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Overview

This collection of articles addresses two copyright systems that provide authors with different copyright reversion options. It is the aim of this collection to deepen the understanding of how such options affect contractual frameworks in copyright licensing and the relationships between authors and publishers in creative industries. In each article, special emphasis is given to the question of whether copyright reversion is an effective and efficient tool, and whether authors benefit financially from regaining control over their creative goods.

Copyright law provides an institutional framework to balance the interests of authors and publishers, thereby ensuring economic stability and growth in cultural and creative industries. As unequal bargaining power usually characterizes monetary misallocation between authors and publishers, policy makers increasingly tend to provide the former with individual rights. The argument is that greater individual rights will automatically put authors into better bargaining positions because they will be able to reuse their licenses in new bargaining situations. The core issue, however, is that publishers may internalize the loss of copyright exclusivity, affecting their willingness to cooperate. This may lead to unintended consequences for license negotiations and authors' decisions to use their individual rights.

Each of the selected articles deals with this core issue and questions the effectiveness and efficiency of such regulatory interventions, comparing different institutional settings that include or exclude copyright reversion options. While there are valuable informal contributions to this topic in the legal literature, no article provides a clear economic analysis with answers to the issue (Towse, 2018). As such, this collection attempts to fill the gap, with the caveat that the underlying analysis cannot be exhaustive as this field is vast. Still, this endeavor provides a significant contribution to the economics literature on intellectual property rights, and represents the first attempt to deal with copyright reversion from an economist's perspective, stimulating discussion among economic experts (see, e.g., Towse, 2018).

From a methodological perspective, the three articles are related insofar as they model and compare contractual relationships in different institutional frameworks. In particular, articles one and two apply the Nash bargaining solution to analyze copyright reversion effects on contract enforcement. However, the articles address different copyright systems; article one details the German system, while article two discusses the American system. Both systems differ technically, further elaborated upon in article one. Meanwhile, article three also investigates the American system, yet it applies a Bayesian signaling model to question the prospects of copyright reversion, assuming copyright contracts are enforced.

The first article was coauthored with my supervisor, Roland Kirstein, and published in the Journal of Institutional and Theoretical Economics (JITE). It analyzes the impact of different use rights in German copyright law, including license prices, publisher investments, and authors' lifetime incomes. Different use rights allow authors to retransfer copyrights to an additional publisher after a vesting period, implying a loss of copyright exclusivity for copyright licensees. We build on Landes and Posner (1989) and Caves (2003), who show that negotiations over copyrights mainly depend on publishers' expectations about license profitability. Loss of exclusivity may lead to heightened competition among publishers while decreasing profitability expectations and negatively affecting license prices.

Indeed, authors are able to resell licenses in later career stages; however, it is ambiguous whether lifetime incomes increase. In particular, we consider the economic concept of time preferences (Darling, 2015), publishers' investment incentives (Patry, 1999; Gilbert, 2016), and bargaining power evolution (Rub, 2013) to demonstrate that different use rights are not systematically advantageous to authors. Our results show that authors typically benefit from different use rights if an exclusive publisher has lost interest in holding the license and a new publisher seeks to continue marketing the creation after the vesting period; such a scenario is always Pareto efficient. The case is much different, however, if the initial publisher is still exploiting the license, as the interest of another publisher triggers competition and undermines profitability.

The first article is a first attempt to model the German copyright system and our findings contribute to the discussion on its desirability (e.g., BMJV, 2016; Wiele, 2016). The article also contributes to broader literature on copyright reversion (e.g., Towse, 2018), because different use rights are an alternative type of copyright reversion as compared to termination rights.

The second article deals with the American Copyright Act of 1976, which includes copyright termination rights, under which, if exercised, all rights revert to the originator after a vesting period. Authored together with my supervisor, Roland Kirstein, and published in the International Review of Law and Economics (IRLE), this article models a bargaining situation between an author and his publisher to investigate how copyright termination affects their contractual relationship. In particular, we demonstrate that such an option may increase an author's payoff while decreasing the cooperation rent from the bargaining situation, what questions collective desirability. Moreover, we show that authors who exercise termination rights should receive different contracts compared to those who abstain from copyright terminations. We propose that contracts for terminating authors should include reduced royalties but higher certain lump-sum payments. This justifies a risk analysis, which reveals that, contrary to the literature (e.g., Patry, 1999; Rub, 2013; Darling, 2015; Gilbert, 2016), termination options do not always force authors into lotteries.

This article introduces the first economic analysis of copyright contracts that include termination rights, scrutinizing informal results from the literature (e.g., Rub, 2013; Brown, 2014; Darling, 2015). It helps to understand that termination practices not only impact initial license prices, but also trigger side-effects regarding contractual design (e.g., Williamson, 1979; Gilbert, 2016) and risk allocation (Rub, 2013). Moreover, the underlying article may have merit in research on two-person cooperative games (e.g., Nash, 1953), as a termination option affects the cooperation rent, and alters the information and the structure of the game.

Building on article two, the third article focuses on the "work made for hire" clause, which has drawn great media attention (e.g., Browne, 2011; Rohter, 2011; Rohter, 2013). Under this clause, only certain authors are entitled to terminate copyright grants. Accepted for publication by the Review of Economic Research on Copyright Issues (RERCI), this article will be published in mid-2019. I build on the literature that assumes a legal gray zone, as both publishers and authors are unsure of their rights due to the aforementioned clause, wherefore a “hailstorm of litigation” is expected (e.g., Strohm, 2003; Beldner, 2012). This may lead to general copyright termination deterrence (Gilbert, 2016) and negatively affect cooperation between authors and publishers (Starshak, 2001). Thus, I provide a Bayesian signaling model in which an author is the uninformed party and a publisher sends an informative but costly signal to induce termination deterrence. My results demonstrate that termination deterrence is an equilibrium outcome only if a publisher sues with certainty. Otherwise, the results indicate positive termination probabilities under most parameter settings. Here, I also scrutinize the role of courts, which may guide parties into certain behavior.

The article helps elucidate that the “work made for hire” clause does not systematically make the law ineffective, even though the clause triggers friction between involved parties (Strohm, 2003). It adds to the body of literature on copyright termination law (e.g., Rub, 2013; Darling, 2015) and, more generally, on copyright reversion (e.g., Towse, 2018).

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ARTICLE ONE

More Rights, Less Income?: An Economic Analysis of the New Copyright Law in Germany

More Rights, Less Income?: An Economic Analysis of the New Copyright Law in Germany

by

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We investigate the conflict between authors and their publishers that may result from a copyright system that allows authors to transfer copyrights to an additional publisher. A two-period bargaining model analyzes effects of competition, time preferences, and bargaining power on license prices, publisher investments, and authors' lifetime incomes. We demonstrate that authors benefit from the new copyright system if new publishers continue the distribution of their orphaned works. Authors do not necessarily benefit if exclusive publishers are still exploiting licenses, because high levels of competition result in underinvestment by publishers and in internalization effects during contract negotiations.

Keywords: institutional regulation, copyright law, bargaining, creative industries, author–publisher relationship

JEL classification code: K23, O33, Z18

1 Introduction

We examine copyright legislation that has not yet been analyzed in the economics literature (Towse, 2018), which grants more individual rights to authors with the goal of increasing their remuneration. Copyright law provides an institutional

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framework to balance the interests of authors and publishers so as to ensure economic stability and growth in cultural and creative industries. More individual rights and control given to authors may have a negative impact on this stability due to decreasing profitability expectations for publishers, thereby affecting the negotiations for copyright licenses. Our results show that the new copyright system will not systematically benefit authors financially.

Reasonable remuneration for authors is an important element of European copyright law (Deutscher Bundestag, 2016) and is seen as an essential instrument for the stimulation of creative output in the regulation of copyright systems (Towse, 1999). Since 2002, this element has been embedded in German copyright law, and it obligates legislators to design a copyright system that guarantees fair participation for authors in the revenues from their creative services (Deutscher Bundestag, 2016). To achieve this goal, the German copyright system was most recently amended in 2016, granting authors more individual rights. The disparity in market power between authors and publishers is used as an argument for regulatory policy in that only a few authors receive a decent income from their creative works. In Germany, as well as in other countries, authors often sell exclusive licenses for an inappropriately low license price in perpetuity (Caves, 2000). If their creations turn out to be successful, authors fear using legal means to enforce appropriate remuneration, since publishers may de facto boycott them in the future. Those two observations are seen as the main factors that prevent reasonable remunerations to authors, leading to an unsatisfactory prereform copyright system (Deutscher Bundestag, 2016).

Regulation aside, the most promising individual right for overcoming these problems is § 40a UrhG,[1] which entitles authors to different use rights (henceforth, DUR), i.e., authors can license the usage rights over their creation to a different publisher[2] after a vesting period of ten years. The publisher who purchased the exclusive rights of usage initially may continue producing; however, she forfeits the claim of exclusivity. A second publisher may then produce concurrently with the initial publisher. Legislators assume that DUR are a suitable instrument to overcome the disparity of power between authors and publishers during negotiations, resulting in a higher share for authors. Moreover, the overall remuneration would likely increase due to additional income from the second contract after ten years (Deutscher Bundestag, 2016).

Legislators, however, neglect the fact that a loss of copyright exclusivity is likely to trigger competition between license holders, resulting in lower expected values for licenses. Moreover, while evaluating the expected value of a license, publishers may take into account the fact that successful copyright assignments are most likely to lose exclusivity. An undesirable effect is that publishers internalize the harm and adjust their expectations downward, resulting in lower prices for copyright licenses. A second undesirable effect is the undermining of investment incentives, as pub-

[1] This abbreviation stands for *Urheberrechtsgesetz*, which is the German copyright law.

[2] To simplify matters, we include all types of intermediaries or licensees from the music industry, print media, movie industry, software sector, etc., in the term "publisher."

lishers may be less willing to fund projects with a limited period of exclusivity than projects that exclusively remain back-catalog after ten years.

This paper proposes a theoretical model to examine these effects with a focus on the contractual relationship between authors and publishers. We ask the following questions: How do the prices for exclusive licenses change after institutional intervention? Does the new law shift bargaining power towards authors? If an internalization effect exists, under which circumstances do authors benefit financially from the new copyright system? How are these results affected by the level of competition between publishers? Will diminished profit expectations decrease publishers' investment incentives? What are the consequences for all participants in creative industries, from an overall welfare perspective? How does the new law interact with an earlier doctrine, namely, the *bestseller paragraph*?

Our theoretical framework demonstrates that an internalization effect likely bears on the contractual situation between authors and publishers. This is in line with Landes and Posner (1989) and Caves (2003), who show that a publisher will consider the expected gains from holding a license and share these gains with the author. Caves (2003) also states that an author may exchange decision rights for pecuniary compensation by contract agreement. The new law establishes such an exchange because an entitlement with DUR may entail lower-paying license contracts. Thereby, the competition effect not only impacts the license prices in the initial contracting stage but also impacts the pricing decision of the additional publisher in the second stage. If competition is high, there is little to gain for both publishers, and we show that authors entitled to DUR receive lower remuneration. DUR can be beneficial to authors in a mainly heterogeneous Cournot duopoly or if the initial publisher has expectations about a success period of ten years or less during contract negotiations. Our comparative-static analysis shows that more competition strictly decreases authors' lifetime incomes in a Cournot duopoly. In a Bertrand duopoly, these incomes are likely to be lower under the new copyright system. This is also true for the investment level of the initial publisher, regardless of what type of duopoly is underlying. In other words, if the competition effect is higher, the incentives to induce product success decrease.

This paper is organized as follows. Section 2 provides a short overview of the strand of literature that analyzes the effect of individual rights on author remuneration in copyright industries. Section 3 introduces the basic model setup and derives preliminary results. In section 4, we derive our main results while comparing the two institutional frameworks, and we discuss their implications. Thereby, emphasis is placed on the analysis of license prices, author lifetime incomes, and a welfare analysis. In section 5, we discuss our results and provide reasons for the validity of our analysis. The last section concludes the paper. An appendix, finally, collects our formal derivations and proofs.

2 *Individual Rights and Remuneration*

The actual impact of institutional intervention that grants authors more rights is not without dispute in the copyright literature. Karas and Kirstein (2018) provide a theoretical paper that investigates an institutional framework with unilateral contract termination rights to authors, which can be found in American copyright law. They use the internalization effect to show that such rights are likely to influence the contractual situation between authors and publishers, decreasing license prices and altering contract designs. Whereas they demonstrate that some authors may benefit financially from copyright reversions, Brennick (2018) claims that a retransfer of copyright license to the original publisher would be the only economically rational option for an author. Patry (1997) and Murphy (2002) analyze the peculiarity of the same law according to which only certain authors are entitled to more rights. Both papers agree that granting authors more control over licenses would result in the need to differentiate between these author groups during contract negotiations. Moreover, more individual rights given to authors may increase tension between authors and publishers and affect contract negotiations. Patry (1997) argues that it would only be a matter of time until the motivations of the parties would be affected, with negative incentives to create and invest.

Rub (2013), Darling (2015), and Gilbert (2016) analyze further effects of the American copyright law. All three authors agree that such rights are not sufficient to challenge the market-power disparity and will not improve the bargaining process. This is in line with the view of Kretschmer (2012) and is also in agreement with the results of Karas and Kirstein (2018). The argument is that a change in the valuation of a creative good will determine the cooperation rent without consequences for the technical features of the players (Darling, 2015). Termination rights may, however, undermine publishers' investment incentives and therefore affect the value to be negotiated, resulting in worse initial deals for authors (Gilbert, 2016; Towse, 2018). Kretschmer (2005) claims that publishers need exclusive and transferable property rights to extract maximum returns from their investments. According to Darling (2015), publishers may be less willing to carry out relationship-specific investments because the risk of contract termination increases the risk of forfeiting nonrecoupable financial means. She believes that such opportunistic behavior may also negatively affect the distribution of creative works. Hence, authors are entitled to more rights; however, this circumstance includes the possibility of setting suboptimal incentives for publishers (Darling, 2015).

Rub (2013) argues that these negative effects will generally not lead to a decrease in lifetime compensation of authors in America. Indeed, initial prices will likely decrease; however, authors will resell licenses in a later career stage as established artists with increased bargaining power, and they would easily benefit from holding more individual rights (Rub, 2013). Darling (2015) and Gilbert (2016) question this argument while introducing the economic concept of time preferences. In particular, a shift of compensation to the future could easily lead to decreases in lifetime income (Darling, 2015).

We believe that time preferences and bargaining-power evolution may play a role in analyzing DUR; we incorporate both into the model, as we believe that the results are more differentiated than described above. Moreover, the results are limited in applicability to the underlying topic in that the American copyright system differs from the German system. It entitles authors to terminate grants of copyright assignments after a vesting period of 35 years.[3] On the one hand, in the U.S., the vesting period is longer, and on the other hand, the entire bundle of rights reverts to the authors. In contrast, a German publisher will only lose the exclusivity claim after ten years.

Experimental support for the previously mentioned findings is provided by Engel and Kurschilgen (2011). Analyzing the bestseller paragraph,[4] they compare two institutional arrangements for copyright markets and show that more individual rights are likely to decrease license prices. We incorporate the bestseller paragraph into our model to investigate the interaction with DUR as a bargaining situation if the creation turns out to be a bestseller. The bargaining setting is different from that in Engel and Kurschilgen (2011), who introduce a third party that adjusts the remuneration. Our modification, however, does not impair comparability, as it technically models the situation in a related manner, avoiding the introduction of an additional player into our game. In doing so, we provide support for their findings and, in addition, analyze the question they raise about the investment incentive effect in influencing the probability of success.

Kretschmer (2012) proposes a copyright system that limits a copyright term to ten years with the goal of overcoming the "orphan works" problem. Such a system grants more rights to authors, as usage rights automatically revert, offering them more control over their creations (Varian, 2006). He argues that such a system would easily benefit authors financially; however, he admits that a clear answer to this question is overdue. His argument is that such a copyright system would induce contract renewals, which are built on more accurate profit expectations in that parties would be able to assess the real value after ten years. While this sounds reasonable, his argument neglects negative effects on license prices and the problem of time preferences, which both play a role in evaluating such a system.

In the new system, the loss of exclusivity may play a substantial role and requires a more detailed view, since, as Landes and Posner (1989) state, copies may not be perfect substitutes for the original. Thus, we allow for product differentiation in a duopoly setting. We believe that profitability expectations of all involved publishers will depend on the competition level after the vesting period, expecting that lifetime income under DUR is more likely to increase under the new institutional framework the lower the competition level is.

One may argue that modeling a Bertrand duopoly with no capacity constraints and modest product differentiation might be justified as a way to model creative

[3] More specifications of the law can be found under 17 U.S.C. § 203.

[4] This paragraph was introduced by the German legislature before DUR were introduced with the same purpose: to enforce reasonable remuneration. The law entitles authors to demand higher remuneration in the event of unexpected product success.

industries. However, creative industries offer a diversity of goods, which are different in their uses and their technical features (Vogel, 2014). Caves (2000) notes that contract structures may depend on these features and that in many industries the limitation of quantity plays a role. Darling (2015) also mentions that individual author rights may lead to strategic capacity choices by publishers. Therefore, one can imagine that publishers would not necessarily undercut each other's prices. We consider these observations and focus, also for analytical convenience, on a model with Cournot competition. However, the effect of Bertrand outcomes is also analyzed, using a comparative-static approach, which might be sensible for markets without capacity limits. We take into consideration that Bertrand competition with symmetric publishers yields zero profits if their products are homogeneous and that the outcomes become closer to the Cournot solution the more heterogeneous their products are (Gravelle and Rees, 2004). We believe that our approach increases the transparency of the paper while predicting results in a more abstract manner.

The theoretical setup closest to our research was modeled by Karas and Kirstein (2018). They use a bargaining model to compare the effects of termination rights on the bargaining outcomes. Our paper introduces DUR, which are, as explained above, different from termination rights. Moreover, we introduce a second stage where bargaining-power evolution and competition levels play a substantial role. Another related paper is that of Michel (2006), who addresses the author–publisher relationship in a bargaining model to investigate the impact of new copying technologies in music markets. Institutional intervention is directed towards consumer rights in that Michel (2006) varies copyright protection for published creations to overcome unintentional copying. He demonstrates that a stricter copyright law reduces copying incentives while increasing the profitability of creations, with a positive effect on authors' remunerations (Michel, 2006; Watt, 2010). The latter result is useful, as it predicts the influence of copyright law on the bargaining outcome. However, his approach is applicable only to a limited degree, since his analysis is directed towards consumer rights, whereas our paper investigates author rights.

3 The Model

3.1 Setup

We formally describe a game from which we can derive results for both institutional frameworks. Assume there are two periods denoted $i \in \{1;2\}$ and four players: an author[5] (denoted A), who owns a creation; an initial publisher (denoted P), who negotiates with A in period one over the rights to hold the license in both periods; and two types of additional publishers (denoted Q and R), one of whom may enter the game in period two and bargain over the license with A. The two types differ

5 This simplifying assumption may be extended to a collective of authors or a delegate who negotiates on behalf of authors. As we believe, this simplification has no impact on our results, because the starting position is equal in all frameworks.

in their strategic orientations: publisher Q, like P, is only attracted by a license in period two if a creation proved successful, whereas publisher R is specialized in licenses for unsuccessful creations and serves demand in the niche. Moreover, Q and R both have a cherry-picking mentality, i.e., they will not offer a contract if a creation is not yet on the market. For simplicity, assume that all players are perfectly informed about the relevant specifications of the game and that all players are risk-neutral. A is interested in maximizing the lifetime income for her creation,[6] and each publisher wishes to maximize own profits.

Let M be the license price resulting from the first contract, and assume two states of nature, viz., the creation is successful with probability q and unsuccessful with probability $1-q$. In the success state, the bestseller paragraph applies, granting an additional share m to the author. Different use rights may become relevant if Q enters the game in the success state and if R enters in the nonsuccess state. Then Q would pay the license price T, and R would pay t. Each license price is designed to be a share of the profits of the respective publisher.

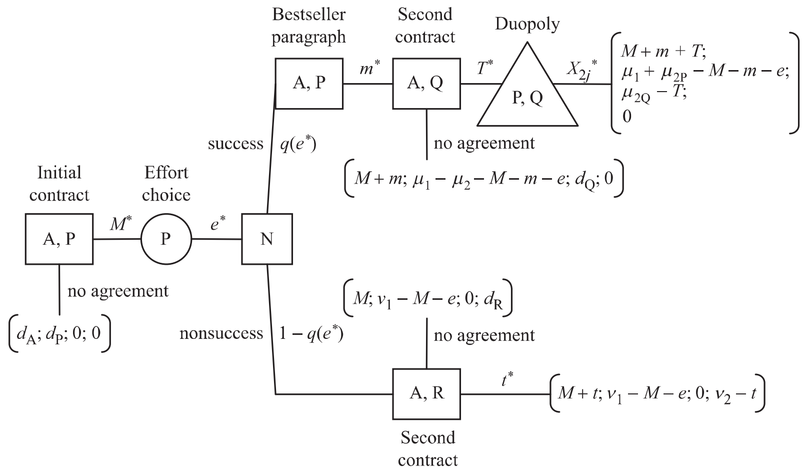
We solve the contracting stages each as a two-person bargaining situation, applying the asymmetric Nash bargaining solution. The asymmetry includes the relative bargaining power of each party, and we denote this power between A and P by α and that between A and Q or A and R by β, assuming $0 < \alpha, \beta < 1$. In other words, α and β reflect the technical features of A in comparison with the technical features of the respective publisher. Thus, the closer α, β are to one, the higher A's bargaining power in the bargaining situation is. The Nash bargaining solution presupposes axioms, one of which is individual rationality (Nash, 1953). This axiom is satisfied if a player's payoff exceeds her outside option in the respective bargaining situation. Let d_{A}, d_{P}, d_{Q}, and d_{R} denote each player's outside option in case of breakdown of negotiations. All four parameters are nonnegative. The source of conflict during all negotiations is the share of A. Cooperation is required to induce the distribution of the creation to the market and establishes cooperation rents between A and P, A and Q, and A and R. Note that since there is no asymmetric information in our model, each player's expectations about future payoffs can be incorporated in the Nash product (Rubinstein and Wolinsky, 1985; Binmore et al., 1986). These future payoffs require the consideration of publishers' profits, which are modeled by $\mu_i(X_i)$ and $\nu_i(x_i)$. The first parameter is the profit realized in case of success in period i and is contingent on the quantity tendered in the same period. $\nu_i(x_i)$ is the profit realized given that the creation is not successful, depending on the quantity offered in i. Note that X_i only refers to the success state, whereas x_i relates to the nonsuccess state.

The problem of time preferences is relevant when modeling two periods. Therefore, let δ_{A} and δ_{P} be the discount factors of the players, where $0 < \delta_{\mathrm{A}}, \delta_{\mathrm{P}} < 1$.[7] The

[6] We put aside all intrinsic motivations of the author (fame, reputation, etc.), since we are solely interested in investigating the effect of the institutional intervention on author remuneration.

[7] The discount factor depicts the present value of future gains, which is required to model the expected payoffs of the players in period one. $\delta_{\mathrm{A}}, \delta_{\mathrm{P}} < 1$ implies that the players

Figure 1
The Information Structure



final detail is the effect of P's investment efforts on the success probability. We introduce the parameter e, which is incorporated in $q(e)$. The investment is a fixed cost, and $e \geq 0$. It comprises costs incurred increasing the overall probability of product success, such as marketing costs of promoting A's work. We assume that effort increases product success with a decreasing marginal rate. This can be modeled such that $q(e) = \overline{q} - 1/e$, where $0 < \overline{q} < 1$ stands for an upper limit of success probability. We assume $0 < q(e) < 1$, which implies $q'(e) > 0$ and $q''(e) < 0$. The investment effect on the success probability is characterized by $\lim_{e\to\infty} q'(e) = 0$ and $\lim_{e\to 0} q'(e) = -\infty$.

A detailed sequence of events is illustrated in Figure 1. The payoffs for each player are denoted in brackets, whereby the order of the payoffs is (A; P; Q; R). The game starts with the negotiations between A and P, which are symbolized by the box labeled "A, P"; in case of disagreement, they have the outside options d_A and d_P, respectively. In case of agreement, A is remunerated with a Nash product maximizing M^*, and P makes an optimal effort choice e^* based on her expectations about future profits. The box labeled "N" illustrates that Nature randomly determines the success probability, i.e., an outcome dependent on chance. With probability $1 - q(e^*)$ the game follows the path labeled "nonsuccess" in the first period and yields ν_1. Recall that this causes a loss of interest on the part of P and Q, whence neither publisher will market the creation in period two in the nonsuccess state. However, R may be interested in marketing the product but need to agree with A over the license price first, as illustrated by the box named "A, R". The bargaining rent between A and R is positive if $\nu_2 - t \geq d_R \wedge t > 0$. This is true as-

evaluate future gains to be lower than gains today. Q and R do not require a discount factor, as both collect profits in the same period in which they enter the game.

suming that R is the only possible market entrant in period two and the individual rationality axiom is thereby satisfied. Given a positive bargaining rent, A is remunerated with a Nash product maximizing t^*, and R makes profit ν_2. Otherwise, disagreement leads onto the path above the box "A, R".

Now consider the path "success." With probability $q(e^*)$, the product is successful in period one, and the bestseller paragraph applies, shown by the box labeled "A, P" below "Bestseller paragraph." At this stage of the game, still in period one, A receives the additional share m^*, which is a result of new contract negotiations. We assume a certain bargaining agreement, so that outside options are redundant. More details and the result of these negotiations will be explained in a later stage of this paper. Subsequently, the game proceeds with period two, in which Q may enter the market and negotiate with A over T, denoted by the box "A, Q". Note that P is still supplying the market, and market entry would induce the parties to compete over quantities, each choosing quantity X^*_{2j} where $j \in \{P;Q\}$. Here μ_{2P} and μ_{2Q} denote the profits of P and Q, respectively. A will always agree whenever T^* is positive, as follows from the same rationale as stated above. Q will however only agree on T^* if $\mu_{2Q} - T \geq d_Q$ and will then enter a duopolistic market competing with P. This situation is illustrated by the triangle labeled "P, Q". However, if $\mu_{2Q} < T + d_Q$, then A and Q do not agree, P remains the only producer in period two earning μ_2, and the players play the disagreement path below the box named "A, Q".

The next two subsections serve to derive helpful results for the ongoing analysis. In section 3.4, we start solving the two-stage game by backward induction.

3.2 Case Distinction

The two institutional frameworks can be differentiated by considering the decision of Q and R whether to enter the market in period two. No entry by any additional publisher is equivalent to the prereform case. The postreform situation offers two examples. First, Q enters the market in the success state and R in the nonsuccess state. Second, only R enters the market in the nonsuccess state.[8] The second example may sound counterintuitive at first glance; however, we assumed that Q and R differ in their strategic orientations. Recall from Figure 1 that Q will not enter the market in the success state if $d_Q > \mu_{2Q} - T$, e.g., due to a tough pricing policy of P. R, however, is not a rival of P, as she serves demand in the niche, and if ν_2 is sufficiently high that $\nu_2 \geq t + d_Q$, then the second example is conceivable. Using the entry conditions for each additional publisher type, we can identify three relevant cases to be analyzed:

[8] Actually, a third example exists, namely, only Q enters the market in the success state. It is partly included in the first example and can be easily derived by setting $\nu_2 = 0$.

Case I: The prereform case without DUR (benchmark), if $d_{\mathrm{Q}} > \mu_{2\mathrm{Q}} - T \wedge d_{\mathrm{R}} > \nu_2 - t$;
Case II: DUR, and Q and R enter in the respective states, if $\mu_{2\mathrm{Q}} - T \geq d_{\mathrm{Q}} \wedge \nu_2 - t \geq d_{\mathrm{R}}$; and
Case III: DUR, and only R enters in the nonsuccess state, if $d_{\mathrm{Q}} > \mu_{2\mathrm{Q}} - T \wedge \nu_2 - t \geq d_{\mathrm{R}}$.

3.3 Optimal Profits

Assuming that the remuneration to the author and the investment are not recoupable, the publisher will consider these as sunk costs while maximizing profits. Thus, define the profit function $\nu_i(x_i) = (a_i - bx_i - c)x_i$ for the nonsuccess state in period i, where a_i denotes the prohibitive price of the inverse demand curve. For analytical convenience, we use a constant parameter b, which determines the slope of the inverse demand function, and a constant parameter c, which denotes the variable cost of a publisher. At the same time, we assume that all publishers have the same variable costs. Recall from Figure 1 that only P would provide the market in period one, and R may serve the market potentially as the only producer in period two.[9] A profit-maximizing publisher will choose her quantity such that

$$\frac{\partial \nu_i(x_i)}{\partial x_i} = a_i - 2bx_i - c \overset{!}{=} 0,$$

for which rearrangement yields the optimality condition $x_i^* = (a_i - c)/2b$. Using x_i^* to rearrange $\nu_i(x_i)$, we can derive

$$\nu_i^* = \frac{(a_i - c)^2}{4b}. \tag{1}$$

If P is the only producer in both periods in the success state, her profit function is given by $\mu_i(X_i) = (A_i - bX_i - c)X_i$, where A_i denotes the prohibitive price of the inverse demand function in period i. Then, P will maximize her profits by choosing the quantity such that

$$\frac{\partial \mu_i(X_i)}{\partial X_i} = A_i - 2bX_i - c \overset{!}{=} 0.$$

Rearrangement of the first-order condition leads to $X_i^* = (A_i - c)/2b$. We can use X_i^* to supplement $\mu_i(X_i)$, and after rearrangement the publisher's optimal profit in period i is

$$\mu_i^* = \frac{(A_i - c)^2}{4b}. \tag{2}$$

[9] In many instances, even exclusive license holders face a certain degree of competition because dissimilar creative goods can be imperfect substitutes (Caves, 2000; Towse, 2006). The monopoly assumption makes our analysis more transparent, and it is redundant for the institutional analysis, as both proposed frameworks simply need to have the same starting point.

Given that Q enters the market in the success state in period two, the profit function of player j is $\mu_{2j}(X_{2j}) = [A_2 - b(X_{2j} + \gamma X_{2k}) - c]X_{2j}$, where X_{2j} is the quantity choice of player j and X_{2k} determines the quantity choice of the opposite player k, so that $j,k \in \{P;Q\}$ and $j \neq k$. The continuous parameter γ lies between zero and one and determines the competition level for which it holds true that the higher γ is, the higher the competition in the duopolistic market. In other words, $\gamma = 0$ implies that the publishers offer perfectly heterogeneous products that do not affect each other's markets. However, if $\gamma = 1$, then the publishers offer perfectly homogeneous products with a large influence on reciprocal markets. Publisher j will choose the optimal quantity such that the first-order condition is

$$\frac{\partial \mu_{2j}(X_{2j})}{\partial X_{2j}} = A_2 - 2bX_{2j} - b\gamma X_{2k} - c \stackrel{!}{=} 0.$$

Restructuring yields the reaction function

$$X_{2j}(X_{2k}) = \frac{A_2 - b\gamma X_{2k} - c}{2b}.$$

Note that due to our assumptions, the publishers P and Q have identical technical features. This implies symmetrical reaction functions (Singh and Vives, 1984). Thus, inclusion of the remaining reaction function $X_{2k}(X_{2j})$ in $X_{2j}(X_{2k})$ yields the optimal quantities

$$X_{2j}^* = X_{2k}^* = \frac{A_2 - c}{b(2+\gamma)}.$$

Substituting these quantities into $\mu_{2j}(X_{2j})$ yields the optimal profit function for each publisher in period two:

$$\mu_{2j}^* = \mu_{2k}^* = \frac{(A_2 - c)^2}{b(2+\gamma)^2}. \quad (3)$$

Having defined the publisher and market characteristics, we assume the relationship $A_1 > A_2 > a_1, a_2 > c \geq 0$. This assumption replicates the common observation in creative industries that product life cycles are short for most products (Caves, 2000; Vogel, 2014) and the intuition that market demand is higher in the success state than in the nonsuccess state. For further analysis purposes, we do not specify $a_1 > a_2$, as we are also interested in the question how DUR will affect lifetime incomes if an initial publisher loses interest but another publisher is able to attract new consumers. This assumption immediately implies some intermediate results that will prove helpful when deriving the main results of this paper:

LEMMA 1 *(i) The profits are related so that* $\mu_1^* > \mu_2^* > \nu_1^*, \nu_2^*$ *and* $\mu_2^* \geq \mu_{2j}^* = \mu_{2k}^*$. *(ii)* μ_{2j}^* *and* μ_{2k}^* *are globally decreasing in* γ. *(iii)* $\mu_{2j}^* = \mu_{2k}^* \geq \nu_2^*$ *is only true if the condition* $\gamma \leq 2(A_2 - c)/(a_2 - c) - 2$ *is satisfied.*

3.4 Contract Negotiations in Period Two

We start solving our game by backward induction in the second period, where the license negotiations with an additional publisher are possible in both states of nature. Thus, A and Q may negotiate over T in the success state, and A and R over t in the nonsuccess state. By intuition, the discount factors are redundant here, since the bargaining situation proceeds in period two. As outlined above, each player will consider her gains from agreement to the gains from her outside option during the negotiations. Thus, the Nash products in the respective states can be defined as

$$NP_t = \operatorname{argmax}[t]^{\beta}[\nu_2 - t - d_{\mathrm{R}}]^{1-\beta}$$

and

$$NP_T = \operatorname{argmax}[T]^{\beta}[\mu_{2\mathrm{Q}} - T - d_{\mathrm{Q}}]^{1-\beta}.$$

The respective first-order conditions for an internal maximum of the Nash products are

$$\frac{\partial NP_t}{\partial t} = \beta(\nu_2 - t - d_{\mathrm{R}})^{1-\beta} t^{\beta-1} - (1-\beta) t^{\beta} (\nu_2 - t - d_{\mathrm{R}})^{-\beta} \overset{!}{=} 0$$

and

$$\frac{\partial NP_T}{\partial T} = \beta(\mu_{2\mathrm{Q}} - T - d_{\mathrm{Q}})^{1-\beta} T^{\beta-1} - (1-\beta) T^{\beta} (\mu_{2\mathrm{Q}} - T - d_{\mathrm{Q}})^{-\beta} \overset{!}{=} 0.$$

We solve the first-order conditions for t and T, and thus obtain the following Nash bargaining solutions:

$$t^* = \beta(\nu_2 - d_{\mathrm{R}}) \tag{4}$$

and

$$T^* = \beta(\mu_{2\mathrm{Q}} - d_{\mathrm{Q}}). \tag{5}$$

In both cases A's share increases in her own bargaining power, since $\partial t^*/\partial\beta = \nu_2 - d_{\mathrm{R}} > 0$ and $\partial T^*/\partial\beta = \mu_{2\mathrm{Q}} - d_{\mathrm{Q}} > 0$, which follows if we consider that $\nu_2 > d_{\mathrm{R}}$ and $\mu_{2\mathrm{Q}} > d_{\mathrm{Q}}$ are equilibrium conditions. Comparing the two equations, we can also infer that the bargaining result in the success state is not necessarily higher than in the nonsuccess state. In particular, $t^* \le T^*$ requires $\nu_2 \le \mu_{2\mathrm{Q}}$. The latter condition is pursuant to the relationship in result (iii) from Lemma 1. This implies that A only yields a higher license price in period two in the success state if $\gamma \le 2(A_2 - c)/(a_2 - c) - 2$ is satisfied. In other words, a high competition level may yield a lower share of the bargaining rent for A than in the nonsuccess state. Lemma 1(ii) also entails that the higher the competition level is, the lower the license price is in the success state of period two.

3.5 Bestseller-Paragraph Remuneration

Following backward induction, we will now discuss the renegotiation of contractual terms between A and P in the success state. Due to § 32a UrhG, a renegotiation is enforceable if a noticeable disproportion between expected and realized profits is underlying. We incorporate the law in our model so that an additional remuneration m is paid from P to A whenever any difference between expected and realized profits occurs. Such an approach does not match the bestseller paragraph in its entirety, but it captures the main idea of the law and is sufficient to identify connections between DUR and the bestseller paragraph. In this connection we make three assumptions: we do not allow for a breakdown of negotiations, both parties learn the realized profits in the success state, and they are both unable to technically manipulate the bargaining result. With these assumptions, we also match the setting of Engel and Kurschilgen (2011). The first assumption implies that no underlying threat points are to be considered in the Nash product. The second assumption helps to define the cooperation rent. In particular, the parties agreed upon an initial contract in period one using their expected gains, i.e., P referred to her profit expectations. Since $q \neq 1$, it is intuitive that expected profits are lower than realized profits, and we can interpret this difference as the cooperation rent for this particular bargaining game. The third assumption states that the parties have the same bargaining power as during the initial contract negotiations. In other words, product success does not reallocate relative technical features during negotiations, i.e., the parameter for bargaining power remains α.

Note that that time preferences are relevant because A and P negotiate over the bestseller-paragraph remuneration in period one, in which P has profit expectations about period two. In cases I and III, Q does not participate in the success state, so that the realized payoff of P is $\mu_1+\delta_P\mu_2-M-m-e$. If Q enters the market in case II, P realizes $\mu_1+\delta_P\mu_{2P}-M-m-e$. Recall from Figure 1 that the entry decision of R in the nonsuccess state does not affect the payoffs of P, which are ν_1-M-e in all three cases. Thus, we can define P's expected payoffs, denoted EP_s for case $s \in \{I;II;III\}$, as follows:

1. $EP_I = EP_{III} = q(\mu_1+\delta_P\mu_2-m)+(1-q)\nu_1-M-e$;
2. $EP_{II} = q(\mu_1+\delta_P\mu_{2P}-m)+(1-q)\nu_1-M-e$.

Following our assumptions on the bargaining rent, P's maximum willingness to pay is the realized payoff minus the expected payoff, i.e., $\mu_1+\delta_P\mu_2-M-m-e-EP_I$ in case I, or equivalently $(1-q)(\mu_1+\delta_P\mu_2-\nu_1-m)$. This is the same in case III, due to the symmetry of expected payoffs. Note that A's only gain from the bestseller-paragraph remuneration is the Nash product maximizing m. Thus, the Nash product in cases I and III is

$$NP_I = NP_{III} = \operatorname{argmax}[m]^{\alpha}[(1-q)(\mu_1+\delta_P\mu_2-\nu_1-m)]^{1-\alpha},$$

and the first-order condition for an internal maximum of the Nash product is

$$\frac{\partial NP_I}{\partial m} = \frac{\partial NP_{III}}{\partial m} = \alpha[(1-q)(\mu_1+\delta_P\mu_2-\nu_1-m)]^{1-\alpha}m^{\alpha-1} \\ -(1-\alpha)(1-q)m^{\alpha}[(1-q)(\mu_1+\delta_P\mu_2-\nu_1-m)]^{-\alpha} \stackrel{!}{=} 0.$$

Rearrangement of this condition with respect to m yields

$$m_{\mathrm{I}}^* = m_{\mathrm{III}}^* = \alpha(\mu_1 + \delta_{\mathrm{P}}\mu_2 - \nu_1). \tag{6}$$

The same approach can be used to derive the optimal bestseller-paragraph remunerations for case II. P's maximum willingness to pay is $\mu_1 + \delta_{\mathrm{P}}\mu_{2\mathrm{P}} - M - m - e - EP_{\mathrm{II}}$, which equals $(1-q)(\mu_1 + \delta_{\mathrm{P}}\mu_{2\mathrm{P}} - \nu_1 - m)$. With threat points of zero, the Nash product is

$$NP_{\mathrm{II}} = \arg\max\,[m]^{\alpha}[(1-q)(\mu_1 + \delta_{\mathrm{P}}\mu_{2\mathrm{P}} - \nu_1 - m)]^{1-\alpha},$$

for which a local maximum exists when

$$\frac{\partial NP_{\mathrm{II}}}{\partial m} = \alpha[(1-q)(\mu_1 + \delta_{\mathrm{P}}\mu_{2\mathrm{P}} - \nu_1 - m)]^{1-\alpha} m^{\alpha-1} - (1-\alpha)(1-q)m^{\alpha}[(1-q)(\mu_1 + \delta_{\mathrm{P}}\mu_{2\mathrm{P}} - \nu_1 - m)]^{-\alpha} \stackrel{!}{=} 0.$$

We can rearrange this equation with respect to m, and our result predicts

$$m_{\mathrm{II}}^* = \alpha(\mu_1 + \delta_{\mathrm{P}}\mu_{2\mathrm{P}} - \nu_1). \tag{7}$$

A comparison of the bargaining results reveals a relationship between the bestseller paragraph and DUR: $m_{\mathrm{I}}^* = m_{\mathrm{III}}^* \geq m_{\mathrm{II}}^*$ can be displayed as $\alpha(\mu_1 + \delta_{\mathrm{P}}\mu_2 - \nu_1) \geq \alpha(\mu_1 + \delta_{\mathrm{P}}\mu_{2\mathrm{P}} - \nu_1)$. This can be simplified to $\mu_2 \geq \mu_{2\mathrm{P}}$, implying, in view of Lemma 1(i), that the previously mentioned relationships between m_{I}^*, m_{II}^*, and m_{III}^* always hold true. Under our implicit assumptions, the following results hold true:

COROLLARY *The bestseller-paragraph remuneration decreases if* A *makes use of DUR in the success state and if* $\gamma \neq 0$. *The distance between the bestseller-paragraph remuneration in a copyright system without DUR and in a system with DUR is greater the closer* γ *is to one.*

PROOF If $\gamma \neq 0$ then $\mu_2 > \mu_{2\mathrm{P}}$, implying $m_{\mathrm{I}}^* > m_{\mathrm{II}}^*$. From Lemma 1(ii), it follows that $(\mu_2 - \mu_{2\mathrm{P}}) \to \mu_2$ if $\gamma \to 1$, implying $(m_{\mathrm{I}}^* - m_{\mathrm{II}}^*) \to m_{\mathrm{I}}^*$ if $\gamma \to 1$. *Q.E.D.*

Time preferences of P affect the bestseller-paragraph remuneration so that

$$\frac{\partial m_{\mathrm{I}}}{\partial \delta_{\mathrm{P}}}, \frac{\partial m_{\mathrm{III}}}{\partial \delta_{\mathrm{P}}} = \alpha\mu_2 > 0 \quad \text{and} \quad \frac{\partial m_{\mathrm{II}}}{\partial \delta_{\mathrm{P}}} = \alpha\mu_{2\mathrm{P}} > 0.$$

This is straightforward considering that P updates payoff expectations for period two, and the higher the discount factor is, the less is deducted from these payoff expectations during contract negotiations, leading to a greater bargaining rent. We can further see from (6) and (7) that δ_{A} has no influence on the bargaining result: A receives the remuneration immediately in the first period, canceling out the problem of time preferences. These findings will prove helpful in the ongoing analysis and will be discussed in greater detail below.

3.6 Investment Effort

Recall that P makes a decision on her optimal investment effort in period one to influence the success probability of the product. She will do so to maximize her expected payoff. We have already shown that, due to symmetry of cases I and III, it is sufficient to distinguish just two cases. Moreover, we have defined $q(e) = \overline{q} - 1/e$ and derived m_s^* earlier, which are both used in the definition of EP_s. This yields

$$\begin{aligned} EP_{\text{I}} = EP_{\text{III}} &= \left(\overline{q} - \frac{1}{e}\right)[\mu_1 + \delta_{\text{P}}\mu_2 - \alpha(\mu_1 + \delta_{\text{P}}\mu_2 - \nu_1)] \\ &\quad + \left(1 - \overline{q} + \frac{1}{e}\right)\nu_1 - M - e, \\ EP_{\text{II}} &= \left(\overline{q} - \frac{1}{e}\right)[\mu_1 + \delta_{\text{P}}\mu_{2\text{P}} - \alpha(\mu_1 + \delta_{\text{P}}\mu_{2\text{P}} - \nu_1)] \\ &\quad + \left(1 - \overline{q} + \frac{1}{e}\right)\nu_1 - M - e. \end{aligned}$$

In the symmetric cases I and III, a local maximum is reached where

$$\frac{\partial EP_{\text{I}}}{\partial e} = \frac{1}{e^2}(\mu_1 + \delta_{\text{P}}\mu_2 - m_{\text{I}}^*) - \frac{1}{e^2}\nu_1 - 1 \stackrel{!}{=} 0.$$

If we solve the first-order condition for e and use equation (6) to substitute m_{I}^*, our model predicts the optimal investment efforts

$$e_{\text{I}}^* = e_{\text{III}}^* = \sqrt{(1-\alpha)(\mu_1 + \delta_{\text{P}}\mu_2 - \nu_1)}. \tag{8}$$

The local maximum for case II is such that

$$\frac{\partial EP_{\text{II}}}{\partial e} = \frac{1}{e^2}(\mu_1 + \delta_{\text{P}}\mu_{2\text{P}} - m_{\text{II}}^*) - \frac{1}{e^2}\nu_1 - 1 \stackrel{!}{=} 0.$$

We now substitute m_{II}^* through equation (7) and solve for e, yielding the optimal investment effort for case II:

$$e_{\text{II}}^* = \sqrt{(1-\alpha)(\mu_1 + \delta_{\text{P}}\mu_{2\text{P}}(\gamma) - \nu_1)}. \tag{9}$$

Equations (8) and (9) reveal that the optimal investment level in case II depends on the competition factor γ, which is included in $\mu_{2\text{P}}(\gamma)$, whereas cases I and III are independent of γ. Juxtaposing and analyzing both optimality conditions, we can state the following results:

LEMMA 2 *(i) Investment levels and (ii) success probabilities of the product are strictly lower under DUR if a nonheterogeneous duopolistic competition, i.e., $\gamma \neq 0$, is induced through the market entry of* Q. *(iii) The amount of investment is decreasing globally in γ in case II.*

Lemma 1 already demonstrated that more competition reduces the expected profits of the initial publisher in period two. As a result, the publisher needs lower levels of investment to compensate for these lower profit expectations, as compared to the expectations without duopolistic competition. Indeed, higher investments still increase the probability of product success; however, they imply an economic trade-off, as they also cause higher fixed costs in period one. This trade-off affects the optimal choice of investment effort. Thus, the probability of product success is greater in the prereform system, or is unchanged if DUR do not affect the profits of the initial publisher.

These predictions are based on modeling Cournot competition. The negative competition effect on profits even increases if both symmetric publishers compete on price, since the only equilibrium is the homogeneous Bertrand duopoly equilibrium where profits are zero (Varian, 2005). Then,

$$\frac{\partial e_{\text{II}}^*}{\partial \mu_{2\text{P}}} = \sqrt{\frac{(1-\alpha)\delta_{\text{P}}}{2(1-\alpha)(\mu_1+\delta_{\text{P}}\mu_{2\text{P}}-\nu_1)}} > 0$$

already indicates that e_{II}^* is increasing in $\mu_{2\text{P}}$. Comparing investment efforts in a homogeneous Cournot competition with the efforts in a homogeneous Bertrand competition – i.e., $e_{\text{II}}^*(\mu_{2\text{P}}(\gamma = 1))$ with $e_{\text{II}}^*(\mu_{2\text{P}} = 0)$ – yields $e_{\text{II}}^*(\mu_{2\text{P}}(\gamma = 1)) > e_{\text{II}}^*(\mu_{2\text{P}} = 0)$, since $\mu_{2\text{P}}(\gamma = 1) > 0$. However, case II is only in equilibrium if $\mu_{2\text{Q}} - T > d_{\text{Q}}$. This is important because our model assumes symmetric publishers, implying $\mu_{2\text{Q}} = \mu_{2\text{P}}$. Using (5) to substitute T shows that $\mu_{2\text{Q}} - \beta(\mu_{2\text{Q}} - d_{\text{Q}}) \geq d_{\text{Q}}$, and rearrangement yields $\mu_{2\text{Q}} \geq d_{\text{Q}}$. This has two implications. First, a Bertrand equilibrium only exists if $d_{\text{Q}} = 0$. Second, markets that are characterized through Bertrand competition may systematically lead to market entry deterrence, implying the possibility of DUR ineffectiveness. This is an interesting aspect for future research, but it will not be considered in the ongoing analysis, due to our focus on authors' incomes.

Note that the Bertrand competition with heterogeneous goods yields outcomes that resemble that of the Cournot equilibrium with perfectly homogeneous products (Gravelle and Rees, 2004). The parameter settings thereby determine whether profits are above or below the Cournot equilibrium outcome. As the differences are negligible (Gravelle and Rees, 2004), we abstain from discussing the Bertrand competition with heterogeneous goods, referring to the Cournot equilibrium outcomes with $\gamma = 1$ in such a case. We emphasize, however, that a growing level of homogeneity shifts the outcomes towards the results of perfect competition.

3.7 License Price Negotiations in Period One

The last step of backward induction is the initial bargain over the license price between A and P. Both players will carry out negotiations based on their expectations about product success and profitability in both periods. This implies that we need to distinguish each of the three cases. Moreover, time preferences now matter in period one for A and P.

Lemma 3 *The asymmetric Nash bargaining solution predicts the Nash product maximizing license prices*

$$M_{\mathrm{I}}^{*}(q_{\mathrm{I}},m_{\mathrm{I}},e_{\mathrm{I}}) = \alpha[q_{\mathrm{I}}(\mu_1+\delta_{\mathrm{P}}\mu_2)+(1-q_{\mathrm{I}})\nu_1-e_{\mathrm{I}}-d_{\mathrm{P}}-d_{\mathrm{A}}] - q_{\mathrm{I}}m_{\mathrm{I}}+d_{\mathrm{A}}; \tag{10}$$

$$\begin{aligned} M_{\mathrm{II}}^{*}(q_{\mathrm{II}},m_{\mathrm{II}},e_{\mathrm{II}},T,t) = \alpha[&q_{\mathrm{II}}(\mu_1+\delta_{\mathrm{P}}\mu_{2\mathrm{P}}+\delta_{\mathrm{A}}T) \\ &+(1-q_{\mathrm{II}})(\nu_1+\delta_{\mathrm{A}}t)-e_{\mathrm{II}}-d_{\mathrm{P}}-d_{\mathrm{A}}] \\ &-q_{\mathrm{II}}(m_{\mathrm{II}}+\delta_{\mathrm{A}}T)-(1-q_{\mathrm{II}})\delta_{\mathrm{A}}t+d_{\mathrm{A}}; \end{aligned} \tag{11}$$

$$\begin{aligned} M_{\mathrm{III}}^{*}(q_{\mathrm{III}},m_{\mathrm{III}},e_{\mathrm{III}},t) = \alpha[&q_{\mathrm{III}}(\mu_1+\delta_{\mathrm{P}}\mu_2) \\ &+(1-q_{\mathrm{III}})(\nu_1+\delta_{\mathrm{A}}t)-e_{\mathrm{III}}-d_{\mathrm{P}}-d_{\mathrm{A}}] \\ &-q_{\mathrm{III}}m_{\mathrm{III}}-(1-q_{\mathrm{III}})\delta_{\mathrm{A}}t+d_{\mathrm{A}}. \end{aligned} \tag{12}$$

We have not yet included the information on q_s, m_s, e_s, T, and t in the conditions (10) to (12), which leaves more analytical leeway for the ongoing sections of the paper. The parameter for relative bargaining power, α, affects the bargaining results in period one. For all three cases, it holds true that $\partial M_s^*/\partial\alpha > 0$, implying that more bargaining power for A increases the license price. The increase of license price through a marginal increase of bargaining power is different between a case without DUR and the cases with DUR, i.e., $\partial M_{\mathrm{I}}^*/\partial\alpha \neq \partial M_{\mathrm{II}}^*/\partial\alpha$ and $\partial M_{\mathrm{I}}^*/\partial\alpha \neq \partial M_{\mathrm{III}}^*/\partial\alpha$. In our model, this is an effect of altered expectations of the parties, caused by DUR, like varying future profit expectations or additional remuneration prospects. This implies that DUR do not affect preferences of the players, the bargaining procedure, or other factors that may affect α, but only affect the threat points in the bargaining solution and consequently the marginal valuation of each player. Thus, it does not follow from our model that DUR act as a remedy against the bargaining-power disparity between authors and publishers, and thus the new copyright system may not shift more bargaining power towards authors. However, this does not imply lower incomes for authors, and it remains to be seen whether authors can benefit financially from DUR. The following section is dedicated to this question and compares our previous findings.

4 Comparison

4.1 License Price

The following analyses will merely compare the cases with DUR with the case without DUR, i.e., cases II and III with case I, as our focus is on the comparison between the new and the preceding institutional frameworks. Analyzing each license price, we can state the following result:

Proposition 1 *The higher the remuneration from the second contract and the lower the competition level γ in period two, the lower are the initial license prices.*

The first result is straightforward and clearly demonstrates the internalization effect of DUR, which has often been mentioned in the literature (e.g., Darling, 2015; Karas and Kirstein, 2018). The second result has a rather counterintuitive property: one would expect that the internalization effect decreases the license price because a higher competition level undermines profitability in period two. In other words, a publisher may be less willing to pay for a license under a higher level of competition. However, the actual effect is the opposite. More competition increases the license price in case II, and two factors are accountable for this: the bestseller-paragraph remuneration and the remunerations from the contracts with the additional publishers. Including m_{II}^*, t^*, and T^* in equation (11) yields

$$\begin{aligned} M_{\text{II}}^*(q_{\text{II}}, e_{\text{II}}) = {} & \alpha(\nu_1 - e_{\text{II}} - d_{\text{P}} - d_{\text{A}}) + d_{\text{A}} \\ & - (1-\alpha)\delta_{\text{A}}\beta[q_{\text{II}}(\mu_{2\text{Q}} - d_{\text{Q}}) + (1-q_{\text{II}})(\nu_2 - d_{\text{R}})]. \end{aligned}$$

From Lemmas 1 and 2, we know that $\partial\mu_{2\text{Q}}/\partial\gamma$, $\partial e_{\text{II}}/\partial\gamma$, and $\partial q_{\text{II}}/\partial\gamma$ are all negative, implying that $\partial M_{\text{II}}^*/\partial\mu_{2\text{Q}}$, $\partial M_{\text{II}}^*/\partial e_{\text{II}}$, and $\partial M_{\text{II}}^*/\partial q_{\text{II}}$ are all negative. Consequently, $\partial M_{\text{II}}^*/\partial\gamma$ must be positive. Such representation offers the following intuition: the bestseller-paragraph remuneration and the second-contract remunerations already internalize the competition effect and thereby mitigate the internalization effect. From section 3.4, we know that the remuneration from the contract with Q decreases with rising competition level. Considering the corollary, we learned that the same outcome is true with respect to the bestseller paragraph. Thus, the higher the competition level is, the less the bestseller-paragraph remuneration; the second-contract remuneration pushes down the initial license price.

Proposition 1 also demonstrates that the initial publisher participates in the gains of A even if DUR do not harm P's profitability. This effect is especially obvious in case III, in which no competition effect exists but P still participates in the gains of A from a second contract. It remains to be seen whether DUR systematically decrease license prices. We therefore present the following result:

Proposition 2 *(i) DUR do not offer higher license prices to authors in case II if the condition*

$$\begin{aligned} & (1-\alpha)\delta_{\text{A}}\beta[q_{\text{II}}(\mu_{2\text{Q}} - d_{\text{Q}}) + (1-q_{\text{II}})(\nu_2 - d_{\text{R}})] \\ & \qquad - \alpha\sqrt{(1-\alpha)\delta_{\text{P}}(\mu_2 - \mu_{2\text{Q}})} > 0 \end{aligned}$$

is fulfilled. (ii) In case III, the new copyright system decreases license prices.

The license price in case III, which models the bestseller paragraph in the success state and DUR in the nonsuccess state, is always smaller. This is intuitive, as the second-contract remuneration t makes A more eager to sign the contract, whereby P benefits from the increased agreement rent. However, license prices in case II are not systematically smaller under the new copyright system, in contrast with forecasts from the literature up to now. From Lemma 1, we can deduce that lower expected profits of P lead to a lower agreement rent in case II than in case I, implying support for the fulfillment of the condition in Proposition 2. Lemma 2 shows that investment levels and success probabilities decrease in case II. This causes the opposite effect, because, as we have shown earlier, the partial derivatives $\partial M_{\text{II}}^{*}/\partial e_{\text{II}}$ and $\partial M_{\text{II}}^{*}/\partial q_{\text{II}}$ increase the license price in case II. Moreover, we have demonstrated in the corollary that if $\gamma \neq 0$, the bestseller-paragraph remuneration is always smaller in the presence of DUR. It is intuitive that a smaller bestseller-paragraph remuneration in case II leads to a weaker internalization effect than in case I, leading to a higher participation of A in the agreement rent. However, the overall effect is ambiguous and requires consideration of the condition in Proposition 2. This condition includes A's expectations about the second-contract remunerations from Q and R, i.e., $\beta[q_{\text{II}}(\mu_{2\text{Q}} - d_{\text{Q}}) + (1 - q_{\text{II}})(\nu_2 - d_{\text{R}})]$. Whenever future remuneration expectations increase, the left-hand side of this condition increases, making the fulfillment of the condition more obvious. In other words, P has a lower marginal valuation of the agreement, which diminishes her readiness to pay.

We have already outlined that in a homogeneous Bertrand equilibrium, q_{II} decreases and $\mu_{2\text{Q}}$ tends towards zero. Denote the left-hand side of the inequality in Proposition 2 by *LP* for a moment. Then, $\partial LP/\partial \mu_{2\text{Q}} < 0$ demonstrates that the fulfillment of this condition is more questionable the smaller $\mu_{2\text{Q}}$ is. This implies that DUR may lead to higher license prices under Bertrand competition. This outcome has a counterintuitive property in that one would expect decreasing license prices due to decreasing profit expectations of P. But it is in line with Proposition 1 that a lower marginal valuation of the agreement makes A a tougher bargainer. The competition factor γ replicates the Bertrand competition effect, as is intuitive, considering that profits in the success state decrease under DUR. Using Proposition 1, we can infer that a γ close to one contributes to the fulfillment of the condition in Proposition 2.

The first derivative

$$\frac{\partial LP}{\partial \beta} = (1-\alpha)\delta_{\text{A}}[q_{\text{II}}(\mu_{2\text{Q}} - d_{\text{Q}}) + (1 - q_{\text{II}})(\nu_2 - d_{\text{R}})] > 0$$

demonstrates the positive effect of marginal change of second-period bargaining power on the fulfillment of the condition. In other words, authors with high bargaining-power prospects receive lower license fees during exclusive contract negotiations. Referring to the discount factor of A, the derivative

$$\frac{\partial LP}{\partial \delta_{\text{A}}} = (1-\alpha)\beta[q_{\text{II}}(\mu_{2\text{Q}} - \nu_2) + \nu_2 - d_{\text{Q}}] > 0$$

indicates that the more A time-adjusts future earnings, the smaller *LP* is. A receives a higher license price under the new copyright system because the internalization effect becomes smaller. Thus, future incomes are valued at a smaller rate during exclusive contract negotiations, revealing a smaller negative influence on license prices in case II.

4.2 Lifetime Income

Above, we have defined EA_s as A's expected payoff from the underlying game in case s. This expected payoff constitutes the lifetime income of the author in the underlying game, as it includes all potential remunerations for the license. Comparison of the expected payoffs EA_{II} and EA_{III} with the expected payoff EA_{I} allows us to present the following results:

PROPOSITION 3 *(i) Authors do not earn more from their licenses under the new copyright system applying DUR in all states (case II) if the condition*

$$(q_{\mathrm{I}}-q_{\mathrm{II}})(\mu_1-\nu_1)+\delta_{\mathrm{P}}(q_{\mathrm{I}}\mu_2-q_{\mathrm{II}}\mu_{2\mathrm{P}})-(e_{\mathrm{I}}-e_{\mathrm{II}}) \\ -\delta_{\mathrm{A}}\beta[q_{\mathrm{II}}(\mu_{2\mathrm{Q}}-d_{\mathrm{Q}})+(1-q_{\mathrm{II}})(\nu_2-d_{\mathrm{R}})]>0 \tag{13}$$

is fulfilled. (ii) Authors' lifetime incomes for licenses are always higher under the new copyright system if they apply DUR in a state where a creation has not yet proven to be successful (case III).

Even though our model predicts lower license prices if DUR are applied in a nonsuccess state (case III), the lifetime income of A increases for any parameter setting. This is because P internalizes just a part of A's second-contract income during initial contract negotiations, as shown by $\partial M^*_{\mathrm{III}}/\partial t=(\alpha-1)(1-q_{\mathrm{III}})\delta_{\mathrm{A}}<0$, where any $\alpha>0$ implies that less than the full second-contract income is internalized by P in the initial contract. This circumstance certainly increases the lifetime income of A. Moreover, since P assumes no prospects in the nonsuccess state, the competition effect is irrelevant in case III. Thus, the positive income effect from the second contract is sufficient to increase the lifetime income of A. This is not always true in case II, as the first result of Proposition 3 is conditional on the inequality (13). From this inequality, we also see that the fulfillment of this condition varies for different parameter settings. Comparative-static analysis proves helpful in determining their direction. For a moment, denote the left-hand side of (13) as LI. Note that this lifetime-income condition is independent of the outside options of A or P, i.e., $\partial LI/\partial d_{\mathrm{A}}, \partial LI/\partial d_{\mathrm{P}}=0$, which is an effect of the assumption that the new institutional framework will not change the initial setup of the players before negotiations. The outside options of Q and R, however, affect the condition positively, since

$$\frac{\partial LI}{\partial d_{\mathrm{Q}}}=q_{\mathrm{II}}\delta_{\mathrm{A}}\beta>0 \quad \text{and} \quad \frac{\partial LI}{\partial d_{\mathrm{R}}}=(1-q_{\mathrm{III}})\delta_{\mathrm{A}}\beta>0$$

This is straightforward because higher outside options of Q or R decrease the cooperation rents during second-contract negotiations. A's compensation in period two declines, implying a lower positive influence of the second-contract remuneration on LI. It is also intuitive that

$$\frac{\partial LI}{\partial \beta} = -\delta_A[q_{II}(\mu_{2Q} - d_Q) + (1 - q_{II})(\nu_2 - d_R)] < 0$$

and

$$\frac{\partial LI}{\partial \nu_2} = -(1 - q_{II})\delta_A \beta < 0$$

show the opposite effect, because both factors increase t^*. Note that for $\partial LI/\partial \beta$, it is true that $q_{II}(\mu_{2Q} - d_Q) + (1 - q_{II})(\nu_2 - d_R) > 0$, since $\mu_{2Q} > d_R$ and $\nu_2 > d_R$ are existence conditions of case II.

Referring to the discount factor of A, we can see that

$$\frac{\partial LI}{\partial \delta_A} = -\beta[q_{II}(\mu_{2Q} - d_Q) + (1 - q_{II})(\nu_2 - d_R)] < 0,$$

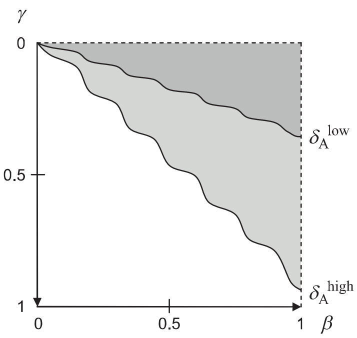
implying that if $\delta_A \to 0$, then $LI \to \infty$, and it becomes more questionable whether the new copyright system can benefit A financially. Our intuition follows the argument of Darling (2015), who believes that a money shift to the future may make DUR undesirable if more authors need to discount future remunerations. This is different from the case of δ_P, for which the first derivative of LI is positive. The corresponding function in the proof for the positive direction is provided in appendix section A.7. An explanation is that a higher δ_P fosters the competition effect and thereby enhances the underinvestment problem. This can be shown by using the difference between e_I^* and e_{II}^*, whose first derivative, using (8) and (9), yields

$$\frac{\partial(e_I^* - e_{II}^*)}{\partial \delta_P} = \frac{\alpha \mu_{2P}}{2\sqrt{\mu_1 + \delta_P \mu_{2P} - \nu_1}} + \frac{(1-\alpha)\mu_2}{2\sqrt{\mu_1 + \delta_P \mu_2 - \nu_1}} > 0.$$

This implies that the more important future profits are from the perspective of P, i.e., as $\delta_P \to 1$, the less will she invest and the less can be shared between A and P. Thus, time preferences matter, and a higher discount factor of A supports income increases under the new institutional framework. The opposite effect is found on considering the discount factor of P.

Comparing the outcomes between cases II and III from Proposition 3, the relevance of the competition effect becomes apparent. Recall that DUR do not trigger competition in case III, in which authors always benefit from the new copyright system. However, the financial improvement in case II is conditional. We learned from Lemma 1 that a higher competition factor γ decreases publishers' profits in period two. From Lemma 2, we can see that this factor likewise undermines incentives to invest. The first derivative of LI with respect to γ proves our intuition, because $\partial LI/\partial \gamma > 0$, implying $LI \to \infty$ whenever $\gamma \to 1$. A mathematical proof of this relationship is provided in appendix section A.7. Indeed, we have shown earlier that more competition tends to increase initial license prices. However, the effect on lifetime income is negative. An increasing γ contributes to the fulfillment of LI because there is less bargaining rent to be shared from period two in the new institutional framework. This finding also implies a negative effect of switching

Figure 2
The Lifetime Income Condition in the β–γ Relationship



from Cournot to Bertrand competition. In an earlier stage, we demonstrated that the direction is correlated positively because both criteria decrease μ_{2j}. Our model consequently predicts even lower chances for authors to benefit financially from DUR in markets that are characterized by Bertrand competition.

It remains to be seen how the parameters interact with respect to the lifetime income condition in (13). We focus on the interrelation between β, γ, and δ_{A}, for three reasons. First, we are interested in the factors that are most often discussed in the literature, viz., bargaining-power evolution (e.g., Rub, 2013) and time preferences (e.g., Darling, 2015; Gilbert, 2016). Second, we suspect parameters that model publishers to be more stable than parameters that model authors. Thus, δ_{P} may be less volatile than δ_{A}. Furthermore, d_{Q} and d_{R} may only be slightly volatile. The idea is that publishers are mostly established market players with both a portfolio of alternative opportunities and easier access to capital markets (Caves, 2000). Furthermore, it is well observed that career progress, risk attitude, bargaining power, and other related properties bring forth many diverse types of authors in the creative industries (Caves, 2000; Towse, 2006). Third, simulations reveal that the mentioned factors are the most powerful ones with respect to changes in results.

Figure 2 illustrates the findings of Proposition 3(i) and considers the relationship between A's bargaining power β and the competition factor γ. Recall that case III financially benefits A at all parameter settings, so we abstain from a graphical representation. Any position in the top right of the graph illustrates a situation with slight competition, and A has rather high bargaining power in period two. In contrast, any position in the bottom left depicts the situation where P and Q compete rigorously and where the bargaining power of A is small in period two. The two sinuous lines describe the condition in (13) for different discount factors of A, where $\delta_{\mathrm{A}}^{\mathrm{high}}$ denotes a high and $\delta_{\mathrm{A}}^{\mathrm{low}}$ a relatively low discount factor. The hatched areas embody parameter settings under which this condition is not fulfilled, i.e., A financially benefits from DUR in case II.

Figure 2 shows that if there is almost no competition between the publishers in period two, where γ tends towards zero, authors will almost always be better off. P will not internalize undermined profits, and A will additionally benefit from the contract with Q even if her bargaining power is low in period two. Note that in Figure 2, there exists a range, for γ close to one, where the author is worse off even for $\beta = 1$, i.e., even given that she collects the entire cooperation rent from the contract in period two. Our simulations have shown that solutions also exist, given certain values for β and δ_A, where the author benefits over the whole range of γ, implying steeper sinuous lines. Then $\beta < 1$ may be sufficient to predict results leading to the hatched areas. However, the simulation was performed on parameter settings like α close to one and δ_P close to zero. These assumptions seem rather unlikely, since throughout creative industries mainly publishers dominate negotiations, and their stable market positions suggest a rather high discount factor (Caves, 2000). Therefore, Figure 2 seems to represent market characteristics more appropriately.

The white area in Figure 2 also reveals that authors from creative industries, who trigger high competition after ten years, will likely be worse off under the new copyright system. This is true even if intermediate stardom leads to a positive evolution of their bargaining power in period two. A high competition level then affects all possible bargaining situations, because it decreases cooperation rents. This explains why, as Figure 2 demonstrates, even if A were to capture the entire cooperation rent in period two, i.e., if $\beta = 1$, she still might be worse off in the new institutional framework. From Proposition 1, we learned that DUR may indeed increase license prices more the stronger the competition effect is; however, a strong competition effect decreases further remuneration.

Variations of δ_A impact the steepness of the sinuous lines; a higher discount factor yields a steeper sinuous line. In Figure 2, a steeper sinuous line entails a larger space of parameter settings under which the condition (13) is rejected. In other words, the higher the discount factor of A, the more authors benefit financially, matching our findings from the comparative-static analysis above. Note that in the example δ_A^{low}, even $\beta = 1$ may not be sufficient to reject the condition (13) if the competition level γ is moderate, and then authors would always be worse off applying DUR in the success scenario as well. For the composition of Figure 2, we have chosen a large distance between $\delta_A^{low} = 1/4$ and $\delta_A^{high} = 3/4$ to illustrate the effect of time preferences explicitly. However, we believe that the distance may be smaller in the real world and that estimates closer to δ_A^{high} may be more appropriate to represent discount factors in creative industries. Our assertion rests on the fact that even an opportunity cost of capital of 5 % yields $\delta_A > 0.6$,[10] and that this opportunity cost may be even lower for most authors (Kretschmer, 2005), implying a higher δ_A.

[10] This is true for the assumption that interest is compounded once per period for ten periods.

The other key factors are γ and β. From empirical observations, it is straightforward to assume that $\alpha \leq \beta$, i.e., the bargaining powers of authors increase during the vesting period or remain constant (Caves, 2000). Still, it seems likely that publishers hold the predominant bargaining power even in negotiations with experienced authors, so that a moderate β can be regarded as high in most creative industries. Then, considering the border δ_A^{high} to evaluate the desirability of the new system while taking Figure 2 into account, the importance of the competition factor γ is stressed. In this setting, even a low competition level may make DUR undesirable, making a copyright transfer without DUR more attractive.

The competition level in itself may vary throughout creative industries, however, depending on the importance of the exclusivity claim and the properties of the creation. In creative markets with less focus on the exclusivity claim, DUR may easily benefit authors. This may be the case if publishers exploit licenses for the same creation concurrently, while offering to different markets, for example in the presence of exclusive access to different consumer groups and niche markets. A related scenario is that publishers exploit their licenses using different media or product consistency. Under these circumstances, γ is expected to be low, and authors may benefit under the new institutional framework.

4.3 Social Welfare

Thus far, we have restricted our analysis to the author–publisher relationship by analyzing the efficient division of the bargaining rent. The bargaining rent is equal to the producer rent in the market, because a publisher's maximum willingness to pay for the license stems from her expectations about market profitability. The consumer rent can be defined as the aggregated surplus of all consuming individuals that obtain the creation. The social surplus is the total value of publishing the creation minus the cost of creating and marketing it. The social welfare is then the aggregated value of all utility that all involved individuals obtain from the creation. Using a utilitarian welfare function to evaluate the new copyright system, it is Kaldor–Hicks superior if the sum of producer and consumer rents is greater than the equivalent rents in the prereform system. Comparison of those rents yields the next results:

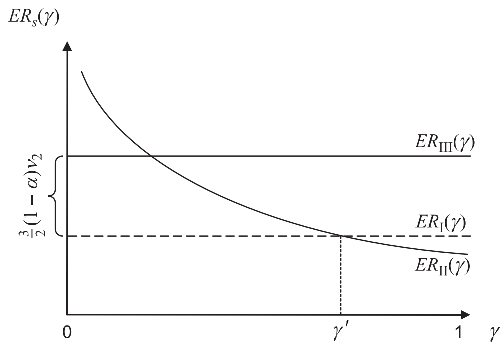
Proposition 4 *(i) Given that DUR are applied in both states (case II), the new copyright system is Kaldor–Hicks superior only if the inequality*

$$(14) \qquad (q_{\mathrm{I}} - q_{\mathrm{II}})(\mu_1 - \nu_1) + q_{\mathrm{I}}\mu_2 - (1 - q_{\mathrm{II}})\nu_2 - q_{\mathrm{II}}\mu_{2\mathrm{P}}\left(2 + \frac{2}{3}\gamma\right) < 0$$

holds true. (ii) Given that DUR are only applied to induce market entry in the nonsuccess state (case III), the new copyright system is Pareto superior.

In case III, all market participants benefit from the new copyright system. Whether this is also true in case II is conditional. On the one hand, the additional publisher R raises producer and consumer rents in the nonsuccess state in

Figure 3
Expected Total Rents



period two, in accordance with case III. Moreover, a higher competition level between P and Q in the success state leads to price decreases, and more consumers are willing to buy a copy of the creation. On the other hand, stronger competition implies decreasing producer rents and lower investment levels become a consequence, causing lower overall market supply. This assertion is in line with our findings in section 4.2, where we have already demonstrated that a high γ will easily lead to lifetime income decreases, an effect of reduced bargaining rents.

Figure 3 illustrates the expected total rent functions (A4), (A5), and (A6) as presented in appendix section A.8 to derive the results for Proposition 4. We can see that the total expected welfare in case II is strictly decreasing in γ, whereas, intuitively, the expected total rent functions ER_{I} and ER_{III} remain unaffected by the competition factor. The first observation demonstrates that the positive effects of increased competition, as outlined above, are outweighed by the negative effects. The intersection γ' between ER_{I} and ER_{II} represents the condition (14), implying that any γ to the left of the intersection leads to fulfillment of (14) and consequently to welfare superiority of the new copyright system in any entry scenario. However, any γ to the right of this intersection yields that the new copyright system is only welfare superior in case III, due to nonfulfillment of the inequality (14).

The relative distance between ER_{I} and ER_{III}, i.e., $3[(1-\alpha)\nu_2]/2$ (see appendix section A.8 for the derivation), contains some general implications for our model: If publisher R abstains from entering the market, implying $\nu_2 = 0$, then $ER_{\text{I}} = ER_{\text{III}}$ and no welfare effect exists. Such a parameter setting shifts ER_{III} downwards to the position of ER_{I} in Figure 3. In other words, no additional consumer and producer rents are raised. Such a setting also implies a downward shift of ER_{II} for the same reasons as stated above. Since ER_{I} remains unaffected by ν_2, it is easy to conclude that γ' shifts more to the left the smaller ν_2 is. Then, a lower competition factor is sufficient to decrease social welfare in case II. This also indicates that if ν_2 is sufficiently high, then even under a high competition factor there may be a positive social welfare effect from DUR under all states.

The parameter α affects the relative distance between ER_{I} and ER_{III}, as well. In particular, $\partial(ER_{\mathrm{III}} - ER_{\mathrm{I}})/\partial\alpha = -3\nu_2/2 < 0$ demonstrates that the positive effect on social welfare in case III is stronger the weaker A's bargaining power in period one is. From Proposition 1 we learned that P participates in second-contract remunerations through the internalization effect. Thus, the lower α, the more is P involved in such gains, implying a positive effect on investment efforts and consequently increasing expected total rents in case III compared to case I. No such strict effect exists on comparing cases I and II, because

$$\frac{\partial(ER_{\mathrm{II}} - ER_{\mathrm{I}})}{\partial\alpha} = -\frac{3}{2}(\mu_2 + \nu_2) + \mu_{2\mathrm{P}}(3+\gamma)$$

offers no unambiguous direction (see appendix section A.8 for the derivation). Thus, if $3(\mu_2 + \nu_2)/2 > \mu_{2\mathrm{P}}(3+\gamma)$, then a lower α contributes to the relative desirability of case II because it increases the distance between ER_{I} and ER_{II}. A reverse relationship implies the opposite effect.

5 *Discussion*

5.1 Ten-Year Vesting Period

In some creative industries, product life cycles are short, and creative goods yield almost no profits soon after market penetration (Caves, 2000). In reference to our model, this implies no profit expectations in period two, i.e., μ_2, μ_{2j}, $\nu_2 = 0$, and the prediction of our model is straightforward: DUR show no effect, and authors neither win nor lose. However, if expectations of the exclusive publisher or the entry decisions of Q and R play a role, we can expect certain effects. Assume that P limits her expectations to a ten-year vesting period or less, regardless of which scenario transpires after ten years. A may easily benefit from DUR whenever she is able to attract a new publisher, i.e., if ν_2 is sufficiently high to induce market entry, because any additional remuneration from period two increases the lifetime income of A. We have modeled such a scenario in case III, for which Proposition 3 predicts strict desirability. Assuming that P's expectations are limited to period one and that entry of Q would induce P to resume production, then a modified version of case II is underlying. The modification is that the internalization effect is void because expectations are limited, implying no changes in initial license prices or investment levels. Then, our model proposes a higher lifetime income even with $\gamma = 1$, as the lowest possible additional remuneration will increase A's lifetime income.

Under such market conditions, DUR introduce better chances to authors because of easier secondary exploitability, which is due to the limited exclusivity claim. Authors do not need to consult publishers who hold useless exclusive licenses after ten years, and can act more independently. Such a copyright system may contribute to overcoming the orphan-works problem, and it partly matches the proposals made by Kretschmer (2012). As our paper shows, the evaluation is more difficult for creative industries where publishers' expectations exceed the ten-year vesting period, i.e., if μ_2 and μ_{2j} are positive. Then, our model predicts that the internalization problem matters and the evaluation of DUR becomes more difficult. A related problem is that publishers are not able to assess product success after ten years, which may lead to a general effect on contract conclusions. In particular, publishers may assume an average loss in value and deduct a "different use rights fee" from all license prices, claiming product success for more than ten years.

In a previous section, we already outlined that DUR will not cause an imbalance of bargaining power during exclusive contract negotiations. This is true even if it transpires that the parties start limiting contracts to ten years. That limitation may however imply that authors benefit from negotiating more favorable exclusive contracts in subsequent periods, even if initial contracts pay lower license prices. Still, there is a trade-off between (i) decreases in license prices and investment efforts and (ii) additional remunerations in period two. We abstain from a comprehensive analysis of this trade-off in view of scope limitations; however, we point to the fact that comparison between case II with $\mu_{2j} = 0$ and the prereform case I with $\mu_2 > 0$ yields the condition under which authors benefit from DUR, which may be investigated in further studies.

5.2 *Bestseller-Paragraph Implications*

We have demonstrated how DUR affect the bestseller-paragraph remuneration in the corollary. Our results also deliver implications for the issue of how the bestseller paragraph influences the negotiations between A and P, unbiased by DUR. To begin with, our results give support to the finding of Engel and Kurschilgen (2011) that the presence of the bestseller paragraph decreases prices for copyright licenses. Recall our optimality conditions from Lemma 3 for case s, which both include the bestseller paragraph as represented by the parameter m_s. Comparative-static analysis reveals that $\partial M_s^*/\partial m_s = -q_s < 0$. In other words, any additional marginal unit of bestseller-paragraph remuneration strictly decreases the license price weighted by q_s. Note that in case II, the marginal effect is smaller because, following Lemma 2, our model predicts that $q_{\mathrm{II}} < q_{\mathrm{I}}, q_{\mathrm{III}}$ if $\gamma > 0$. This also holds true in a Bertrand competition scenario.

Next, Engel and Kurschilgen (2011) mention that future work might extend their analysis by examining the impact of the paragraph on the product success probability. In section 3.6, we derive the optimal investment efforts that determine success probability. Consider the first derivatives that yield the conditions in (8) and (9), respectively, i.e., $\partial EP_{\mathrm{I}}/\partial e = \partial EP_{\mathrm{III}}/\partial e$ and $\partial EP_{\mathrm{II}}/\partial e$. Recall that $m_{\mathrm{I}}^* = m_{\mathrm{III}}^*$; then, rearrangements without consideration of the details for m_s^* yield

$$e_{\mathrm{I}}^*(m_{\mathrm{I}}) = e_{\mathrm{III}}^*(m_{\mathrm{I}}) = \sqrt{\mu_1 + \delta_{\mathrm{P}}\mu_2 - \nu_1 - m_{\mathrm{I}}}$$

and

$$e_{\mathrm{II}}^*(m_{\mathrm{II}}) = \sqrt{\mu_1 + \delta_{\mathrm{P}}\mu_{2\mathrm{P}} - \nu_1 - m_{\mathrm{II}}}.$$

Comparative-static analysis reveals

$$\frac{\partial e_{\mathrm{I}}^*}{\partial m_{\mathrm{I}}} = \frac{\partial e_{\mathrm{III}}^*}{\partial m_{\mathrm{I}}} = -\frac{1}{2\sqrt{\mu_1 + \delta_{\mathrm{P}}\mu_2 - \nu_1 - m_{\mathrm{I}}}} < 0$$

and

$$\frac{\partial e_{\mathrm{II}}^*}{\partial m_{\mathrm{II}}} = -\frac{1}{2\sqrt{\mu_1 + \delta_{\mathrm{P}}\mu_{2\mathrm{P}} - \nu_1 - m_{\mathrm{II}}}} < 0.$$

Both first derivatives are negative because the expressions within the square roots must be positive. This result highlights that investment efforts of license buyers decrease in the presence of the bestseller paragraph. In an earlier section, we defined the success probability as a function influenced by effort, i.e., $q(e_s) = \overline{q} - 1/e_s$. The preceding findings imply that $q(e_s) \to 0$ if $e_s \to 0$. In other words, our model predicts that the presence of the bestseller paragraph decreases license buyers' efforts to influence the probability of product success.

We cannot provide an answer to the question of whether the bestseller paragraph affects authors' incentives to create, as stressed by Engel and Kurschilgen (2011). We therefore admit to a shortcoming of our stylized model, which neglects the effects of DUR and the bestseller paragraph on creative output levels. One might argue that more individual rights may foster incentives to create (Liebowitz and Watt, 2006). On the other hand, diminished license prices may prevent authors from creating if their opportunity costs are too high (Koboldt, 1995; Shavell and van Ypersele, 2001). If such a trade-off plays a role in the profitability of creative goods, our model deserves an extension, as the results may additionally depend on the incentive effects of author–publisher contracts. Our intuition says that the internalization effect may be weakened with the purpose of satisfying a certain level of creative output. Such circumstances may support the outcome that authors benefit from DUR and the bestseller paragraph.

5.3 General Discussion

Our model predicts possible effects of institutional regulation on negotiations in an abstract manner, without specific reference to different technical attributes of the respective creative good. Such definite application requires the clear identification of creative-content markets with distinct technical attributes, resulting in different parameter settings. We explore here how the results of our model differ in the variation of some important dimensions in the market for music content. Like many other creative-content markets, the music market is characterized by a highly skewed distribution of profits, implying that only very few products turn out to be successful (Davies, 2002). A few major labels supply to a broad community, whereas many independent labels are specialized on niche markets (Vogel, 2014; BVMI, 2018). In many instances, less successful creative goods become useless within a short time period (Kretschmer, 2012). The new copyright system may establish new markets for less successful goods after the vesting period, as independent labels might be able to refurbish old pieces without having to fear legal consequences. Then, our model assumes a positive ν_2 and, as we have demonstrated earlier with case III, it predicts a beneficial situation for all involved parties as long as exclusivity is redundant.

The claim of exclusivity may, however, play an important role for music that still yields profits after ten years, as many music labels substantially depend on back-catalog sales (Vogel, 2014). This would lead to a parameter setting where μ_2, μ_{2j}, $\nu_2 > 0$ and, thereby, to case II. The competition factor γ may depend on which labels compete and how competition affects their sales. In particular, it will make a difference whether the labels compete in homogeneous goods, as in direct music sales to audiences of the same CD or digital file, or whether a successive publisher uses the license to produce a differentiated version of a composition, causing only a negligible impact on the sales of an existing publisher. With homogeneous goods, direct music sales of digital files do not likely imply capacity restrictions, and thus a Bertrand duopoly with low product differentiation may sensibly model such a scenario. However, direct music sales of CDs may rather lead to strategic capacity restrictions and thus result in a Cournot duopoly with modest product differentiation. One would need to consider a high value of γ for both examples, but with a higher γ in the first example. The first example may become more relevant in the future as the German music market follows a digitalization trend (BVMI, 2018).

When discussing DUR in creative industries in general, it seems to be more sensible to assume risk-averse players, especially when modeling the utility functions of authors (Towse, 2006). Such a modification impacts our results because risk aversion affects the utility functions of the players, implying diminishing marginal utilities whenever additional income is risky. Note that the consideration of risk would not affect the structure of the underlying game, as it only determines the players' evaluation of risky profits. Assuming that A is more risk-averse than P, the latter should bear more risk, and our model predicts that the new copyright system may not benefit authors. The rationale is that more uncertain additional future income in exchange for the safer license price increases the level of risk for A, decreasing her utility level.[11] This may also be true with respect to case III, which was desirable under all parameter settings. The internalization effect may cause even lower license prices, and one should expect that DUR desirability becomes conditional on the respective levels of risk aversion. On the other hand, less risk for P may increase her incentives to invest under the new copyright system. Under our model, sufficiently higher investments may then increase the success probability so that lifetime income increases. Whether the investment effect prevails cannot be concluded without further analysis. But the fact that authors are usually assumed to be more risk-averse (Towse, 2006) leads us to the intuition that positive investment effects would be outweighed by the negative effects on A's utility level.

The analysis presented in the previous sections is based on absolute investment efforts, neglecting the more appropriate actuality that publishers will make their investment decisions relative to their opponents in the market. Indeed, our model

[11] Related effects are discussed in, e.g., Darling (2015) and Karas and Kirstein (2018).

would rather replicate the real world by assuming that the target function of P includes a strategic calculus to influence the market share. The impact on our predictions is negligible, however. One argument is that the strategic interaction is between A and P and not between P and her contestants with imperfect substitutes. Another argument is that the underlying model compares two institutional frameworks assuming equal starting points. This fact suggests that P will base her decision on the same market conditions regardless of the underlying copyright system.

The relative-investment issue, however, may play a more substantial role in period two, where market entry of Q may induce a strategic interaction between P and Q. In reality, high fixed costs are often observed in creative industries and entry barriers may exist (Handke, Balazs, and Vallbé, 2016). In section 3.2, we derived conditions under which Q will enter the market to compete with P. A fixed investment cost would easily affect these conditions. In case II, P may have an incentive to signal high competition, undermining the profitability of entry, with the purpose of deterring Q from market entry. Such behavior would question the effectiveness of DUR, and it may slightly change the implications of our model if the entry threat affects investment efforts. We propose further research on the trade-off between entry threats and investment costs in a more strategic context.

Our model reallocates shares to the negotiating parties and thereby neglects diverse payment mechanisms in creative-content markets. License agreements often include a mixture of lump-sum and royalty-based payments (Caves, 2000). Our analysis neglects such mixtures, as the analysis of shares is sufficient to demonstrate the effects of DUR. The impact of alternative payment mechanisms on the effectiveness and efficiency of DUR has been analyzed in Karas and Kirstein (2018). The authors show that the consideration of DUR would lead to new contract designs and may deter authors from exercising DUR if, e.g., royalty payments outweigh possible remuneration from an additional contract. Such considerations would add another strategic component to our model and might question the effectiveness of the law under scrutiny. Still, we believe that our limited analysis is relevant, since, as outlined earlier, publishers may deduct license prices systematically while assuming a certain exercise probability. Moreover, one can imagine that many authors are motivated to exercise DUR on principle, whether because of their irrationality or because of their conceivable unawareness of what publishers owe them in royalties.

6 Conclusions

We have shown that authors do not systematically benefit from a copyright system granting them more individual rights. They benefit from the new copyright system if an exclusive publisher loses interest in holding the license, while a new publisher can be attracted to continue marketing the creation after the vesting period. Our model then predicts a positive effect on consumer and producer rents, as well. If the exclusive publisher is still exploiting the license, then the underlying model supports the new copyright system only if the entry of the second publisher does not trigger strong competition for the creation in the market. Authors' lifetime incomes are greater the more future income is discounted and the more their bargaining power evolves over their careers. Whenever the entry of another publisher triggers strong competition, authors do not benefit from the new copyright system. This is due to the externality that undermines publisher profits in period two, reducing the joint surpluses that determine the incomes of authors. We demonstrate that such an effect is smaller in creative industries where publishers compete over quantities than in markets in which price competition is underlying.

Our model reveals that DUR may undermine publisher investments and such a negative effect is stronger the higher the competition level is. A sufficiently high level of competition may then even result in lower social welfare. It is in line with the literature that DUR can decrease initial license prices due to the internalization effect. Contrary to the intuition that this effect is strict, we demonstrate that the interplay between DUR and the bestseller paragraph can lead to higher exclusive license prices, as well. The condition for this result is fulfilled under high levels of competition.

Future work might extend the model to a more dynamic context that considers authors' benefits from further sources. In particular, DUR may also affect ticket sales, demand for merchandise, and demand for complementary works. It may transpire that DUR can help to stabilize careers if authors are able to attract new publishers and consumers in a more constant manner. It may also transpire that DUR increase publishers' incentives for blacklisting, potentially making DUR ineffective. Further modifications have been emphasized throughout the paper, highlighting the need for further research and empirical tests, which may prove helpful in determining how more individual rights influence cooperative interactions between authors and their publishers.

Appendix

A.1 Proof of Lemma 1

The proof for the first part of (i) immediately follows from the previously made assumption that $A_1 > A_2 > a_1, a_2$. With respect to the second part, $\mu_2^* = \mu_{2j}^* = \mu_{2k}^*$ is only true if $\gamma = 0$, because then the conditions (2) and (3) are equal. Moreover, using (2) and (3), the rearrangement of $(A_2 - c)^2/(4b) > (A_2 - c)^2/[b(2+\gamma)^2]$ yields $\gamma > 0$, which implies that the profits in a duopoly are smaller whenever the competition level is positive. For (ii), it is sufficient to show that

$$\frac{\partial \mu_{2j}^*}{\partial \gamma} = -2\frac{(A_2 - c)^2}{b(2+\gamma)^3} < 0$$

to prove correctness. Result (iii) requires consideration of (1) and (3) and can be derived by setting $(A_2-c)^2/[b(2+\gamma)^2] \geq (a_2-c)^2/(4b)$. Rearrangement with respect to γ yields the condition in (iii). *Q.E.D.*

A.2 *Proof of Lemma 2*

Using equations (8) and (9), the first result is true if

$$\sqrt{(1-\alpha)(\mu_1+\delta_{\mathrm{P}}\mu_2-\nu_1)}-\sqrt{(1-\alpha)(\mu_1+\delta_{\mathrm{P}}\mu_{2\mathrm{P}}-\nu_1)} \geq 0,$$

from which simplification yields $\mu_2 \geq \mu_{2\mathrm{P}}$. This is congruent with Lemma 1(i), which implies $\mu_2 \geq \mu_{2\mathrm{P}}$ and consequently $e_{\mathrm{I}}^* = e_{\mathrm{III}}^* > e_{\mathrm{II}}^*$ whenever $\gamma > 0$. Success probability was defined as $q(e_s) = \overline{q}-1/e_s$, and result (ii) requires $\overline{q}-1/e_{\mathrm{I}} > \overline{q}-1/e_{\mathrm{II}}$, from which rearrangement yields $e_{\mathrm{I}}^* > e_{\mathrm{II}}^*$. We demonstrated previously that this is true always if $\gamma > 0$. Result (iii) is correct because

$$\frac{\partial \mu_{2\mathrm{P}}}{\partial \gamma} = -\frac{2(c-A_2)^2}{b(2+\gamma)^3} < 0$$

shows that $\mu_{2\mathrm{P}}$ is strictly decreasing in γ, implying that equation (9) is smaller the greater γ is. *Q.E.D.*

A.3 *Proof of Lemma 3*

In case I, no DUR apply and P remains the exclusive license holder in both periods. This implies that A will not gain from another contract. Only the bestseller paragraph may yield an additional remuneration. Thus, her expected payoff is $EA_{\mathrm{I}} = M+q_{\mathrm{I}}m_{\mathrm{I}}$. The expected payoff of P is EP_{I}, which was defined in section 3.5. Considering asymmetric bargaining power and each player's respective outside option, the Nash product is

$$NP_{\mathrm{I}} = [M+q_{\mathrm{I}}m_{\mathrm{I}}-d_{\mathrm{A}}]^{\alpha}[q_{\mathrm{I}}(\mu_1+\delta_{\mathrm{P}}\mu_2-m_{\mathrm{I}})+(1-q_{\mathrm{I}})\nu_1-M-e_{\mathrm{I}}-d_{\mathrm{P}}]^{1-\alpha}.$$

The first-order condition for an internal maximum of the Nash product is

$$\begin{aligned}\frac{\partial NP_{\mathrm{I}}}{\partial M} &= \alpha(M+q_{\mathrm{I}}m_{\mathrm{I}}-d_{\mathrm{A}})^{\alpha-1}\big[q_{\mathrm{I}}(\mu_1+\delta_{\mathrm{P}}\mu_2-m_{\mathrm{I}}) \\ &\quad +(1-q_{\mathrm{I}})\nu_1-M-e_{\mathrm{I}}-d_{\mathrm{P}}\big]^{1-\alpha}-(1-\alpha)\big[q_{\mathrm{I}}(\mu_1+\delta_{\mathrm{P}}\mu_2-m_{\mathrm{I}}) \\ &\quad +(1-q_{\mathrm{I}})\nu_1-M-e_{\mathrm{I}}-d_{\mathrm{P}}\big]^{-\alpha}(M+q_{\mathrm{I}}m_{\mathrm{I}}-d_{\mathrm{A}})^{\alpha} \overset{!}{=} 0.\end{aligned}$$

Simplification and rearrangement with respect to M yields equation (10).

In case II, A has the payoff expectations $EA_{\mathrm{II}} = M+q_{\mathrm{II}}(m_{\mathrm{II}}+\delta_{\mathrm{A}}T)+(1-q_{\mathrm{II}})\delta_{\mathrm{A}}t$. Recall from section 3.5 our definition for EP_{II}; then, the Nash product is

$$\begin{aligned}NP_{\mathrm{II}} &= [M+q_{\mathrm{II}}(m_{\mathrm{II}}+\delta_{\mathrm{A}}T)+(1-q_{\mathrm{II}})\delta_{\mathrm{A}}t-d_{\mathrm{A}}]^{\alpha} \\ &\quad \cdot[q_{\mathrm{II}}(\mu_1+\delta_{\mathrm{P}}\mu_{2\mathrm{P}}-m_{\mathrm{II}})+(1-q_{\mathrm{II}})\nu_1-M-e_{\mathrm{II}}-d_{\mathrm{P}}]^{1-\alpha}.\end{aligned}$$

The first-order condition for an internal maximum of the Nash product then is

$$\begin{aligned}\frac{\partial NP_{\text{II}}}{\partial M} &= \alpha[M+q_{\text{II}}(m_{\text{II}}+\delta_{\text{A}}T)+(1-q_{\text{II}})\delta_{\text{A}}t-d_{\text{A}}]^{\alpha-1}\\ &\quad\cdot[q_{\text{II}}(\mu_1+\delta_{\text{P}}\mu_{2\text{P}}-m_{\text{II}})+(1-q_{\text{II}})\nu_1-M-e_{\text{II}}-d_{\text{P}}]^{1-\alpha}\\ &\quad-(1-\alpha)[q_{\text{II}}(\mu_1+\delta_{\text{P}}\mu_{2\text{P}}-m_{\text{II}})+(1-q_{\text{II}})\nu_1-M-e_{\text{II}}-d_{\text{P}}]^{-\alpha}\\ &\quad\cdot[M+q_{\text{II}}(m_{\text{II}}+\delta_{\text{A}}T)+(1-q_{\text{II}})\delta_{\text{A}}t-d_{\text{A}}]^{\alpha}\overset{!}{=}0,\end{aligned}$$

and we receive equation (11).

For case III, we only need to consider DUR in the nonsuccess state, i.e., A additionally receives t. This implies the expected payoff $EA_{\text{III}} = M+q_{\text{III}}m_{\text{III}}+(1-q_{\text{III}})\delta_{\text{A}}t$ for A. Using EP_{III} for P (see section 3.5), the Nash product is

$$\begin{aligned}NP_{\text{III}} &= [M+q_{\text{III}}m_{\text{III}}+(1-q_{\text{III}})\delta_{\text{A}}t-d_{\text{A}}]^{\alpha}\\ &\quad\cdot[q_{\text{III}}(\mu_1+\delta_{\text{P}}\mu_2-m_{\text{III}})+(1-q_{\text{III}})\nu_1-M-e_{\text{III}}-d_{\text{P}}]^{1-\alpha}.\end{aligned}$$

The first-order condition is

$$\begin{aligned}\frac{\partial NP_{\text{III}}}{\partial M} &= \alpha[M+q_{\text{III}}m_{\text{III}}+(1-q_{\text{III}})\delta_{\text{A}}t-d_{\text{A}}]^{\alpha-1}\\ &\quad\cdot[q_{\text{III}}(\mu_1+\delta_{\text{P}}\mu_2-m_{\text{III}})+(1-q_{\text{III}})\nu_1-M-e_{\text{III}}-d_{\text{P}}]^{1-\alpha}\\ &\quad-(1-\alpha)[q_{\text{III}}(\mu_1+\delta_{\text{P}}\mu_2-m_{\text{III}})+(1-q_{\text{III}})\nu_1-M-e_{\text{III}}-d_{\text{P}}]^{-\alpha}\\ &\quad\cdot[M+q_{\text{III}}m_{\text{III}}+(1-q_{\text{III}})\delta_{\text{A}}t-d_{\text{A}}]^{\alpha}\overset{!}{=}0,\end{aligned}$$

and rearrangement yields the equation (12). *Q.E.D.*

A.4 Proof of Proposition 1

For the first part of the sentence, it is sufficient to show that the partial derivatives in equations (11) and (12) from Lemma 3 with respect to T or t are negative. Accordingly, $\partial M^*_{\text{II}}/\partial T = (\alpha-1)q_{\text{II}}\delta_{\text{A}} < 0$, $\partial M^*_{\text{II}}/\partial t = (\alpha-1)(1-q_{\text{II}})\delta_{\text{A}} < 0$, and $\partial M^*_{\text{III}}/\partial t = (\alpha-1)(1-q_{\text{III}})\delta_{\text{A}} < 0$. To prove correctness of the second part of the sentence, we only need to consider case II, because this is the only case with a competition effect. Using the optimality conditions in equations (4), (5), and (7) to supplement m_s, T, and t in equation (11), we obtain

$$\begin{aligned}M^*_{\text{II}} &= \alpha(\nu_1-e_{\text{II}}-d_{\text{P}}-d_{\text{A}})-(1-\alpha)\delta_{\text{A}}\\ &\quad\cdot\beta[q_{\text{II}}(\mu_{2\text{Q}}-d_{\text{Q}})+(1-q_{\text{II}})(\nu_2-d_{\text{R}})]+d_{\text{A}}.\end{aligned}$$

In this equality, $\mu_{2\text{Q}}$, e_{II}, and q_{II} are the only parameters that include γ. From Lemma 1(ii) and Lemma 2(ii), we know that all three parameters are decreasing in $\gamma \to 1$. Since

$$\frac{\partial M^*_{\text{II}}}{\partial \mu_{2\text{Q}}} = -(1-\alpha)\delta_{\text{A}}\beta q_{\text{II}}, \quad \frac{\partial M^*_{\text{II}}}{\partial e_{\text{II}}} = -\alpha,$$

and

$$\frac{\partial M^*_{\text{II}}}{\partial q_{\text{II}}} = -(1-\alpha)\delta_{\text{A}}\beta(\mu_{2\text{Q}}-\nu_2-d_{\text{Q}}+d_{\text{R}})$$

are all negative, it is easy to conclude that $\gamma \to 1$ leads to $M_{\mathrm{II}}^* \to \infty$. *Q.E.D.*

A.5 Proof of Proposition 2

First, use the optimality conditions from equations (4) to (9) to supplement m_s, e_s, T, and t in equations (10) to (12) from Lemma 3, respectively. This procedure yields

$$M_{\mathrm{I}}^* = \alpha[\nu_1 - \sqrt{(1-\alpha)(\mu_1+\delta_{\mathrm{P}}\mu_2-\nu_1)} - d_{\mathrm{P}} - d_{\mathrm{A}}] + d_{\mathrm{A}},$$

$$M_{\mathrm{II}}^* = \alpha[\nu_1 - \sqrt{(1-\alpha)(\mu_1+\delta_{\mathrm{P}}\mu_{2\mathrm{P}}-\nu_1)} - d_{\mathrm{P}} - d_{\mathrm{A}}] - (1-\alpha)\delta_{\mathrm{A}}\beta[q_{\mathrm{II}}(\mu_{2\mathrm{Q}}-d_{\mathrm{Q}}) + (1-q_{\mathrm{II}})(\nu_2-d_{\mathrm{R}})] + d_{\mathrm{A}},$$

and

$$M_{\mathrm{III}}^* = \alpha[\nu_1 - \sqrt{(1-\alpha)(\mu_1+\delta_{\mathrm{P}}\mu_2-\nu_1)} - d_{\mathrm{P}} - d_{\mathrm{A}}] - (1-\alpha)(1-q_{\mathrm{III}})\delta_{\mathrm{A}}\beta(\nu_2-d_{\mathrm{R}}) + d_{\mathrm{A}}.$$

Second, we need to set $M_{\mathrm{I}}^* > M_{\mathrm{II}}^*$, and rearrangement yields the condition in result (i). Since

$$(1-\alpha)\delta_{\mathrm{A}}\beta[q_{\mathrm{II}}(\mu_{2\mathrm{Q}}-d_{\mathrm{Q}}) + (1-q_{\mathrm{II}})(\nu_2-d_{\mathrm{R}})] > 0$$

and

$$\alpha\sqrt{(1-\alpha)\delta_{\mathrm{P}}(\mu_2-\mu_{2\mathrm{Q}})} \geq 0,$$

we can conclude that in case II, no copyright system yields strictly higher license prices to authors, justifying the condition in Proposition 2.

Simplification of $M_{\mathrm{I}}^* > M_{\mathrm{III}}^*$ yields $(1-\alpha)(1-q_{\mathrm{III}})\delta_{\mathrm{A}}\beta(\nu_2-d_{\mathrm{R}}) > 0$, which is always satisfied because there exists a positive bargaining range for the second contract with R only if $\nu_2 - d_{\mathrm{R}} > 0$. This implies $M_{\mathrm{I}}^* > M_{\mathrm{III}}^*$ for any parameter setting, and correctness of result (ii) is proven. *Q.E.D.*

A.6 Proof of Proposition 3

In a first step, we need to amend each expected payoff by the optimality conditions as derived in the previous sections. Plugging (6) and (10) into $EA_{\mathrm{I}} = M_{\mathrm{I}} + q_{\mathrm{I}}m_{\mathrm{I}}$ leads to

$$EA_{\mathrm{I}} = \alpha[q_{\mathrm{I}}(\mu_1+\delta_{\mathrm{P}}\mu_2) + (1-q_{\mathrm{I}})\nu_1 - e_{\mathrm{I}} - d_{\mathrm{P}}] + (1-\alpha)d_{\mathrm{A}}. \tag{A1}$$

Include the optimality conditions from (4), (5), (7), and (11) in $EA_{\mathrm{II}} = M_{\mathrm{II}} + q_{\mathrm{II}}(m_{\mathrm{II}} + \delta_{\mathrm{A}}T) + (1-q_{\mathrm{II}})\delta_{\mathrm{A}}t$. This yields

$$EA_{\mathrm{II}} = \alpha[q_{\mathrm{II}}(\mu_1+\delta_{\mathrm{P}}\mu_{2\mathrm{P}}+\delta_{\mathrm{A}}\beta(\mu_{2\mathrm{Q}}-d_{\mathrm{Q}})) - e_{\mathrm{II}} - d_{\mathrm{P}} + (1-q_{\mathrm{II}})(\nu_1+\delta_{\mathrm{A}}\beta(\nu_2-d_{\mathrm{R}}))] + (1-\alpha)d_{\mathrm{A}}. \tag{A2}$$

For case III, the expected payoff is $EA_{\mathrm{III}} = M_{\mathrm{III}} + q_{\mathrm{III}}m_{\mathrm{III}} + (1-q_{\mathrm{III}})\delta_{\mathrm{A}}t$, and consideration of (4), (6), and (12) yields

$$EA_{\mathrm{III}} = \alpha[q_{\mathrm{III}}(\mu_1+\delta_{\mathrm{P}}\mu_2-\nu_1) - e_{\mathrm{III}} - d_{\mathrm{P}} + (1-q_{\mathrm{III}})(\nu_1+\delta_{\mathrm{A}}\beta(\nu_2-d_{\mathrm{R}}))] + (1-\alpha)d_{\mathrm{A}}. \tag{A3}$$

The inequality (13) is a result of juxtaposing the conditions in (A1) and (A2), i.e., $EA_{\mathrm{I}} > EA_{\mathrm{II}}$. Note that $(q_{\mathrm{I}} - q_{\mathrm{II}})(\mu_1 - \nu_1) + \delta_{\mathrm{P}}(q_{\mathrm{I}}\mu_2 - q_{\mathrm{II}}\mu_{2\mathrm{P}}) > 0$ and that $-\delta_{\mathrm{A}}\beta[q_{\mathrm{II}}(\mu_{2\mathrm{Q}} - d_{\mathrm{Q}}) + (1 - q_{\mathrm{II}})(\nu_2 - d_{\mathrm{R}})] < 0$, because $(q_{\mathrm{I}} - q_{\mathrm{II}})$, $(e_{\mathrm{I}} - e_{\mathrm{II}}) > 0$, as was demonstrated in Lemma 2. As neither of the inequalities outweighs the other, the first result in Proposition 3 is conditional.

Result (ii) would not be true if $EA_{\mathrm{I}} > EA_{\mathrm{III}}$ were satisfied. The information for both expected payoffs is provided in (A1) and (A3), and rearrangement reveals the condition $0 > (1 - q_{\mathrm{III}})\delta_{\mathrm{A}}\beta(\nu_2 - d_{\mathrm{R}})$. Obviously, the preceding inequality is not enforceable in the underlying game, because $\nu_2 > d_{\mathrm{R}}$ is a necessary condition for case III to be an equilibrium of the game. Thus, $EA_{\mathrm{I}} < EA_{\mathrm{III}}$, and result (ii) is correct.

Q.E.D.

A.7 Comparative-Static Analysis in Section 4.2

$$
\begin{aligned}
\frac{\partial LI}{\partial \delta_{\mathrm{P}}} = {} & \frac{[-(1-\alpha)][(2-\alpha)\mu_2^2\delta_{\mathrm{P}} + \beta\delta_{\mathrm{A}}\mu_2(\mu_2 - \nu_2)]}{-2[(1-\alpha)(\delta_{\mathrm{P}}\mu_2 + \mu_1 - \nu_1)]^{3/2}[(1-\alpha)(\delta_{\mathrm{P}}\mu_{2\mathrm{P}} + \mu_1 - \nu_1)]^{3/2}} \\
& + \frac{[-(1-\alpha)][(2-\alpha)\mu_2(\mu_1 - \nu_1)((1-\alpha)(\delta_{\mathrm{P}}\mu_{2\mathrm{P}} + \mu_1 - \nu_1))^{3/2}]}{-2[(1-\alpha)(\delta_{\mathrm{P}}\mu_2 + \mu_1 - \nu_1)]^{3/2}[(1-\alpha)(\delta_{\mathrm{P}}\mu_{2\mathrm{P}} + \mu_1 - \nu_1)]^{3/2}} \\
& + \frac{[-(1-\alpha)][(1-\alpha)(\delta_{\mathrm{P}}\mu_2 + \mu_1 - \nu_1)]^{3/2}}{-2[(1-\alpha)(\delta_{\mathrm{P}}\mu_2 + \mu_1 - \nu_1)]^{3/2}[(1-\alpha)(\delta_{\mathrm{P}}\mu_{2\mathrm{P}} + \mu_1 - \nu_1)]^{3/2}} \\
& \cdot [(1-\alpha)\delta_{\mathrm{P}}(\mu_{2\mathrm{P}}^2 + \mu_1\mu_{2\mathrm{P}})((1-\alpha)(\delta_{\mathrm{P}}\mu_2 + \mu_1 - \nu_1))^{3/2}] > 0.
\end{aligned}
$$

Note that all the numerators and denominators are negative, because $\mu_1 > \nu_1$ and $\mu_2 > \nu_2$. Therefore, all the fractions are positive, and the entire first derivative is positive. The positive effect of δ_{P} on the lifetime income condition is hereby proven.

The first derivative of LI with respect to γ necessitates considering the optimality conditions for the profit parameters, which were derived in section 3.3. e_{II} can also be written

$$
e_{\mathrm{II}} = \sqrt{\frac{(1-\alpha)[(A_1 - c)^2 - (a_1 - c)^2]}{4b} + \frac{\delta_{\mathrm{P}}(A_2 - c)^2}{b(2+\gamma)^2}},
$$

which is positive due to our assumption that $A_1 > a_1$ and because $A_i, a_i > c$. Then,

$$
\begin{aligned}
\frac{\partial LI}{\partial \gamma} = {} & \frac{\delta_{\mathrm{P}}(A_2 - c)^2[(A_1 - c)^2 - (a_1 - c)^2]}{4b^2(2+\gamma)^3 e_{\mathrm{II}}} \\
& + \delta_{\mathrm{A}}\beta\left[\frac{2(A_2 - c)^2(\overline{q} - e_{\mathrm{II}})^2}{b(2+\gamma)^3} + \frac{\delta_{\mathrm{P}}(A_2 - c)^2(a_2 - c)^2}{4b^2(2+\gamma)^3 e_{\mathrm{II}}} - \frac{\delta_{\mathrm{P}}(A_2 - c)^2}{b^2(2+\gamma)^5 e_{\mathrm{II}}}\right] \\
& - \frac{\delta_{\mathrm{P}}(A_2 - c)^2}{b(2+\gamma)^3 e_{\mathrm{II}}} + \delta_{\mathrm{P}}\left[\frac{2(A_2 - c)^2 e_{\mathrm{II}}}{b(2+\gamma)^3} + \frac{\delta_{\mathrm{P}}(A_2 - c)^4}{b^2(2+\gamma)^5 e_{\mathrm{II}}}\right] > 0.
\end{aligned}
$$

The proof of correctness requires two comparisons: First,

$$
\frac{\delta_{\mathrm{P}}(A_2 - c)^2[(A_1 - c)^2 - (a_1 - c)^2]}{4b^2(2+\gamma)^3 e_{\mathrm{II}}} - \frac{\delta_{\mathrm{P}}(A_2 - c)^2}{b(2+\gamma)^3 e_{\mathrm{II}}} > 0
$$

is true if $[(A_1-c)^2-(a_1-c)^2]/(4b)>0$, which is always satisfied in our setting. Second,

$$\frac{\delta_P(A_2-c)^2(a_2-c)^2}{4b^2(2+\gamma)^3e_{II}}-\frac{\delta_P(A_2-c)^2}{b^2(2+\gamma)^5e_{II}}>0$$

can be rearranged to $[(a_2-c)(2+\gamma)]^2/4>0$, showing that the preceding inequality is always correct. Since all remaining fractions are nonnegative, correctness of $\partial LI/\partial\gamma>0$ is hereby proven. *Q.E.D.*

A.8 Proof of Proposition 4

Before comparing expected total rents, we first need to derive optimal total rents, i.e., the sums of consumer and producer rents, in all states and periods, respectively. Therein, the consumer rent is the aggregated surplus of all consuming individuals, i.e., the area below the demand curve and above the price. In period i in the nonsuccess state this is equivalent to $cr_i=[(a_i-p_i)x_i]/2$, where p_i denotes the price and $p_i=a_i-bx_i$ yields the respective inverse demand curve, as already used to define the profit function ν_i in section 3.3. Including the information for p_i in cr_i and simplifying the equation yields $cr_i=(bx_i^2)/2$. Here x_i is known from section 3.3, and simplification finally reveals $cr_i^*=(a_i-c)^2/(8b)$ in the equilibrium. Equivalently, $CR_i=[(A_i-P_i)X_i]/2$ gives the consumer rent for the success state in period i if P remains monopolistic producer in period two. We know from section 3.3 that $P_i=A_i-bX_i$ and $X_i=(A_i-c)/(2b)$. This information can be used to yield $CR_i^*=(A_i-c)^2/(8b)$.

The producer rents in the respective states and periods are $pr_i^*=\nu_i^*$ and $PR_i^*=\mu_i^*$. The respective conditions can be found in section 3.3. Consequently, the total rents in the equilibrium are $r_i^*=cr_i^*+pr_i^*=[3(a_i-c)^2]/(8b)$ in the nonsuccess state and $R_i^*=CR_i^*+PR_i^*=[3(A_i-c)^2]/(8b)$ in the success state for the respective period i. Note that this is equivalent to $r_i^*=3\nu_i^*/2$ and $R_i^*=3\mu_i^*/2$. Given a duopoly in the success state in period two, the total rent is $R_{2d}=[(A_2+P_{2d}-2c)(X_{2j}+X_{2k})]/2$, where $P_{2d}=A_2-b(X_{2j}+\gamma X_{2k})$. Substituting P_{2d} into R_{2d} and using the optimal quantities X_{2j} and X_{2k} from section 3.3 to supplement the total rent function, we have

$$R_{2d}^*=\frac{(A_2-c)^2}{b(2+\gamma)}\left(2-\frac{1+\gamma}{2+\gamma}\right).$$

Note that this is equivalent to $R_{2d}^*=\mu_{2j}^*(3+\gamma)$.

Having derived the total rents, we are now able to derive the case-specific expected total rents. Defining the expected total rent ER_s for case s, consideration of our previous derivations yields the functions

(A4) $$ER_{\mathrm{I}} = \frac{3}{2}[q_{\mathrm{I}}(\mu_1 + \mu_2) + (1 - q_{\mathrm{I}})\nu_1],$$

(A5) $$ER_{\mathrm{II}} = \frac{3}{2}[q_{\mathrm{II}}\mu_1 + (1 - q_{\mathrm{II}})(\nu_1 + \nu_2)] + q_{\mathrm{II}}\mu_{2j}(3 + \gamma),$$

and

(A6) $$ER_{\mathrm{III}} = \frac{3}{2}[q_{\mathrm{III}}(\mu_1 + \mu_2) + (1 - q_{\mathrm{III}})(\nu_1 + \nu_2)].$$

$ER_{\mathrm{I}} < ER_{\mathrm{II}}$ yields the condition (14), which is ambiguous, since

$$(q_{\mathrm{I}} - q_{\mathrm{II}})(\mu_1 - \nu_1) + q_{\mathrm{I}}\mu_2 > 0$$

and

$$-(1 - q_{\mathrm{II}})\nu_2 - q_{\mathrm{II}}\mu_{2\mathrm{P}}\left(2 + \frac{2}{3}\gamma\right) < 0.$$

For part (ii), rearrangement of $ER_{\mathrm{I}} < ER_{\mathrm{III}}$ reveals $0 < 3[(1-q_{\mathrm{III}})\nu_2]/2$, which always holds true under our assumptions that $q_{\mathrm{III}} \neq 1$ and $\nu_2 \neq 0$. Note that the right-hand side of the inequality coincides with the relative distance between ER_{I} and ER_{II}, which is illustrated in Figure 3. Pareto superiority is proven by the following intuition: P remains the exclusive license holder in the success state with no impact on her expected profits, implying that her expected producer rent remains unaffected. Market entry of R in the nonsuccess state raises additional producer and consumer rents, as, without entry, the creation would be useless. In sum, producer and consumer rents increase under case III, and recall from Proposition 3 that A's lifetime income is always higher as well, implying that all market participants benefit from DUR in case III.

The effect of α on the relative distance between ER_{I} and ER_{II} is shown through

$$\frac{\partial(ER_{\mathrm{II}} - ER_{\mathrm{I}})}{\partial\alpha} = \frac{e_{\mathrm{II}}\overline{q}[\mu_1 - \nu_1 - \nu_2 + \mu_{2\mathrm{P}}(2 + 2\gamma/3)]}{2[e_{\mathrm{II}}(1-\alpha)]^{3/2}} - \frac{e_{\mathrm{I}}\overline{q}(\mu_1 + \mu_2 - \nu_1)}{2[e_{\mathrm{I}}(1-\alpha)]^{3/2}}.$$

Simplification finally yields

$$\frac{\partial(ER_{\mathrm{II}} - ER_{\mathrm{I}})}{\partial\alpha} = -\frac{3}{2}(\mu_2 + \nu_2) + \mu_{2\mathrm{P}}(3 + \gamma),$$

which can be positive, negative, or equal to zero. *Q.E.D.*

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ARTICLE TWO

Efficient Contracting
Under the
U.S. Copyright Termination Law

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Efficient contracting under the U.S. copyright termination law☆

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ABSTRACT

The American copyright act from 1976 has drawn much attention in the literature, however it has received little consideration by economists. We contribute to this literature by taking up the assumption that publishers may internalize the harm from termination decisions and illuminate the consequences for the contractual relationship between authors and publishers.

We provide a bargaining model, the results of which offer new insights and provide a benchmark for future research. We identify differences in contract structures between terminating and non-terminating authors and introduce some key principles for contractual designs. A risk analysis reveals that, contrary to the view in the literature, a termination option does not necessarily force authors into lotteries. In addition, we analyze the limits of the law with respect to complementary institutional regulations and current norms in creative industries.

1. Introduction

In 1976, the United States Congress introduced a new law that inalienably entitles authors[1] and their heirs to terminate grants of copyright assignments after a vesting period of 35 years. This right relates to all creations that are released post-1978 and that are not made for hire.[2] If the grant is terminated, the entire bundle of rights under copyright reverts to either the originator or her statutory successors, and the licensee is no longer entitled to use the creation without the originator's permission.

The lawsuit has led to a heated debate, and the overall reactions reflect the bilateral nature of the negotiations. Composers and established superstars in the music industry, such as Don Henley (the Eagles), Bob Dylan, and Bryan Adams (among many others) warmly welcome the termination clause, value it as fair, and hope for increasing authors' shares over the "gazillion dollars" the publishers make with their works. Some of them have already expressed their readiness to terminate agreements or have even filed to regain the rights to some of their compositions (Rohter, 2011). On the other hand, labels from the music industry fear the termination clause as being "life-threatening" and signal "that they will not relinquish recordings they consider their property without a fight" (Strohm, 2003; Rohter, 2011).

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[1] The indication äuthorp̈ertains to any type of creator of copyrightable work.

[2] There are a few more requirements, e.g., necessary termination notices, which are of minor importance to the underlying study but can be followed under 17 U.S.C. §203. Further discussions and the history of the law may be found in Abdullahi (2012).

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There is one goal of the law that directly affects the author–publisher[3] relationship: stimulating creativity through giving authors more rights to control their works and make more profit from their works (Abdullahi, 2012). While defining the law, the U.S. Congress was motivated to remedy the imbalance between publishers and authors, because the latter have been forced to accept poorly paid buy-out contracts over recent decades (Gilbert, 2016). The idea was to provide authors with a "second bite" to obtain fair remuneration for creative efforts through being paid an amount proportional to the value of their creation (Brown, 2014; Darling, 2015; Gilbert, 2016).

However, such a law also implies that a publisher's control over a licensed work is limited and that profitability per copyright grant may decrease. The bargaining power disparity between publishers and authors may result in a situation whereby publishers internalize potential harms and react by offering different contracts to authors who profit from these externalities (Karp and Perloff, 1993; Gayer and Shy, 2006; Rub, 2013; Darling, 2015). Such a reallocation problem is likely to contain efficiency implications.

Another problem is elucidated by considering that there are works that are not subject to termination,[4] and that two different classes of authors now exist in the various creative industries. These are termination-entitled authors and all remaining authors. Let contract design be defined as the remuneration structure, i.e., a mixture of a royalty earning and a single upfront buy-out payment, in an agreement. With respect to Williamson (1979), we believe that a unilateral termination option may require a more precise distinction in contract designs between these two classes. Copyright grant termination may decrease the degree to which a publisher is willing to incur durable transaction-specific investments and increase the uncertainty within the contractual relationship. The named issues might affect transactions and, consequently, the specifications in contracts (Williamson, 1979).

Most studies agree that the termination right substantially affects the author–publisher relationship (Patry, 1999; Abdullahi, 2012) and many others argue that it has a direct influence on the initial contracting situation (Patry, 1999; Rub, 2013; Brown, 2014; Darling, 2015; Gilbert, 2016). In particular, termination rights reduce prices for initial copyright assignments because publishers adjust their expectations downwards, which is often considered as the "internalization effect". Furthermore, their willingness to offer deals similar to those made before decreases (Rub, 2013; Brown, 2014; Darling, 2015), and it is often assumed that this fact may also affect the payment structure of termination-endangered contracts (Starshak, 2001; Rub, 2013).

These informal analyses offer great groundwork for the termination law discussion. However, a clear economic analysis is still overdue, in particular with respect to its implications for contracts. This paper starts filling this gap by, to our best knowledge, modeling the institution first and then providing benchmark results for future economic research. We show that the internalization effect not only reduces initial prices but also changes contract designs, an issue that has just been assumed but not clearly investigated, as yet. It is, however, important to examine these new contract structures, as they may interfere with the balance of risk allocation and rewards in creative industries (Rub, 2013) and, consequently, either hamper or stimulate creativity and the dissemination of creative works.

Our results reveal that terminating authors may exchange a lower royalty earning for a higher advance, which implies a risk reduction by contract. However, a lower overall remuneration in the first contract in exchange for a future termination revenue stream increases risk. We analyze this trade-off and contradict the general view in the literature by showing that a termination option does not necessarily increase the risk to authors, a result that is also important for the discussion on authors' incentives to create. Furthermore, we use our results to discuss the observation in creative industries that most contracts are standardized (Karp and Perloff, 1993; Murphy, 2002; Tschmuck, 2009) and evaluate the circumstances under which our results conform with underlying market norms.

The literature, without relation to the law under scrutiny, may also prove helpful in analyzing termination options. In the context of the employer–employee relationship in labor markets, it is often observed that a unilateral option to dissolve employment relationships affects cost–reward structures of the involved parties. Consequently, the types of agreements and the efforts to find mutually preferable agreements may change in the presence of termination clauses (Martin, 1977; Stiglitz and Weiss, 1983). Brickley et al. (1991) analyze the impact of unilateral termination clauses in the context of franchising contracts. They show that policies that give franchisees termination clauses would restrict contractual possibilities to franchisors. Furthermore, Brickley et al. (1991) point out that contracts would be less restrictive in areas where termination clauses do not exist.

Termination clauses are also analyzed in real estate and credit markets. It is shown that optimal contracts are contingent on termination incentives (Hallman et al., 2011). In particular, a contract design may change whenever a credible possibility to terminate a relationship exists (Stiglitz and Weiss, 1983; Hallman et al., 2011). Although neither of these papers attempts to measure the impact of a unilateral termination option with respect to the U.S. copyright law, the findings in the literature disclose that changes in the contractual relations between authors and publishers can be expected.

The following section lists our assumptions and sets up the model. Section 3 provides and juxtaposes the termination criteria and efficiency criteria. Section 4 defines the efficient contract designs and analyzes the differences between these designs. Section 5 relaxes the risk–neutrality assumption, shows limits of the U.S. termination law, and discusses our results from a more general perspective. Section 6 concludes the analysis.

2. The model

An author[5] (denoted A) and a publisher (denoted P) bargain over the copyright grant[6] for a specific creation or a series of creations. The possible contract design contains an upfront one-off payment F (advance) and a royalty rate r. The royalty rate $r \geq 0$ is a share of the expected operational profit $\mu > 0$.[7] Consider that μ already includes P's assessment of the project's total present value and is consequently discounted in time. The one-off payment may be pos-

[3] By publisher, we mean all types of intermediaries between authors and the consumers of creative goods, such as record labels in the music industry or publishers in the print media.

[4] Authors are not entitled to terminate either if their relationship is work made for hire or if they fail to serve a notice of termination on the grantee (Brown, 2014).

[5] For simplicity, we assume that there is only one author. It may be possible that the personality rights of a creation belong to more than one author; however, this is of minor importance in the contracting problem.

[6] Copyright grants are often exclusive throughout creative industries and usually include the rights of usage, the rights of distribution, and mechanical rights.

[7] Royalties greater than one tend not to be observed in creative industries (Caves 2000). For example, in the music industry they tend to vary around 10 percent (Zentner, 2006). However, for analytical purposes, we do not want to limit our model to this observation and allow for royalties equal to or greater than one.

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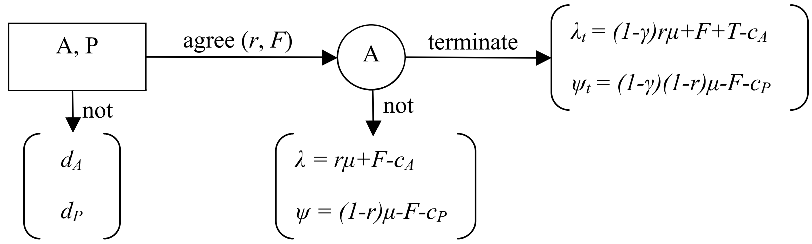

Fig. 1. Sequence of events.

itive, negative, or equal to zero.[8] Both remuneration parameters r and F can be considered endogenous.

Assume that both players have complete and perfect information and that the sets of strategies and utilities will be considered in each respective payoff function (Nash, 1953). Moreover, assume that both players are rational and profit maximizing individuals and are also risk-neutral (at least initially). Additionally, we assume that if A terminates the contract, P will always accept the termination and will not litigate. Finally, assume that the author will be the one who terminates and earns the fruits of termination.[9]

The sequence of events is illustrated in Fig. 1. At the initial bargaining stage, depicted by the box labeled "A, P", the players may agree over r and F. If they do not agree, they can fall back on their respective outside options, denoted d_A and d_P. If they do agree, A may choose whether to terminate the deal after the vesting period, labeled by the circle denoted as "A". In the case of no termination, A receives the payoff λ, which contains a royalty and an advance, minus her cost c_A.[10] Thus, her opportunity to terminate lapses. P would earn ψ, which is the royalty deducted part of the expected operational profit minus the advance (if positive) and minus her cost c_P.[11]

If A terminates the copyright grant, the expected operational profit decreases. This is captured by $\gamma \in]0, 1[$, where the importance of μ decreases with $\gamma \rightarrow 1$. This is reflected in A's payoff λ_t, because she is involved in the total operational profit whenever $r > 0$. Moreover, A gets a one-off payment F, minus her cost c_A, and also receives termination revenue streams, denoted T. These streams reflect the discounted present value of expected revenues after termination if A manages to exploit her creation a second time elsewhere.[12] Then, $T \geq 0$, and we assume that A and P will not renegotiate the terms of the contract. P's payoff is ψ_t, which is the royalty-deducted part of the now negatively affected expected operational profit, minus the one-off payment and minus her cost c_P.

Note that only agreements that satisfy the axioms of the Nash bargaining solution are considered (Nash, 1953). Thus, $\lambda > d_A \wedge \psi > d_P$ and $\lambda_t > d_A \wedge \psi_t > d_P$ must hold true. By implication, the scenario without termination is equal to a copyright system without a termination right, because P's expected operational profit remains unaffected. This also refers to work made for hire or other works that are exempted from termination clauses.

3. Termination decision and collective desirability

3.1. Termination condition

By using our backward induction approach, we first analyze the last stage. Whether the contract is terminated is determined by A. At this stage of the game, the optimal royalty rate and the advance will already be agreed upon. As a rational player, A will choose the option that grants the highest individual payoff. Thus, A terminates if $\lambda_t \geq \lambda$. This is satisfied if $(1-\gamma)r\mu+F+T-c_A \geq r\mu+F-c_A$ holds true, and the termination condition is

$$r \leq \frac{T}{\gamma\mu}. \quad (1)$$

Condition (1) can be rearranged to yield $\gamma r\mu \leq T$. We can interpret this result in the following way: A has an incentive to terminate whenever her termination revenue streams can compensate for the losses of her share of the expected operational profit.

3.2. Efficiency condition

To carry out a termination is a Kaldor-Hicks improvement if it increases the cooperation rent between the contracting parties. We can illustrate this situation by juxtaposing the sum of both players' payoffs from the respective scenarios. Thus, the fulfillment of inequality (1) reveals an increase in cooperation rent if $\lambda_t + \psi_t \geq \lambda + \psi$ is satisfied. Inserting the details for the payoffs yields $(1-\gamma)r\mu+F+T-c_A+(1-\gamma)(1-r)\mu-F-c_P \geq r\mu+F-c_A+(1-r)\mu-F-c_P$, and rearrangement reveals the condition

$$1 \leq \frac{T}{\gamma\mu} \quad (2)$$

under which the termination decision is efficient. This condition tells us that the cooperation rent increases whenever the termination revenue streams outweigh the losses on expected operational profit.

3.3. Desirability condition

Now that we have determined the termination and the efficiency conditions, it remains to us to determine the condition under which the termination decision is collectively desirable. This is the case if A terminates the contract and the cooperation rent increases, and vice versa, if A does not terminate and the cooperation rent decreases. Merging conditions (1) and (2), we can state:

Lemma 1. *The termination right is only desirable if* $\frac{T}{\gamma\mu} \geq \gamma\Lambda \frac{T}{\gamma\mu} \geq 1$ or if $\frac{T}{\gamma\mu} < \gamma\Lambda \frac{T}{\gamma\mu} < 1$ *is satisfied.* ■

Our result shows that a source of conflict may exist if Lemma 1 does not hold true. Imagine that the initial contract includes a royalty rate close to zero, but T is just slightly smaller than $\gamma\mu$. Then,

[8] In the real world, fixed honorariums are predominantly paid from publishers to authors in creative industries (Caves 2000; Zentner, 2006). For the same purpose as explained in the previous footnote, we also allow here for an upfront investment by the author.

[9] The law suggests that, in case of the author's death, the termination right transfers to her statutory successors. It makes no difference who terminates, it is just important that the termination decision is reflected in the initial bargaining stage for the problem under scrutiny.

[10] The cost can be considered as the cost of expression, which is time and effort invested in the underlying creation [a detailed description can be found in Caves (2000)].

[11] This cost already includes all relevant types of costs, such as marketing, agent, and administrative costs. A nice overview is given in Caves (2000).

[12] Personal motives, such as holding control over the creation's copyright again, can also be evaluated in monetary terms and may be reflected in T. Rohter (2011) points out that this may be relevant in many instances, at least in the music business.

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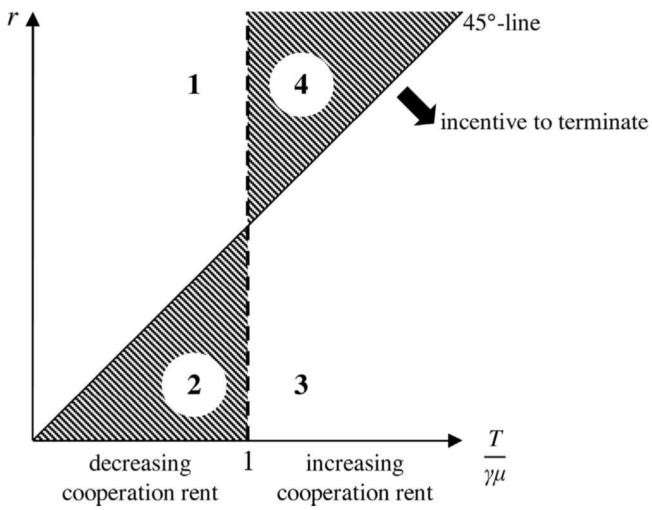

Fig. 2. Termination incentives vs. cooperation rent.

A will perceive the losses on her share of the expected operational profit as being smaller than the termination revenue streams and terminate the contract, even though it decreases the cooperation rent. Indeed, this would make A better off, but also externalize a disproportionate harm on P.

Fig. 2 illustrates this problem. Condition (1) is described by the 45°-line, where any position to the right depicts the incentive to terminate the copyright grant. The vertical dotted line shows condition (2), where any point to the left depicts decreasing cooperation rent and any point to the right depicts the opposite. The white areas 1 and 3 then reflect our result from Lemma 1. The hatched areas 2 and 4 are the discussed scenarios under which there is a trade-off between termination incentives and collective desirability; i.e., Lemma 1 does not hold true.

While area 4 is a forgone opportunity, as A would not be induced to terminate, even though it would increase cooperation rent, the hatched area 2 is a serious harm, as it is not even Kaldor–Hicks efficient. The loss of P's share from the expected operational profit is not compensated by A's additional benefit from termination revenue streams. In this case, the termination right would be undesirable from an economic perspective.

Our analysis reveals an important matter: the choice of royalty rate in the initial contract has a significant impact on the effectiveness and the efficiency of termination rights. Thus, and probably more important, the termination decision should be internalized in the initial contract to incentive A appropriately. As the optimal solution is dependent on the choice of royalty rate, a need for different schemes regarding royalty rates and one-off payments may exist. We will dedicate the following section to this problem.

4. Efficient contracting

4.1. Optimal royalty rates and one-off payments

Finalizing our backward induction approach, we determine the Nash bargaining solution, which maximizes the cooperation rent in both scenarios. There is a source of conflict regarding the remuneration of A, in that A and P need to negotiate over the royalty and one-off payment to define the optimal contract. Following condition (2), the cooperation rent may differ depending on the termination decision, leading us to consider both scenarios separately.

During the negotiations, both contestants will use their expectations about future outcomes to determine the size of their share of the cooperation rent. Let us first consider the royalty rate in the bargaining situation where condition (1) is not fulfilled, denoted r_n. The one-off payment is denoted F_n in this scenario. Let NP_n be the Nash product and $\alpha \in]0, 1[$ indicate the relative bargaining power of A. We can then define $NP_n = argmax[\lambda - d_A]^{\alpha}[\psi - d_P]^{(1-a)} = argmax[r_n\mu + F_n - c_A - d_A]^{\alpha}[(1-r_n)\mu - F_n - c_P - d_P]^{(1-a)}$. The first order condition for an internal maximum of the Nash product is $\partial NP_n/\partial r_n = \alpha\mu(r_n\mu + F_n - c_A - d_A)^{-1} - (1-\alpha)\mu((1-r_n)\mu - F_n - c_P - d_P)^{-1} \overset{!}{=} 0$ and rearrangement yields the optimal royalty rate for the case in which A does not exercise her termination right

$$r_n{}^*(F_n) = \frac{\alpha\left(\mu - c_P - d_P + (\frac{1}{\alpha} - 1)(c_A + d_A)\right)}{\mu} - \frac{F_n}{\mu}. \quad (3)$$

The first derivate with respect to F_n yields the first order condition $\partial NP_n/\partial F_n = \alpha(r_n\mu + F_n - c_A - d_A)^{-1} - (1-\alpha)((1-r_n)\mu - F_n - c_P - d_P)^{-1} \overset{!}{=} 0$, and the optimal advance is

$$F_n{}^*(r_n) = \alpha\left(\mu - c_P - d_P + \left(\frac{1}{\alpha} - 1\right)(c_A + d_A)\right) - r_n\mu. \quad (4)$$

Now consider the case that A intends to terminate the contract, as a result of which NP_t defines the Nash product, r_t is the royalty rate, and F_t denotes the one-off payment. Consequently, $NP_t = argmax[\lambda_t - d_A]^{\alpha}[\psi_t - d_P]^{(1-a)} = argmax[(1-\gamma)r_t\mu + F_t + T - c_A - d_A]^{\alpha}[(1-\gamma)(1-r_t)\mu - F_t - c_P - d_P]^{(1-a)}$ defines the respective Nash product, and the first derivative with respect to r_t yields the first order condition $\partial NP_t/\partial r_t = \alpha(1-\gamma)\mu((1-\gamma)r_t\mu + F_t + T - c_A - d_A)^{-1} - (1-\alpha)(1-\gamma)\mu((1-\gamma)(1-r_t)\mu - F_t - c_P - d_P)^{-1} \overset{!}{=} 0$. The Nash bargaining solution then suggests

$$r_t{}^*(F_t) = \frac{\alpha\left((1-\gamma)\mu - c_P - d_P + (\frac{1}{\alpha} - 1)(c_A + d_A - T)\right)}{(1-\gamma)\mu} - \frac{F_t}{(1-\gamma)\mu} \quad (5)$$

as the optimal royalty rate, given that A will terminate the contract. The first order condition with regards to F_t is $\partial NP_t/\partial F_t = \alpha((1-\gamma)r_t\mu + F_t + T - c_A - d_A)^{-1} - (1-\alpha)((1-\gamma)(1-r_t)\mu - F_t - c_P - d_P)^{-1} \overset{!}{=} 0$. Thus, the optimal advance to maximize the Nash product is

$$F_t{}^*(r_t) = \alpha((1-\gamma)\mu - c_P - d_P + (\frac{1}{\alpha} - 1)(c_A + d_A - T)) - (1-\gamma)r_t\mu. \quad (6)$$

Proposition 1. *In the presence of a unilateral termination right, the Nash bargaining solution predicts that contracts are efficient if royalty rates are chosen, such that*

$$r^*(F) = \begin{cases} \dfrac{\alpha\left(\mu - c_P - d_P + (\frac{1}{\alpha} - 1)(c_A + d_A)\right)}{\mu} - \dfrac{F}{\mu}, r > \dfrac{T}{\gamma\mu} \\[2ex] \dfrac{\alpha\left((1-\gamma)\mu - c_P - d_P + (\frac{1}{\alpha} - 1)(c_A + d_A - T)\right)}{(1-\gamma)\mu} - \dfrac{F}{(1-\gamma)\mu}, r \leq \dfrac{T}{\gamma\mu} \end{cases} \quad (7)$$

and one-off payments comply with

$$F^*(r) = \begin{cases} \alpha(\mu - c_P - d_P + (\frac{1}{\alpha} - 1)(c_A + d_A)) - r\mu & , r > \dfrac{T}{\gamma\mu} \\[2ex] \alpha((1-\gamma)\mu - c_P - d_P + (\frac{1}{\alpha} - 1)(c_A + d_A - T)) - (1-\gamma)r\mu, & r \leq \dfrac{T}{\gamma\mu} \end{cases} \quad (8)$$

Proof. The proof follows from Eqs. (3)–(6) and condition (1). ■

Now that we have determined the optimality conditions needed to maximize the Nash product, we may take a closer look at the initial remuneration to authors. In the literature, we observe not only the view that initial payment structures may be affected (Patry, 1999; Gilbert, 2016), as shown under Proposition 1, but also concerns about the fact that publishers may negotiate lower-paying royalties and less favorable deal points by internalizing the termination of a copyright grant within initial negotiations (Rub, 2013; Brown, 2014; Darling, 2015). This argument comes from the fact that the initial assignment of a copyright would be less valuable to publishers, and they would consequently decrease prices (Darling, 2015).

By using our model, we can predict a result for this claim. Recall that the total initial remuneration in our set-up consists of a share of the profit and a one-off payment. If condition (1) is not fulfilled, this can be represented by $r_n\mu+F_n$. If this condition is satisfied, A's total initial remuneration is $(1-\gamma)r_t\mu+F_t$. Comparing these two payments leads to the next result:

Proposition 2. *Authors who terminate their contracts realize strictly lower total remunerations from the initial contract, compared to their non-terminating or non-entitled colleagues. Moreover, higher termination revenue streams lower the total initial remuneration.*

Proof. A's payment assuming termination is strictly lower if $r_n\mu+F_n>(1-\gamma)r_t\mu+F_t$ holds true. From Proposition 1, we know that the optimal royalties and advances are consistent with condition (1). If we plug the results from (7) and (8) into the previous inequality, we get $\left(\frac{\alpha\left(\mu-c_P-d_P+\left(\frac{1}{\alpha}-1\right)(c_A+d_A)\right)}{\mu}-\frac{F_n}{\mu}\right)\mu+F_n > \left(\frac{\alpha\left((1-\gamma)\mu-c_P-d_P+\left(\frac{1}{\alpha}-1\right)(c_A+d_A-T)\right)}{(1-\gamma)\mu}-\frac{F_t}{(1-\gamma)\mu}\right)(1-\gamma)\mu+F_t$ wherein the one-off payments cancel out. Rearrangement then reveals $\gamma\mu>(1-1/\alpha)T$. As long as $0<\alpha<1$, the right-hand side is always negative. Because of our assumption that $\gamma>0$, the left-hand side is always positive, confirming our result. Furthermore, let $R_t=\left(\frac{\alpha((1-\gamma)\mu-c_P-d_P+(\frac{1}{\alpha}-1)(c_A+d_A-T))}{(1-\gamma)\mu}-\frac{F_t}{(1-\gamma)\mu}\right)(1-\gamma)\mu+F_t$ be the total remuneration, given that (1) is true. The first derivative of R_t with respect to T then yields $\partial R_t/\partial T=\alpha-1<0$, and shows that $R_t\rightarrow-\infty$ as $T\rightarrow\infty$. This proves that the total initial remuneration decreases in the termination revenue streams. ■

Our prediction stems from the fact that the termination decision is a negative externality on the cooperation rent, as it cuts off some part of the expected operational profit. The anticipating P will internalize this in the initial contract by tapping some of the termination revenue streams. Consequently, A initially receives less, as demonstrated in Proposition 2.

This result both supports and mathematically proves the view in the literature that the termination right may force authors into lower paying contracts. In particular, the initial contract contains a lower initial remuneration in exchange for a payment from a termination revenue stream in the future.

It seems obvious that a decrease of financial rewards to creators may cause adverse effects with respect to stimulating creativity. This may be especially the case for young talents who are more dependent on stable incomes in the early stages of their careers, which obviously break off to some degree in exchange for a termination option. However, reward is not the only function that should be addressed in copyright contracts, as the allocation of risk often also plays a central role in stimulating creativity (Rub, 2013). Risk plays no role in the underlying setting, as both parties are assumed to be risk-neutral, but we will relax this assumption below. However, we first need to work out the differences in termination and non-termination contract designs and will dedicate the following section to this issue.

4.2. Contract designs

We analyzed how royalty rates and advances should be chosen to incentivize terminating and non-terminating authors to maximize the Nash products under Proposition 1. However, it remains to be seen how contracts should be designed in the different scenarios to reveal efficient outcomes for all involved parties. Figs. 3 and 4 use the results from Proposition 1 to juxtapose r and F, considering the efficiency criteria. The curves represent Eqs. (3) and (5), respectively. In both figures, we can see that r_t is steeper than r_n. The comparison of the first derivatives of the curves' functions proves this observation, as $\partial r_n/\partial F_n=-1/\mu>\partial r_t/\partial F_t=-1/(1-\gamma)\mu$.

The dotted horizontal line in both Figs. 3 and 4 illustrates the termination border, below which the author has an incentive to terminate the contract. Thus, all positions on the bold curve to the top of the termination border depict Nash product maximizing *r-F* combinations if condition (1) is not satisfied. Note that any position on this curve yields equal payoffs to the players in this scenario. The bold curve to the bottom represents Nash product maximizing *r-F* combinations, given the fulfillment of condition (1). Any position on this curve leads always to the same payoff for A and P in the termination scenario. The light curves show *r-F* combinations that would not fulfill Lemma 1 and yield undesired cases. Consequently, the numbers 1, 2, 3, and 4 reflect the respective areas in Fig. 2.

Let r^{int} be the intersection between both curves. In this position, $r_n=r_t$ and $F_n=F_t$. We can find the intersection mathematically by setting Eq. (4) equal to Eq. (6), where $r_n=r_t=r^{int}$. The rearrangement with respect to r^{int} yields $r^{int}=\alpha+(1-\alpha)\frac{T}{\gamma\mu}$. We can use this to explain the difference between Figs. 3 and 4. In the former, the termination border is lower than the intersection between both curves, i.e., $\alpha+(1-\alpha)\frac{T}{\gamma\mu}>\frac{T}{\gamma\mu}$. In the latter, the termination border is above the intersection, i.e., $\alpha+(1-\alpha)\frac{T}{\gamma\mu}<\frac{T}{\gamma\mu}$.

This observation is significant for the efficient contract determination with respect to the one-off payment. In particular, potential settings exist under which the efficient parts of the curves overlap, as shown in Fig. 3. However, there are also settings where the curves are positioned such that certain one-off payment levels are excluded from the efficient result, as we can see in Fig. 4. Let F_n^{int} and F_t^{int} denote the one-off payment for which the respective curve intersects with the termination border. Then, $F_n{}^{int}=\alpha(\mu-c_P-d_P+(1/\alpha-1)(c_A+d_A))-T/\gamma$ and $F_t{}^{int}=\alpha((1-\gamma)\mu-c_P-d_P+(1/\alpha-1)(c_A+d_A-T))-(1-\gamma)T/\gamma$, and we can formulate the next results:

Proposition 3. *(i) There is no unique contract design that maximizes the cooperation rent efficiently, as contracts for terminating authors include lower royalties. The contract may include one-off payments that are (ii) systematically diverse or (iii) equal for terminating and non-terminating authors. (iv) Parameter settings exist under which no contract design maximizes the cooperation rent efficiently, because $F=\emptyset$.*

Proof. The proof for *(i)* follows immediately from Lemma 1. Note that the fulfillment of Lemma 1 is sufficient for *(i)* to be true. *(ii)* holds true whenever $r^{int}=\alpha+(1-\alpha)\frac{T}{\gamma\mu}<\frac{T}{\gamma\mu}\wedge F_n<F_n{}^{int}\wedge F_t\geq F_t{}^{int}$ or if $r^{int}=\alpha+(1-\alpha)\frac{T}{\gamma\mu}>\frac{T}{\gamma\mu}\wedge F_n<F_t{}^{int}\wedge F_t\geq F_n{}^{int}$. Note that *(ii)* is also sufficient to confirm the necessity of unique contracts. If $r^{int}=\alpha+(1-\alpha)\frac{T}{\gamma\mu}>\frac{T}{\gamma\mu}\wedge F_t{}^{int}\leq F<F_n{}^{int}$, then statement *(iii)* holds true. Note that *(iii)* is not a sufficient condition to define a unique contract and requires the consideration of Lemma 1. Statement *(iv)* is only relevant if $r^{int}=\alpha+(1-\alpha)\frac{T}{\gamma\mu}<\frac{T}{\gamma\mu}\wedge F_n{}^{int}\leq F<F_t{}^{int}$. This implies that efficient contract designs only exist whenever *(iv)* does not hold true. ■

From Proposition 3, we see that a "one size fits all" contract design is inappropriate. Explicitly, terminating authors must

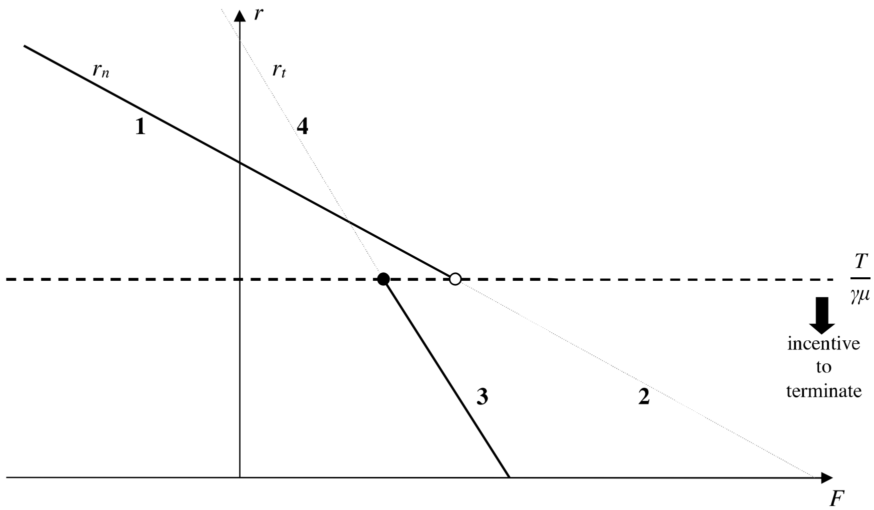

Fig. 3. Efficient contracts if $r^{int} \geq \frac{T}{\gamma\mu}$.

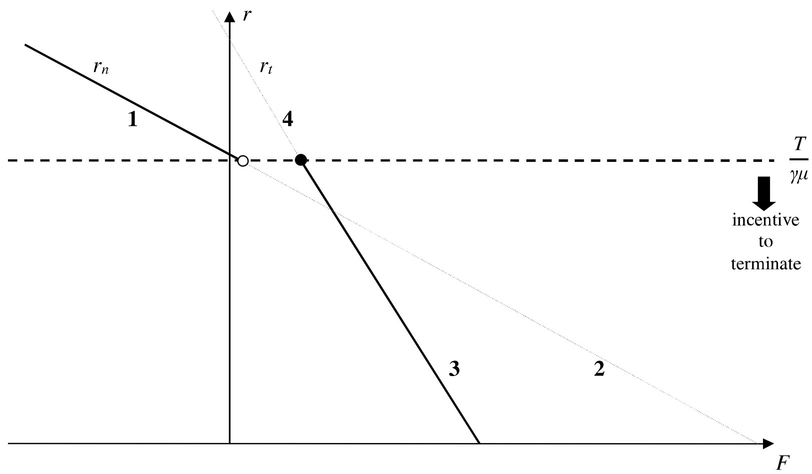

Fig. 4. Efficient contracts if $r^{int} < \frac{T}{\gamma\mu}$.

receive contracts that are designed differently from those for non-terminating authors. Implicitly, authors who are entitled to terminate and intend to make use of this right should already receive contracts different from those of their non-entitled colleagues. From now on, we aggregate all authors who are either not entitled to terminate or who will not terminate the contract into the category "non-terminating author".

Another fact is that the publisher, anticipating her loss and the benefit of her contestant in the future, participates indirectly by offering a different contract to A (see Proposition 1 and Proposition 2). This can be done by adjusting *r*, through which P has an indirect influence on the termination decision. Thus, efficient contracts can be defined through a sensible choice of royalty rate. We also learn from Proposition 1 that both payments are interrelated. This shows that the parties need to sensibly consider the correct type of advance when determining the royalty rate.

In Proposition 3, we showed that the efficient contract decreases the share of royalties in contracts of terminating authors and increases the number of advances proportionally. This sounds counterintuitive both to our result from Proposition 2 and to the view in the literature; so, let us now compare these results, and especially the terminology, with caution. In Proposition 2, we stated that the initial remuneration decreases in exchange for a future revenue stream, because the cooperation rent decreases. In that proposition, we defined the future stream as royalty-like because it has a related characteristic: it is an exchange of remuneration from the initial negotiations for a potential compensation from a different contract in the future. However, in Proposition 3, the royalty rate is determined on the basis of the underlying cooperation rent. In particular, the royalty rate in that proposition acts as an exchange for an advance.

Thus, the first effect has an exogenous nature, as it follows from the termination decision and is an inter-periodical exchange. We define this as the exogenous effect. The latter effect follows directly from the contract design and considers the royalty paid by the initial publisher. We define this as the endogenous effect. Hence, we can conclude that the exogenous effect increases the royalty rate through termination, while the endogenous effect decreases it. The relation between both effects will be discussed in the following section.

5. Discussion

5.1. The matter of risk

Creative industries are usually characterized by a low probability of product success, where many products flop, but just a few turn out to be successful (Caves, 2000). One may characterize these industries as volatile and highly risky. Thus far, we disregarded risk by assuming that the involved players are risk-neutral; this was convenient for analytical purposes. This section relaxes this assumption, at least for the market side of authors, to address more realistic situations. Indeed, one could argue that publishers may also be considered risk-averse. However, we concentrate only on authors in this paper, because, in most instances, they seem to be far more risk-averse than are publishers (Caves, 2000; Darling, 2015). A second reason is that our focus is to evaluate how risk may affect authors' incentives to create, an increase of which was one of the major goals of the law.

Authors are often assumed to be risk-averse because their alternatives and financial possibilities are limited, at least in the very first stage of their careers (Caves, 2000). As risk aversion is modeled by a concave utility function, each additional unit of risky income (i.e., royalty payments or termination revenue streams) would increase A's utility at a decreasing rate. Authors would, therefore, be more interested in advances than in risky future payments, even if the objective value would be the same. In the previous section, we have observed endogenous and exogenous effects. In other words, contracts for terminating authors involve a lower royalty rate; i.e., the endogenous effect decreases risk. However, Proposition 2 has demonstrated that the total remuneration would decrease in exchange for risky termination revenue streams in the future; i.e., the exogenous effect increases risk. The overall effect is, however, ambiguous and requires further investigation.

To analyze whether a termination decision adds risk into the contract, we need to refine our model first. Recall Fig. 1 and imagine a stylized world with a discrete probability distribution, in which a third player, e.g., "nature", may choose between two events before the author makes her termination decision. These events characterize the demand for the creative product and are defined "high demand" and "low demand"; i.e., a measure of product success before a termination decision. In this bilateral setting, the respective probabilities are defined q_h for high demand and q_l for low demand, where $q_h + q_l = 1$ and $q_h, ql \geq 0$. For simplicity, assume that $\mu = T = 0$ in the event of low demand, which implies that ex-ante product success is positively correlated with ex-post product success.[13] For this section, we specify μ and T as positive only in case of high demand. Consequently, both determinants measure the difference between the low and the high demand scenario.

The modification of the information structure also implies a change in the payoff structure.[14] Recall that we are only interested in the derivation of the author's risk measure concerning her earnings from the contract; therefore, we can neglect the publisher's payoffs for the moment. In the low demand event, A would get $\lambda_{n,l} = F_n - c_A$ if the author does not terminate and $\lambda_{t,l} = F_t - c_A$ if the author terminates. In the high demand event, the payoffs would be $\lambda_{n,h} = r_n\mu + F_n - c_A$ without termination and $\lambda_{t,h} = (1-\gamma)r_t\mu + F_t + T - c_A$ in the case of termination. Based on this, we can derive the expected payoffs $E(non\text{-}termination) = \lambda_{n,l} + \lambda_{n,h} = q_h r_n \mu + F_n - c_A$ and $E(termination) = \lambda_{t,l} + \lambda_{t,h} = q_h((1-\gamma)r_t\mu + T) + F_t - c_A$.

These definitions prove helpful in deriving the variances of the probability distributions to measure the riskiness of the contracts under non-termination and termination circumstances. In the first contract, the variance is $VAR(non\text{-}termination) = q_l(\lambda_{n,l} - E(non\text{-}termination))^2 + q_h(\lambda_{n,h} - E(non\text{-}termination))^2$. In the latter contract, we get $VAR(termination) = q_l(\lambda_{t,l} - E(termination))^2 + q_h(\lambda_{t,h} - E(termination))^2$. The risk measures can be illustrated in detail by substituting the details for the (expected) payoffs as previously defined:

$$VAR(non\text{-}termination) = q_l(q_h r_n \mu)^2 + q_h((1-q_h)r_n\mu)^2 \quad (9)$$

and

$$VAR(termination) = q_l(q_h((1-\gamma)r_t\mu + T))^2 + q_h((1-q_h)((1-\gamma)r_t\mu + T))^2. \quad (10)$$

Eqs. (9) and (10) can now be used to evaluate the circumstances that determine a riskier contract in the case of a termination. Note that the higher the variance, the riskier the earnings from the contract. Thus, a termination contract includes a higher risk if, and only if, $q_l(q_h r_n \mu)^2 + q_h((1-q_h)r_n\mu)^2 < q_l(q_h((1-\gamma)r_t\mu + T))^2 + q_h((1-q_h)((1-\gamma)r_t\mu + T))^2$. This can be rearranged to

$$q_h[((1-q_h)r_n\mu)^2 - ((1-q_h)((1-\gamma)r_t\mu + T))^2] < q_l[(q_h((1-\gamma)r_t\mu + T))^2 - (-r_n\mu q_h)^2]. \quad (11)$$

Based on inequality (11) we can define our next result:

Proposition 4. *The termination option does not necessarily force authors into riskier contracts. The exogenous effect prevails and termination contracts are riskier whenever inequality (11) is met. Conversely, the endogenous effect outweighs the exogenous effect if (11) does not hold true and termination contracts are less risky.*

Proof. Both the left- and the right-hand side of inequality (11) tend toward the same direction, which can be shown by looking at both sides separately: if we set the both sides as smaller than zero we get the condition $(r_n - (1-\gamma)r_t) < T$ in both instances. Thus, the fulfillment of inequality (11) depends on the parameter calibrations, and it is both a sufficient and a necessary condition. ■

The necessity of different contract structures, which imply $r_t < r_n$, has the effect that a risk-averse author will not necessarily suffer a higher risk if she terminates her copyright grant. This is a very interesting and important observation that is contrary to the general view in the literature. It is usually assumed and agreed that the introduction of a termination right may put authors into lotteries by exchanging secure advances for high-risk rewards in the future (e.g., Patry, 1999; Rub, 2013; Darling, 2015; Gilbert, 2016).

Considering our results, this is not necessarily true: if the endogenous effect prevails, i.e., the present value of royalty earnings avoided through a termination decision is smaller than the present value of termination revenue streams, we have the contrary effect, and the amount of risk in termination contracts decreases. In other words, the termination right would not necessarily force authors into lotteries, at least no more so than in the conventional copyright systems.

The parameter calibrations determine the circumstances under which terminations are more likely to increase the risk in contracts. Variances for terminated and non-terminated contracts are juxtaposed in Fig. 5 to illustrate the sensitivity of these calibrations. The continuous line represents equality (9). Moreover, the figure shows two dashed lines, i.e., *VAR(termination)* and *VAR(termination)#*, which both result from equality (10); however, they each have slightly different parameter calibrations. More specifically, *VAR(termination)#* differs, ceteris paribus, through an increase in T and r_t. Note that both parameters are not included in (9); therefore, we have no effect on the continuous line.

One can see that all three curves increase in μ, which is intuitive, since a higher operational profit in the high demand scenario spreads the distribution. μ^* and μ^{**} illustrate the threshold values where conditions (9) and (10) intersect, and we can see that

[13] It is conceivable that ex-ante and ex-post product success are also negatively correlated. We emphasize this for future research, but we focus on the mentioned case as we believe that it is the most realistic one.

[14] It is important to mention that the consideration of uncertainty also slightly changes our results in the previous sections. These are the termination condition, the efficiency condition, the desirability condition, and the results based on these conditions. However, our calculations have shown that the propositions remain unaffected with respect to our core outcomes, which implies that our arguments are stable against relaxing the certainty assumption. Consequently, we neglect the presentation of the extended version for lack of new insights.

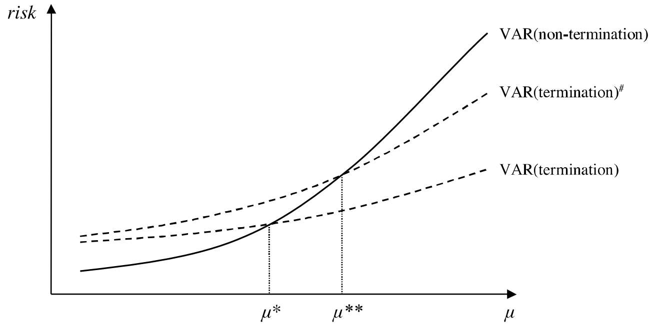

Fig. 5. Risk and expected operational profit.

$\mu^* < \mu^{**}$. This implies that, ceteris paribus, the higher is T, the higher is the risk due to the exogenous effect. In other words, a higher operational profit is required in μ^{**} to balance in proportion with T.

The endogenous effect becomes apparent in r_t because the more $r_t \to r_n$, the weaker this effect and the higher the risk. In Fig. 5, this can be seen in *VAR(termination)* shifting upward toward *VAR(termination)#*. Conversely, a greater distance between r_n and r_t fosters the endogenous effect, which makes a termination contract less risky.

By extension, our results may offer some insights for the discussion on authors' incentives to create. It is often agreed that authors dislike risk because they are unable to bear production costs and potential losses for their works (Darling, 2015; Gilbert, 2016). However, if the level of risk in contracts decreases, one can imagine that this may incentivize more authors to create new works, because a failure in the market would be compensated by better-equipped publishers. This may especially stimulate young and unequipped artists to spend their resources on their artistic talent and not on their outside options.

It is, however, questionable on how this may affect publishers' incentives to invest. Indeed, this is an important issue and deserves closer examination. We discuss this problem in Section 5.3, but we emphasize future research for this matter.

5.2. Institutional regulation and market norms

The interplay between the termination right, other copyright systems, and typical market norms is important, because many creative industries are either already regulated or have specific norms. One common rule is the Droit-de-Suite, the right of authors in fine arts to be involved in future sharing of their creations. In other words, authors are entitled to a mandatory royalty, for which there is usually a prescribed rate, or at least a lower boundary. In practice, the latter may be less relevant to our topic under scrutiny, but, out of theoretical interest, let us consider it first.

Let r^{lb} denote a lower boundary (e.g., determined by regulation), and imagine that $r^{lb} > \frac{T}{\gamma\mu}$, i.e., the lowest possible royalty rate is usually higher than the termination border. This implies that authors will not terminate usually. We question the occurrence of the problem, because it would require $r^{lb} \geq \frac{T}{\gamma\mu} > 1$ to be relevant, and inalienable royalty rate boundaries greater than one are not practically relevant (Caves, 2000; Rub, 2013). On the other hand, if evidence would reveal that authors should generally be prevented from terminating for economic reasons, a lower bound royalty rate may act as a remedy against inefficient termination.

An upper royalty rate bound (denoted r^{ub}), unusual in practice, would have the reverse effect: it may force authors to terminate whenever $r^{lb} < \frac{T}{\gamma\mu}$. The effects would be harmful whenever the right hand-side is smaller than one. However, if it transpires that $\frac{T}{\gamma\mu} > 1$ usually, an r^{ub} may be useful to enforce contract designs that incentivize termination.

Now, consider the more likely case, using a standardized royalty rate denoted r^{st}. If $r^{st} < \frac{T}{\gamma\mu} < 1$, A will inefficiently terminate the contract. But, if $r^{st} > \frac{T}{\gamma\mu} > 1$, the forgone opportunity problem emerges. In both examples, Lemma 1 is violated. The intuition is that a prescribed level systematically excludes the option to internalize the termination decision within the contract simply because the payment structure is bound. Indeed, the choice of F may be subject to negotiations, but recall that r is the strategic component that affects A's incentives to terminate.

Standardized one-off payments are rarely implemented because of political decisions, but they are established in contracting and are commonly observed in creative industries (Caves, 2000; Zentner, 2006; Rub, 2013). The restriction or specification of one-off payments, which we denote F^{st}, may be critical to some degree because it may also exclude efficient contract designs. Considering Proposition 3, where $r^{int} = \alpha + (1-\alpha)\frac{T}{\gamma\mu} < \frac{T}{\gamma\mu}$ (see Fig. 4), a specified advance within the range $F_n{}^{int} < F^{st} \leq F_t{}^{int}$ would not, under any circumstances, yield an efficient result. For this case, any $F^{st} > F_n{}^{int}$ would preclude efficient contracts for the non-termination scenario, and $F^{st} > F_t(r_t = 0)$ would even preclude efficient contracts in all scenarios.

Now, consider $r^{int} = \alpha + (1-\alpha)\frac{T}{\gamma\mu} > \frac{T}{\gamma\mu}$, as shown in Fig. 3. Any $F^{st} > F_n{}^{int}$ would also then preclude efficient contracts for terminating authors. Moreover, $F^{st} > F_t(r_t = 0)$ would definitely preclude efficient contracts for terminating authors. Whether this would also preclude efficient contracts for the non-termination scenario depends on the parameter settings.

Thus, policy makers should not either restrict or control the contract designs in creative industries in the presence of an inalienable unilateral termination option. Although standardized one-off payments may be harmful to some degree, it seems that standardized royalty rates may usually trigger some issues. Furthermore, standardized royalty rates may even render the termination law inapplicable by simply excluding the termination decision.

5.3. General discussion

We have analyzed the matter of risk in Section 5.1 by considering risk-averse authors, however, we neglect that publishers may also be risk-averse. Therefore, a higher risk may undermine publishers' investment incentives if a marginal investment unit would add too much risk to their portfolios. One can imagine that risk-averse publishers may then focus even more on established superstars with a more stable rate of return, as compared to young talents whose creations entail a higher risk of being successful. Another effect of the termination right may be that publishers try to avoid additional risk by changing their business models and offering employee contracts to circumvent the termination right due to the work made for hire clause.

These thoughts underline the idea that it may become harder for young talents to be considered by publishers, as work made for hire contracts often imply a longer-lasting relationship compared to independent contractors. One can argue that publishers can absorb risk better and that the termination right may, therefore, still benefit authors. However, further research should investigate how the termination right affects the equilibrium between incentives to create and to invest. A suggestion is to make μ and T conditional on the publisher's investments and to investigate the effects in the shadow of the author's incentives to create.

Another shortcoming of our model is the lack of a more dynamic context. Creative industries are often characterized through repeated interactions between authors and publishers. Many contracts are option contracts, in which the publisher can

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refuse to accept later works but the author is bound to offer them (Caves, 2000). Thus, it is likely that the publisher would have published other works or may still be interested in publishing works of the terminating author because of the option contract. This is somewhat different from our stylized world, which considers just a single bargain over the author's creative good and may require an adjustment of the termination condition.

A related study by Karas (2017) demonstrates that termination incentives may be undermined the closer authors and publishers work together and the stronger authors depend on the efforts of the publisher. It would be interesting to investigate the difference in the range of possible full-on long-term options to short-term single creation contracts with respect to contract structures and incentives to create and to terminate.

Allowing for information imperfection, the discussion on efficient contracting may lead to slightly different conclusions. Publishers are typically the better-informed market side and may approximate the success of a creation more sensibly (Caves, 2000). However, authors very often cannot assess the course of their careers (Caves, 2000), and it may be difficult for them to estimate the termination revenue streams in times of negotiations (Darling, 2015). Publishers may well have better access to market information than authors, but nobody knows what will happen in 35 years after the first copyright grant.

The problem of imperfect information encourages the doubts about the desirability of the termination law, because it excludes the "one size fits all" approach and already necessitates the presence of information in the negotiation stage. If we also consider Proposition 2 and the fact that publishers are the more powerful market side, publishers could stochastically assume copyright terminations and offer lower paying contracts to a greater number of entitled authors than required. Even non-entitled authors may be affected by these contracts, as a clear definition of who is entitled is overdue and may require costly court decisions (Strohm, 2003; Abdullahi, 2012).

Another question hinges on whether the problem of asymmetric information may impact authors' incentives to terminate their copyright grants. Karas (2017) demonstrates that the uncertainty about publishers' reactions to terminations may lead to systematic renunciation to terminate, even if terminations are desirable to authors. Furthermore, Gilbert (2016) points out that publishers may act strategically to reduce the risk of terminations. With regard to our analysis, one can imagine that this may reduce the cases of efficient terminations and subvert the positive effects of copyright grant terminations.

It is well observed that market players in the creative industries do not always act rationally (Caves, 2000). Authors are often considered as either overoptimistic or too motivated (Darling, 2015) and may overestimate their options after termination, leading to the potential for inefficient terminations (compare Fig. 2, hatched area 2). Furthermore, they may act irrationally by terminating either as a matter of principle or for reasons of pride (Rohter, 2011).

Different contract structures also offer the potential for strategic behavior of publishers. Rent-seeking publishers may try to prevent authors from terminating, having different future plans in mind. A possible practice would be to offer an overpriced royalty. The effect would be inappropriate contracts, as authors would never terminate, and increased risk to authors.

Strategic behavior and personal motives increase the risk of inefficiently designed contracts. Publishers, especially, will never have a guarantee until they receive a termination notice, and they may consider this uncertainty in initial contracts. The consequence for our model is that the initial payment may be low and the contract designs equal for all authors in the market, as termination may be assumed at all times, as discussed above. We believe that studies that take up the mentioned shortcomings and develop our findings may present additional insightful results that contribute to the debate on the U.S. copyright law and termination options in contracts in general.

6. Conclusion

The U.S. copyright termination right has triggered a heated debate about the effectiveness and efficiency of the law. This paper offers a bargaining model, with a basic framework to support the debate, by first modeling the institution from an economic perspective, which may prove helpful for future research in this field. The focus of the paper is on the author–publisher relationship, as the paper analyses the impact of inalienable unilateral termination options on contract designs.

We highlight the following results: Terminating authors should be equipped with contracts that are different to those of their non-terminating colleagues. In this sense, we have introduced some key principles for contractual designs. These reveal that the termination contract design should include a lower proportion of royalties in exchange for a higher proportion of advances. Based on this result, we refute the common view in the existing literature that terminating authors would be systematically forced into lotteries. Under certain circumstances, contractual risk may even decrease, as compared to conventional buy-out contracts, which may, by extension, stimulate creativity. Complementary institutional regulations and current norms in creative industries may contradict with the termination law and either prevent authors from efficient terminations or provoke inefficient terminations. As a by-product, we have proved mathematically the informal argument in the literature that overall remuneration from initial negotiations is strictly lower for terminating authors due to the internalization effect.

Our results should, of course, be considered with care. We understand that our concept is difficult to put into practice directly, due to the many assumptions that are necessary for reasons of analytical convenience and transparency. However, we believe that our results can prove helpful as a benchmark in approximating the real world and we emphasize the need for more efforts in future research on this topic, as not much work has yet been done by economists. In this sense, modifications to our analysis have been suggested in the discussion section above. Finally, we stress the issue that research on copyright policies should give even greater consideration to the interplay between authors and publishers as, in the end, this relationship is dispositive for the positive question of whether copyright law works efficiently.

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ARTICLE THREE

The U.S. Copyright Termination Law, Asymmetric Information, and Legal Uncertainty

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

MICHAEL KARAS

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.

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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

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catalogs provide a dependable bottom line for profitability and stability to publishers (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,

[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).

2003; Henslee and Henslee, 2011). Consequently, recent studies suggest a "hailstorm of 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 cost. 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.

[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.

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 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 decision and cost, 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

[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.

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 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.

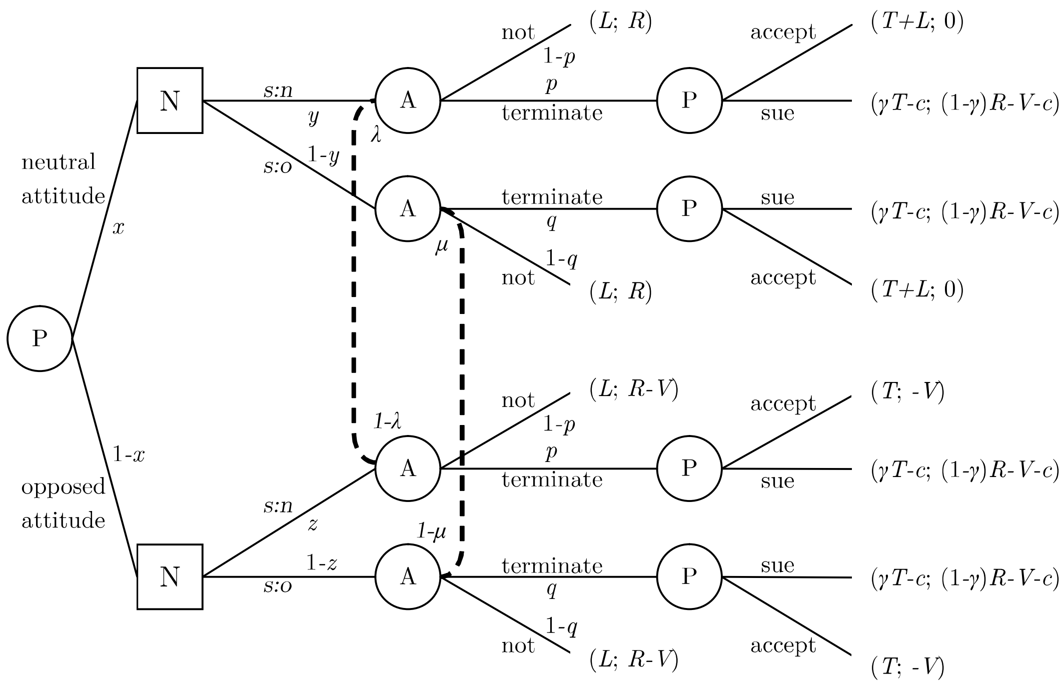

FIGURE 1. The information structure

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 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

[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 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).

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 $\gamma T - c$. 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.*

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

– *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.

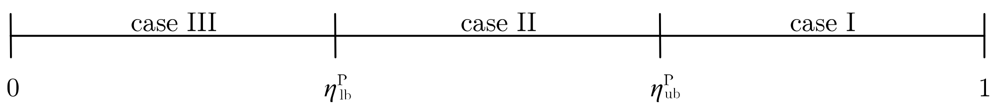

FIGURE 2. Case distinction

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

[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 $R > c$.

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

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

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 $\partial \mathrm{EA}_{\mathrm{I}}^{s:n} / \partial p = \gamma T - c - L \stackrel{!}{=} 0$,

$\partial \mathrm{EA}_{\mathrm{II}}^{s:n}/\partial p = \lambda(T + L - \gamma T + c) - L + \gamma T - c \overset{!}{=} 0$, 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 $x_{\text{II}}^{s:n}$ and $x_{\text{III}}^{s:n}$, 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

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

Recall that $\text{EA}_{\text{I}}^{s:n} = \text{EA}_{\text{I}}^{s:o}$ 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 $\partial\text{EA}_{\text{II}}^{s:o}/\partial q = \mu(T + L - \gamma T + c) - L + \gamma T - c \overset{!}{=} 0$ and $\partial\text{EA}_{\text{III}}^{s:o}/\partial q = \mu L - L + T \overset{!}{=} 0$. 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 $x_{\text{II}}^{s:o}$. 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 $x_{\text{III}}^{s:o}$. Altogether, the optimal choice of A, given case II or III, is

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

and

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

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 $x_{\mathrm{II}}^{s:o}$ or $x_{\mathrm{III}}^{s:o}$, 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* ($\eta_{ub}^P < \eta^P$)*:*
  - *i) The author is induced to choose* $p = q = 0$ *if* $\eta^A < \frac{T}{(1+\gamma)T-c}$*.*
- *Case II* ($\eta^P \in [\eta_{lb}^P, \eta_{ub}^P]$)*:*
  - *ii) If* $\eta^A < \frac{(1-z)T}{(1-z)(\gamma T-c)+(y-z)T}$*, then* $1 > x_{II}^{s:o} \gtreqless x_{II}^{s:n}$*.*
  - *iii) If* $\eta^A < \frac{T}{(1+\gamma)T-c}$*, then* $1 > x_{II}^{s:o} > x_{II}^{s:n} > 0$*.*
  - *iv) If* $\eta^A > \frac{(1-z)T}{(1-z)(\gamma T-c)+(y-z)T}$*, then* $x_{II}^{s:o} > 1 > 0 > x_{II}^{s:n}$ *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* ($\eta^P < \eta_{lb}^P$)*:*
  - *v) If* $\eta^A < \frac{1-z}{1+y-2z}$*, then* $1 > x_{III}^{s:o} \gtreqless x_{III}^{s:n}$*.*
  - *vi) If* $\eta^A > \frac{1-z}{1+y-2z}$*, then* $x_{III}^{s:o} > 1 > 0 > x_{III}^{s:n}$*. 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* $0 \leq p^* = q^* < 1$. *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 $\sigma_{\text{II}} = \frac{V-q[(1-\gamma)R-c]}{yR-z(\gamma R+c)}$ 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 $\eta^{\text{A}} < \frac{1-z}{1+y-2z}$, 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.

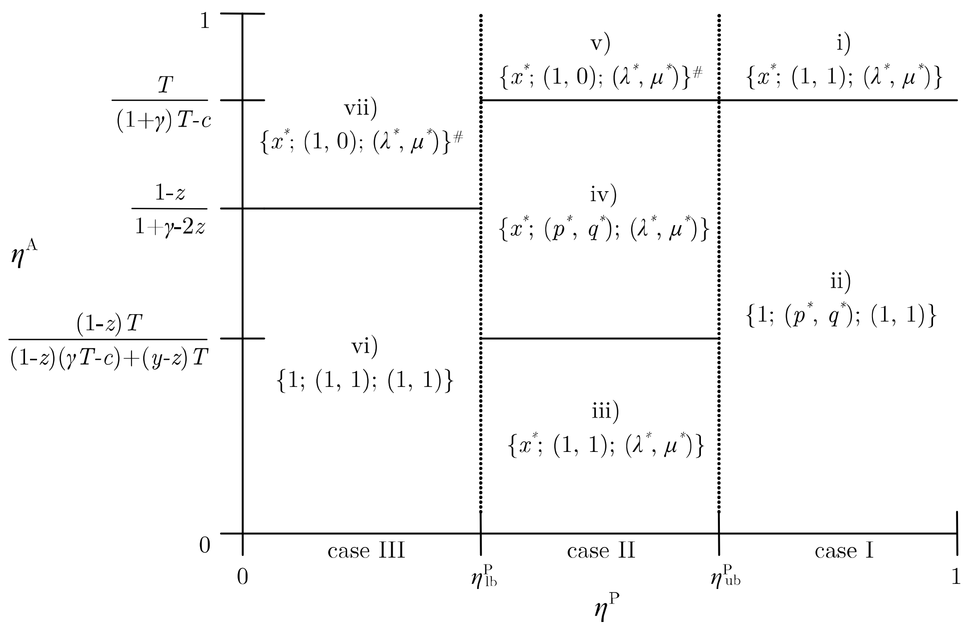

FIGURE 3. Equilibria of the game

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 $\partial\sigma_{\text{II}}/\partial\gamma > 0$. Recall that $\sigma_{\text{II}} > p - q$ 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., $\partial x_{\text{III}}^k/\partial\gamma = 0$ and $\partial\sigma_{\text{III}}/\partial\gamma = 0$. 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 $\gamma^{\text{A}} \neq \gamma^{\text{P}}$; 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 $c^{\text{A}} \neq c^{\text{P}}$. 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 $x_{\mathrm{II}}^{k} > 0$ with respect to η^{A} while using $L(\eta^{\mathrm{A}})$ to substitute L in x_{II}^{k}, 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 $x_{\mathrm{II}}^{s:o} > x_{\mathrm{II}}^{s:n}$, 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 $x_{\mathrm{III}}^{s:n}$ has no vertical asymptote in the definition area[12] but $x_{\mathrm{III}}^{s:o}$ 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 $x_{\mathrm{III}}^{s:o}$, 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 $x_{\mathrm{III}}^{s:n}$, 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 $x_{\mathrm{III}}^{s:n}(T(\eta^{\mathrm{A}})) < 1$, which is true since $0 < \eta^{\mathrm{A}}yL$. Moreover, it is necessary to show that a horizontal asymptote exists for $x_{\mathrm{III}}^{s:o}$, which is equal to one. Therefore, expand $x_{\mathrm{III}}^{s:o}$ to $x_{\mathrm{III}}^{s:o}(L(\eta^{\mathrm{A}})) = \frac{(1-z)(L(\eta^{\mathrm{A}})-T)}{(1-y)T+(1-z)(L(\eta^{\mathrm{A}})-T)}$ 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 $0 \leq x \leq 1$.

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[12] If we substitute $L(\eta^{\mathrm{A}})$ in the denominator of $x_{\mathrm{III}}^{s:n}$ 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 $\sigma_{\text{II}} > 0$ with $q < 1$ and $1 > x_{\text{II}}^{s:o} > x_{\text{II}}^{s:n} > 0$. Since $q < 1$, x^* must not be greater than $x_{\text{II}}^{s:o}$. If P chooses, such that $\sigma_{\text{II}} = p - q$, then A is indifferent between all values in the range $x_{\text{II}}^{s:o} \geq x^* \geq x_{\text{II}}^{s:n}$. If $x^* = x_{\text{II}}^{s:o}$, then A randomizes q^* and chooses $p^* = 1$ because then $x^* > x_{\text{II}}^{s:n}$, as we know from Lemma 1 iii). This implies $\sigma_{\text{II}} = 1 - q^*$, yielding $q^* = 1 - \sigma_{\text{II}}$. If, however, $x^* = x_{\text{II}}^{s:n}$, then A randomizes p^* while playing $q^* = 0$ due to $x^* < x_{\text{II}}^{s:o}$. Altogether, our previous derivations imply $1 \geq p^* = \sigma_{\text{II}}$ and $1 - \sigma_{\text{II}} = q^* \geq 0$.

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, $p^* - q^* = 1 \gtreqless \sigma_{\text{II}}$ 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 $\eta^{\text{A}} < \frac{1-z}{1+y-2z}$ P's best response to a (p, q) combination with $\sigma_{\text{III}} > p - q = 0$ is always $x^* = 1$, implying $p = q$. We can deduce from Lemma 1 v) that $1 = x^* > x_{\text{III}}^k$ 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 $\sigma_{\text{III}} = 1 = p - q$, 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 $\sigma_{\text{III}} = 1 = p - q$. 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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