\bar{w}_T} \bar{w}_T + \left( 1 - \frac{w_T}{\bar{w}_T} \right) w_o \right) \right). \quad (4)$$

*In any subgame perfect Nash equilibrium (SPNE), if advisors are hired, then*

- (a) *The bidder advisor's equilibrium strategy is the  $\bar{w}_T$  strategy.*
- (b) *The acquisition occurs if and only if the bidder advisor signals  $s_B = \bar{w}_T$ ; otherwise, the bidder advisor sends signal  $s_B = 0$ , and the acquisition attempt fails.*
- (c) *In any payoff dominant SPNE, the sum of bidder and target payoffs equals*

$$\begin{aligned} \text{Total}^{BP} &:= w_B + \left( 1 - \frac{w_B}{\bar{w}_T} \right) \left( \frac{w_T}{\bar{w}_T} \bar{w}_T + \left( 1 - \frac{w_T}{\bar{w}_T} \right) w_o \right) - f \\ &= \text{Total}^{FI} - \left( \frac{w_B}{\bar{w}_T} - \frac{w_B}{w_B} \right) \left( \frac{w_T}{\bar{w}_T} \bar{w}_T + \left( 1 - \frac{w_T}{\bar{w}_T} \right) w_o \right). \end{aligned}$$

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<sup>11</sup>A simple calculation shows that  $\bar{w}_T/w_T = 1 + (\text{CV}[\bar{w}_T])^2$ , where CV represent the coefficient of variation, i.e., the standard deviation divided by the mean.

*When, on the other hand, (4) is reversed, no advisors are hired and no acquisition takes place.*

Proposition 1 shows that hypothesis Hyp-P1 implies that the bidder advisor's equilibrium signaling strategy is the  $\bar{w}_T$ -strategy. The acquisition occurs along the equilibrium path if and only if the bidder advisor sends the signal  $s_B = \bar{w}_T$ . The total payoff (bidder + target) from the acquisition equals the signal sent by the bidder advisor,  $\bar{w}_T$ , less the fee,  $f$ , i.e.,  $\bar{w}_T - f$ . The price paid to the target is  $\mathbb{E}[\max[\tilde{s}_T, w_o]] - f$ , the target's reservation. The target advisor does not receive a fee, so all feasible signal distributions are best responses for the target advisor. Since the total payoff from the acquisition is unaffected by target advisor's signal distribution, any target advisor signal distribution is supported by a payoff dominant SPNE. However, increasing the informativeness of the target advisor's signal distribution increases the target's reservation, so the most informative signaling strategy from the target advisor,  $\tilde{s}_T = \bar{w}_T$ , maximizes the target's gains. This is very much in line with solutions to mechanism design problems, which are pervasive and only require that agents to have a weak preference for actions being implemented.

When the bidder advisor sends the signal  $s_B = 0$ , the acquisition does not occur. In this event, the bidder's and bidder advisor's payoffs equals zero, and the target advisor is paid  $f$  regardless the signal it sends. The most informative target-advisor signaling strategy,  $\tilde{s}_T = \bar{w}_T$ , maximizes the payoff to the target and, along the equilibrium path, the signal sent by the target advisor does not affect the payoffs of the target advisor, bidder, or bidder advisor. Thus, in any payoff dominant SPNE, the target advisor sends the most informative signal,  $s_T = \bar{w}_T$ .

In equilibrium, the efficiency loss relative to the full-information environment is proportional to the gap between the maximum value under bidder control and the alternative,  $w_B/\bar{w}_T - w_B/\bar{w}_B$ , times the target's gross payoff under full information. As the gap shrinks to zero, i.e.,  $\bar{w}_T \rightarrow \bar{w}_B$ , total value approaches value under full information. Thus, even though the advisors' incentives are profoundly misaligned with the interests of the target and the bidder, the dialectic between the advisors forces information revelation and results in outcomes that approach those under full information.

In summary, the "obstructionist" target advisor increases the welfare of both the target and the bidder. The improvement in the target's welfare follows directly from the target advisor's attempt to signal better alternatives to the acquisition to block it. The target advisor's obstructionist efforts also indirectly improve the bidder's welfare by influencing the bidder advisor's signaling strategy. The bidder advisor just wants to push the acquisition through to maximize the probability of receiving the success fee. In the absence of a

target advisor, the bidder advisor would achieve this goal by simply signaling the status-quo value minus the fee  $f$ , resulting in an acquisition that generates no value for the bidder or the target. When the target advisor is present, anticipating the target advisor's attempt to make a persuasive argument for the alternative, in order to push the acquisition through, the bidder advisor must provide a more informative signal about the acquisition value. Because more informative signals better discriminate between value-increasing and value-destroying acquisitions, the bidder's welfare is increased.

#### 4 Importance of a capable target advisor

The highest value the target can attain without being acquired, the target's "upside value," is  $\bar{w}_T$ . Let us refer to equilibria in which the bidder advisor sends the persuasive signal  $s_B = \bar{w}_T$ , *target upside equilibria*. Proposition 1 shows that all equilibria are target-upside equilibria when hypothesis Hyp-P1 is satisfied. In this section, we extend the analysis of our baseline model to situations in which this hypothesis is not satisfied. These extensions will give us deeper insight into the benefit of obstructionist target advisors, and show how outcomes vary with their abilities to identify viable alternatives to the acquisition for the target firm. The complete set of equilibrium outcomes for our baseline model is described in Proposition 2.

**Proposition 2.** *In any subgame perfect Nash equilibrium (SPNE), after completing the initial investigation, the bidder advisor employs the simple signaling strategy  $F_B^{0,s_B^*}$  of sending either  $s_B = 0$  or  $s_B = s_B^*$ , where*

$$s_B^* = \begin{cases} w_o & \frac{w_T}{w_o} < \frac{1}{2} \text{ and } \frac{w_T}{\bar{w}_T} < \frac{w_T}{w_o} \left(1 - \frac{w_T}{w_o}\right), \\ 2w_T & \frac{w_T}{w_o} > \frac{1}{2} \text{ and } \frac{w_T}{\bar{w}_T} < \frac{1}{4}, \\ \bar{w}_T & \text{otherwise.} \end{cases}$$

*In any payoff dominant SPNE, the bidder chooses to conduct the initial investigation if (a) is satisfied, and the sum of bidder and target payoffs is the same as part (c) of Proposition 1, when  $s_B^* = \bar{w}_T$ . When  $s_B^* = 2w_T$ , the bidder chooses to conduct the initial investigation if*

$$C_0 < \pi \left( w_B - \frac{w_B}{2w_T} \left( \frac{w_T}{2w_T p} 2\bar{w}_T + \left(1 - \frac{w_T}{2w_T}\right) w_o \right) \right), \quad (5)$$

*and the sum of bidder and target payoffs is given by*

$$Total^{BP} = Total^{FI} - \left( \frac{w_B}{2w_T} - \frac{w_B}{\bar{w}_B} \right) \left( \frac{w_T}{\bar{w}_T} \bar{w}_T + \left(1 - \frac{w_T}{\bar{w}_T}\right) w_o \right).$$

*For any positive cost of the initial investigation,  $C_0 > 0$ , the bidder chooses to not investigate when  $s_B^* = w_o$ .*

Figure 1 illustrates the conclusions of Proposition 2 concerning the subgame that follows a successful initial investigation. We have partitioned the parameter space for the figure based on the bidder advisor's optimal signaling strategy, which largely determines the target advisor's strategy as well as target and bidder actions. In the region that satisfies the condition  $w_T/\bar{w}_T > 1/4$  (hypothesis Hyp-P1) there exist only target-upside equilibria. However, these equilibria exist even when Hyp-P1 is not satisfied, which illustrates that Hyp-P1 is not a necessary condition for target-upside equilibria. In the region where  $w_T/\bar{w}_T < 1/4$  and  $w_T/\bar{w}_T < 1/2$ , there can exist either target-upside or *status-quo equilibria*, equilibria in which the bidder's equilibrium persuasive signal is always  $s_B^* = w_o$ . When the  $w_T/\bar{w}_T < 1/4$  and  $w_T/w_o > 1/2$ , there exist only *intermediate equilibria* in which the bidder advisor's equilibrium persuasive signal is always  $s_B^* = 2w_T$ .

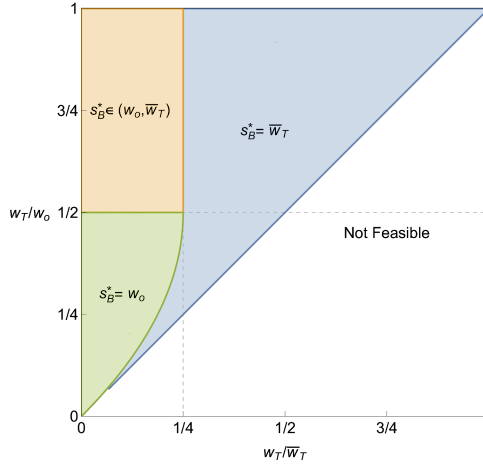


Figure 1: The figure depicts the equilibrium configuration as determined by two factors,  $w_T/\bar{w}_T$  (horizontal axis) and  $w_T/w_o$  (vertical axis). The regions are labeled based on the persuasive signal sent by the bidder advisor in equilibrium, denoted by  $s_B^*$ . The blue region supports only target-upside equilibria. The green region supports only status-quo equilibria, and the orange region supports only intermediate equilibria. Because  $\bar{w}_T > w_o$ , it is not possible for  $w_T/w_o > w_T/\bar{w}_T$ . So points to the right of the diagonal are not feasible.

In status-quo equilibria both advisors just “pitch a deal” and the target’s value remains  $w_o$ . Even gross of fees, advisors add no value. Hence, there is no reason for the bidder to conduct the initial investigation. Status-quo equilibria result when the expected value of the alternative is small relative to the status-quo value  $w_T/w_o < 1/2$  and the variation of the alternative’s value is large,  $w_T/\bar{w}_T < 1/4$ . We interpret this region as representing cases where the target advisor is *incapable*. That such cases exist is hardly surprising. Without a viable alternative, it is not hard for the bidder advisor to persuade.

What is more interesting is that target advisor capability depends both on the expectation and variation of

the alternative's value. Under full information disclosure, the call-like nature of the target's reservation value implies that variation in the alternative's value, measured by  $w_T/\bar{w}_T$ , increases the value of information from the target advisor. However, as Proposition 2 shows, when this variation increases sufficiently to cross the  $w_T/\bar{w}_T < 1/4$  boundary, the equilibrium configuration shifts from target-upside value disclosure to so little disclosure that the target advisor's input produces no value for the target firm. Hence, increases in the "option value" of the alternative can reduce target firm welfare. In contrast, holding expectations constant, variation in acquisition value has no welfare effects on the target or bidder. Increasing the expected acquisition value only affects bidder and target welfare through its effects on the probability the bidder advisor sends a persuasive signal and thus has no effect on the equilibrium configuration, i.e., whether the equilibrium is a target-upside, a status-quo, or an intermediate equilibrium.

#### 4.1 The concave envelope approach

In order to provide more insight into the equilibrium configurations described in Proposition 2, we will now analyze them using the "concave envelope approach." This approach, introduced to the economics literature in Aumann and Maschler (1966), is commonly used to analyze persuasion games (e.g., Lipnowski and Ravid, 2020).<sup>12</sup> It will help explain and illustrate the tensions underlying the equilibrium configurations, and show that, in our baseline setting, and most of its extensions, equilibrium advisor behavior can be determined simply by identifying the persuasive advisor signal with the best cost/benefit ratio.

*Remark 1* (Concave envelope). Our discussion will focus on Figure 2. Each of its panels is based on a parameterization (detailed in the figure's caption) of the model that supports one of the three equilibrium configurations identified in Proposition 2. For the figure, the advisory fee,  $f$ , is normalized to 1. With this simplification, the bidder advisor's payoff equals the probability with the acquisition occurs. Mathematically, the function describing this payoff is identical to expression  $u_{BA}^*(s_B)$  in part (ii) of Lemma 3 when  $f = 1$ . Expression  $u_{BA}^*(s_B)$  describes the bidder advisor's payoff if it sends signal  $s$  (in equilibrium) and the target advisor, the bidder, and the target follow their equilibrium strategies as described in Lemmas 1–3. For the purposes of this discussion, we need to consider signals that need not represent a signal actually sent by the bidder advisor in any equilibrium but, with a slight abuse of notation, we will use  $u_{BA}^*$  to represent the bidder advisor's payoff function without subscripting  $s$  with  $B$ . In each panel, the red curves plot  $u_{BA}^*$ .

The blue curves represent the concave envelopes of this payoff function, which we denote by  $\hat{u}_{BA}$ .<sup>13</sup>

<sup>12</sup>The concave envelope approach is also utilized in financial economics (e.g., Carpenter, 2000), operations research (e.g., Hochbaum, 2009), and, in mathematics, is a key ingredient in establishing Choquet representations of measures (Phelps, 2001).

<sup>13</sup>The concave envelope of a function, say  $g$ , denoted by  $\hat{g}$  is the *least* upper semicontinuous concave function that majorizes  $g$ ,

As is well known, the concave envelope represents the maximum bidder advisor payoff attainable by any random signal  $\tilde{s}$  supported by  $[0, \bar{w}_B]$ . The expectancy condition requires that  $\mathbb{E}[\tilde{s}] = w_B$ . Thus, the points  $(w_B, \hat{u}_{BA}(w_B))$  in each panel, illustrated by black dots, represent the expected value of the acquisition (first component), and the equilibrium payoff of the bidder advisor (second component).<sup>14</sup>

Each panel also contains a “0-support line” for the payoff function  $u_{BA}^*$ , which is a support line for  $u_{BA}^*$  that passes through the origin  $(0,0)$ , i.e., it is a line of the form  $\ell(s) = s\delta$ , with slope  $\delta$ , such that  $\ell(s) \geq u_{BA}^*(s)$  for all  $s \in [0, \bar{w}_B]$ , and  $\ell(s) = u_{BA}^*(s)$  for some  $s \neq 0$ . Because all lines through the origin have the same intercept, of all such lines that intersect the graph of  $u_{BA}^*$  at some point, a 0-support line is the line that has the greatest slope,  $u_{BA}^*(s)/s$ . We call values of  $s$  where  $\ell(s) = u_{BA}^*(s)$ , support points. Unless otherwise noted, “concave envelope” and “0-support line” will mean the concave envelope and a 0-support line for the payoff function  $u_{BA}^*$ , respectively.

Consider Panel A of Figure 2. In this panel,  $\bar{w}_T/w_T = 3.8 < 4$  so hypothesis Hyp-P1 is satisfied. Line  $\bar{\ell}$  is a 0-support line. Its support points are 0 and  $\bar{w}_T$ , its slope is  $1/\bar{w}_T$ , and it coincides with the concave envelope for all  $s \in [0, \bar{w}_T]$ . The reason is as follows: Since  $\bar{\ell}$  is affine and continuous, it is concave and upper-semicontinuous. It also majorizes  $u_{BA}^*$ . Because  $\hat{u}_{BA}$  is the concave envelope,  $\hat{u}_{BA}(s) \leq \bar{\ell}(s)$ , for all  $s \in [0, \bar{w}_B]$ . Because a concave envelope can never be less than the function it majorizes, and because 0 and  $\bar{w}_T$  are support points of  $\bar{\ell}$ , it must be the case that  $\hat{u}_{BA}(0) = u_{BA}^*(0) = \bar{\ell}(0)$  and  $\hat{u}_{BA}(\bar{w}_T) = u_{BA}^*(\bar{w}_T) = \bar{\ell}(\bar{w}_T)$ . Because a concave function majorizes any chord that connects points on its graph,  $\hat{u}_{BA}(s) \geq \bar{\ell}(s)$  for all  $s \in [0, \bar{w}_T]$ .<sup>15</sup>

The bidder advisor’s equilibrium signaling strategy must satisfy the expectancy condition and the expected bidder advisor payoff from the signaling strategy must be  $\hat{u}_{BA}(w_B)$ . Because  $\hat{u}_{BA}(w_B) > u_{BA}^*(w_B) = 0$ , the bidder advisor cannot attain its equilibrium payoff by sending the signal  $s = w_B$  with probability 1. Consider the simple signaling strategy with support points,  $s = 0$  and  $s = \bar{w}_T$ , that coincide with the support points for  $\bar{\ell}$ , i.e., the points in the panel represented by the white dots. Note that  $\hat{u}_{BA}(s) = u_{BA}^*(s) = \bar{\ell}(s)$  when  $s = 0$  and  $s = \bar{w}_T$ . Moreover, if the signaling strategy places weight  $\lambda = w_B/\bar{w}_B$  on signal  $\bar{w}_T$ ,

$$\hat{u}_{BA}(w_B) = \bar{\ell}(w_B) = \bar{\ell}(\lambda \bar{w}_T + (1-\lambda)0) = \lambda \bar{\ell}(\bar{w}_T) + (1-\lambda) \bar{\ell}(0) = \lambda \hat{u}_{BA}(\bar{w}_T) + (1-\lambda) \hat{u}_{BA}(0).$$

i.e.,  $\hat{g} \geq g$ , and if  $h$  is any other upper semicontinuous concave function that majorizes  $g$ ,  $\hat{g} \leq h$ .

<sup>14</sup>A proof of this result, in a much more general context than ours, is provided by Proposition 11.8 in Simon (2011).

<sup>15</sup>A more algebraic derivation: If  $s \in (0, \bar{w}_T)$ , there exists  $\lambda \in (0, 1)$  such that  $s = (1-\lambda)0 + \lambda \bar{w}_T$ . So  $\hat{u}_{BA}(s) = \hat{u}_{BA}((1-\lambda)0 + (1-\lambda)\bar{w}_T)$ . Because  $\bar{\ell}$  is affine,  $\bar{\ell}(s) = (1-\lambda)\bar{\ell}(0) + \lambda \bar{\ell}(\bar{w}_T)$ . Because,  $\bar{\ell}(0) = \hat{u}_{BA}(0)$  and  $\bar{\ell}(\bar{w}_T) = \hat{u}_{BA}(\bar{w}_T)$ ,  $\bar{\ell}(s) = (1-\lambda)\hat{u}_{BA}(0) + \lambda \hat{u}_{BA}(\bar{w}_T)$ . So the concavity of  $\hat{u}_{BA}$  implies that  $\hat{u}_{BA}(s) \geq \bar{\ell}(s)$ , for all  $s \in [0, \bar{w}_T]$ .

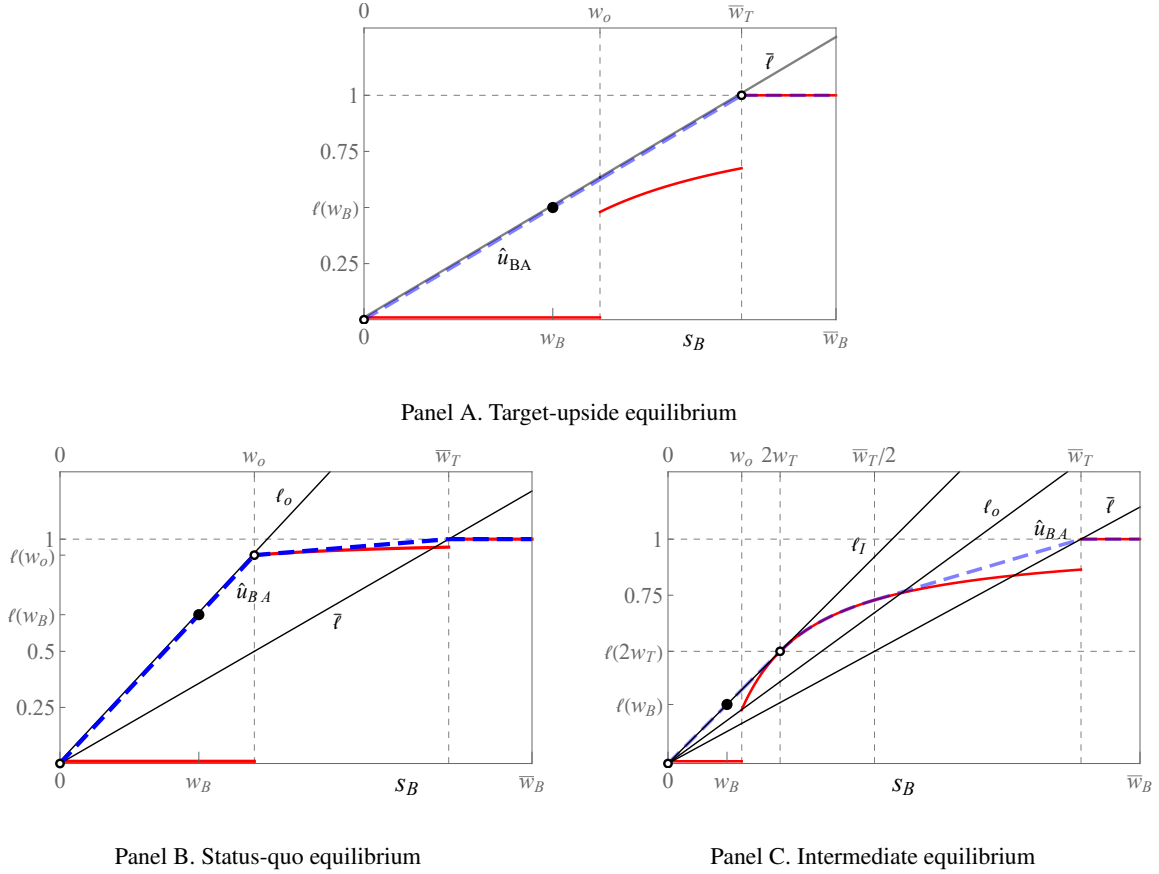


Figure 2: In all panels, the success fee received by the bidder advisor is normalized to 1. The target advisor, the bidder, and the target are assumed to follow their equilibrium strategies. In Panel A,  $\bar{w}_T = 3.8$ ,  $w_T = 1$ ,  $w_B = 2.5$ ,  $\bar{w}_B = 5$ , and  $w_o = 3$ . In Panel B,  $\bar{w}_T = 28$ ,  $w_T = 1$ ,  $w_B = 10$ ,  $\bar{w}_B = 34$ , and  $w_o = 14$ . In Panel C,  $\bar{w}_T = 14$ ,  $w_T = 1.9$ ,  $\bar{w}_B = 16$ ,  $w_B = 2$ , and  $w_o = 2.5$ . The red (blue) lines depict the reward function (the reward function's concave envelope) given the parameters of the panel.

Hence, this simple signaling strategy satisfies the expectancy condition and delivers the bidder advisor's equilibrium payoff. It is the signaling strategy for the bidder advisor we have described in Proposition 2. From the figure it is clear that no other simple signaling strategy or a strategy that places a weight on a signal other than the two support points for  $\bar{\ell}$  can attain the equilibrium payoff. Because the bidder advisor sends two signals, the unpersuasive signal  $s_B = 0$  and the persuasive signal  $s_B = \bar{w}_T$ , not surprisingly, given Proposition 1, this panel represents an target-upside equilibrium. More interestingly, our analysis has shown that verifying a target-upside equilibrium is equivalent to verifying that  $\bar{\ell}$  is the 0-support line for  $u_{BA}^*$ .

Now consider Panel B of the figure. In this panel,  $\bar{w}_T/w_T = 28 > 4$  and the hypothesis Hyp-P1 is not satisfied. Thus, the variation of the alternative value is quite large. Moreover, the expected value of the alternative,  $w_T$ , is also 14 times less than the firm's status-quo value,  $w_o$ . So, even when the bidder advisor



sends the status-quo signal,  $s = w_o$ , the probability that the takeover occurs is close to 1. Hence, as is apparent in the figure, the “reward to signal ratio,”  $u_{BA}^*(s)/s$ , is decreasing in  $s$  for  $s \in (w_o, \bar{w}_T)$ .

In this panel the 0-support line is  $\ell_o(s)$ . Its support points are the origin and  $(w_o, u_{BA}^*(w_o))$ , and its slope equals  $u_{BA}^*(w_o)/w_o$ . The line  $\bar{\ell}$ , which connects the origin with  $(\bar{w}_T, u_{BA}^*(\bar{w}_T))$ , is not even a support line. All of the arguments applied in the discussion of Panel A to identify the equilibrium signaling strategy for the bidder advisor hold in Panel B after replacing  $\bar{w}_T$  with  $w_o$ . So, as we show in Proposition 2, the equilibrium is a status-quo equilibrium in which the bidder randomizes between the two supports of the 0-support line  $\ell_o$ ,  $s' = 0$  and  $s'' = w_o$ .

Finally consider in Panel C. In this panel,  $\bar{w}_T/w_T \approx 7.7$ . Thus, once again the hypothesis Hyp-P1 is not satisfied. However,  $w_T = 1.90$ , so in contrast to Panel B, the mean value of the alternative is fairly close to the status-quo value,  $w_o = 2.5$ . For  $s \in [w_o, \bar{w}_T)$ ,  $u_{BA}^*(s) = 1 - \bar{w}_T/s$ . Hence, the reward to signal ratio,  $u_{BA}^*(s)/s$ , is maximized at  $s = 2w_T$  and the maximum value of the ratio equals  $1/(4w_T)$ .<sup>16</sup> For the parameters in this panel  $w_o < 2w_T < \bar{w}_T$  and the 0-support line, which we denote by  $\ell_I$ , passes through  $(2w_T, u_{BA}^*(2w_T))$ . Inspection shows that neither  $\bar{\ell}$  nor  $\ell_o$  are support lines. Based on the same argument as we used for the first two panels, we see that, consistent with Proposition 2, the equilibrium is an intermediate equilibrium because the 0-support line is  $\ell_I$ , and its support points are  $s' = 0$  and  $s'' = 2w_T$ .

Note that in all three panels, the only role for  $w_B$  is that it fixes the point on the line 0-support line that produces the bidder advisor’s equilibrium payoff. Although  $w_B$  obviously significantly affects the welfare of the agents, it plays no role in determining whether the equilibrium is a target-upside, status-quo, or intermediate equilibrium. This accounts for the absence of bidder advisor characteristics,  $w_B$  and  $\bar{w}_B$ , in the characterization of bidder advisor signaling strategies provided in Proposition 2.

In summary, we have shown the outcome of an acquisition attempt depends critically on the target advisor’s ability to identify a viable alternative. When the target advisor is not very capable of identifying a viable alternative or there is considerable variation in the value of the alternative, neither the target firm nor the acquiring firm stand to gain much from the acquisition. In fact, what may occur is that both advisors just pitch, the deal is completed, and neither firm enjoys any benefit from the deal.

On a more technical note, our analysis has shown that an advisor’s equilibrium signaling strategy can be identified by finding the advisor payoff function’s 0-support line, which maximizes the reward to signal ratio,  $u_{BA}^*(s)/s$ .<sup>17</sup> Identifying optima by maximizing ratios that determine support lines in this manner is a

<sup>16</sup>Note that  $(u_{BA}^*(s)/s)' = (2w_T - s)/s^3$ , when  $s > w_o$ .

<sup>17</sup>If the maximum reward-to-signal ratio,  $u_{BA}^*(s)/s$ , is attained by more than one  $s$ , the parameters of the model support more

commonly used tool in finance and economics and one that we will use in the subsequent extensions of the baseline model.<sup>18</sup> In the extensions, we will also use this approach to identify the equilibrium strategies for the target advisor. In one extension we consider, the strong bidder extension in Section 6.1, we will need to consider both the 0-support line and one other support line passing through  $(w_o, u_{BA}^*(w_o))$  but extending the arguments to this case is straightforward.

## 5 Target advisor fees

In the baseline analysis, we assumed that the target advisor receives a fee,  $f$ , if and only if the bidder's acquisition attempt fails. Our motivation for choosing this fee structure, is that, consistent with target firm's legal obligation to consider alternatives to the bidder's offer, it incentivizes the target advisor to identify alternative options. In the baseline model, target advisor's compensation is contingent only on the option—takeover, alternative project, or status quo—chosen by the target firm. However, in contrast to the almost uniform adoption of success-fee compensation for bidder advisors, the actual fee structure for target advisors varies considerably. This raises the question of the extent to which our results are the product of our fee structure assumptions. In this section, under the assumption that the baseline hypothesis, Hyp-P1, is satisfied and the cost of the initial investigation is sufficiently low to satisfy (4), we investigate the effects of other fee structures have on our baseline results in Section 3.

### 5.1 *Paying for the status-quo?*

Target advisors often receive contingent fee payments even when the result of the takeover attempt is maintaining the status quo (e.g., McLaughlin, 1992). Commentators have argued boards pay target advisors such fees to obstruct takeovers that would increase the wealth of shareholders but reduce the private benefits of board members. In the baseline model, the target advisor receives the fee even when the target rejects both the bidder's offer and the alternative option, and accepts the status quo option. To see if paying contingent fees for status quo outcomes actually harms target shareholders or reduces takeover market efficiency, we drop the status-quo component of the target advisor's baseline fee and examine how the resulting outcomes compare with the baseline outcome.

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than one equilibrium configuration. These non-generic edge cases are ruled out in Proposition 2 by the strict inequalities used to define the regions.

<sup>18</sup>For example, in portfolio theory, the tangent portfolio is the line emanating from the risk-return profile of the riskless asset that supports the set of efficient portfolios. This line, called the capital market line, is in turn determined by Sharpe ratio. In long-term contracting theory, Clementi and Hopenhayn (2006) show that optimal liquidation policies are determined by support line emanating from the agent utility/firm value profile under liquidation that majorizes the set of agent utility/firm value profiles under continuation.

For clearer exposition, we refer to the fee paid to target advisor fee in the baseline analysis—a payment of  $f$  so long as the acquisition attempt fails—as the *baseline fee* and denote the baseline fee with  $f_T$ . We refer to the fee paid to the target advisor when the target advisor receives a fee only if the target chooses the alternative, as the *alternative fee* and denote this fee with  $f_a$ . We use  $f_B$  to represent the bidder advisor's fee under both target advisor fee structures.

Clearly, *ceteris paribus*, dropping the status-quo fee component lowers the expected cost of hiring the target advisor. To remove this mechanical effect, we endogenize the target advisor's fee as follows: the target advisor has a reservation requirement that arises because the advisor must exert a unit of effort which costs the target advisor  $c > 0$  in order to produce a signal. We describe the target's choice between the two fee structures subject to the restriction that both meet the target advisor's reservation requirement. Lemma 5 shows that, when advisor fees are small relative to firm value, as is typically the case in the real world, the baseline fee structure dominates the alternative fee structure.

**Lemma 5.** *The target shareholders will prefer the baseline target advisor fee to the alternative fee when  $\frac{f_T}{w_T} \in (0, B_a)$ ,  $B_q > 0$ . The upper bound on the ratio  $\frac{f_T}{w_T}$ , given by  $B_a$ , is decreasing in  $w_o$  and  $w_B$ .*

To understand Lemma 5, first note that, under both fee structures, in order to have any hope of capturing the fee, target advisor must respond to the bidder advisor's persuasive signal with a persuasive signal at least equal to the bidder advisor's persuasive signal. So, the target advisor's incentives conditioned on the bidder advisor sending a persuasive signal are the same under both fee structures. Thus, in response to persuasive bidder advisor signal, the target advisor follows the same matching strategy under both the baseline and alternative fee structures. At the same time, the strategy played by the target advisor in response to an unpersuasive bidder advisor signal has no effect on the bidder advisor's welfare because, in this event, the acquisition always fails regardless of the target advisor's strategy. Thus, bidder advisor incentives are the same under both fee structures. Hence, under both fee structures, Proposition 1 ensures that the bidder advisor uses the target-upside strategy of sending persuasive signal  $\bar{w}_T$  and succeeds if and if it sends the persuasive signal. Hence, target advisor behavior following the bidder advisor signal  $\bar{w}_T$  is the same under both fee structures.

In the event that the bidder advisor sends an unpersuasive signal, the target advisor's incentives are fundamentally affected by switching to the alternative fee structure. Under the baseline fee structure, the target advisor is indifferent between the target advisor choosing between the status-quo or the alternative option and thus has no incentive to send a less than fully informative signal. Under the alternative fee

structure, the target advisor's unique optimal signaling strategy is the status-quo strategy of just "pitching the alternative," i.e., sending a persuasive signal that just matches the status-quo payoff and thus eliminates all target gains whenever the bidder advisor sends an unpersuasive signal. Hence, when the bidder advisor fails to persuade, from an information production perspective, the alternative structure is inferior to the baseline fee structure. The probability that the bidder advisor fails to persuade is inversely proportional to the expected value of acquisition,  $w_B$ . The cost to the target of the target advisor adopting the status-quo signaling strategy depends on the difference from between the fully informative persuasive signal,  $\bar{w}_T$ , and status quo value,  $w_o$ .

However, there is a countervailing effect. Under the baseline fee structure, whenever the bidder advisor sends a persuasive signal and the target advisor send an unpersuasive signal, the target's reservation demands, which equals the target's status quo payoff, are reduced by the payment of a fee for the status-quo outcome. Thus, the status quo fee reduces the bidder's offer dollar for dollar. This bargaining-power effect is proportional to the size of the target advisor's fee and inversely proportional to  $w_T$ , which determines the probability that the target advisor sends an unpersuasive signal, and is increasing in the expected value of acquisition,  $w_B$ , which determines the probability that the bidder advisor sends a persuasive signal. Note that the bargaining power effect is a pure wealth transfer between the bidder and the target. Thus, it has no effect on the efficiency of the takeover market. In contrast, the information effect reduces market efficiency. Hence, efficiency is always lower under the alternative fee structure.

Clearly the positive bargaining power effect (for the target) is absent when fees equal 0. In which case, the baseline fee structure dominates the alternative fee structure with respect to target welfare. Lemma 5 provides a range of  $f_T/w_T$  ratios between 0 and  $B_a$  over which the baseline fee structure is guaranteed to dominate alternative fee structure. The size of this interval, and thus  $B_a$ , increases with the strength of the information effect and decreases with the strength of the bargaining-power effect. The information effect is only realized when the bidder advisor sends an unpersuasive and the bargaining effect only realized when the bidder advisor sends a persuasive signal and the target advisor sends an unpersuasive signal. The probability of sending a persuasive signal is proportional to  $w_B$ . So the region where the information effect dominates is decreasing in  $w_B$ . Because the gain from informative relative to status-quo signaling is decreasing in  $w_o$ , the force of the information effect is reduced by increases in the status quo value. Thus, the region of guaranteed baseline fee dominance,  $(0, B_a)$ , is decreasing in  $w_B$  and  $w_o$ .

In order to provide some evidence that the region of baseline fee dominance,  $(0, B_a)$ , contains plausible

parameter choices, consider the following case. Suppose  $\bar{w}_T = 1$ ,  $w_o = 0.65$ ,  $w_T = 0.45$ , and  $w_B = 0.50$ . Computing  $B_a$  using the formula for  $B_a$  provided in the appendix (in the proof of the lemma) reveals that  $B_a \simeq 0.233$ . Which implies that as long as  $f_a/w_T \leq 0.233$  or  $f_T < 0.1049$ , about 10.5% of  $\bar{w}_T$ , the expected firm value conditioned on the acquisition occurring, the baseline fee structure dominates the alternative fee structure. Suppose now that  $w_T$  is set to equal the smallest  $w_T$  satisfying the baseline hypothesis, Hyp-P1, i.e.,  $w_T = 0.25 \bar{w}_T$ , and the other parameters remain the same. Repeating this calculation shows that then the baseline fee is better than the alternative if  $f_T$  is less than about 6% of the expected firm value conditional on the acquisition occurring. Thus, status-quo fee payments, while they may appear to be harmful to target shareholders, can promote better outcomes for target shareholders over reasonable levels of target advisor compensation.

## 5.2 Paying for performance?

Target advisors also often receive performance fees that tied to acquisition outcomes and the targets' values if they remain independent. McLaughlin (1992) documents that 71.4% of the target advisor contracts include fees that are based on value improvement and over 80% of these contracts make payment contingent on *an acquisition* being completed.<sup>19</sup> Cain and Denis (2013) provide further evidence that target advisors are especially incentivized to produce precise information about target firms' values. The obvious argument in favor of such performance-contingent fees is that they better align the interest of target advisors and targets, which should improve target outcomes.

To consider the effects of performance-sensitive compensation for target advisors on our analysis, we add a *performance component* to the target advisor's baseline fee compensation. Thus, the target advisor's contingent compensation, denoted by  $\text{comp}_T$ , consists of two components: a fee of  $f \geq 0$  if the acquisition attempt fails (as in the baseline setting), which we term the *baseline component*, and a performance component equal to some fraction,  $\alpha \in (0, 1)$  of the target shareholders' payoff in excess of the target's status quo value,  $w_o - f$ .

$$\text{comp}_T = \overbrace{\alpha \max[0, V_T - (w_o - f)]}^{\text{performance component}} + \overbrace{\begin{cases} f & r \neq B \\ 0 & r = B. \end{cases}}^{\text{baseline component}} \quad (6)$$

The value received by the target shareholders,  $V_T$ , is defined as  $V_T = P - \text{comp}_T$ , if the acquisition is com-

<sup>19</sup>An example of such a contingent contract in McLaughlin (1992), is an agreement between Unidynamics and its advisors, Goldman Sachs and Smith Barney, to pay \$125,000 plus 2.5% of the value above \$20 per share for a completed acquisition.

pleted,  $s_T - \text{comp}_T$ , if the target opts for the alternative, and  $V_T = w_o - \text{comp}_T$  if the target opts for the status quo. Thus, the performance component equals 0 if the target opts for the status quo. We refer to the  $\text{comp}_T$  as *performance compensation* and refer to fee structure assumed in the baseline model as *baseline compensation*.

The parameter  $\alpha$  captures the sensitivity of the target advisor's payoff to target value improvement. Note that the baseline target compensation is a limiting case of  $\text{comp}_T$  when  $\alpha \rightarrow 0$  and that, if we interpret the alternative option as a bid from a rival acquirer, when  $f \rightarrow 0$ ,  $\text{comp}_T$  converges to contingent compensation received only when an *acquisition* is completed and equals a fraction of the excess of target shareholders' payoff over the status quo value,  $w_o - f$ .

How does performance compensation for target advisors affect advisors' signaling strategies and the informational efficiency of the takeover market? First, consider the target advisor's strategy when the bidder advisor sends the unpersuasive signal,  $s_B = 0$ . In this case, the bidder's offer will be rejected and the target advisor always captures the baseline fee payment  $f$ . Thus, the baseline component is fixed and thus not marginal. Hence, target advisor's and target's incentives are perfectly aligned. Therefore, the target advisor strictly prefers the *fully informative strategy*: sending the  $\bar{w}_T$  persuasive signal when the value of the alternative is  $\bar{w}_T$  and sending the 0 signal when the value of the alternative is 0. In the baseline setting, sending the fully informative signaling strategy is a best response for the target advisor but not the only best response. We have assumed that target advisors, when indifferent, choose the information production strategy that maximizes the welfare of their principal, the target. Hence, the target advisor's signaling strategy is the same under the baseline and performance compensation. However, adding an arbitrarily small but positive performance component to the target advisor's compensation can ensure that the fully informative strategy is the target advisor's unique best response.

When the bidder advisor sends the target-upside persuasive signal,  $s_B = \bar{w}_T$ , which, as shown in Proposition 1, is the persuasive signal sent by the bidder advisor along the equilibrium path in the baseline setting, the effects of performance compensation are similar to unpersuasive signal case discussed above. Under the baseline compensation, the fully informative signaling strategy, which maximizes target welfare, is a best response for the target advisor but not a unique best response. Under performance compensation, the fully informative strategy is a unique best response. So, the signaling strategy of the target advisor is the same under baseline and performance compensation.

However, when the bidder advisor sends a persuasive signal,  $s_B < \bar{w}_T$ , the situation is a bit more complex.

As shown in the baseline analysis, the baseline component militates in favor of the matching strategy of sending the persuasive signal  $s_T = s_B$ . Because of the perfect alignment between the performance component and target welfare, the performance component militates in favor the fully informative strategy regardless of signal sent by the bidder advisor. Using the concave envelope approach, outlined in Section 4 we see that the target advisor's optimal strategy, either matching or fully informative, is the strategy that maximizes the reward-to-signal ratio. Computing the difference between the reward-to-signal ratio for matching the bidder advisor's persuasive signal versus the fully informative persuasive signal yields

$$\frac{\overbrace{f + \hat{\alpha} (s_B - w_o)}^{\text{matching}}}{s_B} - \frac{\overbrace{f + \hat{\alpha} (\bar{w}_T - w_o)}^{\text{fully informative}}}{\bar{w}_T} = \frac{(\bar{w}_T - s_B) (f - \hat{\alpha} w_o)}{s_B \bar{w}_T},$$

where  $\hat{\alpha} \equiv \alpha/(1 + \alpha)$ . Thus, the matching (fully informative) strategy is target advisor's unique best response to persuasive bidder signal  $s_B < \bar{w}_T$  if and only if  $f - \hat{\alpha} w_o > 0$  ( $f - \hat{\alpha} w_o < 0$ ). When baseline fee component dominates the performance component, the target will adopt the same strategy as adopted in the baseline scenario, namely, matching the bidders offer. In this case, Proposition 1 shows that the bidder advisor's equilibrium signaling strategy is using the persuasive signal  $s_B = \bar{w}_T$ . As a result, performance compensation has no effect on either bidder or target equilibrium signaling strategies.

This case is illustrated in Figure 3. In this figure,  $f - \hat{\alpha} w_o > 0$  and thus the baseline component dominates the performance component. As discussed in Section 4, optimal advisor signals lie on the 0-support line (black line) of the advisor's payoff function, denoted by  $\hat{u}_{TA}$ , (the red line in the figures). The 0-support is the line from the origin that intersects the graph of  $\hat{u}_{TA}$  that has the largest slope,  $\hat{u}_{TA}(s_T)/s_T$ , i.e., with the maximum reward-to-signal ratio. In this case, the performance component is not large enough to induce the target advisor to switch to the fully-informative strategy. So the target adopts the matching strategy and the equilibrium signaling strategies of the bidder and the target advisors are equal to their baseline strategies.

Now consider the case where the performance component dominates the baseline fee component, i.e.,  $f - \hat{\alpha} w_o < 0$ . In this case, the target advisor will always use the fully informative strategy. As shown in Proposition 1, under baseline compensation, the matching strategy of the target advisor induces the bidder advisor to use the target upside strategy, i.e. the persuasive signal,  $s_B = \bar{w}_T$ , as long as hypothesis Hyp-P1 is satisfied. However, when the performance fee component dominates the baseline fee component, and thus the target advisor always uses the fully informative strategy, the tradeoffs for the bidder advisor change. Over all persuasive signals,  $s_B \in [w_o, \bar{w}_T)$  the probability that the target advisor will send a persuasive signal is the same. Thus, conditioned on sending a persuasive signal  $s_B < \bar{w}_T$ , the bidder advisor will send the

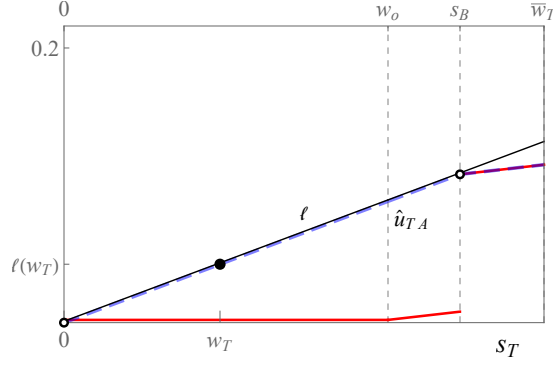


Figure 3: *Baseline component dominates performance component.* The red line, labeled  $\hat{u}_{TA}$ , depicts target advisor payoff as function of its signal  $s_T$  (horizontal axis) given that the bidder advisor send signal  $s_B$ ; The blue line shows the upper envelope for the target advisor's payoff function. The black line  $\ell$  is the 0-support line for the target's payoff function. In the figure,  $\bar{w}_T = 4$ ,  $w_T = 1.5$ ,  $w_B = 2.5$ ,  $f = 0.1$ ,  $\hat{\alpha} = 0.01$ ,  $w_o = 3$ , and  $s_B = 3.3$ .

smallest persuasive signal, the signal that can be sent with the highest probability, i.e., the status-quo signal,  $w_o$ . Thus, the only two candidates for an optimal bidder signaling strategy are status-quo signaling and target upside signaling. Because the target upside signal,  $s_B$ , captures the bidder advisor's baseline fee payment,  $f$ , with probability 1 while the status-quo signal captures the fee payment only when the target advisor send the unpersuasive signal  $s_T = 0$ , which under the fully informative signaling strategy occurs with probability  $1 - w_T/\bar{w}_T$ , the difference in the reward-to-signal ratio between the two strategies is

$$\underbrace{\frac{f}{\bar{w}_T}}_{\text{target upside}} - \underbrace{\frac{f \left(1 - \frac{w_T}{\bar{w}_T}\right)}{w_o}}_{\text{status quo}} = f \frac{(w_o + w_T) - \bar{w}_T}{w_o \bar{w}_T}.$$

Thus, when the target advisor adopts the fully informative strategy, i.e., when  $f - \hat{\alpha} w_o < 0$ , the bidder advisor will strictly prefer the status-quo persuasive signal,  $s_B = w_o$  to the target upside persuasive signal,  $s_B = \bar{w}_T$  whenever  $(w_o + w_T) - \bar{w}_T < 0$ . Because the model's parameter assumptions (equation 1) imply that  $w_T < w_o$ , this condition will always be satisfied whenever  $2w_o < \bar{w}_T$ , i.e., the status-quo value is low relative to the target advisor's upside value,  $\bar{w}_T$ .

This case is illustrated by Figure 4. Panel A illustrates the 0-support lines for the target advisor when the bidder advisor sends the persuasive signal  $s_B$ . Panel B represents the bidder advisor's payoff function, denoted by  $\hat{u}_{BA}$  (red line) and the zero support line (black line) conditioned on equilibrium target advisor signaling strategies. Panel A shows that, regardless of the signal sent by the bidder advisor, the target advisor's optimal strategy is the fully informative strategy. Thus, in contrast with the baseline case, the



target advisor will not, as in the baseline setting, respond to the bidder sending the status-quo persuasive signal,  $s_B = w_o$ , by matching and instead will send the fully informative persuasive signal,  $s_T = \bar{w}_T$ . The probability that the target advisor sends the unpersuasive signal is much higher when the target advisor's persuasive signal is the fully informative signal. This increases the bidder advisor's payoff from the status-quo signaling strategy. In contrast, because the target advisor's response to the bidder advisor sending the target upside signal,  $\bar{w}_T$ , is to match both in the baseline setting and performance compensation setting, the bidder advisor's payoff from the target upside strategy in the performance compensation setting equals the bidder advisor's payoff in the baseline setting. In the figure,  $(w_o + w_T) - \bar{w} < 0$ . Hence, as illustrated in Panel B, the increase in the bidder advisor's payoff from the status-quo strategy engendered by the effect of performance compensation on the target advisor's strategy is sufficient to induce the bidder advisor to switch from the baseline strategy, target upside signaling, to the status-quo signaling strategy.

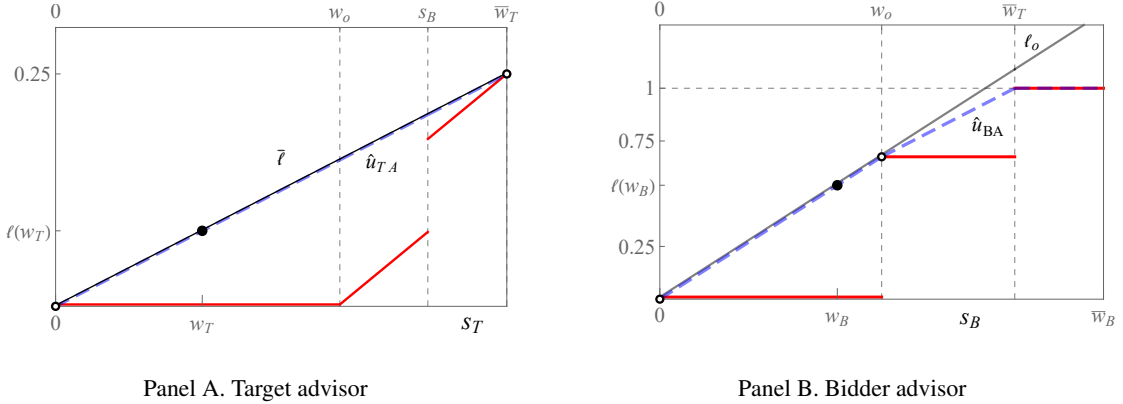


Figure 4: *The performance component dominates the baseline component.* The red lines depict advisors' payoff as functions of signals sent (horizontal axis). The blue line represents the concave upper envelopes of advisors' payoff functions and the black line represents their 0-support lines. Panel A represents target responses to a bidder persuasive signal,  $s_B$ , less than  $\bar{w}_T$ . Panel B depicts bidder advisor payoffs. In both panels,  $\bar{w}_T = 4$ ,  $w_T = 2.1$ ,  $w_B = 2.5$ ,  $f = 0.1$ ,  $\hat{\alpha} = 0.1$ ,  $w_o = 3$ , and  $\alpha = 0.1$ . In Panel A,  $s_B = 3.3$ .

According to Proposition 2, when hypothesis Hyp-P1 does not hold and the target receives the baseline compensation, the bidder advisor may forego the target upside strategy equilibrium, and choose instead either the status-quo signaling strategy or the signalling strategy with the persuasive signal  $s_B^* = 2w_T$ . As before, when a strong performance component induces the target advisor to use the fully informative strategy, the bidder advisor strictly prefers the status-quo persuasive signal whenever  $(w_o + w_T) - \bar{w}_T < 0$ . This inequality always holds under the parameter conditions that lead to the bidder advisor foregoing the target upside strategy in Proposition 2. Thus, the conclusion that a strong performance component for the target

advisor leads to the bidder adopting the status-quo signaling strategy extends to the parameters violating hypothesis Hyp-P1.

Given a positive cost of the initial investigation by the bidder,  $C_0 > 0$ , the expectation of the status-quo signaling strategy by the bidder advisor will cause the bidder to not conduct the initial investigation in the first place. Comparing the equilibria obtained with and without strong performance compensation component, we can see that the expectation of strong incentives for the target advisor may have a negative consequence for the target when the target advisor is not very capable. In this case, strong incentives for the target advisor weaken the incentives for the bidder advisor to produce information, which in turn dissuades the bidder from conducting the initial investigation and hiring an advisor in the first place. As a result, the target may fail to spot value-improving options. On the other hand, strong performance compensation for a more capable target advisor may induce the bidder advisor to shift to a more informative signaling strategy, thereby improving the target's ability to take advantage of value-improving options.

Highly performance sensitive target advisor compensation can eliminate bidder merger gains and thus drastically reduce the efficiency of the acquisitions market. Incentive alignment through performance sensitive compensation makes the target advisor's signaling strategy more sensitive to target value effects but less sensitive to the bidder's advisor's signaling strategy. This weakens the competitive pressure for disclosure provided by the advisor dialectic and thereby encourages the bidder advisor to just pitch the deal by adopting the status-quo signaling strategy. Consequently, the channel through which target advisor compensation affects the efficiency of the acquisitions market is not the direct effect of compensation on target advisor strategies, but rather the indirect effect resulting from the effect on bidder advisor strategies of changes in off-equilibrium target advisor strategies engendered by changes in target advisor compensation.

## 6 Extensions

Our model is stylized. We now consider the effect of loosening assumptions we have made about the ex ante value of the target post acquisition, the sequence of moves after the advisors have produced their signals, the sequence of advisor signals, and the nature of the information produced by the advisors. We show the robustness of our basic thesis to these changes—even though the advisors' compensation appears to generate incentives for inefficient behavior, the dialectic between them promotes efficient information production.

## 6.1 Strong bidders

According to Assumption 1,  $w_B < w_o$  so, ex ante, the target firm is an *unattractive* investment for the bidder. We have shown that, based on this assumption, an acquisition that is profitable for both the target and the bidder can occur only if the target engages a sufficiently capable advisor. It is quite plausible that this assumption is not satisfied and a target may, ex ante, be an *attractive* investment for the bidder. Will this impact the inferences we can draw from our model?

To see how important this assumption about the target's ex ante value is to the inferences we have drawn, will now consider the case of an ex ante attractive target. We will show that the threat of obstruction by the target advisor can continue to promote information production by the bidder advisor and a value-increasing acquisition. However, perhaps surprisingly, the advisors' signals may be less informative and the acquisition may create less value than if the target is unattractive ex ante.

To distinguish this analysis from the baseline analysis, we will denote the ex ante expected post-acquisition value of the target by  $w_B^h$  instead of  $w_B$ . We will assume that  $w_B^h > w_o$  so, ex ante, the target is an attractive investment. We will assume that  $w_B^h < \bar{w}_T < \bar{w}_B$ , so both the target and bidder advisors continue to maintain the ability to produce valuable information.

The assumption change does not alter the target and bidder actions following the revelation of the advisors' signals from the baseline scenario. It is still the case that the target will agree to an acquisition if the bidder advisor produces an untoppable signal  $s_B \geq \bar{w}_T$ , and the acquisition will fail if the target advisor tops the bidders advisor's signal. The target advisor also continues to try and top the bidder advisor's signal to block the acquisition by choosing the simple signaling strategy  $F_T^{0,s_B}$  as we describe in Lemma 2.

However, the bidder advisor's problem has changed. Unlike the baseline scenario, the expectancy condition now permits the bidder advisor to select a signaling strategy that only places positive probability weights on target values at least as high as  $w_o$ , and expect the acquisition to occur even if it fails to produce the untoppable signal  $\bar{w}_T$ . This is not possible in the baseline setting. The following result describes an undesirable implication of an ex ante high target value on information production by the advisors.

*Result 1.* Suppose, ex ante, the target firm is an attractive investment for the bidder, so  $w_B^h > w_o + \varepsilon$ , and the target advisor is relatively weak so

$$w_o > \max\{2w_T, \bar{w}_T/2\}, \quad (7)$$

and

$$\frac{\bar{w}_T}{w_o} \left(1 - \frac{w_T}{w_o}\right) > 1. \quad (8)$$

Then,

- In any SPNE the bidder advisor uses the simple signaling strategy  $F_B^{w_o, \bar{w}_T}$ .
- If  $\varepsilon$  is sufficiently small, the total payoff to the target and bidder is non-monotone in the target's ex ante expected post-acquisition value,  $w_B^h$ , and is lower than the total payoff in the baseline scenario specified in Proposition 1.

To see why the bidder advisor's optimal signaling strategy can change from the baseline scenario, compare the outcomes the bidder advisor can expect from the  $\bar{w}_T$  strategy and the strategy  $F_B^{w_o, \bar{w}_T}$ . Both strategies produce the same payoff for the bidder advisor conditional on the signal  $s_B = \bar{w}_T$ , which ensures that the acquisition will succeed. However, the bidder advisor's payoff conditional on the realization of the low signal from each strategy are quite different: If the bidder advisor produces the signal  $s_B = 0$ , as we have described previously, the acquisition will always fail, the bidder advisor will receive no fee, and the  $\bar{w}_T$  strategy is optimal for the target advisor. In contrast, if the bidder advisor generates the signal  $s_B = w_o$ , the target advisor's best response is the matching strategy  $F_T^{0, w_o}$ ; the bidder advisor can receive a fee if the target advisor generates the signal  $s_T = 0$ . Thus, the strategy  $F_B^{w_o, \bar{w}_T}$  offers the bidder advisor the chance of a fee payment in more states. However, the bidder advisor's capacity constraint ensures that it can produce the optimal untoppable signal,  $\bar{w}_T$ , with a higher probability by picking the  $\bar{w}_T$  strategy. Faced with this tradeoff, as Result 1 demonstrates, when the target advisor is sufficiently weak, the bidder advisor prefers the strategy  $F_B^{w_o, \bar{w}_T}$ .

Under the advisors' optimal signaling strategies, when  $s_B = w_o$ , the sum of target and bidder payoffs is  $w_o - f$ , and when  $s_B = \bar{w}_T$ , the sum of target and bidder payoffs is  $\bar{w}_T - f$ . Therefore, in expectation, the sum of the payoffs is  $w_B - f = w_o + \varepsilon - f$ . This is lower than in the baseline analysis. The reason is that, because the target's high ex ante value induces the bidder advisor to produce less useful information about the target's value: The low signal produced by the advisor still generates no profit for the bidder (or the target), but consumes bidder advisor capacity (as opposed to the zero signal). The target also receives less information about the value of the alternative: Following a low signal from the bidder advisor, the target advisor focuses on just matching the signal rather than adopting a full-information signaling strategy. These negative impacts on advisor information production are large enough to dominate the overall positive impact of a higher ex ante post acquisition value of the target. It follows that a capable target advisor is particularly

helpful when the target is, ex ante, an attractive investment.

## 6.2 Bid Price Set by the Target

In the baseline setting, the bidder makes a take-it-or-leave-it to the target at the price  $P$ . This assumption ensures that the bidder has all the power in the transaction and thus can capture the entire surplus from the acquisition. Will outcomes change if power is transferred to the target? We will show that the switch in power, while it transfers profit from the bidder to the target, does not affect advisor behavior or the total payoffs.

*Result 2.* The total payoff described in Proposition 1 continues to hold if, after observing the two advisors' signals, the target, rather than the bidder, proposes the acquisition price  $P$ .

Once the bidder and the target advisors produce their signals  $s_B$  and  $s_T$ , it continues to be the case that the rational target and bidder will agree to the acquisition if and only if the signals indicate that the acquisition will produce a nonnegative synergy, i.e.,  $s_B \geq \max\{w_o, s_T\}$ . By setting  $P = s_B - f$  the target will maximize its profit while the bidder will be left with a profit of zero. Closure problems similar to those we discussed in the baseline setting imply that, in the event of a tie between the target's value under the alternatives,  $s_B = \max\{w_o, s_T\}$ , in any SPNE the acquisition will occur when either  $s_B = s_T = \bar{w}_T$  or  $s_B = w_o > s_T$ . Thus, the equilibrium strategies of the two firms imply that, conditioned on signal realizations, outcomes of the attempted acquisition and the total value of the two firms are the same as in the baseline.

The payoffs for both the target and the bidder advisors depend only on the probability of the acquisition. Since this is the same as in the baseline, the problems faced by the two advisors are also the unchanged. Thus, both advisors select the same equilibrium signaling strategies as in the baseline setting, which ensures that total payoff of the bidder and target remains unchanged.

## 6.3 Simultaneous persuasion

Thus far we have assumed that the target advisor observes the signal produced by the bidder advisor before selecting its signaling strategy. This permits the target advisor to tailor its strategy to top the bidder advisor's signal based on the signal's realization. This maximizes the topping threat, which can drive the bidder advisor to prefer signaling strategies that deliver untoppable signals.

It is quite possible that a target advisor may not have access to a bidder advisor's signal before choosing its own signaling strategy. In this case, will the target advisor continue to effectively curb bidder advisor opportunism and induce it to produce informative signals? To answer this question we will examine a

scenario in which the two advisors produce their signals simultaneously. We will show that, while both advisors may shift away from their signaling strategies in the baseline scenario, they continue to produce informative signals.

In the baseline setting, only the bidder advisor played a best response to an expected signaling strategy (of the target advisor). Now, with simultaneous signal production, even the target advisor plays a best response to an expected signaling strategy (of the bidder advisor). The following result describes the effects of this change.

*Result 3.* Suppose the bidder and the target issue their signals simultaneously, and let  $u \equiv w_T + \sqrt{w_o^2 + w_T^2}$ . Then, in an SPNE

- The bidder advisor's signal distribution places a positive weight on  $s_B = 0$  and  $s_B = w_o$ , and linearly increases on the interval  $(w_o, u]$  if  $\bar{w}_T$  is sufficiently large; otherwise the remaining weight is placed on  $\bar{w}_T$ .
- The target advisor's signal distribution places a positive probability on  $s_T = 0$  and  $s_T = w_o$  and linearly increases on the interval  $(w_o, \min\{u, \bar{w}_T\}]$ .

To see how the advisors' problems have changed from the baseline, consider the bidder advisor's problem. In the baseline, for every toppable signal  $s_B \in [w_o, \bar{w}_T)$ , the bidder advisor could expect the target advisor to pick the signaling strategy that maximized the probability of topping  $s_B$ , i.e., the target advisor would pick the strategy  $F_T^{0, s_B}$ . The target advisor can no longer respond in this way, and the bidder advisor will no longer expect the target advisor to top a toppable signal with the maximum probability. This makes toppable signals attractive to the bidder advisor because they can effect the acquisition while conserving the advisor's capacity.

The target advisor's problem changes too if the bidder advisor no longer focuses solely on generating untoppable signals. While the target can no longer threaten to top toppable signals with the maximum probability, the target advisor can pose enough of an obstruction to limit the capacity the bidder advisor will devote to toppable signals. To do so, the target advisor must produce signals that can beat toppable signals from the bidder advisor with a sufficiently high probability. Thus, as the above result shows, the target advisor may focus on producing signals lower than  $\bar{w}_T$  so that it can devote sufficient capacity to block toppable signals with a high probability.

Figure 5 illustrates the advisor's signaling choices when  $u < \bar{w}_T$  and the target advisor refrains from producing the signal  $\bar{w}_T$  because it doesn't have sufficient capacity to deter the bidder advisor from pro-

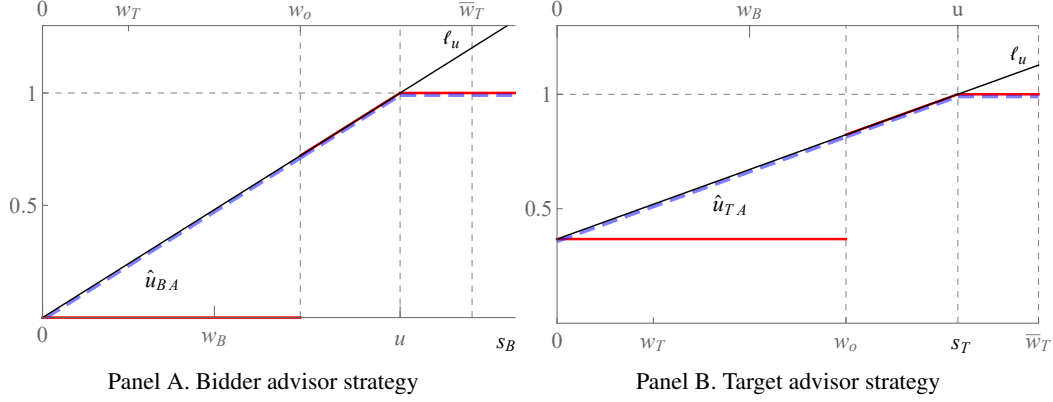


Figure 5: The red line depicts the advisor payoff (Bidder advisor in the left panel and target advisor in the right panel) as function of the value of the target firm (horizontal axis) when  $\bar{w}_T \geq u$ . The blue line shows the upper envelope for the payoff function. The bidder and the target are assumed to follow their equilibrium strategies. Both panels assume  $\bar{w}_T = 5$ ,  $w_T = 1$ ,  $w_B = 2$ ,  $f = 1$ , and  $w_o = 3$ .

ducing toppable signals. The right-hand panel illustrates the target advisor's strategy. The target advisor's payoff is linear over the interval  $(w_o, u]$  because the linearly increasing probability of bidder advisor signals in this interval. Instead of adopting the  $\bar{w}_T$  strategy, which is optimal in the baseline, to discourage the bidder advisor from producing toppable signals, it is optimal for the target advisor to produce signals in the interval  $[w_o, u]$  with positive probability. Because,  $[0, u]$ , the support for the target advisor's signaling strategy is more compact than in the baseline, the target advisor is able to conserve capacity to produce these blocking signals. The left-hand panel illustrates the bidder advisor's strategy. Because the target advisor linearly increases the probability of bidder advisor signals in the interval  $(w_o, u]$ , the bidder advisor's payoff function is linear over this interval. The panel shows that the bidder is not deterred from producing toppable signals. However, the bidder advisor does devote some capacity to producing signals close to  $u$ , which the target is unlikely to top.

Figure 6 illustrates outcomes when the target advisor is capable enough to deter the bidder from producing toppable signals. The figure shows that, when  $u < \bar{w}_T$ , just like the baseline, the bidder advisor is completely deterred from producing toppable signals. The reason is that the target advisor has a high capacity to top signals in the interval  $[w_o, \bar{w}_T)$  even if it employs only the  $\bar{w}_T$  strategy, and does so even though it doesn't observe the bidder advisor's signal. Thus, the target advisor can continue to effectively curb bidder advisor opportunism and induce it to produce informative signals even if it does not have access to the bidder advisor's signal before choosing its own signaling strategy. The result also, once again, underlines the importance of a capable target advisor.

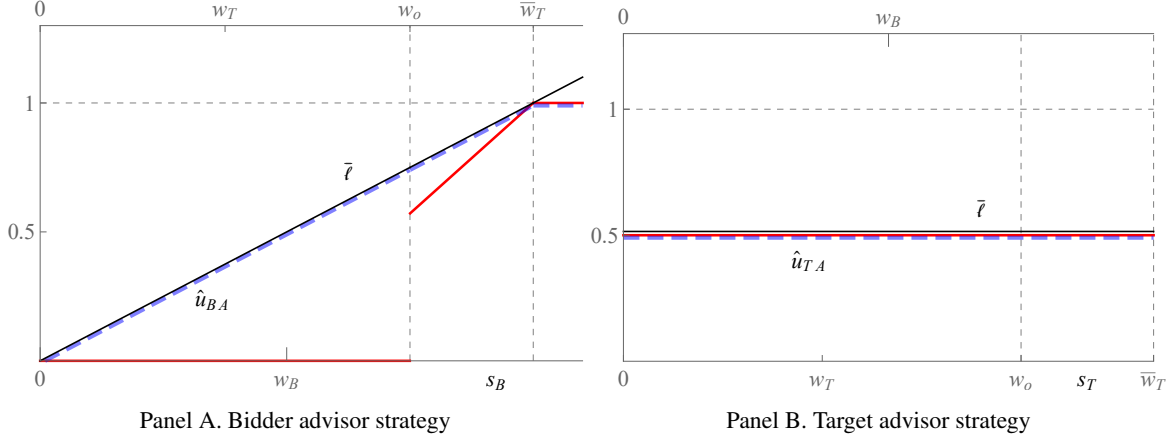


Figure 6: The red line depicts the advisor payoff (Bidder advisor in the left panel and target advisor in the right panel) as function of the value of the target firm (horizontal axis) when  $\bar{w}_T < u$ . The blue line shows the upper envelope for the payoff function. The bidder and the target are assumed to follow their equilibrium strategies. Both panels assume  $\bar{w}_T = 4$ ,  $w_T = 1.5$ ,  $w_B = 2$ ,  $f = 1$ , and  $w_o = 3$ .

#### 6.4 An alternative information structure

We have focused on the case where a target advisor produces information *only* about an alternative to an attempted acquisition. We have shown that, in this case, both the target and bidder benefit if the target advisor is incentivized to ensure that the acquisition fails. It is possible that target advisors also produce information about synergies from an acquisition. Moreover, commentators often argue that, instead of opposing bidders, target advisors appear to side them. We now extend our baseline model to examine a setting in which the target advisor produces information about the target's value if the bid is successful, and explain why this sort bid-promoting behavior by the target advisor may benefit both the target and the bidder.

Suppose that, unlike our baseline model, the target advisor's signal is also informative about the target's value if the acquisition succeeds. Specifically, suppose that the post-acquisition is  $\tilde{w}$ , and equals the sum of the two random variables  $\tilde{w}_B$  and  $\tilde{w}_T$ , i.e.,  $\tilde{w} = \tilde{w}_B + \tilde{w}_T$ . Thus, the target advisor's signal  $\tilde{s}_T$ , by informing agents about  $\tilde{w}_T$ , also informs them about the target's post-acquisition value. Let us also assume that, when  $s_T > 0$ , with probability  $\rho \in (0, 1)$  the target's value under the alternative to the acquisition is  $w_o + \delta \tilde{s}_T$ , where  $\delta \in (0, 1)$ . Hence, while the target advisor's signal remains informative about the target's value under the alternative, it is more informative about the target's post-acquisition value.

We continue to assume that the acquisition will not occur in the absence of the two advisors, i.e.,  $w_T + w_B < w_o$ . To simplify the analysis and reduce the number of cases we need to consider, we will assume that  $\delta < \rho$ . We will also assume that  $\bar{w}_B + w_T < w_o$ , and thus the acquisition cannot occur without a positive



signal from the target advisor.

Consider the target advisor's behavior if, just as in our baseline setting, the target advisor is incentivized to oppose the acquisition because it is paid a fee only if the acquisition fails. Given this compensation structure and the necessity of a sufficiently positive signal from the target advisor for the bid to succeed, it is optimal for the target advisor to adopt a simple and reliable signaling strategy: Produce an uninformative signal whose distribution has a unit mass at  $w_T$ . By assumption  $s_B + w_T \leq \bar{w}_B + w_T < w_o$ , thus the acquisition will be blocked regardless of the signal produced by the bidder advisor. Hence, if the target advisor is incentivized to block the acquisition, the acquisition will not occur and both target and bidder will receive zero payoffs.

Suppose instead that the target advisor receives a conditional fixed fee  $f$  that is paid only if the target accepts the bidder's offer. We will refer to this as a *promote the bid* compensation scheme. The following result describes the target advisor's behavior under this compensation scheme and its effect on the acquisition.

*Result 4.* Suppose that the target's post-acquisition value is  $\tilde{w} = \tilde{w}_T + \tilde{w}_B$  and  $\bar{w}_B + w_T < w_o$  so the acquisition cannot occur without a positive signal from the target advisor. Let  $\underline{u}_T = w_o + 2f$ . Then, if the target adopts a promote the bid compensation scheme for its advisor, in any SPNE the target advisor will adopt the simple signaling strategy  $F_T^{0, (\underline{u}_T - s_B)/(1-\delta)}$  in response to a bidder advisor signal that satisfies  $(\underline{u}_T - s_B)/(1-\delta) \leq \bar{w}_T$ , and there is a positive probability the acquisition will succeed and both target and bidder will receive positive payoffs.

With a promote the bid compensation scheme, the target advisor wants the bid to succeed. As the above result demonstrates, to attain this goal, when it is feasible for the target advisor to produce a signal that can effect the acquisition, the target advisor's best response is a simple signaling strategy that will do so. To maximize the probability that the acquisition will occur, the bidder advisor will pick the simple signaling strategy  $F_B^{0, \underline{u}_T/2}$ . When  $s_B = \underline{u}_T/2$ , given the target advisor's best response, the target advisor will pick the strategy  $F_T^{0, \underline{u}_T/(2(1-\delta))}$ . These strategies make efficient use of the advisors' signaling capacities because they ensure that the target's value under a successful bid just matches its value if a viable alternative emerges, the threshold that will ensure a successful bid.

The acquisition occurs when both advisors produce high signals. If an alternative to the status-quo does not emerge, the bidder will offer  $P = w_o + f$  and the target will accept. The bidder will earn a positive profit since  $s_B + s_T > P - f$ , while the target will receive its status-quo value of  $w_o$ . If there is a feasible alternative, the bidder will offer  $P = w_o + \delta s_T + f$  and the target will accept. The bidder will earn no profit but the target

will receive more than its status-quo value. Thus, both the bidder and target stand to benefit from a promote the bid compensation scheme for the target advisor.

## **7 Conclusion**

In this paper we examined a paradox: Why do bidding firms compensate their advisors based on acquisition success rather than the economic value generated by the acquisition. We showed that if bidder compensation is viewed as one part of a broader M&A ecology that includes target firms and target advisors, the effect of bidder advisor compensation schemes on M&A outcomes depends not only on the effect bidder compensation has on bidder-advisor actions but also on the effect bidder compensation has, through its effect on the actions of bidders, on target-advisor actions. Thus, mis-alignment between bidder-advisor compensation and the welfare of the bidding firm need not lower the bidding firm's welfare. In fact, we showed that when both bidder and target advisors have compensation contracts that misalign their incentives with those of their principals, the dialectic between these competing biased advisors can reveal the value-add potential of the merger to both the bidder and the target. Moreover, from the perspective of information production, biasing advisors and misaligning their incentives with their principals can be optimal.

We next showed that how aligning target advisor compensation with the target's payoff from the merger can be both unattractive to the target and reduce overall efficiency. Alignment can change target advisor optimal strategies and by so doing change bidder optimal responses in a way that reduces the aggregate informativeness of advisor reports and thus lowers target welfare. Thus, as well as resolving the bidder-advisor compensation paradox we also rationalize some features of target advisor compensation schemes that are viewed as puzzling or inconsistent with boards acting in shareholders' interests such as rewarding advisors simply for thwarting mergers or not conditioning target rewards on the bidder offer.

More generally, we think that the basic insight of this paper—the analysis of the effects of compensation provided to competing experts, e.g. lawyers in civil law suits, advisors to creditors and debtors in insolvency proceedings, depend not only on the direct effect of incentives on a principal's agent but also on the effect the package has on the actions of the rival principal's agent. Hence, compensation designs that are optimal from the perspective of simple principal-agent models may not be optimal when viewed in the larger context of expert competition on behalf of their principals.

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## Appendix

**Proof of Lemma 1.** The target moves in stage 4, and thus the target observes the realized signals of the two advisors and the bidder's offer. If the target accepts the status-quo option, the target receives the status-quo option's value less the fee paid the target advisor,  $w_o - f$ . If the target accepts the bidder's offer, the target receives the acquisition price,  $P$ . If the target opts for the alternative, the target receives the alternative value less the advisor's fee,  $s_T - f$ . Let  $u_T$  represent utility of the target and let  $BR_T$  represent the set of target best responses. Then

$$u_T(r|s_B, s_T, P) = \begin{cases} w_o - f & r = o \\ s_T - f & r = T \\ P & r = B \end{cases}, \quad BR_T(s_B, s_T, P) = \{r : u_T(r|s_B, s_T, P) = \max[w_o - f, s_T - f, P]\}. \quad (\text{A-1})$$

Now consider the payoff to the bidder if the bidder makes the offer  $P$ . If the offer is accepted, the payoff equals the acquisition value net of the bidder advisor's fee and the acquisition price. If the offer is rejected, the bidder's payoff equals 0. Thus, the utility of the bidder,  $u_B$ , is given by

$$u_B(P|s_B, s_T, r) = \begin{cases} s_B - f - P & r = B \\ 0 & r = T \text{ or } o \end{cases}$$

Define an accepted offer as a bidder offer that will be accepted by the target, i.e.,  $P > \max[w_o - f, s_T - f]$ .

Next note that the supremum of the bidder's payoff over accepted offers is

$$\sup_{P \geq 0} \{s_B - f - P : P > \max[w_o - f, s_T - f]\} = \min[s_B - w_o, s_B - s_T].$$

The supremum is positive if and only if  $s_B > \max[s_T, w_o]$  and is attained by the offer  $P = \max[s_T, w_o] - f$ .

Suppose first the supremum is positive,  $s_B > \max[s_T, w_o]$ . Then, in an SPNE, the bidder will make an offer which the target accepts. If the target rejects the bidder's offer of  $P = \max[s_T, w_o] - f$ , the bidder cannot attain the supremum, which leaves the set of bidder's best replies empty. This cannot happen in an SPNE. Therefore, in an SPNE, the target accepts the bidder's offer  $P = \max[s_T, w_o] - f$  when  $s_B > \max[s_T, w_o]$ .

Suppose that, instead,  $s_B < \max[s_T, w_o]$ . Then, any offer that produces a non-negative bidder payoff will be rejected by the seller. Finally, suppose that  $s_B = \max[s_T, w_o]$ . Then, the supremum is zero and, the only offer that achieves the supremum and may be accepted by the target is  $P = \max[s_T, w_o] - f$ . These are the

results in Lemma 1.  $\square$

**Proof of Lemma 2.** The target advisor moves after observing the bidder's realized signal  $s_B$ . The target advisor's objective is to choose a signal distribution that maximizes the probability that the acquisition will be rejected.

Consider first the case where  $s_B \geq w_o$  and  $s_B < \bar{w}_T$ . Suppose also that, when  $s_B = s_T$ , the target accepts the alternative to the acquisition,  $r^* = T$ . With this response strategy, the acquisition is rejected if and only if  $s_T \geq s_B$ . Thus, we can state the target advisor's problem as choosing a feasible signal distribution,  $F_T$ , that maximizes  $\mathbb{P}[\tilde{s}_T \geq s_B]$ .

We will now show that the simple distribution,  $F_T^{0,s_B}$  maximizes  $\mathbb{P}[\tilde{s}_T \geq s_B]$ . Note that, if the target employs the simple distribution,  $F_T^{0,s_B}$ , then the acquisition is rejected with probability  $\mathbb{P}[\tilde{s}_T \geq s_B] = w_T/s_B$ . For a general feasible signaling strategy,  $\tilde{s}_T \stackrel{d}{\sim} F_T$ , an upper bound on the probability of acquisition rejection can be derived as follows: The expectancy constraint on signaling strategies, and the law of conditional expectations imply that,

$$w_T = \mathbb{E}[\tilde{s}_T] = \mathbb{E}[\tilde{s}_T | \tilde{s}_T < s_B] \mathbb{P}[\tilde{s}_T < s_B] + \mathbb{E}[\tilde{s}_T | \tilde{s}_T \geq s_B] \mathbb{P}[\tilde{s}_T \geq s_B] \geq \mathbb{E}[\tilde{s}_T | \tilde{s}_T \geq s_B] \mathbb{P}[\tilde{s}_T \geq s_B].$$

Hence,

$$\mathbb{P}[\tilde{s}_T \geq s_B] \leq \frac{w_T}{\mathbb{E}[\tilde{s}_T | \tilde{s}_T \geq s_B]} \leq \frac{w_T}{s_B}.$$

Thus, no signaling distribution produces a larger target advisor payoff than  $F_T^{0,s_B}$ . Moreover these inequalities can be satisfied as equalities only when  $\mathbb{E}[\tilde{s}_T | \tilde{s}_T < s_B] \mathbb{P}[\tilde{s}_T < s_B] = 0$  and  $\mathbb{E}[\tilde{s}_T | \tilde{s}_T \geq s_B] = s_B$ , i.e. the signal distribution is  $F_T^{0,s_B}$ . Therefore, in any equilibrium in which  $r^* = T$  whenever  $s_T \geq s_B$  the unique optimal target signaling distribution is  $F_T^{0,s_B}$ .

Now suppose that, when  $s_B = s_T$  and  $s_B < \bar{w}_T$ ,  $r^* \neq T$ . Consider a sequence of simple distributions,  $F_T^{0,s^n}$ , where  $s^n$  is defined as follows,  $s^n = (1/n)\bar{w}_T + ((n-1)/n)s_B$ . Note that  $s^n \in (s_B, \bar{w}_T]$  and  $\mathbb{P}[\tilde{s}_T^{0,s^n} > s_B] \rightarrow w_T/s_B$  as  $n \rightarrow \infty$ . This implies that the supremum of the target advisor's payoff exceeds any payoff that the target advisor can attain from a feasible signalling strategy. Thus, if  $r^* \neq T$ , the set of target best replies would be empty. These observations, combined with Lemma 1, yields item (a) in Lemma 2.

A virtually identical argument characterizes target offer selection when  $s_B < w_o$  and yields item (b) in Lemma 2  $\square$

**Proof of Lemma 3.** The bidder advisor's objective is to choose a signal distribution that maximizes the probability that the acquisition will be accepted. Observe first that, for  $s_B \geq w_o$  and  $s_B < \bar{w}_T$ , the

target advisor responds with  $F_T^{0,s_B}$ , and thus the probability of acceptance is  $1 - w_T/s_B$ , while for  $s_B > \bar{w}_T$ , acceptance is certain. Thus, the bidder advisor's equilibrium payoff is given by

$$u_{BA}^o(s_B) = \begin{cases} u_{BA}^*(s_B) & s \neq \bar{w}_T \\ f p & s = \bar{w}_T, \end{cases} \quad (\text{A-2})$$

where  $p \in [0, 1]$ . Let

$$\hat{s}_B \in \underset{s_B \in [w_o, \bar{w}_T]}{\text{Argmax}} \frac{w_B}{s_B} u_{BA}^*(s_B).$$

Note that, since  $\max_{s_B \in [\bar{w}_T, \bar{w}_B]} \frac{u_{BA}^*(s_B)}{s_B} = \frac{u_{BA}^*(\bar{w}_T)}{\bar{w}_T}$ , we can conclude that

$$\hat{s}_B \in \underset{s_B \in [w_o, \bar{w}_B]}{\text{Argmax}} \frac{w_B}{s_B} u_{BA}^*(s_B).$$

The functions  $u_{BA}^o(w_T)$  and  $u_{BA}^*(w_T)$  coincide everywhere except possibly at  $s = \bar{w}_T$ . Suppose first that, given the equilibrium signal  $\hat{s}_B^*$  with distribution  $F_B$ , the expected payoffs under both functions are the same:

$$\int_0^{\bar{w}_B} u_{BA}^o(s_B) dF_B(s_B) = \int_0^{\bar{w}_B} u_{BA}^*(s_B) dF_B(s_B). \quad (\text{A-3})$$

This equivalence immediately implies part (ii) of Lemma 3. Moreover, the bidder advisor's expected equilibrium payoff is

$$\begin{aligned} \int_0^{\bar{w}_B} u_{BA}^*(s_B) dF_B(s_B) &= \int_0^{\bar{w}_B} \frac{s_B}{w_B} \left[ \frac{w_B}{s_B} u_{BA}^*(s_B) \right] dF_B(s_B) \leq \int_0^{\bar{w}_B} \frac{s_B}{w_B} \left[ \frac{w_B}{\hat{s}_B} u_{BA}^*(\hat{s}_B) \right] dF_B(s_B) \\ &= \frac{1}{\hat{s}_B} u_{BA}^*(\hat{s}_B) \int_0^{\bar{w}_B} s_B dF_B(s_B) = \frac{w_B}{\hat{s}_B} u_{BA}^*(\hat{s}_B). \end{aligned}$$

Part (i) then follows by observing that the upper bound on the bidder advisor's payoff is attained by the simple distribution  $F_B^{0,\hat{s}_B}$ .

Now we will show, by contraposition, that it is not possible for (A-3) to be violated in an SPNE. Because  $u_{BA}^o(w_T)$  is never larger than  $u_{BA}^*(w_T)$ , if (A-3) is violated, then

$$\int_0^{\bar{w}_B} u_{BA}^o(s_B) dF_B(s_B) < \int_0^{\bar{w}_B} u_{BA}^*(s_B) dF_B(s_B), \quad (\text{A-4})$$

Given that  $u_{BA}^o(s_B)$  and  $u_{BA}^*(s_B)$ , coincide everywhere but, perhaps, at  $\bar{w}_T$ , the inequality implies that signal realization  $\bar{w}_T$  has strictly positive probability of occurring in equilibrium,  $\Pr(\hat{s}_B = \bar{w}_T) = q > 0$ .

Consider signal strategies  $\tilde{s}_B^a$  that differ from the equilibrium signal only in that the probability of the outcome  $\bar{w}_T$  is reduced by  $q$  while the probability of outcome  $a \in (\bar{w}_T, \bar{w}_B]$  is increased by the same amount



$q$ . This change means that the distribution  $F_B^a$  for signal  $\tilde{s}_B^a$  is given by

$$F_B^a(s_B) = \begin{cases} F_B(s_B) & s_B \in [0, \bar{w}_T) \cup [a, \bar{w}_B] \\ F_B(s_B) - q & s_B \in [\bar{w}_T, a). \end{cases} \quad (\text{A-5})$$

Since bidder advisor's payoff functions  $u_{BA}^o(w_T)$  and  $u_{BA}^*(w_T)$  coincide everywhere except for maybe at  $s = \bar{w}_T$ , and the probability that signal  $\tilde{s}_B^a$  takes the value of  $\bar{w}_T$  is almost surely equal to zero, we can conclude that

$$\int_0^{\bar{w}_B} u_{BA}^o(s_B) dF_B^a(s_B) = \int_0^{\bar{w}_B} u_{BA}^*(s_B) dF_B^a(s_B).$$

Moreover, by definition of SPNE, the equilibrium signal  $\tilde{s}_B$  with distribution  $F_B(s_B)$  at least weakly dominates any other strategy, including strategies  $\tilde{s}_B^a$  for any  $a \in (\bar{w}_T, \bar{w}_B]$ . Therefore, we have

$$\int_0^{\bar{w}_B} u_{BA}^o(s_B) dF_B(s_B) \geq \sup_{a \in (\bar{w}_T, \bar{w}_B]} \int_0^{\bar{w}_B} u_{BA}^o(s_B) dF_B^a(s_B) = \sup_{a \in (\bar{w}_T, \bar{w}_B]} \int_0^{\bar{w}_B} u_{BA}^*(s_B) dF_B^a(s_B). \quad (\text{A-6})$$

Since the definition of  $u_{BA}^*(s_B)$  given in (3) implies that

$$\lim_{a \rightarrow \bar{w}_T} \int_0^{\bar{w}_B} u_{BA}^*(s_B) dF_B^a(s_B) = \int_0^{\bar{w}_B} u_{BA}^*(s_B) dF_B(s_B),$$

we can further conclude that

$$\sup_{a \in (\bar{w}_T, \bar{w}_B]} \int_0^{\bar{w}_B} u_{BA}^*(s_B) dF_B^a(s_B) \geq \int_0^{\bar{w}_B} u_{BA}^*(s_B) dF_B(s_B). \quad (\text{A-7})$$

Inequalities (A-6) and (A-7) combined contradict (A-4).  $\square$

The following result is used repeatedly in the derivation of the equilibrium signalling strategies.

**Lemma A-1.** *Suppose signal  $s_j$  with  $j \in \{B, T\}$  satisfies the expectancy condition (Definition 1) and advisor  $j$  expects the utility  $u_j(s_j)$ . Suppose also that a linear function  $\ell(s_j)$  satisfies  $\ell(s_j) \geq u_j(s_j)$  for all feasible  $s_j$ , and there exist signal levels  $a < w_j < b$  such that  $\ell(s_j) = u_j(s_j)$ ,  $s \in \{a, b\}$ . Then,*

- (a)  $E[u_j(s)] \leq \ell(w_j)$  and the equality obtains if signal  $s_j$  has a simple distribution  $F_j^{a,b}$ .
- (b) No other signal distribution generates results in  $E[u_j(s_j)] = \ell(E[w_j])$  if  $\ell(s_j) = u_j(s_j)$  only if  $s_j \in \{a, b\}$ .

*Proof.* (a) For any feasible signaling distribution,  $F_j$ ,

$$\ell(E[s_j]) = \int_{-\infty}^{\infty} \ell(s_j) dF_j(s_j) \geq \int_{-\infty}^{\infty} u_j(s_j) dF_j(s_j), \quad (\text{A-8})$$

where the equality follows from the expectancy condition (Definition 1) and the inequality follows from the monotonicity of integration. Thus,  $\ell(E[s])$  is an upper bound on the advisor's payoff. This upper bound is reached, that is  $\ell(E[s_j]) = u_j(s_j)$ , when the signal is limited to two values,  $s_j = a$  or  $s_j = b$ .

(b) Since the simple distribution  $F_j^{a,b}$  is the only distribution with positive weights on just  $a$  and  $b$ , it is the only feasible distribution that attains the upper bound if equality  $\ell(s) = u_j(s_j)$  holds only for  $s_j \in \{a, b\}$ .  $\square$

**Proof of Proposition 4.** In an SPNE  $(i^*, F_B^*, F_T^*, P^*, r^*)$ , the bidder will rationally choose to investigate,  $i^* = \text{yes}$ , only if the expected benefit from the investigation exceeds the cost  $C_0$ . The expected benefit depends on the likelihood  $\pi$  of the investigation revealing  $\{0, \bar{w}_B\}$ , as well as the ability of the bidder advisor to identify a profitable acquisition,

$$C_0 \leq \pi E[I_{r^*=B}(\tilde{w}_B - P^*)], \quad (\text{A-9})$$

where the indicator function  $I_{r^*=B}$  equals 1 if  $r^* = B$  and equals zero otherwise, and the expectation is evaluated given the equilibrium strategies chosen by all agents.  $\square$

**Proof of Proposition 1.** Consider the bidder advisor's signaling strategy. Lemma 3 shows that the bidder advisor's payoff is given by (3). The bidder advisor's objective is to choose a signal distribution that will maximize  $u_{BA}^*(s_B)$ . Let  $\ell(s_B) := f s_B / \bar{w}_T$ . Note that  $f s_B / \bar{w}_T \geq u_{BA}^*(s_B)$ , for  $s_B \in [0, \bar{w}_B]$ . This assertion is obvious when  $s_B \in [0, w_o) \cup [\bar{w}_T, \bar{w}_B]$ . So consider the case where  $s_B \in [w_o, \bar{w}_T)$  and thus  $u_{BA}^*(s_B) = f(1 - (w_T / s_B))$ . Simple algebra shows that

$$f \frac{s_B}{\bar{w}_T} - f \left( 1 - \frac{w_T}{s_B} \right) = \left( \frac{f}{s_B \bar{w}_T} \right) \left( \left( s_B - \frac{\bar{w}_T}{2} \right)^2 + \frac{1}{4} \bar{w}_T (4w_T - \bar{w}_T) \right) > 0, \quad (\text{A-10})$$

when  $4w_T > \bar{w}_T$ . Thus, we can conclude that  $f s_B / \bar{w}_T \geq u_{BA}^*(s_B)$ , for  $s_B \in [0, \bar{w}_B]$ .

We have shown that  $\ell(s_B) \geq u_{BA}^*(s_B)$ , for  $s_B \in [0, \bar{w}_B]$ , and the equality holds only for  $s_B = 0$  or  $s_B = \bar{w}_B$ . According to Lemma A-1, we then can conclude that the simple distribution  $F_B^{0, \bar{w}_T}$  is the only distribution that attains the upper bound and maximizes  $\mathbb{E}[u_{BA}^*(\tilde{s}_B)]$ .

Inequality (4) is obtained from (A-9) by evaluating the expected payoff to the bidder on the equilibrium path following a successful initial investigation.  $\square$

**Proof of Proposition 2.** Proposition 2 differs from Proposition 1 because it does not impose the baseline hypothesis,  $4w_T > \bar{w}_T$ . Lemma 1 does not rely on the baseline hypothesis, so it remains the case that in any SPNE if  $s_B > \max[s_T, w_o]$ , then  $r^* = B$  and the bidder offer is  $P^* = \max[s_T, w_o] - f$ ; if  $s_B < \max[s_T, w_o]$ , the target rejects the bidder's offer, i.e.,  $r^* \neq B$ . Similarly, Lemma 2 does not rely on the baseline hypothesis

and continues to hold. Thus, in any SPNE, after observing  $s_B \in [w_o, \bar{w}_T)$  the target advisor responds with  $F_T^* = F_T^{0, s_B}$ , and  $s_B \leq s_T \implies r^* = T$  and  $s_B > s_T \implies r^* = B$ . Moreover, the probability that the bidder's offer is accepted conditional on bidder advisor's signal  $s_B$  is still given by  $u_{BA}^*(s_B)$ , described in (3). Thus, the signal distribution that achieves the upper bound on the unconditional expected probability  $E[u_{BA}^*(s_B)]$  is the bidder advisor's optimal choice.

We will show that an upper bound on the bidder advisor's payoff  $u_{BA}^*(s_B)$  is (a)  $f s_B / \bar{w}_T$  if  $w_o / \bar{w}_T \geq 1 - w_T / w_o$ ; (b)  $f(1 - w_T / w_o)(s_B / w_o)$  if  $w_o / \bar{w}_T < 1 - w_T / w_o$  and  $w_T < w_o / 2$ ; and (c)  $f s_B / 4 w_T$  if  $w_o / \bar{w}_T < 1 - w_T / w_o$  and  $w_T \geq w_o / 2$ . In each case, we will identify the signal distribution that reaches the implied upper bound on the expected probability,  $E[u_{BA}^*(s_B)]$ , and thus identify the bidder advisor's optimal choice.

**Case (a):**  $w_o / \bar{w}_T \geq 1 - w_T / w_o$ . Let  $\ell(s_B) := f s_B / \bar{w}_T$ . Verifying that  $\ell(s_B)$  is an upper bound for  $u_{BA}^*(s_B)$  is straightforward for  $s_B < w_o$ , since  $\ell(s_B) = u_{BA}^*(s_B) = 0$ , and for  $s_B \geq \bar{w}_T$  since  $u_{BA}^*(s_B) = f < \ell(s_B) = f s_B / \bar{w}_T$  if  $s_B > \bar{w}_T$  and  $u_{BA}^*(s_B) = \ell(s_B)$  if  $s_B = \bar{w}_T$ . For  $s_B \in [w_o, \bar{w}_T)$ , the difference between  $\ell(s_B)$  and  $u_{BA}^*(s_B)$  is given by

$$\frac{f s_B}{\bar{w}_T} - f \left(1 - \frac{w_T}{s_B}\right) = \left(\frac{f}{s_B \bar{w}_T}\right) \left( \left(s_B - \frac{\bar{w}_T}{2}\right)^2 + \frac{1}{4} \bar{w}_T (4 w_T - \bar{w}_T) \right), \quad (\text{A-11})$$

In this expression,  $1/(s_B \bar{w}_T) > 0$  and  $((s_B - \bar{w}_T/2)^2 + \bar{w}_T(4 w_T - \bar{w}_T)/4)$  is increasing in  $s_B$ . Thus, the expression is positive for  $s_B \in [w_o, \bar{w}_T)$  if and only if it is positive at  $s_B = w_o$ . That is,  $\ell(s_B)$  is an upper bound for  $u_{BA}^*(s_B)$  if and only if  $w_o / \bar{w}_T \geq 1 - w_T / w_o$ . This condition can also be expressed as

$$\frac{w_T}{\bar{w}_T} \geq \frac{w_T}{w_o} \left(1 - \frac{w_T}{w_o}\right).$$

Since  $\ell(s_B)$  equals  $u_{BA}^*(s_B)$  when  $s_B = 0$  and  $s_B = \bar{w}_T$ , Lemma A-1 implies that  $F_B^{0, \bar{w}_T}$  is bidder advisor's optimal signaling strategy. Since both advisor's signaling strategies are unchanged from the baseline case, as are bidder and target strategies, the claim about total payoff in Proposition 1 continues to hold.

**Case (b):**  $w_o / \bar{w}_T < 1 - w_T / w_o$  and  $w_T < w_o / 2$ . Define  $\ell(s_B) := f(1 - w_T / w_o)(s_B / w_o)$ . We will show that  $\ell(s_B) - u_{BA}^*(s_B)$  is positive. This is obvious for  $s_B \in [0, w_o)$  since  $u_{BA}^*(s_B) = \ell(s_B) = 0$ . For  $s_B \in [w_o, \bar{w}_T)$ , the difference between  $\ell(s_B)$  and  $u_{BA}^*(s_B)$  can be stated as

$$f \left(1 - \frac{w_T}{w_o}\right) \frac{s_B}{w_o} - f \left(1 - \frac{w_T}{s_B}\right) = f \left(1 - \frac{w_T}{s_B} - \frac{w_T}{w_o}\right) \left(\frac{s_B}{w_o} - 1\right) > f \left(1 - \frac{2 w_T}{w_o}\right) \left(\frac{s_B}{w_o} - 1\right) > 0.$$

For  $s_B \in [\bar{w}_T, \bar{w}_B]$ , the difference between  $\ell(s_B)$  and  $u_{BA}^*(s_B)$  can be stated as

$$f \left(1 - \frac{w_T}{w_o}\right) \frac{s_B}{w_o} - f \geq f \left(1 - \frac{w_T}{w_o}\right) \frac{\bar{w}_T}{w_o} - f > 0$$

The last inequality above follows because this is the hypothesis for this case. Since  $\ell(s_B) = u_{BA}^*(s_B)$  for  $s_B = 0$  and  $s_B = w_o$ , Lemma A-1 implies that the bidder advisor's optimal strategy is  $F_B^{0, w_o}$ . The total payoff expression follows from the optimal bidder and target strategies described in Lemma 1 and the target advisor strategy described in Lemma 2.

**Case (c):**  $w_o/\bar{w}_T < 1 - w_T/w_o$  **and**  $w_T \geq w_o/2$ . Define  $\ell(s_B) := f s_B / (4w_T)$ . We will show that  $\ell(s_B) - u_{BA}^*(s_B) \geq 0$ . This is obvious for  $s_B \in [0, w_o)$  since  $u_{BA}^*(s_B) = \ell(s_B) = 0$ . For  $s_B \in [w_o, \bar{w}_T]$ , we have

$$f \frac{s_B}{4w_T} - u_{BA}^*(s_B) = f \frac{s_B}{4w_T} - f \left( 1 - \frac{w_T}{s_B} \right) = f \frac{(s_B - 2w_T)^2}{4s_B w_T} \geq 0.$$

Finally, for  $s_B \in [\bar{w}_T, \bar{w}_B]$ , the inequality follows from observing that  $w_o/\bar{w}_T < 1 - w_T/w_o$  implies  $4w_T < \bar{w}_T$ , and thus,  $f s_B / (4w_T) \geq f \bar{w}_T / (4w_T) > f = u_{BA}^*(s_B) \geq 0$ . Since  $\ell(s_B) = u_{BA}^*(s_B)$  for  $s_B = 0$  and  $s_B = 2w_T$ , and in this case we have  $w_B < w_o < 2w_T$ , Lemma A-1 implies that the bidder advisor's optimal choice is  $F_B^{0, 2w_T}$ . The total payoff expression follows from the optimal bidder and target strategies described in Lemma 1 and the target advisor strategy described in Lemma 2.

Inequality (5) is obtained from (A-9) by evaluating the expected payoff to the bidder on the equilibrium path following a successful initial investigation.  $\square$

**Proposition A-1.** *Suppose that the baseline hypothesis,  $4w_T > \bar{w}_T$ , is satisfied. Then*

*In any subgame perfect Nash equilibrium (SPNE)*

- (a) *Lemmas 1 and 2, as well as items a and (b) of Proposition (1) still hold.*
- (b) *In response to observing any bidder advisor signal  $s_B \in [0, w_o)$ , the target advisor chooses the strategy with the simple distribution,  $F_T^{0, w_o}$  of sending either  $s_T = w_o$  or  $s_T = 0$ .*

*In any payoff dominant SPNE*

- (d) *The sum of bidder and target payoffs equals*

$$Total^{alt} = Total^{BP} - \left( 1 - \frac{w_B}{\bar{w}_T} \right) \frac{w_T}{\bar{w}_T} \bar{w}_T - w_o$$

**Proof of Proposition A-1.** Under the alternative compensation, if the target chooses the status-quo it pays no fee and receives the payoff  $w_o$ . Consequently, the target will accept a bid if  $P > \max[w_o, s_T - f]$ .

The bidder's payoff from offer  $P$  is  $s_B - f - P$  if the offer is accepted, and 0 otherwise. Repeating the arguments we use to establish Lemma 1 allows us to conclude that, in an SPNE, the target accepts the

bidder's offer  $P = \max[s_T - f, w_o]$  when  $s_B > \max[s_T, w_o + f]$ . Further, when  $s_B < \max[s_T, w_o + f]$ , the target rejects any offer that produces a non-negative bidder payoff.

Now consider the target advisor's strategy in response to the bidder advisor's signal  $s_B$ . If  $s_B \in [w_o + f, \bar{w}_T]$ , the status-quo doesn't matter as is the case under the baseline compensation scheme. Thus, the proofs of Lemmas 1 and 2 still hold under the alternative compensation scheme. Therefore, the statements of Lemmas 1 and 2 also hold, implying that  $F_T^{0, s_B}$  maximizes the target advisor's payoff, and when  $s_B = s_T$ , the target selects the alternative,  $r^* = T$ .

If  $s_B < w_o + f$ , the simple distribution,  $F_T^{0, w_o + f}$  maximizes the target advisor's payoff. To see this first note that, if the target employs the simple distribution,  $F_T^{0, w_o + f}$ , then the alternative is accepted with probability  $\mathbb{P}[\tilde{s}_T \geq s_B] = w_T / (w_o + f)$ . For a general feasible signaling strategy,  $\tilde{s}_T \stackrel{d}{\sim} F_T$ ,

$$\mathbb{P}[\tilde{s}_T \geq w_o + f] \leq \frac{w_T}{\mathbb{E}[\tilde{s}_T | \tilde{s}_T \geq w_o + f]} \leq \frac{w_T}{w_o + f}.$$

Thus, no signaling distribution other than  $F_T^{0, w_o + f}$  produces the same or larger target advisor payoff, implying that  $F_T^{0, w_o + f}$  is the unique optimal signaling distribution for the target advisor.

We have established that, when the bidder advisor's signal  $s_B$  satisfies  $w_o + f \leq s_B < \bar{w}_T$ , the target advisor will play the simple strategy  $F_T^{0, s_B}$ , and the bidder's offer will only be selected if  $s_T = 0$ , which occurs with probability  $1 - (w_T / s_B)$ . When  $s_B < w_o + f$ , the bidder advisor's offer will never be selected. When  $s_B \geq \bar{w}_T$  and  $s_B > s_T$ , the bidder advisor's offer will be accepted in any SPNE. Following the arguments in the proof of Proposition 1, we can conclude that  $s_T = s_B = \bar{w}_T$  results in  $P = \bar{w}_T - f$  and the target accepting the bidder's offer. Therefore, we can express the bidder advisor's payoff with  $u_{BA}^{alt}$ , where

$$u_{BA}^{alt}(s_B) := \begin{cases} 0 & s_B \in [0, w_o + f) \\ f(1 - (w_T / s_B)) & s_B \in [w_o + f, \bar{w}_T] \\ f & s_B \in [\bar{w}_T, \bar{w}_B]. \end{cases} \quad (\text{A-12})$$

Note that  $u_{BA}^{alt}(s_B)$  differs from the bidder's payoff in the baseline specification, expression (3), because the bid will never be accepted if  $s_B \in [0, w_o + f)$  as opposed to  $s_B \in [0, w_o)$ . Noting that this doesn't change the upper bound for the payoff function of the fact that the upper bound is attained only when  $s_B = 0$  and  $s_B = \bar{w}_T$ , from Lemma A-1, it follows that  $F_B^{0, \bar{w}_T}$  remains the unique signaling distribution that maximizes  $\mathbb{E}[u_{BA}(\tilde{s}_B)]$ .  $\square$

**Lemma A-2.** Function  $g(x)$ , defined as

$$g(x) := \frac{\bar{w}_T + f_B - w_B - x}{\bar{w}_T + f_B - x}x,$$

is strictly increasing and strictly concave for  $x \in (0, x^+)$ , where  $x^+ \equiv \bar{w}_T + f_B - \sqrt{(\bar{w}_T + f_B)w_B}$ .

**Proof of Lemma A-2.** Note that  $g(0) = 0$ , and the first and the second order derivatives can be computed as

$$g'(x) = \frac{(\bar{w}_T + f_B - x)^2 - w_B(\bar{w}_T + f_B)}{(\bar{w}_T + f_B - x)^2},$$

$$g''(x) = -\frac{1(\bar{w}_T + f_B)w_B}{(\bar{w}_T + f_B - x)^3} < 0.$$

The negative sign of the second order derivative combined with the observations that  $g'(0) > 0$  and  $g'(x^+) = 0$  imply that the first order derivative is positive for  $x \in (0, x^+)$ .  $\square$

**Corollary A-1.** For  $x$  that satisfy  $g(x) \leq \bar{g} \equiv \frac{w_o}{w_o} (\sqrt{\bar{w}_T + f_B} - \sqrt{w_B})^2$ , we can define  $h(x)$  as

$$h(x) := g^{-1} \left( \frac{w_o}{w_T} g(x) \right).$$

**Proof of Corollary A-1.** According to Lemma A-2,  $g(x)$  is increasing and concave on the interval  $x \in (0, x^+)$ , and thus  $g^{-1}(s)$  exists on this interval.  $\square$

**Lemma A-3.** If we have  $f_T \leq \bar{g}$ , then  $f_A \geq \frac{w_o}{w_T} f_T$ .

**Proof of Lemma A-3.** Using function  $g(x)$ , we can rewrite the target advisor participation constraints (A-14) and (A-16) as

$$g(f_T) = \frac{w_T}{w_o + f_a} g(f_a) = c$$

Define  $\hat{f}_a$  as the solution to

$$\frac{w_T}{w_o + f_a} g(f_a) = \frac{w_T}{w_o} g(\hat{f}_a)$$

Since we have  $\frac{w_T}{w_o + f_a} < \frac{w_T}{w_o}$ , the above implies that  $g(f_a) > g(\hat{f}_a)$ . When  $f_a \in (0, x^+)$ , function  $g(x)$  is strictly increasing, which then allows us to conclude that  $f_a > \hat{f}_a$ .

By definition, we have  $g(f_T) = \frac{w_T}{w_o} g(\hat{f}_a)$ . The definition of function  $h(x)$  then implies that

$$\hat{f}_a = h(f_T).$$

We will next argue that  $h(x) \geq \frac{w_o}{w_T}x$ , which will allow us to conclude that  $f_a > \hat{f}_a = h(f_T) \geq \frac{w_o}{w_T}f_T$ , obtaining the statement of the Lemma.

Note first that  $g(x) = \frac{w_T}{w_o}g(h(x))$ . Since  $\frac{w_T}{w_o} < 1$ , we have  $g(x) > g(h(x))$ . This in turn implies that  $x > h(x)$  because the function  $g(x)$  is increasing. Next, applying the inverse function theorem, we can evaluate to  $h'(x)$  on the interval  $x \in (0, x^+)$  as

$$h'(x) = \frac{w_o}{w_T} \frac{g'(x)}{g'(h(x))} > \frac{w_o}{w_T},$$

where the inequality holds because  $h(x) < x$  and  $g(x)$  is concave, implying that  $\frac{g'(x)}{g'(h(x))} > 1$ .

Combining the inequality  $h'(x) > \frac{w_o}{w_T}$  with the observation that  $h(0) = 0$ , we can conclude that  $h(x) > \frac{w_o}{w_T}x$ .  $\square$

**Proof of Lemma 5.** To endogenize the choice of compensation for the target advisor, we will assume that this compensation must meet the target advisor's reservation requirement, and that the target advisor must exert a unit of effort at cost  $c$  in order to produce the required signal. Resolution of the closure problem similar to that discussed in the baseline setting here requires that, in equilibrium, the acquisition is blocked when  $s_T - f_T = s_B - f_a < \bar{w}_T - f_T$ , and goes through at the price of  $\bar{w}_T - f_T$  when  $s_T - f_T = s_B - f_a = \bar{w}_T - f_T$ . For this portion of the analysis, we will also make the following set of assumptions, all stating that advisor fees are small relative to the total firm size:  $w_B < \bar{w}_T + (f_B - f_T)$ ;  $w_B < \bar{w}_T + (f_B - f_a)$ ;  $f_T < w_o < \bar{w}_T - f_a$ ; and  $w_o - w_B > 2f_T$ .

We will show that the target prefers the baseline compensation to the alternative compensation when  $f_T/w_T$  satisfies the following inequality,

$$\frac{f_T}{w_T} \leq \frac{(\bar{w}_T + f_B)((\bar{w}_T + f_B)\bar{w}_T - (\bar{w}_T - w_o)(w_B - f_B) - (w_o + f_B)\bar{w}_T)}{\bar{w}_T(\bar{w}_T + f_B)^2 - (w_o + f_B)w_o f_B}.$$

The Lemma statement will then follow from observing that the right hand side of the above is decreasing in  $w_o$  and  $w_B$ , and increasing in  $f_B$ .

Under baseline compensation, the equilibrium strategies described in Proposition 1 imply that Target payoff is given by:

$$T^* \equiv w_o \left( 1 - \frac{w_T}{\bar{w}_T} \right) + w_T - f_T. \quad (\text{A-13})$$

The target advisor's individual rationality constraint in this case requires that

$$\left( 1 - \frac{w_B}{\bar{w}_T + (f_B - f_T)} \right) f_T = c. \quad (\text{A-14})$$

Under the alternative compensation, the target advisor's strategy changes in the states where the bidder advisor sends the signal below  $w_o$ , as described in Proposition A-1. In this case, Target payoff can be expressed as

$$T_a \equiv w_o + \frac{w_B}{\bar{w}_T + (f_B - f_a)} \left( \frac{w_T}{\bar{w}_T} (\bar{w}_T - f_a) - w_o \right). \quad (\text{A-15})$$

The target advisor's individual rationality constraint is now

$$f_a \left( 1 - \frac{w_B}{\bar{w}_T + (f_B - f_a)} \right) \frac{w_T}{w_o + f_a} = c. \quad (\text{A-16})$$

According to Lemma A-3,  $f_a$  is significantly larger than  $f_T$ , in particular,  $f_a \geq \frac{w_o}{w_T} f_T$ . We will use this inequality to obtain a lower bound on the difference between the target payoff under the baseline compensation and that obtained under the alternative compensation.

The target payoff under alternative compensation, (A-15) is decreasing in  $f_a$ , and since  $f_a \geq \frac{w_o}{w_T} f_T$ , it can be bound from above by

$$\bar{T}_a \equiv w_o + \frac{w_B}{\bar{w}_T + \left( f_B - \frac{w_o}{w_T} f_T \right)} \left( \frac{w_T}{\bar{w}_T} \left( \bar{w}_T - \frac{w_o}{w_T} f_T \right) - w_o \right). \quad (\text{A-17})$$

Since the target payoff under the baseline compensation is given by (A-13), we can evaluate the difference between the payoffs under baseline compensation and alternative compensation as

$$\begin{aligned} T^* - T_a &\geq T^* - \bar{T}_a \\ &= \left[ w_o \left( 1 - \frac{w_T}{\bar{w}_T} \right) + w_T - f_T \right] - \left[ w_o + \frac{w_B}{\bar{w}_T + \left( f_B - \frac{w_o}{w_T} f_T \right)} \left( \frac{w_T}{\bar{w}_T} \left( \bar{w}_T - \frac{w_o}{w_T} f_T \right) - w_o \right) \right] T \\ &= \frac{(\bar{w}_T - w_B)(\bar{w}_T - w_o)}{\bar{w}_T} - \frac{\bar{w}_T f_T}{w_T} + \frac{w_B}{\bar{w}_T} \frac{(\bar{w}_T - w_o)(f_B - w_o f_T / w_T) + w_o \bar{w}_T f_T / w_T}{\bar{w}_T + f_B - w_o f_T / w_T} \end{aligned}$$

For ease of exposition in the remainder of the proof we introduce the following notation,  $\tau \equiv f_T / w_T$ ,  $\omega_o \equiv w_o / \bar{w}_T$ ,  $\omega_B \equiv w_B / \bar{w}_T$ ,  $\beta \equiv f_B / \bar{w}_T$ . Using the new notation, we can rewrite the above difference as

$$\begin{aligned} \bar{w}_T \mathcal{T}(\tau) &\equiv T^* - \bar{T}_a \\ &= \bar{w}_T \left( (1 - \omega_B)(1 - \omega_o) - \tau + \omega_B \frac{(1 - \omega_o)(\beta - \omega_o \tau) + \omega_o \tau}{1 + \beta - \omega_o \tau} \right). \end{aligned}$$

Observe that function  $\mathcal{T}(\tau)$  is positive at 0 and approaches infinity as  $\tau$  approaches  $\frac{1+\beta}{\omega_o}$ . Further,  $\mathcal{T}(\tau)$



is convex for  $0 < \tau < \frac{1+\beta}{\omega_o}$ , which follows from the positivity of the second order derivative on this interval:

$$\mathcal{T}''(\tau) = \frac{2\omega_B\omega_o^2(\beta + \omega_o)}{(1+\beta - \tau\omega_o)^3} > 0.$$

Finally, this function is decreasing at  $\tau = 0$ , which follows from the first order derivative being negative at  $\tau = 0$ :

$$\mathcal{T}'(0) = \frac{\omega_B\omega_o(\beta + \omega_o)}{(1+\beta)^2} - 1 < 0.$$

Therefore,  $\mathcal{T}(\tau)$  has at most two roots on the interval  $(0, \frac{1+\beta}{\omega_o})$ .

If  $\mathcal{T}(\tau)$  is positive on the whole interval, we obtain the required result that baseline compensation is preferred by the target firm. Suppose instead roots exist. In this case, the result is obtained when  $\tau$  is below the smallest root.

To find an approximation for the smallest root, we first rewrite  $\mathcal{T}(\tau)$  as a series,

$$\begin{aligned} \mathcal{T}(\tau) &= (1 - \omega_B)(1 - w_o) - \tau + \omega_B \frac{(1 - \omega_o)(\beta - \omega_o\tau) + \omega_o\tau}{1 + \beta - \omega_o\tau} \\ &= \frac{(1 + \beta - \omega_B)(1 - w_o)}{1 + \beta} - \frac{(1 + \beta)^2 - \omega_B\omega_o(\beta + \omega_o)}{(1 + \beta)^2} \tau + \frac{\omega_B(\beta + \omega_o)}{(1 + \beta)} \left( \frac{\left(\frac{\tau\omega_o}{1+\beta}\right)^2}{1 - \frac{\tau\omega_o}{1+\beta}} \right) \\ &= \frac{(1 + \beta - \omega_B)(1 - w_o)}{1 + \beta} - \frac{(1 + \beta)^2 - \omega_B\omega_o(\beta + \omega_o)}{(1 + \beta)^2} \tau + \frac{\omega_B(\beta + \omega_o)}{(1 + \beta)} \sum_{j=2}^{\infty} \left[ \frac{\omega_o^j}{(1 + \beta)^j} \tau^j \right]. \end{aligned}$$

The series is convergent because  $\frac{\tau\omega_o}{1+\beta} < 1$ . Thus, we can approximate  $\mathcal{T}(\tau)$  from below to any degree of accuracy by using more and more terms, i.e.

$$\begin{aligned} \mathcal{T}(\tau) &= (1 - \omega_B)(1 - w_o) - \tau + \omega_B \frac{(1 - \omega_o)(\beta - \omega_o\tau) + \omega_o\tau}{1 + \beta - \omega_o\tau} \\ &\geq \frac{(1 + \beta - \omega_B)(1 - w_o)}{1 + \beta} - \frac{(1 + \beta)^2 - \omega_B\omega_o(\beta + \omega_o)}{(1 + \beta)^2} \tau, \end{aligned}$$

and, for any  $n \geq 2$ ,

$$\begin{aligned} \mathcal{T}(\tau) &= (1 - \omega_B)(1 - w_o) - \tau + \omega_B \frac{(1 - \omega_o)(\beta - \omega_o\tau) + \omega_o\tau}{1 + \beta - \omega_o\tau} \\ &\geq \frac{(1 + \beta - \omega_B)(1 - w_o)}{1 + \beta} - \frac{(1 + \beta)^2 - \omega_B\omega_o(\beta + \omega_o)}{(1 + \beta)^2} \tau + \frac{\omega_B(\beta + \omega_o)}{(1 + \beta)} \sum_{j=2}^n \left[ \frac{\omega_o^j}{(1 + \beta)^j} \tau^j \right], \end{aligned}$$

The above implies that for positivity of  $\mathcal{T}(\tau)$  it is sufficient to show that the approximation is positive.

Using only the first order terms, we obtain that  $\mathcal{T}(\tau)$  is positive when

$$\frac{(1 + \beta - \omega_B)(1 - w_o)}{1 + \beta} - \frac{(1 + \beta)^2 - \omega_B \omega_o(\beta + \omega_o)}{(1 + \beta)^2} \tau = 0,$$

or equivalently when

$$\tau \leq (1 + \beta) \frac{(1 + \beta) - (1 - \omega_o)(\omega_B - \beta) - (\omega_o + \beta)}{(1 + \beta)^2 - \omega_B \omega_o(\beta + \omega_o)}.$$

Substituting for the new notation, we obtain the statement of the proposition. The comparative statics with respect to  $w_o$ ,  $w_B$  and  $f_B$  follow directly from verifying that the first order derivatives of the expression on the right hand side are negative with respect to  $w_o$  and  $w_B$  and positive with respect to  $f_B$ .  $\square$

**Proof of Result 4** First note that, if the target advisor produces a signal  $s_T > 0$ , with probability  $\rho$  the target has an alternative for under which its value equals  $w_o + \delta s_T$ ; with probability  $1 - \rho$  the target's only alternative to the acquisition is the status-quo, under which the target's value is  $w_o$ . Thus, if the target gives its advisor promote the bid compensation, we can express the target's payoff as

$$u_T(r|s_B, s_T, P) = \begin{cases} w_o & r = o; \\ w_o + \delta s_T & r = T; \\ P - f & r = B. \end{cases} \quad (\text{A-18})$$

The bidder's payoff from making the offer  $P$  is  $s_B + s_T - f - P$  if the offer is accepted, and 0 otherwise.

Repeating the arguments we use in the proof of Lemma 1 we can conclude that, in an SPNE, when the target has an alternative to the acquisition it accepts the bidder's offer of  $P = w_o + \delta s_T + f$  when  $s_B + (1 - \delta)s_T > \underline{u}_T = w_o + 2f$ , and when the target has no alternative it accepts the bidder's offer of  $P = w_o + f$  when  $s_B + s_T > \underline{u}_T$ . Further, when  $s_B + s_T < \underline{u}_T$ , the target rejects any offer that produces a non-negative bidder payoff.

Following bidder advisor signal  $s_B > \underline{u}_T - (1 - \delta)\bar{w}_T$ , the target advisor's expected payoff conditional on signal  $s_T$  can be expressed as

$$u_{TA}(s_T) := \begin{cases} 0 & s_T \in [0, (\underline{u}_T - s_B)/(1 - \delta)); \\ (1 - \rho)f & s_T \in [(\underline{u}_T - s_B), (\underline{u}_T - s_B)/(1 - \delta)); \\ f & s_T \in [(\underline{u}_T - s_B)/(1 - \delta), \bar{w}_T]. \end{cases} \quad (\text{A-19})$$

Define  $\ell(s_T) := f s_T (1 - \delta) / (\underline{u}_T - s_B)$ . Now note that  $\ell(s_T) \geq u_{TA}(s_T)$ , for  $s_T \in [0, \bar{w}_T]$ . This assertion

is obvious when  $s_T \in [0, (\underline{u}_T - s_B)/(1 - \delta)]$ ; and when  $s_T \in [(\underline{u}_T - s_B)/(1 - \delta), \bar{w}_T]$  the assertion holds because  $s_T(1 - \delta)/(\underline{u}_T - s_B) > 1$ . When  $s_T \in [\underline{u}_T - s_B, (\underline{u}_T - s_B)/(1 - \delta))$ ,

$$f s_T(1 - \delta)/(\underline{u}_T - s_B) \geq f(1 - \delta) > (1 - \rho)f.$$

Since  $\ell(s_T) = u_{TA}(s_T)$  only if  $s_T = 0$  and  $s_T = (\underline{u}_T - s_B)/(1 - \delta)$ , Lemma A-1 implies that  $F_T^{0, (\underline{u}_T - s_B)/(1 - \delta)}$  is the unique optimal strategy for the target advisor.

We can express the bidder advisor's expected payoff by  $u_{BA}$ , where

$$u_{BA}(s_B) := \begin{cases} 0 & s_B \in [0, \underline{u}_T - \bar{w}_T) \\ f(1 - \rho)w_T(1 - \delta)/(\underline{u}_T - s_B) & s_B \in [\underline{u}_T - \bar{w}_T, \underline{u}_T - (1 - \delta)\bar{w}_T) \\ f w_T(1 - \delta)/(\underline{u}_T - s_B) & s_B \in [\underline{u}_T - (1 - \delta)\bar{w}_T, \bar{w}_B] \end{cases} \quad (\text{A-20})$$

Define  $\ell(s_B) := f s_B w_T(1 - \delta)/(\underline{u}_T/2)^2$ . Note that  $\ell(s_B) \geq u_{BA}(s_B)$  for  $[0, \bar{w}_B]$ . This is obvious for  $s_B \in [0, \underline{u}_T - \bar{w}_T)$ . For  $s_B \in [\underline{u}_T - (1 - \delta)\bar{w}_T, \bar{w}_B]$ ,

$$f s_B w_T(1 - \delta)/(\underline{u}_T/2)^2 - f w_T(1 - \delta)/(\underline{u}_T - s_B) = f w_T(1 - \delta) \frac{(\underline{u}_T/2 - s_B)^2}{(\underline{u}_T/2)^2(\underline{u}_T - s_B)} > 0.$$

The result for  $s_B \in [\underline{u}_T - \bar{w}_T, \underline{u}_T - (1 - \delta)\bar{w}_T]$  follows because  $u_{BA}(s_B)$  in this interval is strictly smaller than  $w_T(1 - \delta)/(\underline{u}_T - s_B)$ . Since  $u_{BA}(s_B) \leq \ell(s_B)$ , and  $u_{BA}(s_B) = \ell(s_B)$  only if  $s_B = 0$  and  $s_B = \underline{u}_T/2$ , Lemma A-1 implies that the bidder advisor's optimal strategy is the simple distribution  $F_B^* = F_B^{0, (\underline{u}_T/2)}$ . This implies that the target advisor's optimal signaling strategy is  $F_T^* = F_T^{0, (\underline{u}_T/2)/(1 - \delta)}$ .  $\square$