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THE U.S. COPYRIGHT TERMINATION LAW, ASYMMETRIC INFORMATION, AND LEGAL UNCERTAINTY

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Abstract. This paper investigates the conflict between authors and their publishers that occurs as a result of publishers using an ambiguous "work made for hire" clause to sue the author for copyright infringement. A Bayesian signaling model allows a publisher to send an informative signal to the uninformed author that includes his reaction towards a license termination to induce termination deterrence. The model is used to examine the effectiveness of the statutory intervention. The results reveal that complete termination deterrence is an equilibrium outcome only if a publisher sues with certainty. The mere threat to sue is not sufficient for complete termination deterrence. Under most parameter settings, the results indicate positive termination probabilities. The highest probability for a neutral publisher type is obtained in situations where an author has weak outside options or is strongly dependent on his publisher. An author with valuable outside options increases the probability that a publisher will threaten to pursue legal action. If courts tend to favor authors, then termination incentives increase, which may lead to more friction between authors and their publishers.

1. Introduction

In 2015, the core copyright industries in the U.S., i.e., industries whose purpose is to create, produce, distribute or exhibit copyright materials, extended the GDP by $1.2 trillion dollars, which accounts for 6.88% in relative measures (Siwek, 2016). Licensing plays a significant role in these industries because authors license their creative goods to intermediaries, such as publishers, who manage their economic successes (Caves, 2000). Evidence shows that older licenses become more and more valuable in most markets because back catalogs provide a dependable bottom line for profitability and stability to publishers

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(Beldner, 2012). U.S. copyright law permits authors to terminate their licenses, and contemporary experience suggests friction in the markets, with negative effects for authors, publishers, and the general public (Darling, 2015). On the one hand, this presumption is reflected in the reactions of licensees when publishing companies announce their rejection of license terminations (Beldner, 2012). On the other hand, authors have much to gain by reclaiming control over their work and they signal their intention to fight for their rights, wherefore a high potential for costly conflicts is assumed in many creative industries (Strohm, 2003; Chandra, 2005; McGilvray, 2009).

Examining the core details[1] of the law will help to define the source of conflict. Since 1978,[2] authors or their statutory heirs have been allowed to terminate copyrights to their creations 35 years after giving ownership to a publishing company. This termination right is inalienable and contracts that exclude the termination clause are not enforceable. Another limitation of the termination law is that the right is not given to authors whose work is created as "work made for hire". "Work made for hire" occurs when authors act as employees under a firm's contract and create works within the scope of their employment relationship. Thus, only independent contractors are able to terminate a license.

This limitation is the starting point for the research question of this paper. The current legal position tends to be a gray zone, as both publishers and authors are unsure of their respective rights regarding the termination provisions. The discrepancy between the statutory language concerning the "work made for hire" clause and the legal interpretation of that language create this ambiguity (Strohm, 2003; Beldner, 2012). Even the fact that contract designs routinely contain[3] the "work made for hire" clause and the definition of factors that determine this clause do not clarify the actual legal position (Strohm, 2003; Henslee and Henslee, 2011). Consequently, recent studies suggest a "hailstorm of

[1]The law includes more details than mentioned in this paper. These details are of minor importance to the underlying study but can be found under 17 U.S.C. §203. Further discussions and the history of the law may be found in, e.g., Abdullahi (2012).

[2]Pre-1978 grants are regulated separately under 17 U.S.C. §304 but will be excluded due to the deviating specifications of the law. In addition, two major amendments should be mentioned that lead to the status quo: the Copyright Term Extension Act and the Copyright Corrections Act of 2000.

[3]Authors often agree on contracts while being unaware about the details or comply with the details without resistance due to their weak bargaining positions (Rohter, 2013). Courts tend to consider this fact, as precedents have shown that they question the validity of this clause even if this clause is explicitly mentioned in a contract (Strohm, 2003).

litigation" as authors believe that their contracts do not include such a clause, whereas publishers claim that most contracts do include the clause (Strohm, 2003; Henslee and Henslee, 2011; Darling, 2015).

Common sense suggests that such an ambiguity may incentivize publishers to threaten legal consequences for strategic reasons. Prior literature has drawn attention to the fact that such threats may be sufficient to deter actually entitled authors from copyright terminations (Vo, 1998; Strohm, 2003; Menell and Nimmer, 2009). Gilbert (2016) argues that many authors may abstain from copyright terminations due the burden of high court costs. Starshak (2001) mentions that the relationship between authors and publishers may also play a substantial role in authors' motivations to terminate their licenses. In other words, a stronger relationship may prevent termination incentives because authors fear that they might lose their valuable collaborations with their publishers. Many scholars agree that such an ambiguous situation will lead either to useless law or to more court cases (Vo, 1998; Nimmer and Menell, 2001; Strohm, 2003; Beldner, 2012; Gilbert, 2016).[4]

From an economic point of view, license termination is problematic; publishers' investment levels may decrease because the profitability of their projects determines their investment incentives (Macho-Stadler and Pérez-Castrillo, 2014; Karas and Kirstein, 2019). In contrast, license terminations may motivate authors to increase creative outputs, and the recuperation of control may increase the circulation of works (Macho-Stadler and Pérez-Castrillo, 2014; Darling, 2015). Yoon (2002) demonstrated that a copyright system, which leads to greater circulation of works, may increase social welfare. The first attempts to derive welfare implications suggest that the costs of license terminations may outweigh the benefits (Rub, 2013; Darling, 2015). However, the literature agrees on one fact: copyright law that increases friction in the markets and the number of legal disputes is certainly detrimental with respect to authors, publishers, and the general public.

As concerns about friction between authors and publishers have expanded over the last decades, so too has the need to understand the causes of the friction and how market

[4]Strohm (2003) mentions that the determination of joint authorship may also significantly increase the number of litigation cases. For simplicity, this issue is left out and unanimous agreement in joint works is assumed, as the focus of this paper lies on the author-publisher relationship.

participants will react towards the friction. The specific questions of this paper are as follows: When a publisher credibly announces the possibility of legal action, how does this affect an author's motivation to terminate a license? In what way does a publisher react towards an author's conviction to terminate? What role do aspects such as the license value, court decisions and costs, public image, liaison value, and other aspects play in determining the behavior of the involved parties? For these questions, a clear economic analysis, at least in copyright law, is overdue. This paper introduces a game theoretic model to address these questions, i.e., it examines the effectiveness of the termination law. The question of effectiveness also addresses the justifiability of political intervention in such a setting. The introduction of the law took more than two decades of painstaking legal and political negotiations and required many amendments to yield its current form (Strohm, 2003; Darling, 2015). Ineffectiveness would raise questions about the necessity of such a political intervention and uncover a waste of taxpayers' money.

The underlying model assumes asymmetric information because a publisher can perfectly assess the credibility of their threat to sue for infringement, whereas an author has only the ability to guess the consequences while following the media or precedents. A signaling game then models the anticipatory interaction between the two contestants, i.e., how an author reacts to an announcement and how a publisher designs their announcement while anticipating the reaction of the author. This Bayesian signaling game offers equilibrium outcomes for the cases that a publisher will sue with certainty, sue with positive probability, and abstain from legal action at all times.

The parameters of the model consider both parties' expected gains from license ownership, the reputational cost for the announcement of a suit, and the author's dependency on the publisher. The role of the courts is modeled using an exogenous decision parameter. With this technique, both contestants have consistent expectations about the trial outcomes. This paper demonstrates how the previously mentioned determinants impact equilibrium outcomes in a Bayesian game setting, while contributing to the discussion on termination incentives, incentives to trial copyright ownership, and the role of courts under this framework (see, e.g., Vo, 1998; Strohm, 2003; Scott, 2006).

This model approach is new in the discussion on copyright termination law. However, the model proposed here builds both on the paper by Karas and Kirstein (2018) and on the signaling model proposed by Kirstein (2014). Karas and Kirstein (2018) examine the contractual situation between authors and publishers in the presence of the same termination law and make a first attempt to design termination incentives from an economic perspective. The underlying paper extends their approach significantly, while adding uncertainty, legal consequences, and signaling opportunity to their analysis.

For the purpose of modeling information asymmetry, the paper of Kirstein (2014) proves helpful, in which a Bayesian signaling game illuminates the interaction between an athlete and a doping enforcer, who is the uninformed party and reacts with different punishment styles. Kirstein's paper derives equilibria for each punishment style, which all have different implications with respect to the athlete's compliance behavior. The structure of the Bayesian game in Kirstein's paper plays a central role for the underlying model, which also leads to the derivation of multiple equilibria. Even though the underlying model also proves that a player's choice is both interactive and distinguishable on the type choice of the informed party, the equilibrium outcomes are hardly comparable to those of Kirstein (2014). This is because the parameters are designed differently, leading to deviating payoff structures. Moreover, the underlying model adds an umpire to the Bayesian game and includes further subgames where the informed party can determine a final choice.

Another paper by Usman (2002) also considers a Bayesian setting where court decisions play a role. The difference in the underlying approach is that the court's choice is exogenous, whereas Usman's paper models the court as an interactive player who can exert effort to provide evidence. Indeed, it would make sense to additionally consider judges' behaviors as Usman does, because their decisions may be affected by precedents, trends, and other aspects (Tirole, 1999). This detail is not considered in this paper because the focus is on the interaction between authors and publishers. Moreover, the underlying approach demonstrates significant effects of court decisions on the equilibrium outcomes, which allow one to derive appealing implications while contributing to the general discussion on copyright termination law.

The paper proceeds as follows: Section two introduces the model and its assumptions and presents the best response functions of the players, which are used to yield the equilibria of the Bayesian signaling game. Section three proceeds with a discussion, followed by a conclusion to the paper in section four. An appendix, finally, collects our formal derivations and proofs.

2. Model

2.1. **Setup and assumptions.** Suppose that an author (A) and a publisher (P) have a contractual relationship over a specific copyright grant. At a point in time, A may decide to terminate this contract.[5] P is allowed to choose an attitude type towards copyright terminations. This assumption captures the ongoing rumors in copyright industries that may lead to license termination deterrence. In particular, attitude is modeled in a bilateral setting where P may have a neutral or opposed attitude towards terminations. P perfectly knows his attitude; however, A is incapable of observing this attitude perfectly. A has just an intention from following the media, observing the publisher in other relevant cases, or even from direct talks.

Note that the attitude still does not reflect the final reaction of P towards a copyright termination as this attitude serves only to signal certain readiness to plead an extant license. Since both players interact sequentially, A makes the termination decision based on his beliefs about P's attitude. If A terminates the grant, further subgames start in which P may accept the facts or sue A for copyright infringement. It is thus resolute if a publisher with an opposed attitude fights for the license, whereas a publisher with a neutral attitude should accept the facts. Assume that A and P are rational and profit-maximizing individuals and let both contestants be risk neutral. Also assume that authors prefer to terminate copyright grants when the publisher is neutral because an opposed attitude may harm their relationship and may trigger a legal dispute. Furthermore, consider that an

[5]17 U.S.C. §203(a)(4)(A) provides that notice to the copyright office and to publishers "shall be served not less than two or more than ten years before that date". The law provides more specific requirements that may lead to different time spans or points in time where termination notices need to be sent; for the topic under scrutiny, however, it matters only that the author lies within this time span as to maintain the possibility of termination.

opposed attitude is costly to P for reputational reasons, because an opposed attitude may impair the external image and weaken his market position.

The attitude probability for the neutral type is denoted by x, which implies that P is an opposed type with probability $1-x$. As previously mentioned, A receives an informative signal from which he can draw conclusions about the type of P. The signal has two realizations: $s:n$ is the signal for the neutral type and $s:o$ is the signal for the opposed type. Let y and z denote probabilities for a certain signal realization, which are contingent on the type of player P. Consequently, $y = Pr(s:n|\text{neutral type})$, $1-y = Pr(s:o|\text{neutral type})$, $z = Pr(s:n|\text{opposed type})$, and $1-z = Pr(s:o|\text{opposed type})$. Note that only y and $1-z$ denote correct realizations. An assumption from Kirstein (2014) helps in solving the game for perfect Bayesian equilibria: the uninformed party has positive monitoring skills, which allows them to distinguish between a correct and an incorrect signal wherefore $0 < z < y < 1$.

The information asymmetry problem leads to the circumstance that A's expectations depend on his beliefs about P's type choice. These beliefs can be updated to ex post beliefs applying Bayes' rule, for which A's observations of the imperfect signal prove helpful. Denote these ex post beliefs $\lambda = Pr(\text{neutral type}|s:n)$, $1-\lambda = Pr(\text{opposed type}|s:n)$, $\mu = Pr(\text{neutral type}|s:o)$, and $1-\mu = Pr(\text{opposed type}|s:o)$. Based on these beliefs, A decides whether to terminate the license. Consequently, define the behavioral strategies of A as $p = Pr(\text{terminate}|s:n)$, $1-p = Pr(\text{not}|s:n)$, $q = Pr(\text{terminate}|s:o)$, and $1-q = Pr(\text{not}|s:o)$. In particular, p and q describe the probabilities of license termination seeing a neutral or an opposed signal, respectively. Therefore, it must be true that $0 \leq p, q \leq 1$.

Figure 1 shows the entire information structure of the game, i.e., the sequence of events with the players' sequential moves, the generated signals, and the players' payoffs. The first decision node illustrates P's choice about the attitude type. There is then a chance move illustrated by the two squares labeled "N" where nature chooses a signal that is contingent on the type of P. Recall that P knows his own type but the author derives his beliefs from observing a certain signal. The dotted lines between the nodes labeled "A" denote two information sets. In other words, the author does not know whether he is at the upper or lower node when observing the neutral or opposed type signal. At least, the author is able to derive ex post beliefs λ and μ about P's type, which can be found next to each respective node. If A does not terminate, the game follows the path "not", and the game is over at this stage. If, however, A terminates a license, the game continues with further subgames starting each at the nodes illustrated by the circles labeled "P". Then, in each subgame, P may accept or not accept the termination. If not, then P fights for the continuation of the copyright license by suing A.

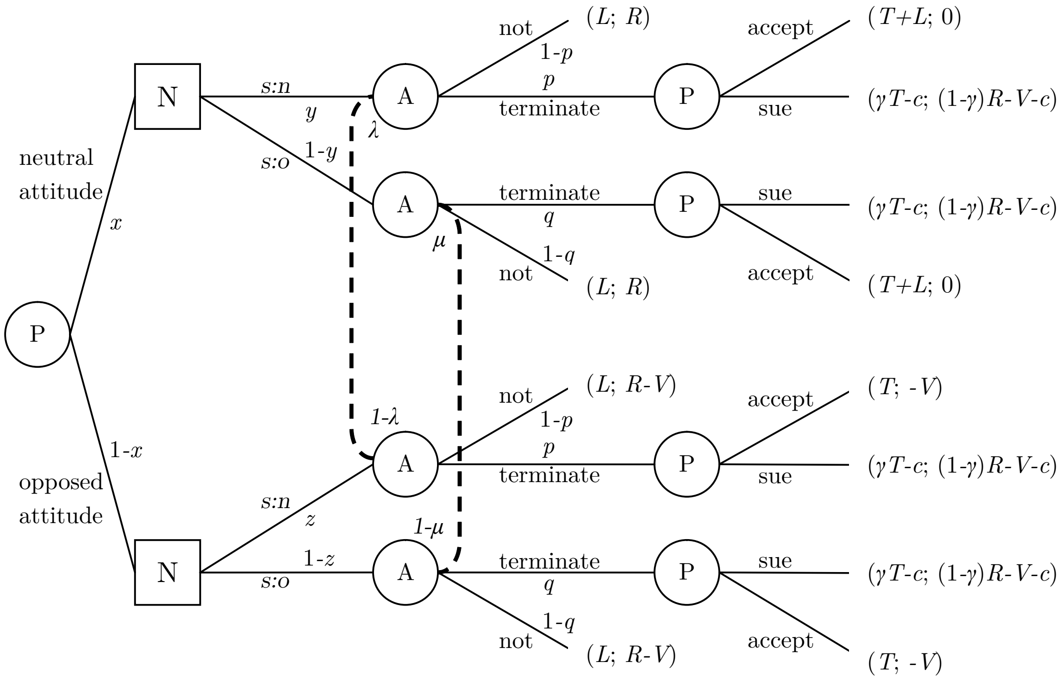

FIGURE 1. The information structure

Now let us explain the payoffs for the different situations, which are also shown in Figure 1. Given that A will not terminate the copyright license, he receives a value for maintaining liaison with his publisher, no matter what type P is. It is a cooperation value that involves the author's valuation for avoiding being blacklisted or disregarded in further projects. This is modeled by $L > 0$.[6] In the same situation, under both attitude

[6]We abstain from modeling outstanding payments or royalties from publishers to authors. Such a monetary relationship could be considered in the analysis but would not contribute any new insights as all that matters is the

types, P can collect his expected profits, denoted $R > 0$, as the publisher will remain the licensee. One important feature of signaling games is that sending a signal is associated with costs for the sender. Thus, the signal cost depends on to the type of P, implying that an opposed type signal negatively affects his external image. This circumstance is modeled with parameter $V > 0$, and the respective payoff is $R - V$.

Now consider the payoffs if A terminates a license. We can see from Figure 1 that the payoffs are contingent on P's type and on his ultimate decision whether to accept the termination. In the neutral attitude type situation, an acceptance of termination entails P losing copyright ownership and, as a consequence, remaining at zero. A's payoff includes a termination revenue stream from a different source and a moral value from termination. Both factors are reflected in $T > 0$.[7] The payoff also includes the liaison value L, which models the dependence on the publisher. In the opposed attitude type situation with termination acceptance, the liaison value for A cancels out as a consequence of the attitude and A just receives T. This attitude, however, is costly to P as V is deducted from his payoff.

It was already outlined why a termination may lead to a legal dispute, presuming that P sues A. For simplicity, the court's decision is assumed to be exogenous and is illustrated by $0 < \gamma < 1$. This implies that P prevails at court with probability $1-\gamma$ and that the parties have consistent expectations about the court's decision. Note that a high γ implies a high chance for A to prevail at court, whereas $\gamma \approx 1/2$ simulates the situation with the highest legal uncertainty for both parties. It is sensible to assume the American cost allocation rule under which each party bears its own court costs. For analytical convenience, these court costs are assumed to be equal for each party and will be denoted $c > 0$.[8] Contingent on the decision of the judge, P's expected payoff is $(1 - \gamma)R - V - c$ and A earns $\gamma T - c$.

difference in value between the choice to terminate or to abstain from termination. This difference is already included in the model in A's gains from termination, and the status quo between the author and publisher is normalized to zero without loss of generality.

[7] Termination revenue streams may, for instance, be earnings from a contract with another publisher or from self-promotion. However, it also includes the moral value to "regain control" over copyright ownership. This value is often mentioned in the literature and seems to be an important driver with respect to authors' termination incentives (Henslee and Henslee, 2011; Rohter, 2011; Rohter, 2013).

[8] Balganesh (2013) even argues that this assumption may be sensible, as legal costs in copyright disputes are uniformly distributed in many instances.

We can see in Figure 1 that A's and P's payoffs in the case of a suit are not contingent on the attitude type. This seems sensible as both parties may not be willing to cooperate after a trial, wherefore L vanishes for A.

Note that the parameters c, L, R, V, and T are normalized to the present value at a certain point in time. Furthermore, it must hold for all probability parameters that $0 \leq p, q, x, \lambda, \mu \leq 1$. All payoff parameters and the signal quality parameters, y and z, are exogenous and common knowledge, whereas the parameters p, q, x, λ, and μ are all endogenous. We will derive the optimality conditions for the endogenous parameters in the ongoing sections. The main results of this paper and their intuitions are provided in section 2.5.

2.2. **Termination acceptance versus legal action.** In this section, we start solving our game by backward induction, analyzing the last stage of the game first. Whether a termination decision follows legal action is determined by P. At this stage, we need to distinguish between the neutral and the opposed attitude types. Both rational types will predicate their decision by comparing the possible payoffs from acceptance to the expected payoffs from a suit. The neutral type sues if

$$(1-\gamma)R - V - c \geq 0 \tag{1}$$

and the opposed type takes on legal action if $(1-\gamma)R - V - c \geq -V$, which can be rearranged to

$$(1-\gamma)R - c \geq 0. \tag{2}$$

Obviously, (1) $<$ (2) whenever $V > 0$, which yields the first helpful result.

Corollary 1. *The underlying game distinguishes three cases:*

- *Case I: If* $0 \leq (1) < (2)$, *then each publisher type sues.*
- *Case II: If* $(1) < 0 \leq (2)$, *then only the opposed type sues, implying that the trial decision is contingent on the attitude type.*
- *Case III: If* $(1) \leq (2) < 0$, *then no publisher type sues.*

Note that case II is definitely contingent on the attitude type as the asymmetry problem discloses the payoff $T+L$ given a neutral type publisher, who would accept a termination, and the payoff $\gamma T - c$, given an opposed type publisher who will fight the copyright in court. At a later stage, it will be demonstrated that information asymmetry plays a role in case III as well. It is possible to distinguish the cases from Corollary 1 with respect to different parameter settings. To better illustrate the results, parameter η^i is introduced, which is a relative measure of the relevant payoff parameters for player $i \in \{\mathrm{A}, \mathrm{P}\}$. In particular $\eta^{\mathrm{A}} = \frac{T}{T+L}$ and $\eta^{\mathrm{P}} = \frac{R}{R+V}$. Rearrange η^{A} to obtain $L(\eta^{\mathrm{A}}) = \frac{(1-\eta^{\mathrm{A}})T}{\eta^{\mathrm{A}}}$ and restructure η^{P} to get $R(\eta^{\mathrm{P}}) = \frac{\eta^{\mathrm{P}}V}{1-\eta^{\mathrm{P}}}$. These relationships will prove helpful for comparing the results in a later stage of this paper.

The modification allows us to define borders that distinguish the three cases on a range between zero and one. First, it is intuitive to state that the upper bound for case I is one for the reason that $R \to \infty$, implying $\eta^{\mathrm{P}} \to 1$. We learned from Corollary 1 that the fulfillment of condition (1) is sufficient to yield a trial choice. The consideration of $R(\eta^{\mathrm{P}})$ allows us to substitute R in (1), and the range in which case I is relevant is

$$\frac{V+c}{(2-\gamma)V+c} < \eta^{\mathrm{P}} < 1. \tag{3}$$

For simplicity, denote the left-hand side $\eta^{\mathrm{P}}_{\mathrm{ub}}$. In the next step, the boundaries for case III should be derived first, as this will prove helpful to position case II. The range is limited downwards to zero, which is shown by $R \to 0$, implying $\eta^{\mathrm{P}} \to 0$. Recall from Corollary 1 that case III is relevant whenever the inequality (2) does not hold true. Substituting $R(\eta^{\mathrm{P}})$ into (2), the range for case III is

$$0 < \eta^{\mathrm{P}} < \frac{c}{(1-\gamma)V+c}. \tag{4}$$

From now on, denote the right-hand side $\eta^{\mathrm{P}}_{\mathrm{lb}}$. After deriving the boundaries for cases I and III, it is clear that case II has the same boundaries with reversed signs because, following Corollary 1, this case is also limited through conditions (1) and (2). Thus, case II is relevant only if

$$\eta^{\mathrm{P}}_{\mathrm{lb}} \leq \eta^{\mathrm{P}} \leq \eta^{\mathrm{P}}_{\mathrm{ub}}. \tag{5}$$

Figure 2 illustrates the previous findings. The range is limited through zero and one, and the borders distinguish the cases. The parameter calibration defines the position η^{P}, which consequently determines the case that will be played by P in the final stage of the game.

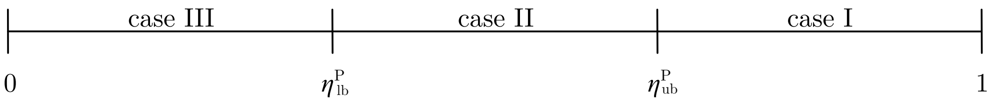

Figure 2. The information structure

Finally, note that (5) implies practicability of Corollary 1 only if $\frac{c}{(1-\gamma)V+c} < \frac{V+c}{(2-\gamma)V+c}$, which can be rearranged to $0 < (1-\gamma)V$. This proves the logical consequence that if $\gamma = 1$, i.e., judges systematically favor authors, a publisher will never pursue the strategy to sue. Thus, it is technically appropriate to assume $0 < \gamma < 1$. Legal certainty pro A, i.e., $\gamma = 1$, would limit the analysis to case III.[9] Legal certainty pro P, i.e., $\gamma = 0$, could lead to any of the described cases.[10]

2.3. **Best response functions of the author.** The question of whether A terminates the copyright grant requires, for the most part, more than just a comparison of the payoffs in two states. In particular, the information asymmetry problem, i.e., the existence of two information sets in the underlying game, assumes that A considers updated beliefs about P's attitude while defining his strategy profile. Thus, we need to derive the optimal response functions of the author, which are the payoff maximizing choices $p^*(x)$ and $q^*(x)$ including the beliefs about the publisher type to fulfill the requirements of the perfect Bayesian equilibrium (Carmichael, 2005). We must also keep in mind that three cases need to be distinguished as previously derived. As both players aim to maximize their

[9] This statement is true since both types would be better off accepting the termination, which is proven by $0 > -V-c$ for the neutral type and by $0 > -c$ for the opposed type.

[10] The condition pro termination acceptance for the neutral type is $R > V+c$ and for the opposed type the condition is $R > c$.

individual payoffs, we need to define $\mathrm{E}i_j^k$, which is the expected payoff of player $i \in \{\mathrm{A, P}\}$ in case $j \in \{\mathrm{I, II, III}\}$, when observing signal

$$k \in \begin{cases} \{s:n, s:o\}, & \text{if } i = \mathrm{A} \\ \{\}, & \text{otherwise.} \end{cases}$$

The exceptional case is given in case I, where a termination will always follow suit, which implies that the payoffs are unbiased by the signal. Thus, the author may be uninformed about the true type of the publisher; this lack of information, however, has no effect as A will have the same payoffs regardless of the underlying type. Consequently, $\mathrm{EA}_{\mathrm{I}}^{s:n} = \mathrm{EA}_{\mathrm{I}}^{s:o}$ and therefore both reaction functions must be equal for both signals. It is sufficient to compare the payoffs under termination and nontermination circumstances, i.e., L to $\gamma T - c$. For consistency purposes, however, the reaction functions will be derived using the same approach as for the remaining cases.

Recall that in case II, the neutral type publisher will accept a termination and the opposed type will sue. As a consequence, A makes a decision contingent on the realization of the signal. In case III, indeed, the author knows that he would never have to fight for the copyright in court. However, the author's choice is dependent on the signal because the neutral publisher is willing to cooperate with A after termination, whereas the opposed type is not. In each of the three cases, the author sets up expected payoff functions to derive strategy profiles that maximize his individual payoff. The expected payoff functions are

- $\mathrm{EA}_{\mathrm{I}}^{s:n} = \lambda(1-p)L + \lambda p(\gamma T - c) + (1-\lambda)(1-p)L + (1-\lambda)p(\gamma T - c)$,
- $\mathrm{EA}_{\mathrm{II}}^{s:n} = \lambda(1-p)L + \lambda p(T + L) + (1-\lambda)(1-p)L + (1-\lambda)p(\gamma T - c)$, and
- $\mathrm{EA}_{\mathrm{III}}^{s:n} = \lambda(1-p)L + \lambda p(T + L) + (1-\lambda)(1-p)L + (1-\lambda)pT$.

Since the author will choose his strategy p to maximize $\mathrm{EA}_j^{s:n}$, we can derive the optimal reaction functions by deriving the internal maximum of each expected payoff function. Therefore, the respective first-order conditions are $\partial \mathrm{EA}_{\mathrm{I}}^{s:n}/\partial p = \gamma T - c - L \overset{!}{=} 0$, $\partial \mathrm{EA}_{\mathrm{II}}^{s:n}/\partial p = \lambda(T + L - \gamma T + c) - L + \gamma T - c \overset{!}{=} 0$, and $\partial \mathrm{EA}_{\mathrm{III}}^{s:n}/\partial p = \lambda L - L + T \overset{!}{=} 0$. It is in line with our expectations that λ and μ are irrelevant for the first-order condition in case I. This implies that no Bayesian update is required and A's reaction function in case I is

$$\begin{aligned}
&\gamma T - c = L \longleftrightarrow 0 \leq p = q \leq 1 \\
&\gamma T - c < L \longleftrightarrow p = q = 0 \\
&\gamma T - c > L \longleftrightarrow p = q = 1.
\end{aligned} \tag{6}$$

The intuition of the reaction function is that if $\gamma T - c = L$, then A will randomize between the two strategies, no matter what signal is underlying. Only if $\gamma T - c > L$ will A terminate with certainty. Note that p must be equal to q because, as outlined earlier, the choice of A is unbiased by the signal in case I. The first-order conditions of cases II and III both include A's ex post beliefs about the neutral type signal, for which we require Bayes' rule, yielding the Bayesian update

$$\lambda = \frac{xy}{xy + (1-x)z}. \tag{7}$$

Using (7) to substitute λ in $\partial \mathrm{EA}_{\mathrm{II}}^{s:n}/\partial p$, we obtain $\frac{xy}{xy+(1-x)z}(T + L - \gamma T + c) = L - \gamma T + c$. Including (7) into $\partial \mathrm{EA}_{\mathrm{III}}^{s:n}/\partial p$ yields $\frac{xy}{xy+(1-x)z} L = L - T$. Both updated first-order conditions can be rearranged with respect to the optimal type choice of P, yielding $x = \frac{z(L-\gamma T+c)}{yT+z(L-\gamma T+c)}$ for case II and $x = \frac{z(L-T)}{yT+z(L-T)}$ for case III. For easier comparability, denote the right-hand side $x_{\mathrm{II}}^{s:n}$ for case II and $x_{\mathrm{III}}^{s:n}$ for case III. This leads to A's reaction functions after having received a neutral type signal as a best response to his opponent

$$\begin{aligned}
&x = x_{\mathrm{II}}^{s:n} \longleftrightarrow 0 \leq p \leq 1 \\
&x < x_{\mathrm{II}}^{s:n} \longleftrightarrow p = 0 \\
&x > x_{\mathrm{II}}^{s:n} \longleftrightarrow p = 1
\end{aligned} \tag{8}$$

and

$$\begin{aligned}
&x = x_{\mathrm{III}}^{s:n} \longleftrightarrow 0 \leq p \leq 1 \\
&x < x_{\mathrm{III}}^{s:n} \longleftrightarrow p = 0 \\
&x > x_{\mathrm{III}}^{s:n} \longleftrightarrow p = 1.
\end{aligned} \tag{9}$$

The intuition of both reaction functions is that if A recognizes a neutral type signal, he will only terminate with certainty if the publisher's neutral type probability is greater than the functions $x_{\mathrm{II}}^{s:n}$ and $x_{\mathrm{III}}^{s:n}$, respectively. The same approach yields the best response functions of A when observing the opposed type signal. Note that A now chooses q as to maximize his expected payoff. The expected payoff for each case is

- $\mathrm{EA}_{\mathrm{I}}^{s:o} = \mu q(\gamma T - c) + \mu(1-q)L + (1-\mu)q(\gamma T - c) + (1-\mu)(1-q)L$,
- $\mathrm{EA}_{\mathrm{II}}^{s:o} = \mu q(T + L) + \mu(1-q)L + (1-\mu)q(\gamma T - c) + (1-\mu)(1-q)L$, and
- $\mathrm{EA}_{\mathrm{III}}^{s:o} = \mu q(T + L) + \mu(1-q)L + (1-\mu)qT + (1-\mu)(1-q)L$.

Recall that $\mathrm{EA}_{\mathrm{I}}^{s:n} = \mathrm{EA}_{\mathrm{I}}^{s:o}$ and that we do not need a Bayesian update here. This both implies and proves that A's reaction function in case I is equal given $s:o$, wherefore (6) is relevant, already including the information $p = q$. This is not true for cases II and III, and the first-order conditions for the opposed type signal are $\partial\mathrm{EA}_{\mathrm{II}}^{s:o}/\partial q = \mu(T + L - \gamma T + c) - L + \gamma T - c \stackrel{!}{=} 0$ and $\partial\mathrm{EA}_{\mathrm{III}}^{s:o}/\partial q = \mu L - L + T \stackrel{!}{=} 0$. Both first-order conditions include the ex post belief μ, for which Bayes' rule reveals

$$\mu = \frac{x(1-y)}{x(1-y) + (1-x)(1-z)}. \tag{10}$$

By substituting μ in the previously mentioned first-order conditions through the information in (10), we obtain $\frac{x(1-y)}{x(1-y)+(1-x)(1-z)}(L - \gamma T + c) = L - \gamma T + c$ for case II and $\frac{x(1-y)}{x(1-y)+(1-x)(1-z)}L = L - T$ for case III. Rearrangement reveals the function $x = \frac{(1-z)(L-\gamma T+c)}{(1-y)T+(1-z)(L-\gamma T+c)}$ in case II. Denote the right-hand side $x_{\mathrm{II}}^{s:o}$. For case III, rearrangement reveals $x = \frac{(1-z)(L-T)}{(1-y)T+(1-z)(L-T)}$, where the right-hand side will be denoted $x_{\mathrm{III}}^{s:o}$. Altogether, the optimal choice of A, given case II or III, is

$$\begin{aligned} x = x_{\mathrm{II}}^{s:o} &\longleftrightarrow 0 \leq q \leq 1 \\ x < x_{\mathrm{II}}^{s:o} &\longleftrightarrow q = 0 \\ x > x_{\mathrm{II}}^{s:o} &\longleftrightarrow q = 1 \end{aligned} \tag{11}$$

and

$$\begin{aligned} x = x_{\mathrm{III}}^{s:o} &\longleftrightarrow 0 \leq q \leq 1 \\ x < x_{\mathrm{III}}^{s:o} &\longleftrightarrow q = 0 \\ x > x_{\mathrm{III}}^{s:o} &\longleftrightarrow q = 1. \end{aligned} \tag{12}$$

The intuition of both reaction functions is that if A recognizes an opposed type signal, he will terminate with certainty only if P's neutral type probability is greater than the function $x^{s:o}_{\mathrm{II}}$ or $x^{s:o}_{\mathrm{III}}$, respectively. We can immediately derive some intermediate results with mathematical characteristics for A's best response functions. Note that only mathematical characteristics are considered that will prove useful when deriving the perfect Bayesian equilibria in the later stage of the analysis.

Lemma 1. *The best response functions of A have the following mathematical characteristics:*

- *Case I* ($\eta^P_{ub} < \eta^P$)*:*
  - *i) The author is induced to choose* $p = q = 0$ *if* $\eta^A < \frac{T}{(1+\gamma)T-c}$.
- *Case II* ($\eta^P \in [\eta^P_{lb}, \eta^P_{ub}]$)*:*
  - *ii) If* $\eta^A < \frac{(1-z)T}{(1-z)(\gamma T-c)+(y-z)T}$, *then* $1 > x^{s:o}_{II} \gtreqless x^{s:n}_{II}$.
  - *iii) If* $\eta^A < \frac{T}{(1+\gamma)T-c}$, *then* $1 > x^{s:o}_{II} > x^{s:n}_{II} > 0$.
  - *iv) If* $\eta^A > \frac{(1-z)T}{(1-z)(\gamma T-c)+(y-z)T}$, *then* $x^{s:o}_{II} > 1 > 0 > x^{s:n}_{II}$ *induces the author to choose* $p = 1$ *and* $q = 0$. *This characteristic only belongs to the definition area of* η^A *if* $c < \frac{T(y-z)-(1-z)(1-\gamma)T}{1-z}$ *is fulfilled.*
- *Case III* ($\eta^P < \eta^P_{lb}$)*:*
  - *v) If* $\eta^A < \frac{1-z}{1+y-2z}$, *then* $1 > x^{s:o}_{III} \gtreqless x^{s:n}_{III}$.
  - *vi) If* $\eta^A > \frac{1-z}{1+y-2z}$, *then* $x^{s:o}_{III} > 1 > 0 > x^{s:n}_{III}$. *Under these circumstances the author's only possible strategy profile is* $p = 1$ *and* $q = 0$.

Proof. The proof is provided in appendix A. □

In Lemma 1 i), iv), and vi) we have binding conditions for the strategy profile of the author. In iv) and vi), we already considered the entire set of strategies of the publisher. In i), this is not necessary as the game with imperfect information changed into a game with perfect information. The observation of signal irrelevance in case I is thereby technically confirmed. For the derivation of A's remaining optimal strategies for each case, we first need to derive the best response functions of player P.

2.4. **Best response functions of the publisher.** Even though the publisher knows his own type, his strategy profile requires the consideration of A's choice as this in turn affects the type choice. Thus, we will derive this choice as a best response to the choice of the author, i.e., $x^*(p,q)$. Recall that the game distinguishes three possible cases. Note that P has just one information set as he knows his own type. This implies that we do not need to consider the ex post beliefs and $k \in \{\}$. The publisher will set up and maximize his case-specific expected payoff to decide upon his type with probability x. Note that the entire information for the expected payoffs and the derivations of the optimality conditions are provided in appendix B. The condition under which P is indifferent between both strategies is

$$\frac{V(1-q)}{(y-z)(\gamma R+c)+yV} = p-q$$

in case I, where the left-hand side is denoted σ_{I},

$$\frac{V-q[(1-\gamma)R-c]}{yR-z(\gamma R+c)} = p-q$$

in case II, where the left-hand side is denoted σ_{II}, and

$$\frac{V}{R(y-z)} = p-q$$

in case III, where the left-hand side is denoted σ_{III}. Consequently, the publisher's best response function as a response to the author's choice is

$$\begin{aligned} \sigma_j = p-q &\longleftrightarrow 0 \le x \le 1 \\ \sigma_j < p-q &\longleftrightarrow x = 0 \\ \sigma_j > p-q &\longleftrightarrow x = 1. \end{aligned} \tag{13}$$

Recall that $j \in \{\text{I, II, III}\}$. The intuition of (13) is that P will choose to be a neutral type with probability one whenever $\sigma_j > p-q$ and with probability zero whenever $\sigma_j < p-q$. If $\sigma_j = p-q$, then P is indifferent between the two strategies and randomizes. The publisher's response functions imply some mathematical characteristics, which will prove helpful to derive the main propositions of this paper.

Lemma 2. *The best response functions of P have the following mathematical characteristics:*

- *Case I* ($\eta^P_{ub} < \eta^P$)*:*
  - *i) If* $q < 1$*, then* $\sigma_I > 0$*; otherwise* $\sigma_I = 0$*.*
- *Case II* ($\eta^P \in [\eta^P_{lb}, \eta^P_{ub}]$)*:*
  - *ii) If* $q < 1$*, then* $\sigma_{II} > 0$*.*
  - *iii) If* $q = 1$*, then* $\sigma_{II} \geq 0$*.*
- *Case III* ($\eta^P < \eta^P_{lb}$)*:*
  - *iv)* $\sigma_{III} > 0$ *for all parameter settings in the definition area.*
  - *v) If* $\eta^P = \frac{1}{1+y-z}$*, then* $\sigma_{III} = 1$*.* $\eta^P = \frac{1}{1+y-z}$ *lies in the definition area only if condition* $c > \frac{V(1-\gamma)}{y-z}$ *is fulfilled.*

Proof. The proof is provided in appendix C. □

We immediately learn from Lemma 2 v) that the upper boundary determines whether σ_{III} can be equal to one. This observation is important for the derivation of the equilibria, as this implies that perfect Bayesian equilibria exist that are contingent on the choice of P in the final stage of the game.

2.5. **Equilibrium analysis.** Having derived the best response functions, we are able to work out equilibrium combinations of behavioral strategies. In particular, we derive perfect Bayesian equilibria, which contain sets of strategies and beliefs for every player and every information set (Carmichael, 2005). This condition was already fulfilled in the previous sections while deriving the best response functions. Note that only the results are presented in which the players' beliefs are consistent with equilibrium strategies in every subgame, as this is another necessary condition in perfect Bayesian equilibrium analysis (Carmichael, 2005). Furthermore, a perfect Bayesian equilibrium will be denoted $\{x^*; (p^*, q^*); (\lambda^*, \mu^*)\}$, where the asterisks denote the optimal choices and beliefs of the players in an equilibrium. Thus, x^* is the probability that P is neutral towards copyright terminations; p^* is the probability that A terminates receiving a neutral signal; q^* is the probability that A terminates receiving an opposed signal; λ^* is the belief of player A that a neutral signal is correct, i.e., that P is in fact a neutral type; and μ^* is the belief of player A that an opposed signal is incorrect, i.e., that P is a neutral type. All equilibria are denoted in consecutive order throughout the paper. Under our explicit assumptions, we can define the following results:

Proposition 1. *If every type of publisher sues with certainty in the last stage of the game, i.e., case I is underlying where $\eta^P_{ub} < \eta^P$, then our game offers two perfect Bayesian equilibrium outcomes:*

i) $\{x^*; (1,1); (\lambda^*, \mu^*)\}$ *with* $0 < \mu^* < x^* < \lambda^* < 1$*. In other words, the publisher randomizes between the two attitude types and the author terminates the copyright license with certainty, no matter how accurate the author's ex post beliefs about the publisher's real type are.*

ii) $\{1; (p^*, q^*); (1,1)\}$ *where* $0 \le p^* = q^* < 1$*. In this equilibrium the publisher is a neutral type with certainty, which is believed by the author under both signal realizations, who answers with a randomization strategy. Note that this set also contains the outcome* $\{1; (0,0); (1,1)\}$ *whenever* $\eta^A < \frac{T}{(1+\gamma)T-c}$*, in which the author plays a pure strategy, avoiding copyright termination under both signals.*

Proof. Proofs for both equilibrium outcomes are provided in appendix D. □

Recall that we discussed the significance of η^{P} for the distinction of the underlying cases in section 2.2. We learned that $\eta^{\mathrm{P}}_{\mathrm{ub}} < \eta^{\mathrm{P}} = \frac{R}{R+V}$ is required for case I to hold true, which implies that in both equilibria of Proposition 1, P's remaining expected profits, i.e., R, must be rather high compared to the value of reputation loss, i.e., V. The parameter settings of $\eta^{\mathrm{A}} = \frac{T}{T+L}$ distinguish both equilibria (see appendix D) and the condition from Lemma 1 i) proves helpful to determine the impact of the parameters. The condition is equivalent to $\frac{T}{T+L} < \frac{T}{(1+\gamma)T-c}$, which can be rearranged to $\gamma T - c - L < 0$, reflecting A's best response function as shown in (6). Denote the left-hand side as ν_{I} for a moment; then $\partial\nu_{\mathrm{I}}/\partial c$, $\partial\nu_{\mathrm{I}}/\partial L < 0 < \partial\nu_{\mathrm{I}}/\partial\gamma$, $\partial\nu_{\mathrm{I}}/\partial T$ demonstrates that a high T or γ, and a low c or L, rather tend towards equilibrium i), whereas the opposite directions are true with respect to equilibrium ii). In other words, if the income for A from a new contract with another publisher largely exceeds the loss of cooperation with P, then A will terminate with certainty and accept a trial, as demonstrated by i). This equilibrium is supported the more courts tend to favor authors in trial outcomes. However, high court costs and a high value for cooperation decrease A's eagerness to terminate.

Considering (13), we can also see that P's strategy choice is sensitive to A's choice, as p and q play a role in P's best response functions. In particular, only $q = 1$ will lead P to choose the opposed type with positive probability. This leads to the counterintuitive observation that no perfect Bayesian equilibrium exists in which P strictly chooses to be the opposed type. Compared to the other cases, η^{P} is rather high, which implies that either the remaining revenue streams are relatively high or that the reputational cost is relatively low. One would expect that a publisher with much to lose would be willing to signal to fight for the license more determinedly.

Proposition 1 i) shows, however, that this is not necessarily a part of the equilibrium. The intuition is that the publisher has to bear a reputation cost at all times, no matter what type is underlying. In other words, a publisher with high expectations about the remaining value of the license will not necessarily engage in undermining the termination ex ante. P will, however, await the subsequent termination decision of the author and respond with legal action. Thus, any x between zero and one is part of the equilibrium. This result is somewhat contrary to the general view in the literature that publishers will predominantly try to undermine termination incentives. It confirms the certain outcome that a publisher who faces a highly dependent author will restrain from announcing legal threats.

Another observation is the pooling equilibrium in ii), where the signal reveals only a neutral attitude type and does not disclose the true type of P. A does not reply with a certain termination which may even lead to a certain nontermination, as shown in the second sentence of Proposition 1 ii). This can be explained by our previous observation that A's behavior in the underlying case is independent from the signal, which is intuitive because the type does not matter here and A's strategies yield the same payoffs under both signals. Thus, the certainty about a suit as a consequence to termination leads A to neglect the signal while considering the question of whether the expected value from legal action is positive. In case II, the signal matters as legal action is contingent on the type of publisher. The analysis of this case yields our next results:

Proposition 2. *Given that only the opposed type publisher sues in the last stage of the game, i.e., case II is relevant where $\eta^P \in [\eta^P_{lb}, \eta^P_{ub}]$, then the underlying game offers three perfect Bayesian equilibrium outcomes:*

iii) $\{x^*; (1,1); (\lambda^*, \mu^*)\}$ *where* $1 \geq x^* > x^{s:o}_{II}$, $1 \geq \lambda^* > \lambda(x^{s:o}_{II})$, *and* $1 \geq \mu^* > \mu(x^{s:o}_{II})$. *Even if the publisher randomizes between his strategies, the author chooses a pure strategy and terminates under both signal realizations. Note that this set also contains* $\{1; (1,1); (1,1)\}$ *if* $\sigma_{II} > 0$. *In this equilibrium, the author believes that the publisher is neutral under both signal realizations, not deviating from his pure strategy choice to terminate.*

iv) $\{x^*; (p^*, q^*); (\lambda^*, \mu^*)\}$ *where* $x^{s:o}_{II} \geq x^* \geq x^{s:n}_{II}$, $1 \geq p^* = \sigma_{II}$, $1 - \sigma_{II} = q^* \geq 0$, *with* $\lambda(x^{s:o}_{II}) \geq \lambda^* \geq \lambda(x^{s:n}_{II})$ *and* $\mu(x^{s:o}_{II}) \geq \mu^* \geq \mu(x^{s:n}_{II})$. *Both players randomize their strategies. The provided conditions determine the probability boundaries of the players' strategies and the ex post beliefs of the author.*

v) $\{x^*; (1,0); (\lambda^*, \mu^*)\}$ *where* $0 \leq \mu^* \leq x^* \leq \lambda^* \leq 1$. *The publisher randomizes, leading to the possibility of mixed ex post beliefs of the author, who terminates the license only at the signal realization of neutral type and abstains from terminating otherwise.*

Proof. All proofs are provided in appendix E. □

In case II, the author has no clear prospect about the consequences of a termination since the opposed publisher type would sue and the neutral type would acquiesce. Thus, information asymmetry plays a role, and A's best response functions are contingent on the signal. Note that the existence of equilibrium v) additionally depends on the second condition in Lemma 1 iv). Equilibrium iii) is the only one that contains an outcome in which pure strategies may be chosen if σ_{II} is positive. Otherwise, P randomizes his strategies in this equilibrium. With the help of section 2.4, we can show that this holds true if $\frac{V-q[(1-\gamma)R-c]}{yR-z(\gamma R+c)} \geq 0$, which can be rearranged to $0 \geq (1-\gamma)R - V - c$, because $q = 1$ in this equilibrium. Denote the right-hand side ν_{II} for a moment; then, $\partial\nu_{\mathrm{II}}/\partial\gamma$, $\partial\nu_{\mathrm{II}}/\partial V$, $\partial\nu_{\mathrm{II}}/\partial c < 0 < \partial\nu_{\mathrm{II}}/\partial R$, and we learn that lower remaining expected profits of P do contribute to the fulfillment of the previous inequality. In other words, P is more willing to be a neutral type. All remaining parameters show the opposite effect, implying that the more courts favor authors and the higher the reputational and court costs are, the more eager P will be to be a neutral type. The opposed type is a zero probability event, and this pooling equilibrium does not reveal the real type of the publisher as each type sends the same signal. The remaining equilibria in case II are characterized by a positive probability of opposed behavior. However, P chooses the opposed type with certainty in none of these equilibria.

In equilibrium iii), A's ex post beliefs are bound downwards through $\lambda(x_{\mathrm{II}}^{s:o})$ and $\mu(x_{\mathrm{II}}^{s:o})$, which can be extended to $\lambda(x_{\mathrm{II}}^{s:o}) = \frac{x_{\mathrm{II}}^{s:o}y}{x_{\mathrm{II}}^{s:o}y+(1-x_{\mathrm{II}}^{s:o})z}$ and $\mu(x_{\mathrm{II}}^{s:o}) = \frac{x_{\mathrm{II}}^{s:o}(1-y)}{x_{\mathrm{II}}^{s:o}(1-y)+(1-x_{\mathrm{II}}^{s:o})(1-z)}$, respectively. Using the full information for $x_{\mathrm{II}}^{s:o}$ (compare section 2.3.) and reducing both equalities, the beliefs are bound downwards through $\lambda(x_{\mathrm{II}}^{s:o}) = \frac{y(1-z)(L-\gamma T+c)}{(1-y)zT+y(1-z)(L-\gamma T+c)}$ and $\mu(x_{\mathrm{II}}^{s:o}) = \frac{L-\gamma T+c}{L+(1-\gamma)T+c}$. We can see that the boundary $\mu(x_{\mathrm{II}}^{s:o})$ is not contingent on the probabilities y and z; that is, the choice q excludes the imperfect signal. The equilibrium belief in Proposition 2 iv) is bound upwards by $\lambda(x_{\mathrm{II}}^{s:o})$ and $\mu(x_{\mathrm{II}}^{s:o})$. The lower boundary can be determined using $\lambda(x_{\mathrm{II}}^{s:n}) = \frac{x_{\mathrm{II}}^{s:n}y}{x_{\mathrm{II}}^{s:n}y+(1-x_{\mathrm{II}}^{s:n})z}$ and $\mu(x_{\mathrm{II}}^{s:n}) = \frac{x_{\mathrm{II}}^{s:n}(1-y)}{x_{\mathrm{II}}^{s:n}(1-y)+(1-x_{\mathrm{II}}^{s:n})(1-z)}$, respectively. The reduction of both equalities while using the information for $x_{\mathrm{II}}^{s:n}$ yields $\lambda(x_{\mathrm{II}}^{s:n}) = \frac{L-\gamma T+c}{L+(1-\gamma)T+c}$ and $\mu(x_{\mathrm{II}}^{s:n}) = \frac{(1-y)z(L-\gamma T+c)}{y(1-z)T+(1-y)z(L-\gamma T+c)}$. Here, $\lambda(x_{\mathrm{II}}^{s:n})$ is independent of the probabilities y and z. Thus, the equilibrium choice of P excludes the imperfect signal. It is true for this game that $\lambda(x_{\mathrm{II}}^{s:o}) > \mu(x_{\mathrm{II}}^{s:o}) = \lambda(x_{\mathrm{II}}^{s:n}) > \mu(x_{\mathrm{II}}^{s:n})$, which is consistent with the equilibrium results in Proposition 2 iii) and iv).

Note that $\sigma_{\mathrm{II}} = \frac{V-q[(1-\gamma)R-c]}{yR-z(\gamma R+c)}$ contains q in the numerator, which significantly distinguishes the equilibria. Equilibrium iii) is characterized by $0 < q \leq 1$ and it is straightforward that A chooses to terminate under both signal realizations: if A already terminates with positive probability while having observed an opposed type realization, then he will also terminate after having observed the neutral type signal realization. Equilibrium v) works exclusively for $q = 0$, and A terminates only when having observed a positive signal. In case III, no publisher type sues A for copyright infringement. For this case, the following equilibrium outcomes can be presented:

Proposition 3. *Under parameter settings where legal action plays no role in the last stage of the game, i.e., case III is underlying where $\eta^P < \eta^P_{lb}$, the following two perfect Bayesian equilibrium outcomes are relevant:*

vi) $\{1; (1,1); (1,1)\}$, *indicating that the publisher is a neutral type with certainty and that the author terminates a copyright license with certainty, believing that the publisher is a neutral type under each signal.*

vii) $\{x^*; (1,0); (\lambda^*, \mu^*)\}$ *where* $0 \leq \mu^* \leq x^* \leq \lambda^* \leq 1$. *This outcome implies that the publisher randomizes his type between the author's ex post beliefs μ^* and λ^*. Moreover, the author chooses a pure strategy profile, reacting with certain termination when receiving a neutral type signal or a certain nontermination when observing the opposed type signal.*

Proof. Proofs for both equilibrium outcomes are provided in appendix F. □

We should recall that the existence of equilibrium vii) is conditional on Lemma 2 v). Otherwise, the game would always reveal a neutral publisher type and certain termination practice, as shown in Proposition 3 vi). This pure strategy equilibrium is rather straightforward: since P will never sue as η^{P} is low, he has no interest in fighting for the copyright license at all. The publisher sends an unambiguous signal, wherefore the author does not fear the loss of liaison and prefers to terminate as long as T is positive. We know from Lemma 2 v) that this equilibrium holds true only for parameter settings that satisfy $\eta^{\mathrm{A}} < \frac{1-z}{1+y-2z}$, which is equivalent to $\frac{T}{T+L} < \frac{1-z}{1+y-2z}$. Rearrangement yields the condition $(y-z)T - (1-z)L < 0$. Denote the left-hand side as ν_{III}; then, $\partial\nu_{\mathrm{III}}/\partial L < 0 < \partial\nu_{\mathrm{III}}/\partial T$, $\partial\nu_{\mathrm{III}}/\partial y$ shows that a higher liaison value supports the existence of this equilibrium, whereas higher values for termination revenue streams and a stronger signal realization y tend towards the equilibrium vii). $\partial\nu_{\mathrm{III}}/\partial z = -T + L$, which can be positive, negative or equal to zero. If $T < L$, then a higher signal realization z makes equilibrium vii) more relevant.

The perfect Bayesian equilibrium in Proposition 3 vii), however, has a rather counter-intuitive property. If P chooses opposed behavior with positive probability, he can induce the author to abstain from termination. This is true even for a very high η^{A}. One intuition is that blurred beliefs about the probability distribution over the nodes in the information set may sufficiently unsettle A. This intuition supports our findings from the previous discussion, where A's behavioral strategy is very sensitive to the realized signal. We can consider the existence condition in Lemma 2 v) to derive another possible intuition: the condition considers the relationship between η^{P} where $\sigma_{\mathrm{III}} = 1$ (denoted $\eta^{\mathrm{P}}_{\sigma=1}$) and $\eta^{\mathrm{P}}_{\mathrm{lb}}$. It helps to understand that it contributes to the existence of this equilibrium if $\eta^{\mathrm{P}}_{\mathrm{lb}}$ exceeds $\eta^{\mathrm{P}}_{\sigma=1}$ as much as possible. Comparative static analysis shows that $\partial\eta^{\mathrm{P}}_{\mathrm{lb}}/\partial V < 0$. In other words, it is more likely that the equilibrium is relevant whenever the reputational cost decreases. This observation seems to have the effect that it makes P more eager to be an opposed type the lower the reputational cost is. This effect combined with a sufficiently high level of $\eta^{\mathrm{P}}_{\sigma=1}$ explains the strategy choice of P in this equilibrium.

Figure 3 juxtaposes all equilibria, including the boundaries between the cases and the conditions necessary for each equilibrium to be true. Recall that these conditions follow from Corollary 1 and Lemmas 1 and 2. Also note that all conditions are normalized to η^i, where η^{A} is positioned on the ordinate and η^{P} can be found on the abscissa. Equilibria marked with # are conditional on Lemma 1 iv) and Lemma 2 v). A horizontal comparison of the equilibria again shows how sensitive A's choice is towards his expectations about P's choice in the final stage of the game. It is intuitive that the higher η^{P} is, the higher the incentives for the publisher to sue. However, it is less intuitive that, for a rather low η^{A}, we can observe a deterrence effect only in case I and not yet in case II, where A's expectations are contingent on his beliefs. At all times, P chooses the neutral type, which is an effect of interdependency when choosing the right strategy. In particular, P might not necessitate termination deterrence, and it seems that the cost to blur the expectations of A is too high in case II. Note that these settings include the highest neutral type probability. In other words, low alternatives or a high liaison value of the author will motivate the publisher to choose the neutral type.

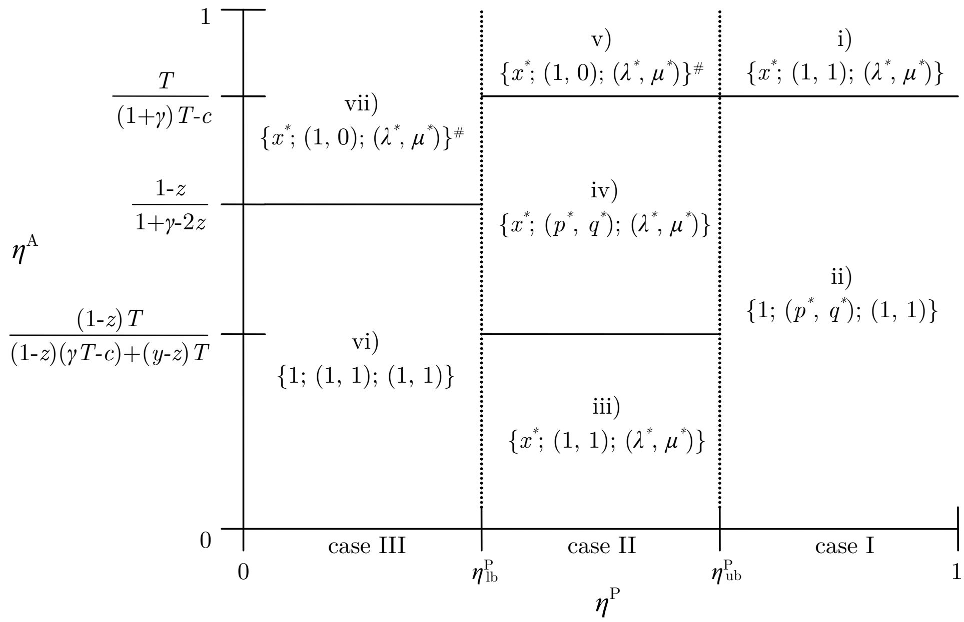

FIGURE 3. Case distinction

This comparison already shows that asymmetric information combined with the threat of legal action might not as strongly deter authors from copyright terminations as often assumed in the literature. The only setting in which certain termination deterrence may become relevant is high η^{P} and low η^{A}, i.e., certain legal action with weak alternatives or a high liaison cost for A. Considering the equilibria in Figure 3 with higher η^{A}, we can observe a tendency towards the opposed type choice. In particular, the highest opposed type probability can be obtained in equilibria i), v), and vii), which all contain the highest η^{A} rates throughout the cases. This again proves the presumption of strategy dependency in the Bayesian setting since the more the author has to gain, the more the publisher is willing to choose an opposed strategy.

The equilibria on top of Figure 3 additionally show that the asymmetric information problem is significant. We know that equilibrium ii) belongs to case I, where beliefs do not matter to infer the consequences. In this equilibrium, the author is unbiased by the mixed strategy of P since η^{A} seems to be sufficiently high to reveal a positive expected value. However, for equal η^{A} in v) or vii), the author seems to react to P's mixed strategy as he does not terminate receiving an opposed signal. Even if the author knows that P will never sue in case III, he fears the consequences of cooperation loss. This result shows how sensitive the equilibria are to A's reaction towards an opposed signal. In particular, the choice of q substantially determines the perfect Bayesian equilibrium. This very interesting observation is included in the technical details of the publisher's best response functions (see section 2.4.) where q affects σ_{I} and σ_{II} directly. In Lemma 2, $q = 1$ and $q < 1$ were already differentiated and we have demonstrated how such differentiation leads to diverse equilibrium outcomes.

The main results are that legal uncertainty will not systematically deter authors from copyright terminations. There may exist a clear deterrence effect only if legal action is a certain consequence and the author has weak outside options or is highly dependent on the publisher. Under these circumstances, a publisher has no incentives to deter copyright terminations, which is proven by the highest neutral type probability in these equilibria. This is, ceteris paribus, also true for the cases where a publisher sues with zero or positive probability. However, the more the author has to gain, the lower the incentives are for the publisher to choose the neutral type. This proves that the equilibria are very sensitive towards the type choice. The uncertainty about the publisher type affects the choice of A and leads to equilibria where the author does not terminate with certainty. The interdependency, however, is reflected especially when the author's reaction towards an opposed signal substantially affects the publisher's strategy. Specifically, if an author always reacts with nontermination towards an opposed signal, then the publisher will choose the opposed type with positive probability at all times. This implies that only a positive termination probability as a reaction towards an opposed signal, i.e., q, may lead to a neutral type choice of the publisher.

3. Discussion

3.1. **The impact of legal uncertainty.** The equilibrium analysis reveals that legal uncertainty has an impact on the interaction between both players in the Bayesian game. This is also true for P's choice in the final stage of the game. We can see in (3) and (4) that the borders that distinguish the three cases include γ, the exogenous parameter which models the choice of the judges. Comparative static analysis reveals $\partial\eta^{\mathrm{P}}_{\mathrm{lb}}/\partial\gamma$, $\partial\eta^{\mathrm{P}}_{\mathrm{ub}}/\partial\gamma > 0$, which implies that if $\gamma \to 1$, then each border also tends towards one. This is intuitive because the more the courts favor the authors, the less attractive it is for a publisher to sue or threaten with legal action; that is, cases I and II become less significant. This straightforward observation proves that courts can guide publishers to a certain behavior, e.g., by increasing γ to decrease the number of suits to foster termination incentives.

The comparative statics of the best response functions show the influence of court decisions on the strategy choice of the players in the Bayesian game. Considering (6), A's incentives to terminate in case I increase with γ since $\partial L/\partial\gamma > 0$. This implies that the greater γ, the more liaison value is required to deter A from license termination. However, $\partial\sigma_{\mathrm{I}}/\partial\gamma < 0$ is less intuitive as, considering (13), this implies that the fewer the judges who acknowledge that contracts include the "work made for hire" clause, the more likely it is that a publisher will be willing to choose the opposed type. This outcome has an interesting characteristic as it shows the trade-off between termination incentives and publisher behavior: systematic court decisions pro author will, on the one hand, increase termination incentives but, on the other hand, foster opposed behavior, which may lead to more friction between the involved parties out of court.

Consider (8) and (11) for the treatment of A's best response functions in case II. For both signals, the condition $x > x^k_{\mathrm{II}}$ implies the pure strategy to terminate. $\partial x^k_{\mathrm{II}}/\partial\gamma < 0$ implies that for both signals, a γ close to one makes it more likely to fulfill the previously shown condition; that is, the same direction as in case I exists for the impact of the court's decision on termination incentives. Regarding the publisher's best response function as shown in (13), we can see that $\partial\sigma_{\mathrm{II}}/\partial\gamma > 0$. Recall that $\sigma_{\mathrm{II}} > p - q$ yields a neutral type choice, which entails that a greater γ deters the publisher from opposed type choice. This is different from case I and implies that if legal action is not certain, courts' decisions pro A will foster termination incentives and hamper opposed behavior by the publisher.

It is superfluous to continue the discussion for case III as this case is not affected by legal uncertainty, i.e., $\partial x^k_{\mathrm{III}}/\partial\gamma = 0$ and $\partial\sigma_{\mathrm{III}}/\partial\gamma = 0$. It is obvious that legal uncertainty and, in particular, judges' decisions play a substantial role in the determination of the equilibria whenever legal action is a credible threat. Whereas termination incentives are consistently fostered by court decisions, which do not acknowledge the "work made for hire" clause in contracts, the direction of the impact on the publisher's type choice is contingent on the probability of effective trial.

At this stage, recall that all results are true only if the two players have consistent beliefs about the prevailing party in court. It is, however, conceivable that the two parties have divergent beliefs about the outcome of the legal case, which may influence our results. This presumption is a result of the fact that an individual's expectations include the beliefs to prevail in court (Posner, 1973) and recall that the individual's expectations determine the best response functions. It is possible to modify the underlying model by distinguishing γ^i for player i where $\gamma^{\mathrm{A}} \neq \gamma^{\mathrm{P}}$; however, it is beyond the scope of this paper to analyze the effects. The same modification is possible if court costs need to be distinguished, i.e., c^i for player i where $c^{\mathrm{A}} \neq c^{\mathrm{P}}$. The author believes that the outcomes may predominantly reflect the underlying results as higher beliefs and lower court costs may tend towards equilibria with license terminations and legal action and vice versa.

3.2. **General discussion.** The underlying model thus far neglects that authors and publishers are usually considered risk averse (Caves, 2000), what may affect the presented results. It is conceivable that the necessity of legal action adds risk, which then decreases players' incentives to terminate or to sue. This would also affect publishers' type choices. However, the effects are obvious, especially if the threat of legal action adds more risk; a risk averse party tends towards behavior that excludes risk. A tendency towards equilibria without legal action is expected to be the consequence. Assuming that the parties are equally risk averse, then it is possible that the effect of risk aversion cancels out without affecting the equilibrium outcomes. This presumption should be tested and one should consider that the levels of risk aversion between authors and publishers substantially differ for the most part (Caves, 2000).

Moreover, unanimous agreement was assumed if more authors are involved in a copyright license and have to decide upon termination. In some instances, this is not the case and 17 U.S.C. §203(a)(1) determines that a total of more than one-half of the involved authors have to agree upon license termination. The simple example with two coauthors, where one might not be willing to terminate, e.g., due to a relationship with the publisher in another project, already shows that a modification of our model might be necessary. The underlying paper provides a benchmark for which future research should consider such an extension. It is conceivable that this clause puts a sufficient number of coauthors into a better position to prevent license terminations, whereas the other authors would be left with empty hands.

The underlying model already considers the value of morality, which is included in the parameter T. It seems that this topic offers more insights with respect to behavioral economics. In particular, behavioral biases such as pride or over enthusiasm may lead to irrational behavior and consequently affect the outcomes of this paper. One can imagine that authors systematically overestimate their options outside the existing relationship with the publisher to terminate licenses, leading to useless work. Another possible scenario is that authors systematically underestimate or overestimate publishers' signals, which leads to deviating equilibrium outcomes. The consideration of behavioral biases may contribute to a more detailed explanation of the underlying findings.

Also recall that $0 < z < y < 1$ was assumed, which implies that the results of this paper hold only if this relationship is true. An uninformative signal, i.e., $y = z$; a perfect signal, i.e., $y = 1$ and $z = 0$; and no monitoring skills, i.e., $z > y$, would all yield different results as each player's expected payoff is affected by the signal quality. Indeed, this assumption is most practical for the topic under scrutiny; however, it is possible that situations exist in which authors show different monitoring skills. An investigation requires the adjustment of the case distinction in section 2.2. But one may use the best response functions from sections 2.3. and 2.4. to derive and analyze the equilibrium outcomes under adjusted parameter settings in section 2.5.

The literature commonly argues that the termination law may incentivize publishers to offer new contracts with the purpose of bypassing the termination right (Loren, 2010; Brown, 2014). The results of the underlying model contribute to the discussion because they constitute the consequences if license renewals cannot be obtained. In other words, our results are the outside options of the players during contract renegotiations. We can demonstrate with one example only that, under certain parameter settings, contract renewals are not an option. P has a willingness to pay additional compensation to A only if his payoff under a new contract exceeds the expected payoff of an outside option. P's new contract payoff then is the remaining value of holding the license, which is defined as R, minus the additional compensation to A, say m. Recall the outcome from Proposition 1 ii), where P chooses the neutral type with certainty and A abstains from license termination under all circumstances. Following the information structure of the game, P's outside option then is R and a new contract fails to appear because the willingness to pay of P is not positive, i.e., $(R - m) - R < 0$.

Note that the outside option in this example is the highest possible one because reputational and court costs play no role. It sounds intuitive that increases of both cost factors may increase the chances for license renewals. Of course, this example does not imply that license renewals are never realizable, and it is out of scope to provide a detailed analysis. However, this example indicates that the discussion on contract renewals under the copyright termination law deserves more attention and emphasizes that legal uncertainty may substantially affect the behavior of participants in copyright markets.

4. Conclusions

This paper contributes to the ongoing debate on the effectiveness of U.S. copyright termination law. A publisher may invoke the "work made for hire" clause in court to challenge a termination. This publisher may also send a costly signal to communicate his attitude towards a termination with the aim of unsettling the uninformed author before the author makes a decision upon termination. A Bayesian signaling model is used to derive equilibrium outcomes for the cases in which a publisher sues for copyright infringement with certainty, sues with positive probability, or abstains from legal action at all times.

The results reveal that legal uncertainty does not systematically deter an author from copyright license terminations as the mere threat to sue is not sufficient for termination deterrence. A clear deterrence effect exists only if legal action is a certain consequence and the author has weak outside options or is highly dependent on the publisher. An author with valuable alternatives and low dependency will, however, react with license termination as long as the expected value from a trial is positive. The results also show that signaling matters for the determination of the equilibrium outcomes. Even an author with valuable outside options reacts sensibly towards a publisher's threat, which may prevent copyright termination. This effect is reciprocal as the publisher adjusts his choice of attitude type specifically to the author's reaction towards a signal that indicates an opposed publisher type. In particular, if an author always reacts with nontermination towards an opposed type signal, then the publisher will choose the opposed type with positive probability at all times. This implies that a choice of neutral type is feasible only if the probability that the author also terminates at the opposed type signal is positive.

Courts' decisions can guide contestants into certain behavior. If legal action is a certain consequence, then systematic court decisions that are pro authors increase their termination incentives; however, publishers then tend towards choosing an opposed type. This may lead to greater friction between authors and publishers in copyright industries. In contrast, if legal action is just a threat, termination incentives increase while leading to a rather neutral type choice of the publisher. The paper argues that if additional legislation is unintended, transparency of the courts can help draw a clear line between the parties. If copyright terminations are desirable, the courts should systematically reject the "work made for hire" clause claims of publishers to induce license terminations.

Throughout the paper, advice for future research was provided that refers to modifications and extensions of the underlying model. However, we emphasize that this topic deserves more attention specifically through empirical research. Discussions with leading intellectual property right experts left the impression that one of the major reasons for this lack of attention is missing data and the difficulty of gathering it. Scientists can address this issue by testing the predictions as exemplified by the underlying paper in experimental research. These outcomes may prove helpful in predicting the impacts of a copyright termination law on creative industries, which may also identify the feasibility of the goals of such copyright system.

Appendix

A. Proof of Lemma 1. i) follows from (6), where we use $\gamma T - c < L$ to substitute L through $L(\eta^{\mathrm{A}})$, which yields the shown condition and the underlying (p, q) combination.

In case II, both best response functions of A have a vertical asymptote. Technically, only the vertical asymptote of $x_{\mathrm{II}}^{s;o}$ belongs to the definition area $\eta^{\mathrm{A}} \in]0;1[$.[11] We can find this asymptote by setting the denominator equal to zero, for which the substitution of L through $L(\eta^{\mathrm{A}})$ and rearrangement yield the position $\eta^{\mathrm{A}} = \frac{(1-z)T}{(1-z)(\gamma T-c)+T(y-z)}$. This asymptote is part of the definition area only if $\frac{(1-z)T}{(1-z)(\gamma T-c)+T(y-z)} < 1$, i.e., if $c < \frac{T(y-z)-(1-z)(1-\gamma)T}{1-z}$ is fulfilled, which already yields the condition for the second sentence of iv). For case II, it remains to be shown that the horizontal asymptote of $x_{\mathrm{II}}^{s;o}$ approaches one. First, expand $x_{\mathrm{II}}^{s;o}$ to $x_{\mathrm{II}}^{s;o}(L(\eta^{\mathrm{A}})) = \frac{(1-z)(L(\eta^{\mathrm{A}})-\gamma T+c)}{(1-y)T+(1-z)(L(\eta^{\mathrm{A}})-\gamma T+c)}$, in which the independent variable is η^{A}. The underlying function has an asymptote parallel to the abscissa as the highest powers in both the denominator and the numerator are equal,

[11]To find the vertical asymptote of $x_{\mathrm{II}}^{s;n}$, we have to set the denominator of $x_{\mathrm{II}}^{s;n}$ equal to zero. Using $L(\eta^{\mathrm{A}})$ to substitute L, the asymptote lies in $\eta^{\mathrm{A}} = \frac{zT}{(z-y)T+z(\gamma T-c)}$. This asymptote never belongs to the definition area, because rearrangement of $\frac{zT}{(z-y)T+z(\gamma T-c)} \geq 1$ yields $0 \geq -(y-z\gamma)T - c$, which is satisfied as long as $z < y$.

which is intuitive as $L(\eta^{\mathrm{A}})$ determines the respective independent variable. The coefficients of both independent variables with the highest power are $(1-z)$, wherefore $\frac{1-z}{1-z} = 1$ determines the horizontal asymptote. Together, with our previous findings, this proves the correctness of ii) and partially of iv). Consider (8) and (11) to see that the (p, q) combination in iv) must be true, since $0 \leq x \leq 1$. To prove iii), first note that, rearranging $x^{k}_{\mathrm{II}} > 0$ with respect to η^{A} while using $L(\eta^{\mathrm{A}})$ to substitute L in x^{k}_{II}, we obtain the condition $\eta^{\mathrm{A}} < T[(1+\gamma)T - c]$ under which both best response functions are always positive. As previously shown, both above functions are limited through one. If we rearrange $x^{s:o}_{\mathrm{II}} > x^{s:n}_{\mathrm{II}}$, while considering the previously derived condition, we can see that iii) is true as long as our assumption $z < y$ holds true.

The proofs of the remaining statements v) and vi) for case III first require the indication that $x^{s:n}_{\mathrm{III}}$ has no vertical asymptote in the definition area[12] but $x^{s:o}_{\mathrm{III}}$ has one in $\eta^{\mathrm{A}} \in]0; 1[$. If we substitute $L(\eta^{\mathrm{A}}) = \frac{(1-\eta^{\mathrm{A}})T}{\eta^{\mathrm{A}}}$ in the denominator of $x^{s:o}_{\mathrm{III}}$, while setting the denominator equal to zero, then the asymptote lies in $\eta^{\mathrm{A}} = \frac{1-z}{1+y-2z}$, which obviously lies in the definition area as long as $z < y$. Note that this equality already distinguishes the conditions in v) and vi). For $x^{s:n}_{\mathrm{III}}$, it is sufficient to show that with $T(\eta^{\mathrm{A}}) = \frac{\eta^{\mathrm{A}} L}{1-\eta^{\mathrm{A}}}$, within the definition area it holds that $x^{s:n}_{\mathrm{III}}(T(\eta^{\mathrm{A}})) < 1$, which is true since $0 < \eta^{\mathrm{A}} y L$. Moreover, it is necessary to show that a horizontal asymptote exists for $x^{s:o}_{\mathrm{III}}$, which is equal to one. Therefore, expand $x^{s:o}_{\mathrm{III}}$ to $x^{s:o}_{\mathrm{III}}(L(\eta^{\mathrm{A}})) = \frac{(1-z)(L(\eta^{\mathrm{A}})-T)}{(1-y)T+(1-z)(L(\eta^{\mathrm{A}})-T)}$ in which the independent variable is η^{A}. Both highest powers in the denominator and numerator are equal, which is because $L(\eta^{\mathrm{A}})$ determines the respective independent variable. The coefficients of both independent variables with the highest power are $(1-z)$, wherefore $\frac{1-z}{1-z} = 1$ determines the horizontal asymptote equal to one. Therefore, the best response functions below the vertical asymptote must be less than one, which proves v). Note that above the vertical asymptote, both functions must fulfill the characteristics as shown in vi). Finally, consider (9) and (12) to see that the (p, q) combination in vi) must be true, keeping in mind that $0 \leq x \leq 1$.

[12]If we substitute $L(\eta^{\mathrm{A}})$ in the denominator of $x^{s:n}_{\mathrm{III}}$ while setting the denominator equal to zero, then there exists an asymptote in $\eta^{\mathrm{A}} = \frac{zT}{T(2z-y)}$. Rearrangement of $\frac{zT}{T(2z-y)} \geq 1$ yields $z \leq y$, which implies that this asymptote lies beyond the definition area.

B. Case specific expected payoffs and derivation of the optimality conditions. The case specific expected payoffs are:

- $\mathrm{EP}_{\mathrm{I}} = x[y(1-p)R + yp((1-\gamma)R - V - c) + (1-y)q((1-\gamma)R - V - c) + (1-y)(1-q)R] + [1-x][z(1-p)(R-V) + zp((1-\gamma)R - V - c) + (1-z)q((1-\gamma)R - V - c) + (1-z)(1-q)(R-V)]$,
- $\mathrm{EP}_{\mathrm{II}} = x[y(1-p)R + (1-y)(1-q)R] + [1-x][z(1-p)(R-V) + zp((1-\gamma)R - V - c) + (1-z)q((1-\gamma)R - V - c) + (1-z)(1-q)(R-V)]$, and
- $\mathrm{EP}_{\mathrm{III}} = x[y(1-p)R + (1-y)(1-q)R] + [1-x][z(1-p)(R-V) + zp(-V) + (1-z)q(-V) + (1-z)(1-q)(R-V)]$.

The first order condition for an internal maximum of the expected payoff in each respective case is

- $\partial\mathrm{EP}_{\mathrm{I}}/\partial x = y[1-p]R + yp[(1-\gamma)R - V - c] + [1-y]q[(1-\gamma)R - V - c] + [1-y][1-q]R + z[1-p][R-V] - zp[(1-\gamma)R - V - c] - [1-z]q[(1-\gamma)R - V - c] - [1-z][1-q][R-V] \overset{!}{=} 0$,
- $\partial\mathrm{EP}_{\mathrm{II}}/\partial x = y[1-p]R + [1-y][1-q]R - z[1-p][R-V] - zp[(1-\gamma)R - V - c] - [1-z]q[(1-\gamma)R - V - c] - [1-z][1-q][R-V] \overset{!}{=} 0$, and
- $\partial\mathrm{EP}_{\mathrm{III}}/\partial x = y(1-p)R + (1-y)(1-q)R - z(1-p)(R-V) - zp(-V) - (1-z)q(-V) - (1-z)(1-q)(R-V) \overset{!}{=} 0$.

$\partial\mathrm{EP}_j/\partial x$ can be rearranged to yield the conditions under which P is indifferent between her strategies (see section 2.4).

C. Proof of Lemma 2. i) Setting $\sigma_{\mathrm{I}} > 0$ and rearranging this inequality yields $q < 1$; setting $\sigma_{\mathrm{I}} = 0$ and rearranging this inequality yields $q = 1$, which justifies "otherwise" as $0 \leq q \leq 1$.

For case II, first note that σ_{II} has a vertical asymptote in $\eta^{\mathrm{P}} = \frac{zc}{V(y-z\gamma)+zc}$, which lies below the definition area for this case because $\frac{zc}{V(y-z\gamma)+zc} < \eta^{\mathrm{P}}_{\mathrm{lb}}$ as long as our assumption $z < y$ holds true. Rearrangement of $\sigma_{\mathrm{II}} > 0$ reveals $\frac{V+qc}{q(1-\gamma)} > R$, which can be supplemented with $R(\eta^{\mathrm{P}})$ to yield $\frac{V+qc}{V[1+q(1-\gamma)]+qc} > \eta^{\mathrm{P}}$. Now we can see that $\frac{V+qc}{V[1+q(1-\gamma)]+qc} < \eta^{\mathrm{P}}_{\mathrm{ub}}$ for any $q < 1$, and $\frac{V+qc}{V[1+q(1-\gamma)]+qc} = \eta^{\mathrm{P}}_{\mathrm{ub}}$ for $q = 1$, implying $\sigma_{\mathrm{II}} = 0$. This proves the correctness of ii) and iii), respectively.

iv) is a consequence of our assumption $V > 0$ and for v), set $\frac{V}{R(y-z)} = 1$ and use $R(\eta^{\mathrm{P}}) = \frac{\eta^{\mathrm{P}} V}{1-\eta^{\mathrm{P}}}$ to substitute R in the previous inequality to yield the relationship shown in the first sentence of v). To prove the second sentence of v), it is necessary to consider the definition area of case III, which is $\eta^{\mathrm{P}} < \eta^{\mathrm{P}}_{\mathrm{lb}}$. It is intuitive that the right-hand side of the inequality in the first sentence must be smaller than $\eta^{\mathrm{P}}_{\mathrm{lb}}$ to be part of the definition area, i.e., $\frac{1}{1+y-z} < \frac{c}{(1-\gamma)V+c}$. Rearrangement yields the condition in sentence two.

D. Proof of Proposition 1. From (6), we know that $p = q$, which implies that $p - q = 0$. Thus, in i), if $q^* = 1$, then $p^* = 1$ must hold true. Note that due to Lemma 1 i), this equilibrium presupposes $\eta^{\mathrm{A}} > \frac{T}{(1+\gamma)T-c}$. Following Lemma 2 i), $\sigma_{\mathrm{I}} = 0$ is also true due to $q^* = 1$. With $\sigma_{\mathrm{I}} = p - q$, P is incentivized to randomize between both attitude types. x^* is limited through $\mu^* < x^* < \lambda^*$. This is proven by the fact that $\mu^* = \frac{x^*(1-y)}{x^*(1-y)+(1-x^*)(1-z)} < x^*$ and $x^* < \lambda^* = \frac{x^* y}{x^* y+(1-x^*)z}$ both yield $(1 - x^*)y > (1 - x^*)z$, which holds true with our assumption that $z < y$, given $x^* < 1$.

In equilibrium ii), $q^* < 1$ from what we can follow, considering Lemma 2 i), that $\sigma_{\mathrm{I}} > 0$. Considering (13), $\sigma_{\mathrm{I}} > p - q = 0$ implies that P will choose the neutral type strategy with certainty, i.e., $x^* = 1$. Recall from above that $\sigma_{\mathrm{I}} = \frac{V(1-q)}{(y-z)(\gamma R+c)+yV}$. Then, A randomizes below one given that $\gamma T \leq L + c$ because rearrangement of $\frac{V(1-q)}{(y-z)(\gamma R+c)+yV} > 0$ yields $q^* < 1$, implying $p^* < 1$. Note that due to Lemma 1 i), this equilibrium presupposes $\eta^{\mathrm{A}} \leq \frac{T}{(1+\gamma)T-c}$, where $\eta^{\mathrm{A}} < \frac{T}{(1+\gamma)T-c}$ leads to $\{1; (0, 0); (1, 1)\}$.

E. Proof of Proposition 2. The equilibrium iii) requires parameter settings, which fulfill Lemma 1 ii) and Lemma 2 iii). P makes her strategy choice such that $\sigma_{\mathrm{II}} > p - q$ only if $\sigma_{\mathrm{II}} > 0$. In this case, the pure strategy $x^* = 1$ is the best answer to any (p, q) combination because the prerequisite $q^* = 1$ implies $0 \geq p^* - q^*$. Since $x^* = 1 > x^{s:n}_{\mathrm{III}}$, $x^{s:o}_{\mathrm{III}}$, the only feasible answer of A is to terminate at all times, i.e., $p^* = q^* = 1$. If player P mixes her strategies with $\sigma_{\mathrm{II}} = p - q$ given that $\sigma_{\mathrm{II}} = 0 = p^* - q^*$, then $p^* = 1$ is also an equilibrium outcome. Since A will only choose to terminate while seeing a neutral signal given that $x^* > x^{s:n}_{\mathrm{II}}$, such restriction limits P's type probability to $1 \geq x^* > x^{s:o}_{\mathrm{II}}$ and justifies the considered equilibrium outcome.

To prove the existence of the equilibrium iv), we need to consider the results in Lemma 1 iii) and Lemma 2 ii) from which we know that $\sigma_{\mathrm{II}} > 0$ with $q < 1$ and $1 > x_{\mathrm{II}}^{s:o} > x_{\mathrm{II}}^{s:n} > 0$. Since $q < 1$, x^* must not be greater than $x_{\mathrm{II}}^{s:o}$. If P chooses, such that $\sigma_{\mathrm{II}} = p - q$, then A is indifferent between all values in the range $x_{\mathrm{II}}^{s:o} \geq x^* \geq x_{\mathrm{II}}^{s:n}$. If $x^* = x_{\mathrm{II}}^{s:o}$, then A randomizes q^* and chooses $p^* = 1$ because then $x^* > x_{\mathrm{II}}^{s:n}$, as we know from Lemma 1 iii). This implies $\sigma_{\mathrm{II}} = 1 - q^*$, yielding $q^* = 1 - \sigma_{\mathrm{II}}$. If, however, $x^* = x_{\mathrm{II}}^{s:n}$, then A randomizes p^* while playing $q^* = 0$ due to $x^* < x_{\mathrm{II}}^{s:o}$. Altogether, our previous derivations imply $1 \geq p^* = \sigma_{\mathrm{II}}$ and $1 - \sigma_{\mathrm{II}} = q^* \geq 0$.

Equilibrium v) is valid whenever Lemma 1 iv) is met. A result is that the author always plays the equilibrium strategy profile $p^* = 1$ and $q^* = 0$. Hence, $p^* - q^* = 1 \gtreqless \sigma_{\mathrm{II}}$ and P's best reply to A's (p, q) combination is $0 \leq x^* \leq 1$. x^* may be limited through $\mu^* \leq x^* \leq \lambda^*$ because $\mu^* = \frac{x^*(1-y)}{x^*(1-y)+(1-x^*)(1-z)} \leq x^*$ and $x^* \leq \lambda^* = \frac{x^*y}{x^*y+(1-x^*)z}$ both yield $(1 - x^*)y \geq (1 - x^*)z$. This inequality holds true with our assumption that $z < y$ for any $x^* < 1$, and independent from our assumption if $x^* = 1$, implying $(1 - x^*)y = (1 - x^*)z$.

F. Proof of Proposition 3. vi) is an equilibrium as long as Lemma 1 v) and Lemma 2 iv) are satisfied. In particular, for any $\eta^{\mathrm{A}} < \frac{1-z}{1+y-2z}$ P's best response to a (p, q) combination with $\sigma_{\mathrm{III}} > p - q = 0$ is always $x^* = 1$, implying $p = q$. We can deduce from Lemma 1 v) that $1 = x^* > x_{\mathrm{III}}^k$ and, consequently, A's best reply to P's choice is to terminate the copyright license at all signal realizations, i.e., $p^* = q^* = 1$.

The equilibrium in vii) is relevant only for parameter settings that satisfy Lemma 1 vi) and Lemma 2 v). In this equilibrium, P chooses a mixing strategy if $\sigma_{\mathrm{III}} = 1 = p - q$, which requires that A plays $p^* = 1$ and $q^* = 0$. We know from Lemma 1 vi) that under given parameter settings, $p^* = 1$ and $q^* = 0$ are valid, also confirming the validity of $\sigma_{\mathrm{III}} = 1 = p - q$. Hence, P's equilibrium strategy is to randomize between his strategies. However, x^* is limited through $\mu^* \leq x^* \leq \lambda^*$. This is proven by the fact that $\mu^* = \frac{x^*(1-y)}{x^*(1-y)+(1-x^*)(1-z)} \leq x^*$ and $x^* \leq \lambda^* = \frac{x^*y}{x^*y+(1-x^*)z}$ both yield $(1 - x^*)y \geq (1 - x^*)z$, which holds true with our assumption that $z < y$ for any $x^* < 1$, and independent from our assumption if $x^* = 1$, implying $(1 - x^*)y = (1 - x^*)z$.

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