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William Hubbard
dangelolawlib+williamhubbard@gmail.com

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Costly Signaling, Pleading, and Settlement

William H.J. Hubbard*

whubbard@uchicago.edu

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Abstract

This paper develops a game-theoretic model that explores the use of costly signals in a litigation environment with private information held by the plaintiff. I compare the costly signaling model with the canonical models of settlement through screening (Bebchuk 1984) and settlement signaling (Reinganum and Wilde 1986), and show that the costly signaling model compares favorably to these models along several dimensions, suggesting that it merits further exploration as a tool for studying suit and settlement. Under plausible conditions, costly signaling (rather than other signaling or screening mechanisms) will emerge endogenously in litigation, and its results are more robust to changes in modeling assumptions. I apply the costly signaling model to study the effects of filing fees and heightened pleading standards, and find counterintuitive and policy-relevant results: steeply raising the costs of litigation through filing fees or heightened pleading standards may lower the total costs of litigation without reducing the number and size of settlements obtained by plaintiffs; but from a private welfare perspective, raising pleading standards may hurt plaintiffs even if their case outcomes are unaffected.

1 Introduction

Most accounts of why parties litigate instead of settle rely on asymmetric information. The canonical models, Bebchuk (1984) and Reinganum and Wilde

*William H.J. Hubbard is Professor of Law and Ronald H. Coase Teaching Scholar at the University of Chicago Law School. I am grateful for comments from Douglas Baird, Scott Baker, Emily Buss, Dan Klerman, and participants at the Law & Economics Colloquium at Northwestern University School of Law, the Law & Economics Workshop at Columbia Law School, and the 2016 Workshop on Law and Economics at the Stony Brook Center for Game Theory. I thank Bartek Woda for research assistance and the Paul H. Leffman Fund for research support.
(1986), involve a settlement offer that either “screens” or “signals” a party’s private information. Yet these canonical models rely on settlement mechanisms that work just as well out of court as in court: parties can make settlement offers at any time.

Yet filing a complaint seems to matter. During litigation, the largest number of settlements occur immediately after a complaint is filed, and before any motion practice or discovery occurs. Boyd and Hoffman (2012) find in a sample of federal civil lawsuits that about one-third of filed cases settled without litigation activity occurring. If the parties had no need for discovery, motion practice, or trial to settle the case, why didn’t they settle before coming to court at all?

One answer, and the answer this paper explores, is that the filing of the complaint itself communicates important information to the defendant, and this revelation of information precipitates settlement. Imagine a setting in which potential plaintiffs vary by “type,” whereby a “high type” plaintiff is one whose claim would, after the time and expense of discovery, generate a large settlement or trial verdict, while a “low type” is one whose claim would ultimately yield a smaller return. The plaintiff’s type is initially private information that is not observable to the defendant—in other words, even if the plaintiff revealed the information to the defendant, it would not be credible.

An example of this kind of private information is the plaintiff’s degree of commitment to follow through on the threat to sue, especially for a claim of modest value. To profess, “No, I really mean it,” does not distinguish the committed plaintiff from the bluffer. Another example is private information that goes to the merits of the case, but is not credibly observable outside of litigation. A plaintiff may lack documentary evidence, but have compelling testimony. Without a deposition or trial, however, the threat of damning witness testimony may appear empty or fabricated.

Eventually, of course, the private information will come to light, but only after considerable cost and delay. After filing of a complaint, discovery, motion practice, and possibly trial, it will be common knowledge whether the plaintiff was litigious or meek; whether her claim was backed by compelling testimony or unconvincing puffery; and whether she had the resources to bring the defendant to its knees or was operating on a shoestring.

But litigation is expensive, and both plaintiffs and defendants would prefer to settle out of court for an amount that reflects plaintiff’s type, rather than exchange the same payment only after costly litigation establishes the plaintiff’s type. In this paper, I present a model of pleading in the presence of asymmetric information in which costly signaling is the key mechanism for overcoming the information asymmetry. The central feature of this model is that plaintiffs can control the strength of the signal they send through plead-
ing or other actions at the very outset of a case.\(^1\) The costs of sending a given signal, however, depend on plaintiff’s type.

This could be for one or both of two reasons. First, if type reflects the information the plaintiff has pre-litigation, then a plaintiff with lots of favorable facts both has a higher ex ante probability of prevailing on the merits and a lower cost of drafting a detailed complaint, if only because the facts needed to substantiate the claim are already in hand. Second, if type reflects a plaintiff’s litigiousness or tolerance for risk, a higher (more litigious or risk-tolerant) type is both more likely to win and more willing to conduct factual and legal investigation.

As a consequence, types can separate themselves through costly signaling. High types will invest in more detailed complaints, knowing that low types cannot gain by mimicking such signals of case strength. There are good reasons why a costly signal might take the form of a legal complaint: Mere assertions of facts made by the plaintiff in out-of-court negotiations may be dismissed as “cheap talk” or bluffing. Documenting the same claims in a complaint, however, creates potential legal liability for misrepresentations.\(^2\) The defendant will therefore offer a generous settlement to a plaintiff who sends a strong signal. Plaintiffs who send weaker signals obtain lesser settlements commensurate with their type, and plaintiffs with cases that aren’t worth pursuing through discovery and trial will forgo filing suit and sending a signal at all.

This model adapts to the litigation context the classic Spence (1973) model of costly signaling in the job market. In Spence (1973), workers invest in expensive credentials to signal their unobservable skill. The litigation setting introduces additional complexities absent from basic Spence model: there is the outside option of trial, and there may be negative-expected value (NEV) claims that (if identified as such by the defendant) have zero settlement value.

Notably, costly signaling models of this type are rare in the law literature. Stephenson (2006) applies the concept of costly signaling to the “hard look” doctrine in administrative law. Cohen and Tabbach (2015) explore costly signaling in torts context, where potential victims can signal their type to potential injurers, thereby influencing the degree of care they take. In the litigation context, Choné and Linnemer (2010) examine costly and observable

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\(^1\) Other signals might include, for example, retainer of an expensive law firm. For reasons I describe below, however, pleadings make particularly effective signals of unobservable case strength. An expensive law firm may be a powerful signal of case strength as well; but in some circumstances spending more on lawyers may be a sign of weakness rather than strength. For this reason, I focus on pleadings. Although they serve purposes other than signaling as well, it is fairly clear that signaling is an important role for pleadings.

\(^2\) Allegations in a complaint that are not based on a reasonable investigation and good faith belief in their validity are a basis for sanctions against both the plaintiff and her lawyer. See, e.g., Federal Rule of Civil Procedure 11, 28 U.S.C. §1927, and state ethics rules for attorneys.
case preparation, in which effort that increases the strength of the plaintiff’s case is observable to the defendant. Jeitschko and Kim (2013) model the effect of a preliminary injunction motion on settlement. Both of these latter articles consider circumstances in which the signals are sufficiently coarse that the defendant resorts to a screening strategy in offering settlements even after the costly signals have been sent. No general model of costly signaling has been developed for the litigation context.

Fairly general models of litigation have been developed, however, in the related context of disclosure and discovery. (See Shavell [1989]; Sobel [1989]; Farmer and Pecorino [2005, 2013].) In these models, a party that chooses disclosure or discovery bears an exogenous cost (the other party may bear a cost as well), at which point the private information becomes common knowledge. The opportunity to disclose favorable, private information can lead to unraveling if the cost of disclosure is low enough, as every type but the lowest has an incentive to reveal her private information in order to distinguish herself from lower types and obtain a higher settlement (Shavell 1989). These models apply well to the discovery context, where cost is often orthogonal to merits of the case and discovered information is observable to the parties and usually verifiable to a court as well.

The costly signaling model that I develop below, in contrast, addresses a different information setting, one more likely to exist in the pre-discovery context. The assumption is that the plaintiff’s private information is not observable to the defendant. Thus, the plaintiff must signal the strength of the information that cannot be directly disclosed in a credible way.

This information environment is also the context in which the canonical screening and settlement signaling models are most relevant. Bebchuk (1984) is the seminal “screening” model. Imagine that the defendant has private information about the strength of her case—it can be strong (the defendant is a “high type” with a high chance of winning) or it can be weak (the defendant is a “low type” with a low chance of winning). The plaintiff makes a single, take-it-or-leave-it settlement demand and goes to trial if the defendant rejects it. The screening strategy is to demand a large settlement, one that represents the maximum amount that the low type defendant is willing to accept. The low types accept this settlement offer, while the high types reject the offer in favor of trial. In this way, the plaintiff’s demand “screens” out the low types, and we observe a mixture of settlement and litigation in equilibrium.

Reinganum and Wilde (1986) present the seminal “settlement signaling” model. In this model, the party with private information makes a single take-it-or-leave-it offer and, if the other party rejects it, litigation ensues. If

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3The Reinganum and Wilde (1986) model is widely known as the canonical “signaling” model. To avoid ambiguity, and because the settlement offer itself conveys the signal of private information, I will call this model the “settlement signaling” model. In contradistinction, I will refer to my model as the “costly signaling” model.
the plaintiff has private information, then in equilibrium high types offer high settlements and low types will offer more modest settlements. Defendants always accept the lower settlements. Defendants only accept larger settlements with a probability less than one.\(^4\) The plaintiff’s settlement offer is a signal of her type, and these offers induce a mixture of settlement and litigation.\(^5\)

The “costly signaling” model I describe herein, like the Bebchuk (1984) screening model and the Reinganum and Wilde (1986) settlement signaling model, provides a simplified representation of pre-trial settlement bargaining that both attempts to account for stylized facts about litigation and facilitate normative analysis. In this paper, I introduce the costly signaling model, describe its equilibrium, and explore its implications.

In Section 2, I present the costly signaling model in an informal way, using an example with three plaintiff types. Readers who are familiar with the Spence (1973) model may want to skip this section, as the analysis is a straightforward application of textbook treatments of the Spence model.

In Section 3, I present a formal version of the model which includes a continuum of plaintiff types and discusses equilibria both with and without the presence of NEV claims. NEV claims present a special challenge to the use of costly signaling to reveal types, because in equilibrium all plaintiffs with PEV claims receive settlements, but no plaintiffs with NEV claims do. The need for positive-expected-value (PEV) types to separate themselves from NEV types dramatically raises signaling costs.

In Section 4, I compare costly signaling to screening and settlement signaling, assessing their likely empirical relevance and normative desirability. In the course of this analysis, I tease out several distinctive and novel results:

**The cost advantage of costly signaling.** Canonical models of screening and signaling rely on settlement offers to screen or signal plaintiff type. Settlement offers, of course, have no inherent cost. But these mechanisms for settlement necessarily entail substantial costs in equilibrium, as the separation of plaintiffs types is achieved by forcing some cases to go to trial. This imposes the costs

\(^4\)This is the result of the incentive compatibility conditions for equilibrium. While the settlement amount reveals the plaintiff’s type, the defendant cannot accept the large settlement offer with a high probability, or else the low-type plaintiffs will find it profitable to mimic the high types by offering large settlements as well.

\(^5\)As will become relevant when I compare costly signaling to these models, it is worth noting that Bebchuk (1984) and Reinganum and Wilde (1986) simply set aside NEV claims, but later work has dealt with the complexities that emerge once potential plaintiffs include those with NEV claims. Farmer and Pecorino (2007) addressed the possibility of NEV claims in the Reinganum and Wilde (1986) signaling model, showing that a separating equilibrium is only possible when filing is costly, and the presence of NEV claims lowers the probability of settlement for all claims in equilibrium. For the screening model with uninformed plaintiffs, Nalebuff (1987) extends the Bebchuk (1984) analysis to allow for some plaintiffs to have NEV claims. More applicable here is Katz’s (1990) analysis, which considers a screening equilibrium in an environment where the plaintiff has private information, and the number of frivolous claims is endogenously determined.
of discovery and trial on both parties. Costly signaling, which entails up-front expenditures but avoid the costs of discovery, may therefore be less costly. I show that under some plausible assumptions “costly” signaling entails lower total costs than its alternatives.

**Comparison of models.** Daughety and Reinganum (1993) present a model that nests a settlement signaling model and a screening model, which allows them to predict which form of settlement mechanism will (as a positive matter) arise endogenously and which is (as a normative matter) preferable from a social welfare perspective. In this paper, I incorporate costly signaling, screening, and settlement signaling into a single analysis. As I will show, under a range of plausible conditions, costly signaling, rather than screening or settlement signaling, will arise endogenously and/or will maximize social welfare. Thus, costly signaling is likely to be empirically relevant and normatively attractive as a settlement mechanism.

**Robustness to bargaining dynamics.** Most of the relevant literature examines a settlement process exogenously fixed to involve a single, take-it-or-leave-it settlement proposal by a single party who holds all of the bargaining power (i.e., the party captures 100 percent of the surplus from settlement). Yet the ability for settlement offers to act as signals or screens depends heavily on this assumption which may not be a suitable abstraction of reality. Costly signaling, in contrast, depends on no assumptions about the bargaining process.

**Attention to real-world information environments.** As Hause (1989) points out, most models of asymmetric information do not account for the reality of pretrial procedure, in which the discovery process exists precisely in order to eliminate asymmetries of information between the parties. Given this, while canonical models refer to the choice between “settlement” and “trial,” they are better understood as models of the choice between “settlement” and “discovery.” The costly signaling model focuses on capturing observed patterns of behavior associated with the early stages of a dispute such as

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7. Without this assumption, the behavior in these models is not sequentially rational, i.e., subgame perfect. A plaintiff whose screening settlement offer is declined would update her beliefs about the defendant’s type and then offer a lower settlement. But of course this destroys the ability of the first offer to successfully screen types; defendants will refuse the first offer because the second offer will be more generous. Nonetheless, these models have empirical relevance if, in practice, parties can credibly commit to make only one settlement offer and credibly commit to refuse offers even when it not sequentially rational to do so.


9. Other articles, however, such as Spier (1992), Schwartz and Wickelgren (2009), and Farmer and Pecorino (2013), are explicit in characterizing themselves as models of pre-suit or pre-discovery settlement.
retention of counsel, complaint drafting, and pre-discovery litigation strategy.\textsuperscript{10}

\textit{Application to pleading.} I show how costly signaling may characterize pleading practice, and how minimum pleading standards may effectively set a floor on signal strength among filed cases. Heightened pleading standards may reduce the social costs of litigation—without reducing the volume of litigation. This social benefit comes at a distributional cost, however: raising pleading standards may raise costs for all plaintiffs, even those whose pleadings would easily clear the bar, regardless of standard.\textsuperscript{11}

\section{Informal Treatment with Discrete Types}

\subsection{Basic Model and Results}

Take a dispute between a plaintiff and a defendant, in which the plaintiff may be one of three types, $H$, $L$, and $NEV$, corresponding to high-value claims ($H$), low-value claims ($L$), or negative-expected-value claims ($NEV$). High settlement value may come from the plaintiff’s claim being high merit, having a high damages claim, or the plaintiff simply being especially dogged or litigious and thus better at extracting a higher settlement from the defendant. The plaintiff’s type cannot be directly observed by the defendant, but the distribution of types is common knowledge.

Plaintiffs can spend resources to send a signal to the defendant. This signal could take the form of a long and detailed complaint based on an intensive pre-filing investigation. With this example of a costly signal in mind, I label the strength of the signal $A$ (for “allegations”), such that a higher value of $A$ reflects higher expenditure by the plaintiff.

The cost of generating a signal of strength $A$ is not the same for high types and low types. High types find it less costly to collect additional facts or law to include in their pleadings or to otherwise send a stronger signal. This could be because their claims are higher merit (they have more favorable facts already on hand), they have higher damages (plaintiff’s private information contains ready evidence of injury), or plaintiff suffers less disutility from gathering otherwise unavailable evidence (a litigious plaintiff may not mind spending time preparing for litigation).

Thus, even though claim strength is not directly observable until after discovery (which itself is costly), high-type plaintiffs can avoid the cost of discovery by sending a strong signal to the defendant. Although a strong

\textsuperscript{10}In contrast, the choice to proceed to “trial” occurs in an environment of (nearly) symmetrical information. As such, trial \textit{per se} may be better explained by divergent expectations models, such as Priest and Klein (1984), rather than models of asymmetric information.

\textsuperscript{11}See Hubbard (2016b) for analysis of the effect of pleading rules in a symmetrical-information environment.
signal may be expensive for high types, it is prohibitively costly for low types, and thus the signal reliably reveals the plaintiff’s type to the defendant. The defendant can then settle with the high type for a high amount.

Equilibrium in this costly signaling game is illustrated by Figure 1.\textsuperscript{12} The horizontal axis measures signal strength, and the vertical axis measure settlement amount. The curves are indifference curves for the three types. They show that as a party sends a stronger (and thus more costly) signal, the party must be able to obtain a larger settlement in order to cover the cost of the signal.\textsuperscript{13} Note that the low types have steeper indifference curves: their costs of signaling rise quickly, making it difficult for them to send a strong signal. High types’ indifference curves are flatter: their marginal cost of sending a stronger signal is lower. In this illustration, I assume that the parties have equal litigation costs and equal bargaining power, and thus a defendant who knows that a plaintiff has a claim of value $H$ will offer a settlement of $H$, which the plaintiff will accept.

The equilibrium is as follows: The low types must separate from the NEV types, and the high types must separate from the low types. We see that the NEV plaintiffs do not sue and do not signal; they obtain zero. This is because revealing their type would reveal that they have no credible threat to sue. Thus, they can only obtain a positive settlement by mimicking a low type or a high type. But low types do not want to pool with NEV types; they can obtain a higher settlement by separating themselves. Thus, low types file suit and send a signal that is just strong enough to ensure that the NEV types do not mimic them. Because the low types’ signal uniquely reveals their type, they receive a settlement of $L$. The low types’ signal ($A_L$ in the figure) is such that it would cost $L$ for the NEV type to send this signal.

Since mimicking the low types yields a settlement of at most $L$, NEV types gain nothing from mimicry. They do not sue, do not signal, and receive nothing in settlement.\textsuperscript{14} Similarly, the high types send a costly signal to separate themselves from the low types. They receive a settlement of $H$. To ensure that low types do not mimic them, the high types’ signal is such that raising their signal from $A_L$ to $A_H$ would cost the low types $H - L$. Thus, low types gain nothing from mimicking high types.

The equilibrium in Figure 1 fully separates each type of plaintiff. While

\textsuperscript{12}Equilibrium definition and derivation is standard and can be found in any textbook treatment of costly signaling with discrete types. See Bolton and Dewatripont (2005). Below, I provide a formal treatment of the model with continuous types, which addresses features not addressed in the canonical Spence (1973) model, such as NEV claims and outside options.

\textsuperscript{13}Formally, the indifference curves are vertically shifted versions of the plaintiff’s cost functions $F(t, A)$, where $F$ is the cost to type $t$ of sending signal $A$.

\textsuperscript{14}Implicit here is the assumption that a party who is indifferent between filing and not filing with not file. This is realistic, given that parties face a low, but positive, filing fee in court.
one might imagine a pooling or semi-pooling equilibrium (i.e., an outcome in which all types, or some subset of different types, send the same signal), no such equilibrium will be stable.\footnote{More precisely, by “stable” I mean that a pooling or semi-pooling equilibrium would fail the “Intuitive Criterion” for equilibrium selection. See Cho and Kreps (1987).} In an equilibrium where different types sometimes or always send the same signal and receive the same settlement reflecting the (weighted) average value of their claims, relatively higher types will have an incentive to deviate, send a stronger signal, and receive a higher settlement reflecting the value of their claims.\footnote{In the discussion of the model with continuous types below, I discuss these criteria for equilibrium in more formal terms.} This is commonly referred to as “unraveling.”

2.2 Application: Heightened Pleading Standards

As noted above, one of the forms that costly signaling may take is a pre-suit investigation, perhaps by an expensive law firm, that is documented in a complaint that includes factual details of the plaintiff’s pre-suit efforts as well as legal argumentation reflecting effort spent on legal research. How well does the model represent the filing and pleading decision? There are two obvious considerations here. First, the basic model has no filing fee or other fixed cost to filing. Given that actual filing fees are very small relative to other litigation costs, though, it is realistic to omit filing fees from the model but assume that a plaintiff who sends a zero signal strictly prefers not to file a complaint, and thereby save the small filing fee.\footnote{To file a civil suit in federal court, the plaintiff must pay a total of $400 in fees. See 28 USC §1914 (setting a $350 filing fee for a civil action in US district courts); District Court Miscellaneous Fee Schedule (Administrative Office of the United States Courts, Aug 20, 2014), archived at http://perma.cc/Y9LR-4LVZ (setting a $50 administrative fee for initiating a civil action in US district courts).} This is exactly what the model does.\footnote{In Section 4 I will consider the implications of higher fees.}

Second, the model above does not incorporate pleading standards.\footnote{Federal Rule of Civil Procedure (“Rule”) 8(a) governs the content of a complaint: “A pleading that states a claim for relief must contain . . . a short and plain statement of the claim showing that the pleader is entitled to relief.” Once a plaintiff files a complaint, the defendant can file a motion to dismiss for “failure to state a claim upon which relief can be granted” under Rule 12(b)(6). A complaint that fails to meet the pleading standard set by Rule 8(a) will be dismissed. Thus, a complaint must meet the applicable pleading standard in order for the plaintiff to have a credible threat to advance the litigation to discovery.} Thus, there is no minimum requirement of detail for a complaint before the plaintiff has a credible threat to take the case forward to discovery. This is a rough approximation of state of federal law at least until 2007; the regime of “notice pleading” included no express requirement that the complaint contain any evidence that the plaintiff’s claim had positive settlement value.\footnote{The “notice pleading” standard is often also called the “Conley” standard, after Conley v. Gibson (355 U.S. 41, 45-46 [1957]).}
Since 2007, however, there arguably has been a heightened pleading standard in federal court, one which requires all complaints to contain costly signals of the strength of the plaintiff’s claim. In *Bell Atlantic Corp. v. Twombly* (550 U.S. 544, 557 [2007]), the Supreme Court required that a complaint plead facts “plausibly suggesting (not merely consistent with)” the plaintiff’s legal claim. This new pleading regime is known as “plausibility pleading.”

With this in mind, we can treat this baseline model as a model of costly signaling in the pre-*Twombly* pleading regime. The model predicts that filed complaints will contain costly signals of case strength, even though there is no legal requirement to do so. Empirically, this was the case. Even before *Twombly*, most complaints were fairly factually detailed. Marcus (1986) and Fairman (2003) document the persistence of “fact pleading” by courts and litigants despite decades of practice under the notice pleading standard; Hubbard (2016a) provides further discussion and examples. Of course, there are a number of reasons why “fact pleading” may have occurred pre-*Twombly*, and surely various factors contributed. Some judges may have applied a heightened pleading standard even under *Conley*; and detailed pleading’s signaling benefits may have extended beyond settlement.

The model also predicts that filing a complaint itself will be sufficient to induce settlement, even if nothing else happens in the litigation. The costly signal is enough to eliminate the information asymmetry. Empirically, while there is hardly a 100 percent settlement rate after filing, a surprisingly large share of cases settle after a complaint is filed but nothing else has happened in the case. As noted above, Boyd and Hoffman (2012) found that about one-third of filed lawsuits are settled without any litigation activity occurring—no motions, no discovery. (Below, the expanded version of the model, which allows for two-sided private information, accounts for both the high rate of early settlement and the fact of trials.)

Further, the model offers insights about the effects of heightened pleading standards, if we incorporate a pleading standard into the model in the form of a minimum level of costly signaling required for every a filed complaint (call this $\bar{A}$). Such a requirement can have quite different effects depending on how high the standard is set. There are three possible effects that can occur as the pleading standard rises:

**Case 1:** There could be no effect whatsoever. This happens, for example, in the range $0 \leq \bar{A} \leq A_L$ in Figure 1. The NEV types do not send signals regardless, and the low types send a signal of strength $A_L$. Thus, raising the standard $\bar{A}$ has no effect on the equilibrium.

**Case 2:** All types that file complaints could increase the strength of their signals. This happens when the pleading standard become a binding constraint.

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21The Supreme Court reaffirmed *Twombly* almost exactly two years later in *Ashcroft v. Iqbal* (129 S. Ct. 1937 [2009]), stating that “only a complaint that states a plausible claim for relief survives a motion to dismiss.” (Id. at 1949-50.)
for the lowest type that still files suit. For example, as the standard $\bar{A}$ rises above $A_L$, it is still worthwhile for low types to sue, but they now must send a stronger signal in order to satisfy the pleading standard. Because low types are sending a stronger signal, high types must send a stronger signal as well to maintain sufficient separation in terms of signal cost. This is illustrated in Figure 2.

Case 3: if the standard rises high enough, some or all types may abandon their (otherwise PEV) claims. This happens when a type would no longer have a net positive payoff from signaling, revealing her type, and then obtaining a settlement reflecting her type. Figure 3 illustrates this. When the pleading standard reaches the threshold $\bar{A}$, the cost of meeting the pleading standard exceeds the settlement that the low-type plaintiff can obtain. Thus, low types drop out of litigation, and only high types remain. Note, though, that even in this situation, high types engage in very costly signaling in equilibrium, lest low types mimic them to obtain a high-type settlement.

This model thus provides a straightforward way to reconcile two competing narratives about plausibility pleading: first, that it has harmful effects on a large number of plaintiffs; and second, that it has had essentially no effect on case outcomes. Depending on which of the three cases above describes the effect of plausibility pleading, one or the other or both of these narratives may be true. In Case 1, there are no effects at all—no effect on case outcomes and no harmful effects on plaintiffs. In Case 2, there are no effects on case outcomes (every plaintiff still files and settles) but all plaintiffs are worse off. In Case 3, case outcomes change dramatically because some plaintiffs who would have received settlements get nothing.

Notably, a fair amount of empirical data suggests that *Twombly* and *Iqbal* may have impacted at most a small share of all case outcomes, such as filing rates, dismissal rates, and overall termination rates. Estimates of the share of cases whose outcomes were affected by *Twombly* or *Iqbal* are almost universally not statistically different from zero; in some cases the estimates of zero are quite precise; and when statistically different from zero, the estimates are in the range of 1 percent of all cases (see Hubbard 2016c for a survey and further evidence). But there is evidence that pleadings may have become more detailed (and presumably more expensive to prepare) since *Twombly*. (See Hubbard 2016c.)

This evidence is consistent with *Twombly* raising the pleading standard to a point near $A_L$—for example, $\bar{A}$ in Figure 2. In this scenario, no plaintiffs are deterred from filing, and all plaintiffs obtain the same settlements as before. But because all plaintiffs send more costly signals in equilibrium, all plaintiffs with PEV claims are made worse off.

Of course, the basic model does not capture all the key stylized facts for civil litigation, such as the fact that many case don’t settle. And of course, factors other than costly signaling are at play when parties decide to plead...
or take other observable actions early in a dispute. Up-front investments in lawyers and pleadings, for example, can save costs later in litigation and improve a plaintiff’s chances of success at trial. I consider these extensions in the Appendix. Importantly, these considerations do not affect the central results here.

3 Formal Model with a Continuum Types

In this section I present a formal model of costly signaling with a continuum of plaintiff types. The qualitative results above continue to hold, but the richer (and I think more realistic) model permits additional insights, including comparison with canonical models of settlement and consideration of mechanisms that could encourage less socially costly patterns of settlement and litigation.

Take a dispute between a plaintiff and a defendant, in which the plaintiff has type \( t \), but her type is unobservable to the defendant. Plaintiffs of different types differ in two ways. First, plaintiff type \( t \in [t, \bar{t}] \) reflects the plaintiff’s expected judgment, accounting for her probability of prevailing on the merits and the amount of her claim. Second, higher types find it less costly to generate a signal that is observable to the defendant.

The plaintiff can send a signal of strength \( A \) at a cost of \( F(t, A) \), such that \( F(t, 0) = 0 \) for all \( t \). I assume that \( F_A(t, A) > 0 \), \( F_{AA}(t, A) \geq 0 \), \( F_t(t, A) \leq 0 \), and \( F_tA(t, A) < 0 \) for all \( t \) and all \( A \). These conditions reflect the fact that it is easier for higher types to send stronger signals than lower types.\(^{22}\) Although this model applies to signals generally, for concreteness I will sometimes refer to the signal \( A \) as “allegations” and the cost \( F(t, A) \) as the “filing cost” for type \( t \) to file a complaint with allegations \( A \). In addition to the endogenously determined cost of drafting allegations, the court may also impose a fixed filing fee \( C_0 \).

After the plaintiff has an opportunity to signal, the parties have an opportunity to settle. For simplicity, I allow only a single, take-it-or-leave-it offer, but allow for bargaining power to vary by having the plaintiff capture a fraction \( \alpha \in [0, 1] \) of the surplus generated by settlement. This means that the plaintiff who reveals her type through costly signaling will obtain settlement amount \( S(t) = t + \alpha C_D - (1 - \alpha) C_P \). With equal bargaining power (i.e., \( \alpha = 0.5 \)) and equal litigation costs, this is simply \( S(t) = t \); the defendant pays the plaintiff the expected value of the plaintiff’s claim. To make this model comparable to the canonical model of settlement signaling (Reinganum and Wilde 1986), one can assume that the plaintiff has all of the bargaining

\(^{22}\)These conditions are sufficient but not necessary for the results below. Although not strictly necessary, these conditions are simple and make intuitive sense. For example, while it is not necessary that, for the same signal strength, higher types always have lower costs than lower types, it is not obvious why they wouldn’t.
power (i.e., $\alpha = 1$). Importantly, this setup, although it takes the form of a single offer, does not place strong restrictions on the bargaining process. All it requires is that, in a setting where type is revealed, the parties settle for an amount no less than the expected trial outcome minus plaintiff’s discovery costs (i.e., plaintiff’s reservation amount) and no greater than the expected trial outcome plus defendant’s discovery costs (i.e., defendant’s reservation amount). Varying bargaining power $\alpha$ allows the parties to reach any settlement in that range. Obviously, this is a very weak restriction on the outcome of the bargaining process, regardless of specific nature of the process.\textsuperscript{23}

If the parties do not settle and the plaintiff has a credible threat to go to discovery, the parties bear litigation costs $C_P$ and $C_D$, respectively. The plaintiff recovers in expectation the amount $t$ after discovery. For simplicity, I assume that the parties will settle rather than litigate if settlement yields an identical payoff to litigation.

### 3.1 Results without NEV claims

I first present results for the scenario where there are no NEV claims.

**Proposition 1: Equilibrium in Absence of NEV Claims.** Assume that all plaintiffs are willing to file suit (i.e., $C_0$ is not too high) and that all plaintiffs have a credible threat to proceed to discovery after filing suit: $t \geq C_P$. Assume further that (at least in equilibrium) the cost of discovery is greater than the cost of signaling.\textsuperscript{24} There is unique, perfect Bayesian equilibrium (PBE) that satisfies the Cho-Kreps Intuitive Criterion (Cho and Kreps 1987). This equilibrium has the following elements:

**Settlement offers and responses.** The defendant offers $S(A^*(t)) = t + \alpha C_D - (1-\alpha)C_P$. Offers are always accepted.

**Signaling strategy.** The equilibrium signaling schedule $A^*(t)$ is such that each type reveals itself by sending a unique signal and no type can increase its payoff by mimicking the signal of a different type. The signaling schedule $A^*(t)$ is defined by an optimality condition and a boundary condition.

The optimality condition is

\[ F_A(t, A^*(t)) \frac{dA^*(t)}{dt} = 1 \tag{1} \]

\textsuperscript{23}As a consequence, this formal model can represent bargaining with any number of offers and counter-offers. For example, it is equivalent to an alternating offer game with unlimited opportunities to make offers and counteroffers, in which the plaintiff and defendant have per-period discount factors $\delta_P$ and $\delta_D$, respectively, such that $\delta_D = (1-\alpha)/(1-\alpha\delta_P)$. (See Rubinstein [1982] for the canonical treatment of the alternating offer game.) For $\delta_P = \delta_D \rightarrow 1$, $\alpha = 0.5$.

\textsuperscript{24}This assumption is relaxed in Section 4.
This equation reflects the optimality condition for a separating equilibrium: each type $t$ maximizes her payoff by sending a signal $A^*(t)$ that uniquely corresponds to type $t$. The left side of Equation (1) is the marginal cost of mimicking a higher type; the right side is the marginal benefit (mimicking a one-dollar-higher type yields a one-dollar-higher settlement). Put another way, Equation (1) represents the (binding) incentive compatibility constraint in this model.

The boundary condition reflects the fact that the lowest type need not signal at all:

$$A^*(t) = 0$$  \hspace{1cm} (2)

Posterior beliefs. The defendant’s posterior beliefs about plaintiff’s type $\beta(t|A)$ in this equilibrium are $\beta(t|A^*(t)) = 1$ and $\beta(t|A^*(j)) = 0$ for all $j \neq t$.

**Proof.** See the Appendix for derivation of this equilibrium.

**Remark.** While there are many PBEs that one may propose, I will focus on the equilibrium described above, which is the “least-cost separating equilibrium,” the unique, pure-strategy, separating equilibrium that minimizes the social cost of costly signaling. Equation 1 ensures that it is a separating equilibrium, and Equation 2 ensures that separation occurs at the lowest possible cost.

It is also the only PBE that also satisfies the Cho-Kreps Intuitive Criterion (Cho and Kreps 1987). The Intuitive Criterion rules out any pooling equilibrium, because such equilibria would not be stable. In any pooling PBE with pooling signal $A^{Pool}$, higher types will have an incentive to deviate by choosing $A(t) > A^{Pool}$ in order to reveal their type and obtain a higher settlement. I focus on this equilibrium selection criterion because of its empirical plausibility: out-of-equilibrium, it seems “intuitive” that real-world defendants would infer that a costlier signal is a sign of a higher-type plaintiff (rather than the opposite). I consider pooling in greater detail in Section 3.3, below.

**Remark.** Note that in the costly signaling model, the costs of signaling represent all of the costs of litigation in equilibrium. Because the parties never proceed to discovery, the parties incur no other costs.

**Remark.** While the model places no upper bound on signal strength, it may be more realistic to assume that beyond a point, a complaint cannot convey further case strength. For example, a plaintiff with a case so strong that she can rule out every conceivable defense or counterargument may have no practical way to signal such information. If there is a maximum signal $\hat{A}$, then the results above hold for all plaintiffs for whom $A^*(t) \leq \hat{A}$. Define $\hat{t}$ such that $A^*(\hat{t}) = \hat{A}$. Plaintiffs just above that threshold (all types $t$ such that $\hat{t} < t \leq S(A^*(\hat{t}) + C_P)$ will plead with signal $\hat{A}$ and receive settlement $S(A^*(\hat{t}))$; in other words, they will mimic type $\hat{t}$. Plaintiffs with the highest
types \((t > S(A^\ast t) + C_P)\) will forgo signaling and proceed straight to discovery. Even after paying the costs of litigation, these highest types gain more from litigation than settlement. See Figure 5 for an illustration.

### 3.2 Results with NEV Claims

I now present results for when some claims are NEV claims. The presence of NEV claims slightly complicates the analysis, because in any sequentially rational equilibrium, the defendant will refuse to settle with a plaintiff who reveals herself to be a type with a NEV claim. Whenever \(\alpha > 0\), such that the plaintiff captures some of the surplus from settlement, the presence of NEV claims creates a sharp discontinuity between the settlements paid to the “cutoff” (zero-expected value) type and types just below it, which means that NEV types will have a strong incentive to mimic the marginal type in order to obtain a strictly positive settlement. For a separating equilibrium to be incentive-compatible, therefore, the cutoff type must have a zero payoff.

**Proposition 2: Equilibrium with NEV Claims.** Assume that (at least in equilibrium) the cost of filing suit and conducting discovery is greater than the cost of filing suit with costly signaling. There is a unique, perfect Bayesian equilibrium (PBE) that satisfies the Cho-Kreps Intuitive Criterion (Cho and Kreps 1987). This equilibrium has the following elements:

**Settlement offers and responses.** To plaintiffs sending signal \(A^\ast(t) \geq A^\ast(C_P)\), the defendant offers \(S(A^\ast(t)) = t + \alpha C_D - (1 - \alpha)C_P\). To plaintiffs sending signal \(A < A^\ast(C_P)\), the defendant offers \(S(A) = 0\). Offers are always accepted.

**Signaling strategy.** The equilibrium signaling schedule \(A^\ast(t)\) is such that (1) each type at or above the cutoff type \(t = C_P\) reveals itself by sending a unique signal, (2) each type below the cutoff type \(t = C_P\) sends a zero-cost signal, and (3) no type can increase its payoff by mimicking the signal of a different type. The signaling schedule \(A^\ast(t)\) for all \(t \geq C_P\) is defined by an optimality condition and a boundary condition. The optimality condition is

\[
F_A(t, A^\ast(t)) \frac{dA^\ast(t)}{dt} = 1
\]

The boundary condition reflects the fact that the cutoff type must have payoff equal to zero:

\[
S(C_P) - F(C_P, A^\ast(C_P)) = 0
\]

**Posterior beliefs.** The defendant’s posterior beliefs about plaintiff’s type \(\beta(t|A)\) in this equilibrium are \(\beta(t|A^\ast(t)) = 1\) and \(\beta(t|A^\ast(j)) = 0\) for all \(t, j \geq C_P\) and \(j \neq t\), and \(\beta(t < C_P|A < A^\ast(C_P)) = 1\) and \(\beta(t < C_P|A \geq A^\ast(C_P)) = 0\).

**Proof.** Derivation of this equilibrium is identical to Proposition 1, except for
the introduction of the boundary condition required to separate NEV claims from PEV claims.

**Remark.** This is a semi-pooling equilibrium, as all types below the cutoff type pool at $A = 0$. For all plaintiffs with PEV claims, however, this is the least-cost separating equilibrium and the optimality condition remains unchanged from Proposition 1. For a separating equilibrium, optimality addresses the marginal costs of additional signaling relative to the marginal benefits, and the presence of NEV claims does not affect that condition for all types above the cutoff type.

**Remark.** When the defendant holds all the bargaining power (i.e., $\alpha = 0$), the equilibria with and without NEV claims are the same. With $\alpha = 0$, the settlement for the cutoff type is zero in both scenarios.

**Remark.** A separating equilibrium requires that the cutoff type have zero net payoff. For some sets of parameter values, this means that the cutoff type spends as much on costly signaling as she expects to spend on discovery! If signaling costs rise with type, then all types above the cutoff type would spend more on signaling than they would spend on discovery.\(^{25}\) Obviously, no plaintiff would choose costly signaling in this scenario unless—as Proposition 2 assumes—there is some cost to filing a lawsuit other than the cost of discovery such that costly signaling may still be preferable to the alternative. Some features of litigation practice, such as filing fees or pleading requirements, have this effect. Any up-front cost (up to the amount of the cutoff type’s settlement) simply replaces the endogenous, costly signaling of all plaintiffs with PEV claims. For plaintiffs who would otherwise choose discovery, however, a filing fee or pleading standard is an additional cost.

Still, the result that cutoff types may spend as much on signaling as they would spend in litigation costs may seem implausible. It is worth noting that this is a property of equilibrium only in a model with continuously distributed types with certain parameter values.\(^{26}\) (Note that the simpler model in Section 2, which had discrete types, did not generate this result.) This is because sequential rationality in the continuous-types model requires that a type infinitesimally lower than the cutoff type receive zero settlement, while the cutoff type receives a settlement. This sharp discontinuity between virtually identical types is why signaling costs are so high in the continuous-types model.

In this way, the continuous-types model can be understood as the “worst-case scenario” for costly signaling; a coarser distribution of types dramatically lowers the costs of signaling and raises the net payoff to the cutoff type. Nonetheless, I will rely upon this model in Section 4 when I compare costly signaling to settlement signaling and screening, so as not to stack the deck

\(^{25}\)Signaling costs may not rise with type, however. It is conceivable that not only marginal costs, but also total costs, fall as type rises.

\(^{26}\)In particular, $\alpha \geq C_P / (C_P + C_D)$. 

Electronic copy available at: https://ssrn.com/abstract=2947302
in favor costly signaling. As we shall see, even with continuous types, costly signaling compares favorable to other mechanisms for settlement.

Illustration. To make these results more concrete, we must specify a cost function for signaling. Given that signaling can take many forms, and that the cost structure of litigation-related activity is understudied empirically, there is no obvious form to use. For expository purposes, I will throughout this paper use a simple function—plaintiff’s signaling costs are inversely proportional to type:

\[ F(t, A) = \frac{A}{t} \]  

(5)

See Figure 4 for a comparison of signaling costs by type with and without the presence of NEV claims, using this functional form. Further details appear in the Appendix.\(^{27}\)

3.3 Pooling Equilibria

Given that signaling may be quite costly, it is natural for one to ask whether a separating equilibrium with costly signaling can be socially optimal. Perhaps costly signaling through pleading is like an arms race—a socially costly dynamic that generates no advantage in equilibrium for any player. So far in this paper, I have focused on separating equilibria, but it is possible to construct equilibria where all plaintiffs, or all plaintiffs with PEV claims, send the same signal and receive the same settlement. Would such “pooling” equilibria make plaintiffs better off? Would they be socially optimal?

The answer to both of these questions is, in general, no. Pooling equilibria may be inferior to separation, both in terms of its effect on primary behavior (i.e., enforcement of the substantive law) and in terms of total litigation costs. As for substantive law, plaintiffs with stronger and weaker cases will be treated alike. Defendants who have caused small injuries or who are less blameworthy will pay the same settlement as defendants who have caused large injuries or who are more blameworthy. This defeats the aims of the substantive law, whether deterrence, compensation, or so on.

\(^{27}\)For this illustration and other illustrations that follow, I choose \( t \in [0,1] \), \( \alpha = 0.5 \), and \( C_P = C_D = 0.3 \). This can be interpreted as normalizing the stakes of the dispute to 1 and having type represent the plaintiff’s likelihood of prevailing at trial (and winning a judgment equal to stakes). Litigation costs for the parties are each equal to 30 percent of stakes, which is roughly in line with prevailing rates for contingency fees, as well as estimates of total litigation costs from empirical studies on tort litigation. See, e.g., Black, Hyman, Silver, and Sage (2008); Silver (2002). Entirely different numbers could be used of course, and importantly, the shape and height of the curves will depend on the parameters chosen. Qualitatively, though, the illustrations provided herein are representative of results within a fair range of plausible parameter values.
As for total litigation costs, the familiar result that pooling eliminates the social costs of costly signaling does not obtain when the pooling equilibrium still must separate NEV claims from PEV claims. Indeed, signaling costs may rise, because incentive compatibility requires that the NEV type not gain from mimicking the cutoff type. In a separating equilibrium, the cutoff type obtains a settlement reflecting the strength of the weakest PEV claim, but in a pooling equilibrium among PEV types, the cutoff type receives a higher settlement precisely because she is pooled with plaintiffs with stronger claims. As a consequence, lower types in the pool must increase their signaling in equilibrium, even as higher types decrease their signaling. These two effects will not, in general, offset. Because the marginal cost of signaling is (by construction) higher for low types, the increased costs for lowest PEV types will be greater than the decreased costs for the highest PEV types. In the Appendix, I provide further details of the conditions required for a pooling equilibrium, with an illustration of how pooling in the presence of NEV claims can raise, rather than lower, total expenditure on signaling.

It is possible, though, to construct a pooling equilibrium that includes some or all plaintiffs with NEV claims, which would reduce the costs of signaling (but also the social benefits). Only if all claimants are included in the pool would the costs of signaling fall to zero. Doing this, however, also reduces the social benefits of litigation to zero, because every claim, from the utterly frivolous to the utterly compelling, receives the same settlement. Finally, a zero-signal pooling equilibrium may be impossible if a defendant’s willingness to settle with all comers means that the pool of plaintiffs with low-type claims will endogenously grow in response to the opportunity for free money.

Of course, costly signaling is not the only way that plaintiffs of different types can separate themselves. It remains to be determined whether costly signaling is a superior means of separation than its alternatives, such as settlement offers that separate types (i.e., settlement signaling) or even going directly to discovery and trial. In the following Section, I present a more general model in which costly signaling, settlement signaling, and screening may occur. In this setting, zero-signal pooling may endogenously arise, because plaintiffs choose to separate themselves not through costly signaling, but through their settlement offers. In this setting, it may be both privately optimal (for plaintiffs) and socially optimal not to engage in costly signaling. Nonetheless, costly signaling remains privately optimal under a range of parameter values—and socially optimally under an even larger range.
4 Comparison with Screening, Settlement Signaling, and Litigation

At this point, the skeptical reader should be wondering why, given the potentially high cost of costly signaling, this method of signaling would be empirically relevant. Above, I simply assumed that costly signaling is superior to discovery for all types, but it is possible that the cost of higher types separating themselves from lower types may be so high that they prefer to conduct discovery to eliminate the information asymmetry. Further, in real-world practice, there is nothing to prevent parties from employing settlement signaling or screening strategies instead of costly signaling.

Thus, the potential empirical and policy relevance of the costly signaling model turns on the following questions:

To what extent is costly signaling likely to emerge endogenously? In other words, to what extent is costly signaling the payoff-maximizing strategy for plaintiffs when plaintiffs and defendants can choose among costly signaling, settlement signaling, screening, and litigation?

To what extent is costly signaling preferable to its alternatives from the social planner’s perspective? In other words, if we want to design procedural rules to reduce the social cost of dispute resolution, should the rules promote costly signaling or one of its alternatives?

As I will show below, costly signaling may compare quite favorably to its alternatives. Under plausible, empirically relevant conditions, we may observe a mix of costly signaling, settlement signaling, and discovery. Below, I first examine a model that incorporates costly signaling, settlement signaling, and screening as settlement mechanisms that are selected endogenously by the parties. I then explore potential policy implications.

4.1 An Expanded Model

To compare settlement mechanisms, I consider the model above, but with slight refinements: after the plaintiff’s opportunity to send a costly signal, the plaintiff then has the opportunity to offer a settlement. If the plaintiff does not make an offer, then the defendant has the opportunity to make an offer. If neither makes an offer or if the offer is rejected, the case proceeds to discovery.

This sequencing prioritizes plaintiff’s preference, which reflects the fact that the plaintiff chooses to initiate the legal dispute in the first place and is thus the natural first mover. Also, I assume that plaintiff type is distributed such that the distribution of types is strictly positive, continuous, and differentiable.

28Note that there is at most one offer made. This abstracts away from bargaining dynamics. This abstraction is necessary for the settlement signaling and screening models, but not the costly signaling model.
for its entire range \([t, \bar{t}]\). To ensure that both costly signaling and settlement signaling are possible, I assume that the fixed filing fee \(C_0\) is strictly positive.\(^{29}\)

By sending a costly signal and then offering settlement, the plaintiff chooses the costly signaling regime; by sending no signal and then offering settlement, the plaintiff opts into the settlement signaling regime; if the plaintiff forgoes making an offer and the defendant makes an offer, this selects the screening regime; if neither party makes an offer, this selects discovery. Different plaintiffs may choose different settlement strategies. For each of the subgames, I focus on the equilibrium identified in their separate treatments in the literature: for costly signaling, see Proposition 2 above; for screening, see Bebchuk (1984); for settlement signaling, see Reinganum and Wilde (1986) and Farmer and Pecorino (2007). See Figure 6 for the game tree.

From this setup, it follows that, even if screening and going directly to discovery are options, identifying the equilibrium path of the game will always come down to a horse race between settlement signaling and costly signaling. Proposition 3 states this result more precisely.

**Proposition 3: Only Costly Signaling or Settlement Signaling Subgames Obtain in Equilibrium.** Assume that a party who is indifferent between settlement and proceeding to discovery will choose to settle, and a party who is indifferent between making a settlement offer and accepting a settlement offer will choose to make the offer.\(^{30}\) First, the parties will always attempt to settle; they will never skip to discovery. Second, screening will not arise in equilibrium. Thus, equilibrium will be characterized by costly signaling, settlement signaling, or a mix of the two.

**Proof.** See the Appendix. The intuition is that skipping to discovery is always dominated by settlement signaling, and any proposed screening equilibrium will unravel. In any proposed screening equilibrium, high types who would reject a screening settlement offer would choose to make a settlement offer of their own. In turn, the optimal screening offer would be lower, which would lead the types who would reject that offer to choose signaling instead, and so on.

As noted above, without specifying how much signaling costs, one cannot determine a priori whether costly signaling will be more or less costly than its alternatives. To make the comparison of equilibria under settlement signaling and costly signaling more concrete, I will illustrate the comparison using the signaling cost function introduced earlier. I also assume that all plaintiffs must incur a filing cost \(C_0\) equal to three-tenths of plaintiff’s discovery costs.\(^{31}\)

\(^{29}\)As Farmer and Pecorino (2007) show, separating equilibrium in the settlement signaling game with NEV types requires a fixed fee \(C_0\), and as the discussion of Proposition 2 above noted, separating equilibrium in the costly signaling game may require a fixed fee \(C_0\).

\(^{30}\)These assumptions are merely to dispense with knife-edge scenarios.

\(^{31}\)As before, I assume that signaling costs are inversely proportional to type, each party’s costs of discovery are equal to 30 percent of the stakes, and plaintiff’s type reflects plaintiff’s
Figure 7 compares the costs of a settlement signaling equilibrium and a costly signaling equilibrium. For costly signaling, the plaintiff’s costs are equal to total costs. For settlement signaling, the total costs are higher than the plaintiff’s costs, because costs arise when settlement offers are rejected and both parties bear the costs of discovery (and potentially trial). In Figure 7, we see that although the total costs of settlement signaling exceed the total costs of costly signaling for all plaintiff types, most plaintiff types prefer settlement signaling, which is (for them) less costly. (For a range of types above the cutoff type, costly signaling is lower cost for the plaintiff than settlement signaling.) In this example, we see a mix of costly signaling and settlement signaling arise endogenously in equilibrium. And because settlement signaling entails settlements being rejected in equilibrium, we would also observe a fraction of cases proceeding to discovery (and potentially trial). This mix of settlement strategies, which includes bargaining failure leading to trial, seems realistic.

4.2 Policy Implications

Is it possible to compare social welfare under costly signaling versus settlement signaling? Roughly, yes. Both costly signaling and settlement signaling equilibria involve all plaintiffs with PEV claims obtaining settlements or expected judgments commensurate with their type, while all plaintiffs with NEV claims obtain nothing. So there is no difference in who obtains relief. Further, if bargaining power and litigation costs are equal between the parties, settlement are exactly equal to expected judgments. In this scenario, transfers from defendants to plaintiffs are identical under costly signaling (which involves only settlement) and settlement signaling (which involves a mix of settlement and further litigation). From the point of view of enforcement of substantive law, both of these settlement mechanisms perform equally well.

These mechanisms differ, however, in the quantity and distribution of litigation costs. As noted above, costly signaling involves the plaintiff spending resources on signaling, but neither party bearing the costs of discovery or trial. Conversely, the costs of settlement signaling are the costs to both parties of discovery (and possibly trial). This has three implications for our normative assessment of settlement mechanisms:

A misalignment between plaintiff’s private incentive to choose a settlement mechanism and the social objective of minimizing litigation costs exists so long as bargaining power is split between the parties. When filing costs are sufficiently low, such as the case illustrated in Figure 8, virtually all plaintiffs prefer settlement signaling to costly signaling, because it is lower cost for them.\(^\text{32}\) Settlement signaling, however, imposes greater total costs than probability of winning, which can be anywhere from zero to 100 percent.

\(^{32}\)Recall that costly signaling and settlement signaling generate the same settlements, so the only factor in the plaintiff’s decision is cost.
costly signaling. This misalignment of private cost and social costs can be seen as a product of the defendant’s discovery cost being an externality from the plaintiff’s perspective.\(^{33}\)

If plaintiffs held all of the bargaining power, the choice between costly signaling and settlement signaling would not be a concern, because a party with all of the bargaining power captures the full surplus from settlement and thus fully internalizes the social cost of discovery. It is not clear, however, that this scenario is empirical relevant, or what policies might be implemented to shift bargaining power in this way.

**Policies that encourage costly signaling rather than settlement signaling could lower the total costs of litigation.** If our concern is to lower the total cost of litigation, policies that shift the equilibrium from settlement signaling to costly signaling could lower total costs. Filing fees and pleading standards are policy tools that can accomplish this result. As noted above, raising the up-front cost of litigation (so long as the cost is less than the cost of discovery for the cutoff type) has no effect on plaintiff’s equilibrium costs, given costly signaling. But it does raise plaintiff’s costs when choosing an alternative settlement mechanism. Thus, raising the costs of filing, such that all plaintiffs shift from settlement signaling to costly signaling, can lower total costs in all cases—even though this policy change has no effect on how many lawsuits are filed or the size of settlements paid by defendants to plaintiffs.

To illustrate, Figure 9 considers an environment with much higher up-front costs than Figure 8. When comparing the two figures, note that the costs of costly signaling are unchanged; so long as the filing requirement is less than the costly signal of the cutoff type, the rise in filing costs has no effect on equilibrium costs for costly signaling. But the higher fee now leads all plaintiffs to select costly signaling rather than settlement signaling, thereby lowering total litigation costs relative to the scenarios in Figures 7 and 8.

**But a policy change that shifts the equilibrium from settlement signaling to costly signaling raises plaintiff’s costs even if it lowers total costs.** While the hypothetical policy illustrated in Figure 9 reduces total costs, plaintiffs as a whole are worse off in the new equilibrium, because their private costs have risen due to the switch from settlement signaling to costly signaling. Thus, this improvement in net social cost does have distributional consequences.

Further, not every increase in up-front costs will reduce total costs for all lawsuits. Imagine that the status quo is represented by Figure 8, and consider a switch to an intermediate regime, such as Figure 7, with lower up-front costs than Figure 9. Here, some plaintiffs, (in the range \(t \in [0.3, 0.52]\)) prefer costly signaling. In this range, the switch to costly signaling lowers total costs. But higher-type plaintiffs still prefer settlement signaling. For these types, the

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\(^{33}\)This misalignment was not considered by the original settlement signaling and screening models, as they assigned all of the bargaining power to the party choosing the settlement offer.
higher up-front cost has not only raised plaintiff’s costs, but total costs as well.\textsuperscript{34} Thus, raising up-front costs will fail to lower total costs if it does not induce a sufficiently large shift from settlement signaling to costly signaling. As a practical matter, these results counsel caution when policymakers tinker with things like pleading standards. The relationship between total litigation costs and pleading standards (or filing fees) is not monotonic, and an intermediate level of up-front costs may in fact be worse than either extreme.

5 Conclusion

This paper introduces a model of costly signaling. It applies to costly and observable undertakings, such as the hiring of lawyers and the filing of a complaint, that plaintiffs can use to signal their private information to defendants, and thereby induce settlement without the need for discovery. The costly signaling model presents an additional, alternative settlement mechanism comparable to the canonical models of settlement through screening (Bebchuk 1984) and settlement signaling (Reinganum and Wilde 1986). Unlike those models, however, costly signaling does not require strict assumptions about the nature of the settlement bargaining process. The costly signaling model accommodates (without altering its central, qualitative results) extensions that allow for spending on costly signals to offset spending later in litigation or for spending on costly signals to double as investments in the litigation, increasing the value of plaintiff’s claim.

I apply the costly signaling model to study the normative implications of raising filing fees and pleading standards. Perhaps counterintuitively, raising filing fees or pleading standards may reduce the total costs of litigation without reducing the number of lawsuits or the settlements obtained by plaintiffs. But not surprisingly, raising the up-front costs of litigation lowers the net private payoffs to plaintiffs.

Although this paper considers several extensions to the costly signaling model and looks at its relationship to filing fees and pleading standards, this paper is narrowly focused on information environments with one-sided private information held by the plaintiff. How costly signaling operates in different information environments, and how it interacts with other legal policies and rules, remains to be explored.

\textsuperscript{34}If the up-front cost is a filing fee, this may constitute a pure transfer rather than a true social cost. In this setting, the higher up-front cost raises plaintiff’s costs but not social costs.
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**A Appendix: Extensions**

**A.1 Combining Costly Signaling with Cost-Sinking**

In Hubbard (2016b), I consider a symmetric-information environment in which spending by a plaintiff at the pleading stage is not a signal at all (information is symmetric), but it allows the plaintiff to front-load costs that otherwise would occur later in litigation. By spending money at the outset, the plaintiff sinks costs, reducing the cost of proceeding to discovery and trial if the defendant refuses to settle. Consequently, a plaintiff whose claim would otherwise be NEV can create a credible threat to proceed to discovery and trial by sinking some of the costs of discovery and trial up front, such that the plaintiff’s expected judgment is no longer less than the remaining costs of litigation.

This model can easily be applied in the costly signaling context. Indeed, the qualitative results of the cost-sinking model of Hubbard (2016b) and of the costly signaling model in this paper remain unmodified. The only meaningful change in the equilibrium is that the cutoff type is now a type with an NEV.
claim—she spends money up-front to reduce her remaining litigation costs and thereby creates a credible threat to sue and obtains a positive settlement. All types above the cutoff type spend money up front as well, although for PEV types, the spending is purely for costly signaling purposes.

A.2 Combining Costly Signaling with Investment in Success at Trial

Another possibility is that up-front spending is neither a pure signal nor front-loading of costs, but expenditures that both affect the outcome at trial and potentially signal case strength, where case strength is now a function of both plaintiff type and up-front expenditure. As noted above, both Choné and Linnemer (2010) and Jeitschko and Kim (2013) explore aspects of this approach.

Incorporating observable investments in case strength into the apparatus of my costly signaling model is fairly straightforward. Rather than treating type as merely reflecting an exogenous level of case strength that also affects signal cost, we now treat type as reflecting both inherent case strength and the cost of supplementing case strength, such that type affects signal cost and the degree to which expenditures affect the outcome at trial. The simplest approach is to treat $A$ as both a measure of signal strength and an input into case strength, such that the expected value of a plaintiff’s claim (call this $\pi(t, A)$) depends on both $t$ and $A$. To reflect the fact that higher spending improves expected value with diminishing returns, let $\pi_A(t, A) > 0$, $\pi_{AA}(t, A) < 0$, and $\pi_t(t, A) > 0$ for all $t$ and all $A$. The cost function $F(t, A)$ retains all of its properties from before.

Under these conditions, we can construct a separating PBE with the optimality condition

$$F_A(t, A^*(t)) \frac{dA^*(t)}{dt} = 1 + \pi_A(t, A^*(t)) \frac{dA^*(t)}{dt}$$

(6)

The left-hand side of Equation (6) reflects the marginal cost of increasing the signal $A$ for type $t$. This is unchanged from the original optimality condition, Equation (1). What has changed in the right-hand side, which now reflects this increase in settlement amount from mimicking a marginally higher type (same as before) but also the marginal increase in settlement amount from the plaintiff’s case actually being stronger, due to the higher up-front investment.

When there are no NEV claims, the boundary condition reflects the fact that the lowest type in equilibrium cannot benefit from signaling, but is still willing to invest in up-front cost to improve case strength. Its expenditure is identical
to the solution to the optimization problem without private information:

\[ F_A(t, A^*(t)) = \pi_A(t, A^*(t)) \]  

(7)

When there are NEV claims, the boundary condition is determined by a pair of equations reflecting that (1) the cutoff type is determined endogenously, because case strength is determined endogenously, and (2) the payoff to the cutoff type must be zero. Thus, the signaling schedule \( A^*(t) \) and cutoff type \( \tau \) are such that the cutoff type is the lowest type who would proceed to discovery in the absence of settlement:

\[ \pi(\tau, A^*(\tau)) - C_P = 0 \]  

(8)

and the payoff to type \( \tau \) in the separating equilibrium is zero:

\[ S(A^*(\tau)) - F(\tau, A^*(\tau)) = 0 \]  

(9)

Figure 10 illustrates the graphical solution to this problem, showing \( A^*(t) \).

A.3 Pooling Equilibria: Conditions and Examples

For simplicity, assume equal bargaining power and equal discovery costs, such that settlements (if type is common knowledge) are equal to expected judgments. Assume that beliefs about out-of-equilibrium signals are such that unraveling will not occur.

For pooling of PEV claims at signal \( A^{Pool} \) and settlement \( S^{Pool} \) to be an equilibrium, it must be that (1) all pooled plaintiffs prefer settlement at \( S^{Pool} \) to proceeding to discovery; (2) the defendant prefers settlement at \( S^{Pool} \) to proceeding to discovery; and (3) no NEV plaintiffs have an incentive to mimic the signal \( A^{Pool} \). Condition (1) requires that no plaintiff with a PEV claim gain more from settlement than from skipping to discovery: \( S^{Pool} - F(t, A^{Pool}) \geq t - C_P \) for all \( t \geq C_P \). Condition (2) requires that defendant’s settlement payment not exceed the expected cost from settlement or trial after discovery: \( S^{Pool} \leq E[t | t \geq C_P] + C_D \). Condition (3) requires that the net payoff to the cutoff type be zero: \( S^{Pool} = F(C_P, A^{Pool}) \).

From Conditions (1) and (3), we see that this pooling equilibrium can only obtain if the costs of signaling fall sufficiently fast in \( t \): it must be that \( F(C_P, A^{Pool}) - F(t, A^{Pool}) \geq t - C_P \) for all \( t \geq C_P \). Depending on the cost function \( F \) for signaling and the distribution of plaintiff types, it is possible to
construct a pooling equilibrium that meets these conditions.

To continue the illustrative example used above, consider a unit mass of plaintiffs with types uniformly distributed in the interval \( t \in [0, 0.9] \), with \( C_P = C_D = 0.3 \), \( \alpha = 0.5 \), and \( F(A, t) = A/t \). The unique pooling equilibrium that meets the three conditions above has \( S_{\text{Pool}} = 0.9 \) and \( A_{\text{Pool}} = 0.27 \), which implies \( F(t, A_{\text{Pool}}) = 0.27/t \). Total litigation costs (borne entirely by plaintiffs) are \((\int_{0.9}^{0.3} (0.27/t) dt)/(0.67) = 0.445\). By comparison, the total litigation costs of a separating equilibrium are \((\int_{0.9}^{0.3} (t/2 + C_P^2/2t) dt)/(0.67) = 0.344\).

One could also construct a pooling equilibrium in which all plaintiffs, including some or all NEV plaintiffs, pool. Such an equilibrium would need to comport with Conditions (1) and (2) above, but not Condition (3). This pooling equilibrium could be reduce total litigation costs to zero, since there is no separation between NEV and PEV claims. The example above also has a unique pooling equilibrium in which all plaintiffs pool: \( S_{\text{Pool}} = 0.6 \) and \( A_{\text{Pool}} = 0. The defendant is indifferent between settling with all plaintiffs or proceeding to discovery with only the plaintiffs with PEV claims, the highest-type plaintiff is indifferent between settlement and proceeding to discovery, and all other plaintiffs are strictly better off. Total litigation costs are zero.

B Appendix: Proofs and Notes

B.1 Derivation of Equilibrium in Proposition 1

The equilibrium concept is PBE. Both the equilibrium concept and the equilibrium I describe are standard for models of this type. Define \( p_t(A) \) to be the probability that a plaintiff of type \( t \) chooses pleading level \( A \). Define \( r_t(S) \) to be the probability that plaintiff of type \( t \) rejects settlement offer \( S \). Define \( \beta_0(t) \) to be the defendant’s prior belief of the probability that a plaintiff is of type \( t \), and define \( \beta(t|A) \) to be the defendant’s posterior belief of the probability that a plaintiff is of type \( t \) given observed pleading detail level \( A \). A PBE is a settlement offer schedule \( \{S(A)\} \) from the defendant, a set of (possibly mixed) strategies \( \{p_t(A), r_t(S)\} \) for the plaintiff’s types \( t \), and conditional beliefs \( \beta(t|A) \) of the defendant such that

1. The making, acceptance, and rejection of settlement offers in any period are consistent with each party maximizing expected payoffs.

2. All signals \( A \) observed in equilibrium must maximize the plaintiff’s expected payoffs.

\( ^{35} \)See Appendix Section B.2 for derivation of the equilibrium cost function for the separating equilibrium in this example.
3. The defendant’s posterior beliefs $\beta(t|A)$ must satisfy Bayes’ Rule whenever $p_t(A) > 0$. There are no restrictions on beliefs when $p_t(A) = 0$.\(^{36}\)

Based on these conditions, we can identify the following PBE:

**Settlement offers and responses.** The defendant offers $S(A^*(t)) = t + \alpha C_D - (1 - \alpha) C_P$. Offers are always accepted.

**Signaling strategy.** The only challenge in identifying the separating PBE in this model is deducing the equilibrium signaling schedule $A^*(t)$ such that each type reveals itself by sending a unique signal and no type can increase its payoff by mimicking the signal of a different type. The payoff to type $t$ that mimics type $j$ and receives the equilibrium settlement for type $j$ is

$$U(t, A^*(j)) = j + \alpha C_D - (1 - \alpha) C_P - F(t, A^*(j))$$  \hspace{1cm} (10)

For separation to be an equilibrium, each type $t$ must maximize their payoff by sending the signal that reveals their own type:

$$t = \arg\max_j \{j + \alpha C_D - (1 - \alpha) C_P - F(t, A^*(j))\}$$  \hspace{1cm} (11)

From this, the first order condition, Equation (1), follows.\(^{37}\)

Equation (1) is a differential equation reflecting the optimality condition for a separating equilibrium—each type $t$ maximizes her payoff by sending a signal $A^*(t)$ that uniquely corresponds to type $t$. Plaintiffs’ equilibrium signaling strategy $A^*(t)$ is therefore given by Equation 1 and the boundary condition, Equation (2), which reflects the fact that the lowest type need not signal at all.

**Posterior beliefs.** The beliefs in this equilibrium are $\beta(t|A^*(t)) = 1$ and $\beta(t|A^*(j)) = 0$ for all $j \neq t$.\(^{38}\)

While there are many PBEs that one may propose, I will focus on the equilibrium described above, as it has intuitively appealing properties. This equilibrium is the “least-cost separating equilibrium,” the unique, pure-strategy, separating equilibrium that minimizes the social cost of costly signaling. This equilibrium is also the only PBE in this model that also satisfies the Cho-Kreps

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\(^{36}\)In defining equilibrium concepts in this model, including PBE and least-cost separating equilibrium, I follow the approach to the Spence (1973) model provided by Bolton and Dewatripont (2005).

\(^{37}\)Note that given the definition of $F(t, A)$, the second order condition will always be met.

\(^{38}\)Note that it is easy to verify that settlement offers and acceptances are sequentially rational and defendant’s posterior beliefs are correct in equilibrium.
Intuitive Criterion (Cho and Kreps 1987).

B.2 Derivation of Equilibrium Costs in the Illustrative Example

Assume that plaintiff’s signaling costs are inversely proportional to type as noted in Figure 5. Given this, the optimality condition (see Equation (1)) for a separating PBE is

\[
\frac{1}{t} [A^*(t)]' = 1 \tag{12}
\]

For the case without NEV claims, this together with the boundary condition in Equation (2) implies

\[
A^*(t) = \frac{t^2}{2} - \frac{t^2}{2} \tag{13}
\]

and thus in equilibrium

\[
F(t, A^*(t)) = \frac{t}{2} - \frac{t^2}{2t} \tag{14}
\]

This cost function is used to generate the lower curve in Figure 4. The lowest type plaintiff sends no signal, and each plaintiff with a PEV claim obtains a settlement \( t + \alpha C_D - (1 - \alpha) C_P \); under the assumptions used in Figure 4, the settlement is simply \( t \).

For the case with NEV claims, Equation (12) together with the boundary condition in Equation (4) implies

\[
A^*(t) = \frac{t^2}{2} + \frac{C_P^2}{2} \tag{15}
\]

and thus in equilibrium

\[
F(t, A^*(t)) = \frac{t}{2} + \frac{C_P^2}{2t} \tag{16}
\]

This cost function is used to generate the upper curve in Figure 4 and the costly signaling curves in Figures 7 through 9.
B.3 Proof of Proposition 3

First, the parties will always attempt to settle. Skipping to discovery is dominated by both settlement signaling and screening; the party making the offer at least weakly prefers (by construction) the equilibrium settlement offer to discovery. For example, in the settlement signaling equilibrium in Reinganum and Wilde (1986) (which involves no NEV types), all types strictly prefer making a settlement offer to litigation. In Farmer and Pecorino (2007) (which allows for NEV types), all PEV types strictly prefer making a settlement offer to litigation, except for the cutoff type, who is indifferent.

Second, screening will not arise in equilibrium. Proof is by contradiction. Assume that some subset of plaintiffs (possibly all plaintiffs) forgo making a settlement offer. Call the distribution of such plaintiffs \( f(t) \) and call the highest type for which \( f(t) \) is positive \( b \). Note that for plaintiffs of type \( b \) to be in \( f(t) \), they must strictly prefer their payoffs under screening to their payoffs otherwise. This implies that all plaintiffs of type \( t < b \) will forgo making settlement offers, because payoffs under both costly signaling and settlement signaling are non-negative in type.\(^{39}\) Thus, it follows from the assumptions for the distribution of all plaintiffs that \( f(t) \) is also continuous, differentiable, and positive for all plaintiff types up to \( b \).

For these plaintiffs, the defendant will then make a screening settlement offer that maximizes defendant’s expected payoff, taking into account the cost of paying settlements to all plaintiffs who accept the offer and the cost of paying judgments and litigation costs when plaintiffs reject the offer. First, assume that the distribution of plaintiffs is degenerate, i.e., a measure-zero set composed only of one type \( (b) \). Defendant’s offer in this case will be \( S = b - C_P \), which is exactly what type \( b \) obtains at trial. This is a contradiction; in this case type \( b \) will choose to make a settlement offer, since the payoff from making a settlement offer for type \( b \) will be no worse than the payoff from going to discovery. Second, assume a non-degenerate distribution of plaintiffs \( f(t) \), but a measure zero of PEV plaintiffs in \( f(t) \). If so, the defendant will offer a screening settlement of zero. (The defendant gains nothing by settling NEV claims.) Given a strictly positive cost of filing suit, the NEV plaintiffs will have a negative payoff from filing suit. This is a contradiction; they will not file suit and therefore will not participate in the screening subgame.

Thus, it must be the case that there is a positive measure of plaintiffs with PEV claims. If so, for these claims, the solution to this optimization problem (for a distribution \( f(t) \) of plaintiffs that is continuous, differentiable, and positive for

\(^{39}\)This can be confirmed by differentiating with respect to type the plaintiff’s payoff function under either costly signaling or settlement signaling. For costly signaling, note that the payoff to a plaintiff of type \( t \) is \( t + \alpha C_P - (1 - \alpha) C_P - F(t, A^*(t)) \). For settlement signaling, see Reinganum and Wilde (1986).
all plaintiff types up to \( b \) is characterized by Bebchuk (1984).\(^{40}\) Proposition 1 of Bebchuk (1984) shows that the optimal screening offer will always be one such that some plaintiff types will reject the offer.

In other words, type \( b \) plaintiffs will never accept a screening settlement offer; they are certain to go to discovery. All type \( b \) plaintiffs, therefore, will choose to make a settlement offer, since doing so is no worse than the payoff from going to discovery (and for all types above the cutoff type, it is strictly better). This is a contradiction; by assumption the subset of plaintiffs \( f(t) \) who forgoed making a settlement offer contained plaintiff of type \( b \). QED.

\(^{40}\)Note that Bebchuk (1984) addresses the scenario when the defendant has private information, so its Proposition 1 should be read with this in mind.
Figures

Figure 1: Separating Equilibrium with Costly Signaling

\[ U_H = H - F(H, A_H) \]
\[ U_L = L - F(L, A_L) \]
\[ U_{NEV} = 0 \]
\[ A_{L} \]
\[ A_{H} \]
\[ S_{NEV} = 0 \]

Electronic copy available at: https://ssrn.com/abstract=2947302
Figure 2: Separating Equilibrium with Heightened Pleading

\[ U_H = H - F(H, A'_H) \]
\[ U_L = L - F(L, A'_L) \]
\[ S_{NEV} = 0 \]
Figure 3: Separating Equilibrium with Ultra-Heightened Pleading

\[
U_H = H - F(H, A''_H)
\]

\[
U_L = 0
\]

\[
A''_L = A''_L
\]

\[
S_H = H
\]

\[
F(H, A''_H)
\]

\[
L
\]

\[
S_L = S_{NEV} = 0
\]

\[
A_L = A_{NEV} = 0
\]

\[
A_H
\]

\[
A'_{H}
\]

\[
A^*_{H}
\]

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Figure 4: Costs of Costly Signaling for $C_P = C_D = .3$ and $\alpha = 0.5$, with and without NEV Claims

Cost

- Total/plaintiff's cost of costly signaling – without NEV type
- Total/plaintiff's cost of costly signaling – with NEV type

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Figure 5: Spending on Costly Signaling with Signal Strength Capped at $\tilde{A}$
Figure 6: Game Tree for Expanded Game

- \( N \) chooses \( t \)
- \( P \) chooses \( A \)
- \( A \geq C_0 \)
- \( A < C_0 \)
- \( (−A, 0) \)
- \( P \) chooses to offer settlement
- \( Y \)
- \( P \) offers \( S \)
- \( D \) accepts \( S \)
- \( (S−A, −S) \)
- \( N \)
- \( D \) chooses to offer settlement
- \( Y \)
- \( D \) offers \( S \)
- \( P \) accepts \( S \)
- \( N \)
- \( Y \)
- \( (S−A−S) \)
- \( (−C_0−A(t), −t−C_D) \)
- \( (−A, 0) \)
Figure 7: Costs of Settlement Signaling and Costly Signaling for $C_P = C_D = 0.3$, $\alpha = 0.5$, NEV Claims, and minimum signal $C_0 = 0.09$. 

![Costs of Settlement Signaling and Costly Signaling](https://ssrn.com/abstract=2947302)
Figure 8: Costs of Settlement Signaling and Costly Signaling for $C_P = C_D = 0.3$, $\alpha = 0.5$, NEV Claims, and minimum signal $C_0 = 0.03$
Figure 9: Costs of Settlement Signaling and Costly Signaling for $C_P = C_D = 0.3$, $\alpha = 0.5$, NEV Claims, and minimum signal $C_0 = 0.3$
Figure 10: Equilibrium Signal Function with Endogenous Investment in Success at Trial

BC: $\pi(\tau, A^*(\tau)) = C_p$

BC: $S(A^*(\tau)) = F(\tau, A^*(\tau))$

OC: $F_A A'(t) = 1 + \pi_A A'(t)$

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