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Free choice of legal fee shifting rules?

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Abstract In every country in the world parties to private litigation are subject to a predetermined fee shifting regime. While there are no institutionalized opt-out provisions so far, we demonstrate that such provisions could improve welfare. We argue that private negotiations are not a viable alternative to such opt-out provisions. We derive the conditions under which welfare improvements occur and suggest an applicable design for such an opt-out scheme.

Keywords Fee shifting · American rule · English rule · Winner rule · Opt-out provision

JEL Classification K40 · K41

1 Introduction

Fee shifting rules in litigation have been a central topic of law and economics research for a considerable amount of time.[1] There is a large body of work which

[1] The seminal works are those of Landes (1971), Posner (1973) and Gould (1973).

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attempts to capture the influence of fee shifting on the decision-making behavior of conflicting parties.[2] The main focus of interest is the impact of different fee shifting rules on variables such as the number of filed suits, the settlement rate, or the level of expenditures if a trial takes place.[3] Numerous partially overlapping, partially contradictory effects demonstrated in the literature mean that predictions can only be made with material qualifications. It is therefore hardly surprising that despite—or perhaps due to—this comprehensive pool of papers, unanimously agreed results are still missing. Even links which initially seem intuitively obvious regularly turn out to be quite difficult and complex.

There are two dominating cost allocation regimes in the world, namely the American rule (AR) and the English rule (ER). While under the AR each party has to bear their own fees, the ER is based on the premise, that the losing party should cover the legal expenses of the winning party. The loser is therefore not only responsible for his own fees but is also required to pay court fees and reimburse the attorney's fees of the winner. In practice however, even under the ER the loser is only required to cover "reasonable" fees of the winner. What is deemed "reasonable" varies from country to country.[4] So in effect, even under the ER the winner will usually have to cover some of his own expenses. Nonetheless, the ER imposes a higher proportion of the entire legal expenses to the loser as compared to the AR. In what follows, we assume just for simplicity that the ER is applied in its pure form, i.e. the loser has to cover the entire legal fees of both parties.

If one now compares AR with ER, one might presume that the latter rule provides advantages regarding the number and characteristics of submitted lawsuits. Due to imminent fee shifting, ER could make suits with a small probability of success less attractive, in comparison to AR, and at the same time promote the pursuit of meritorious claims which under AR might not be brought, as the legal costs threaten to consume the expected return. On the other hand, a general indemnity rule could significantly impede access to the legal system, and discourage even parties with meritorious claims due to risk accumulation, which then would far exceed the advantage of prevention or sanctioning of frivolous suits.[5] The net effect of these opposing aspects is ultimately difficult to predict, and crucially depends on the assumptions of the underlying economic models.[6]

Trying to answer the follow-on question of which fee shifting rule promotes settlements, seems hardly less problematic. The central advantage of settlement versus litigation is the avoidance of legal costs. The potential cost saving is likely to

[2] For a comprehensive overview of the literature on fee shifting see e.g. Rowe (1982), Cooter and Rubinfeld (1989) or Katz (2000).

[3] See also Rowe (1984); Rowe (1998) or Stein (1995). For empirical research on the impact of fee shifting see Snyder and Hughes (1990), Hughes and Snyder (1995) and for a survey Kritzer (2002).

[4] For details see Pfennigstorf (1984).

[5] According to Kritzer (1992, p. 55), a general consensus exists that ER deters privately financed parties from pursuing even meritorious claims.

[6] According to Shavell (1982), the propensity to sue is larger under ER than under AR, if the success assessment of the claimant exceeds a certain threshold and vice versa. Baye et al. (2005) find that bringing a case is relatively more attractive under AR. However, Braeutigam et al. (1984) conclude that the impact of a change from AR to ER on the number of submitted claims is not obvious.

be the main factor motivating involved parties to seek settlement out of court (Shavell 1982, p. 64 f.; Donohue 1991b, p. 196). Under ER the expected legal costs from an optimistic claimant's point of view tend to be less than under AR, as the costs of the prevailing party are ultimately borne by the loser. This effect favors higher litigation rates under ER (Shavell 1982, p. 65; Posner 1988, p. 928). On the other hand it can be presumed that the expenditure per trial will be higher under ER than under AR.[7] This is because under ER there is more to win (or lose), making higher investments worthwhile. Therefore, ER is likely to increase the cost of a trial in comparison with AR. However, since ER triggers higher investments settlement becomes more attractive because potential cost savings are higher than under AR. This effect should advance settlement rates. However, it might not be possible to conclusively assess which effect will ultimately dominate.[8]

So the economic impact of each cost allocation rule is ambiguous and partial effects are often conflicting. This suggests that each regime has some advantages and some disadvantages. If one acknowledges that each rule can meet a desired purpose only with significant impediment of other objectives, the question arises of whether or not the respective deficiencies of a specific alternative must necessarily be accepted. Instead of stipulating a fixed rule, the decision regarding fee shifting applied to an individual case could—at least partially—be shifted to the private level, for example to the parties involved in litigation. Naturally, standard solutions cannot always appropriately accommodate the specific characteristics of an individual case. We derive conditions under which welfare improvements are attainable by granting litigants a right to opt out of the default rule. The law-making agency then provides only a default rule. If, and only if, the litigant parties do not agree on another rule, the default rule applies.

Until now, no systematic economic inquiry exists regarding the question of which fee shifting rule involved participants would choose, if the opportunity of choice between alternatives were given.[9] Yet, in order to derive the characteristics of a legal cost environment which holds potential for welfare improvements, it is essential to consider individual fee shifting preferences. In this respect our paper complements the existing law and economics literature by developing a model which treats the allocation of legal fees as a decision variable in the litigants' maximization calculus. It can be shown that although parties involved in litigation basically have conflicting interests, their preferences for a specific fee shifting rule may nonetheless coincide. The remaining question is then, what kind of institutional framework is best suited to secure possible welfare gains. We argue that private negotiation alone is unlikely to generate efficient outcomes, and therefore cannot actually improve litigants' welfare. Actually, there are situations in which private

[7] The assertion that a transition from AR to ER would c.p. be associated with an increase of total expenditures per trial, definitely seems to have broad support, see e.g. Braeutigam et al. (1984), Katz (1987), Baye et al. (2005), Chen and Wang (2007). Under ER not only the value of the claim but also the entire legal costs are at risk.

[8] Posner (1973), Hause (1989) and Hersch (1990) among others predict a higher settlement rate under ER than under AR.

[9] Papers by Donohue (1991a, b), which will be addressed in Sect. 5.2. in more detail, seem to be the closest to our work.

negotiations would in fact reduce ex post welfare even in the absence of transaction costs or other hindrances. This is true since private negotiations may be biased by asymmetric information regarding winning probabilities. Instead, we propose an institutionalized opt-out regime, where the parties can abrogate their default rule, if, and only if, they agree on one out of a predetermined set of alternatives. We discuss the main design considerations associated with an implementation of such a procedure and show, based on an hypothetical but seemingly appropriate opt-out regime, how such a system could work to improve litigants' welfare beyond what is attainable under the current legal cost environment. As the welfare analysis reveals, only those opt-out provisions that reduce the loser's financial burden in comparison to the applicable default rule improve ex post welfare.

The structure of this paper is as follows: In the next section we present our litigation model, which will be the starting point of all that follows. In Sect. 3 we describe the welfare measure underlying our analysis, and demonstrate which cost allocation regime maximizes litigants' welfare. In Sect. 4 we analyze the individual maximization calculus of the litigants, and derive the conditions for maximizing expected utility in the general case of a continuous fee shifting variable, given that a case must be resolved through trial.[10] Results will be illustrated using a numerical example. Since we argue that welfare improvements necessarily require certain constraints on the number of possible alternatives, Sect. 5 considers the case of utility maximization when the parties have to choose between a limited number of discrete fee shifting rules. In this section we also discuss different opting-out provisions, and explore the welfare implications of such provisions. Section 6 concludes with a summary and outlook.

2 The model

Utility of party i (i = plaintiff, defendant) is given by

$$U_i(x_i) = (x_i)^{a_i}, \tag{1}$$

where x_i is wealth of i, satisfying $x_i > 0$. Exponents a_i meet $0 < a_i < 1$, implying risk-averse decision makers.

For simplification we allow for only two possible outcomes of a suit, namely full approval or complete dismissal of a case.[11] It is assumed that plaintiff and defendant independently form their expectations regarding the outcome of the trial. Specifically, each side expects to win (lose) the case with a probability of p_i $(1 - p_i)$, where $0 \leq p_i \leq 1$. Probability estimates are assumed to be purely subjective beliefs. Total costs of litigation are denoted by c, satisfying $c > 0$. Costs c include attorney fees of both parties, court fees, costs for obtaining expert opinion and so on. The claim's value G is always assumed to be greater than c, that is $G > c$.

[10] Thus the decision to file a case is dismissed and also the settlement vs. litigation decision will only be considered as an aside.

[11] The reduction of possible trial results to 100% success or total failure may seem to be unrealistic. However, since only expected utilities are of interest, the main results are unaffected.

In order to rule out the occurrence of negative wealth situations and to keep analyses as simple as possible, we will further assume that the plaintiff has pretrial wealth of kc, and the defendant has pretrial wealth of G + kc where $k > 1$.

However, unlike the existing literature, we will not assume an exogenously given fee shifting rule. Instead, we will investigate the question of which rule a litigation party would choose, if given the opportunity of choice in each individual case. For this purpose we integrate a decision variable h_i with $0 \leq h_i \leq 1$ into our model. Variable h_i indicates, which part of the total costs shall be covered by the party defeated in the litigation. If, for instance, maximization of the decision-maker results in an optimum value of $h_i = 1$, then this means that the observed participant would want the defeated party to cover the entire trial cost. ER generally stipulates that the defeated litigation party shall cover not only their own attorney fees, but also the court fees as well as attorney fees of the opposing side, and therefore approximately the entire trial cost. A decision-maker maximizing expected utility at $h_i = 1$ therefore prefers ER to any other alternative. The second boundary value $h_i = 0$ indicates an allocation rule, whereby the defeated party is exempt from any burden, and the prevailing litigation party must cover all costs. We label this the Winner rule (WR).[12] Since we assume that the costs of the plaintiff and defendant are equal, we then can approximate AR by setting $h_i = 0.5$, which marks an equal division of trial costs. All other values within the domain of h_i are interpreted accordingly. The greater the value of variable h_i, the larger the part of the total cost that the decision-maker wishes the defeated party to cover.

Under the given assumptions, the economic consequences of a trial are equal for plaintiff and defendant.[13] Therefore, it is sufficient to limit the analysis of the decision problem to one decision-maker. We thus concentrate on the plaintiff's decision problem in the following. Dropping indices, expected utility of the plaintiff can therefore be expressed as

$$U = p(G + kc - (1 - h)c)^a + (1 - p)(kc - hc)^a. \quad (2)$$

3 Welfare analysis

Up until now there has been no unique, generally agreed upon measure of social welfare employed in the analysis of different fee shifting rules in the literature. For example, there are different approaches with respect to whose interests should be considered in the welfare analysis. What is more, whether welfare should be measured ex ante or ex post, that is, before or after a trial, remains ambiguous. For example, when different cost allocation regimes are compared, one typical question

[12] A "winner-pays-all" rule has been barely considered so far. According to our knowledge, only Baye et al. (2005) and Spier (1994) address such a cost allocation alternative. While the Winner rule is never a sensible default rule, it may nonetheless simultaneously be preferred by both parties subject to litigation, see Sect. 5.3.1 for a more detailed discussion. As an example, think of two parties fighting for the heritage of a rich uncle. If the legal situation is unclear and both parties would be ruined after a lost trial, they may well agree on the Winner rule. In that case, financial risk would be shifted to the winner, who would be better equipped to bear it.

[13] This symmetry assumption has no bearing on any of our results, but only simplifies notation.

is how a certain regime impacts the quality of cases brought under the respective regime (Braeutigam et al. 1984; Polinsky and Rubinfeld 1998). The focus of such analyses is obviously the quality of the legal system from society's point of view. Still, these papers employ no explicit measure of social welfare. On the other hand, the literature dealing with the settlement versus trial decision typically focuses on the litigants' individual welfare only. For instance, papers in this field derive conditions under which litigants will prefer to settle instead of going to trial. A typical question is whether a settlement gap exists or not. If one exists, it is assumed that litigants will settle out of court and thereby improve their joint welfare (Shavell 1982; Hause 1989). While not stated explicitly, the welfare measure employed in this stream is just the sum of (expected) utilities. However, any ex ante analysis of expected utilities may lead to incorrect conclusions about welfare effects whenever beliefs are biased. This is true since with consistent beliefs of litigants no trial would ever take place and settlement would be the only observable resolution mechanism. If based on inconsistent beliefs, a trial takes place nonetheless, and the litigants ex post will always be in a worse situation than what would have been attainable via settlement. Since they go to trial, their ex ante estimated welfare must be higher than via settlement, while they actually could and should know that their joint ex post welfare will be below the settlement's welfare state. This raises the question of whether a policy-maker should ever provide mechanisms which improve ex ante expected welfare knowingly based on inconsistent beliefs or only mechanisms that improve welfare ex post.

In what follows we will discuss two alternative welfare measures. Both measures are utilitarian in nature, namely, the sum of equally weighted (expected) utilities of the litigants. We start by analyzing the welfare of the parties involved based on their expected utilities ex ante. Since their beliefs may be biased, the welfare measure itself may also be biased. The second approach is to measure welfare ex post. Since only utilities actually realized are considered, litigants' beliefs will play no more role.

3.1 Ex Ante Welfare

Let $q(1-q)$ be the unbiased winning probability of the plaintiff (defendant). Let $\varepsilon_1(\varepsilon_2)$ be the estimation error of the plaintiff (defendant). So the estimated winning probability of the plaintiff (defendant) is $p_1 = q + \varepsilon_1(p_2 = 1 - q + \varepsilon_2)$. The ex ante welfare measure, that is the sum of expected utilities, is thus given by:

$$W = (1 + \varepsilon_1 + \varepsilon_2)(G + kc - (1-h)c)^a + (1 - \varepsilon_1 - \varepsilon_2)(kc - hc)^a \tag{3}$$

were these estimation errors known, the welfare measure W could be maximized with respect to the cost allocation rule. For example, assume that $\varepsilon_1 + \varepsilon_2 = 1$, implying that both contestants feel sure they will win. In this case W simply becomes:

$$W = 2(G + kc - (1-h)c)^a \tag{4}$$

The derivative of W with respect to h would be strictly positive, so the boundary value $h = 1$ would be optimal. This also makes sense at an intuitive level: If both feel certain to win, both would unanimously prefer a fee shifting rule that requires the loser to pay all costs. If, on the other hand, $\varepsilon_1 + \varepsilon_2 = -1$, that is, both parties are sure to lose, then h = 0 would be optimal. Since W is continuous in h, somewhere between $\varepsilon_1 + \varepsilon_2 = -1$ and $\varepsilon_1 + \varepsilon_2 = 1$, other values of h would be optimal. In Sects. 4 and 5 we will see that there are combinations of beliefs that would make both parties choose the same cost allocation rule. If both prefer the same rule, then ex ante welfare W would be maximized by agreement on the respective rule. However, this welfare measure seems rather problematic. Since litigants' beliefs may be biased, this welfare measure itself may be biased as well. When for example both parties agree on the ER, which happens only if the combined estimation errors are rather large, ex post they will find themselves in a situation that is collectively worse than what was expected. For that reason it is hard to argue that a policy-maker should offer opting-out provisions based on a presumably biased ex ante welfare measure.

3.2 Ex post welfare

As an alternative to ex ante welfare, we will now explore the implications of measuring welfare ex post. Ex post, obviously one party will have won and the other party will have lost. The winner's utility would be $(G + kc - (1 - h)c)^a$, while the loser's utility would be $(kc - hc)^a$. So the ex post welfare, that is, the sum of utilities, will be:

$$V = (G + kc - (1 - h)c)^a + (kc - hc)^a \tag{5}$$

Maximizing V with respect to h yields h = 0, namely the WR.[14] This result is also intuitive: By choosing the WR, litigants partially insure each other against the worst possible outcome of losing the trial. This is optimal, since both parties are assumed to be risk averse. For risk averse parties, ex post welfare V is strictly decreasing in h over its feasible domain. This implies that the ER h = 1 is the worst rule from an ex post welfare point of view, followed by the AR h = 0.5, while the WR h = 0 is always best. It is only if both parties are risk neutral that the cost allocation rule is irrelevant to ex post welfare. Since—if both parties are risk neutral—the sum of ex post realized utilities would become $(G + kc - (1 - h)c) + (kc - hc) = G + 2\,kc - c)$ and the cost allocation variable h drops out of the welfare measure.

The policy implications of these results are straightforward: If ER is to be the default rule, giving parties the right to opt out for the AR or the WR can only improve ex post welfare. If AR is the default rule, an opportunity to opt out for the WR has the same effect, while an opt-out provision to the ER would be ex post inefficient. What is more, the positive welfare effects of an opt-out provision from the ER to AR or WR do not depend on the litigants' beliefs. Even if litigants vote for AR or WR based on biased beliefs, their ex post welfare will nonetheless improve. Thus, offering opt-out provisions can be justified on the ground that it enables welfare gains. In what follows, when we refer to welfare, we refer to ex post welfare V unless otherwise stated.

14 The complete Lagrangian solution is referred to Appendix 1.

4 Individually optimal cost allocation rules

In the preceding section we established that only cost allocation rules that lower the cost bearing of the loser as compared to the default rule improve welfare. We will now explore the conditions under which litigants would collectively vote for such a rule shift. We start by analyzing the optimization calculus of the plaintiff. We treat his beliefs as given, even though these beliefs may be biased. If we now assume that the plaintiff could freely choose the legal cost allocation, then he would select an allocation rule h that maximizes his expected utility for given parameter values G, c, a, k and p.

The first order condition[15] with respect to allocation variable h is:

$$\frac{dU}{dh} = ac(p(G - c + hc + kc)^{a-1} + (p - 1)(kc - hc))^{a-1} = 0. \tag{6}$$

Simple algebra yields an optimum value of[16]

$$h^* = \frac{(1-p)^{\frac{1}{a-1}}kc - p^{\frac{1}{a-1}}(G - c + kc)}{\left(p^{\frac{1}{a-1}}c + (1-p)^{\frac{1}{a-1}}c\right)}. \tag{7}$$

Given our model assumptions, we can now draw conclusions about the behavior of the utility-maximizing allocation variable h over the interval $0 \leq h \leq 1$. Feeding in the optimum value of h, we get:

$$0 \leq \frac{(1-p)^{\frac{1}{a-1}}kc - p^{\frac{1}{a-1}}(G - c + kc)}{\left(p^{\frac{1}{a-1}}c + (1-p)^{\frac{1}{a-1}}c\right)} \leq 1. \tag{8}$$

The lower limit can be solved for p, giving

$$p \geq \frac{(kc)^{a-1}}{(G - c + kc)^{a-1} + (kc)^{a-1}} \equiv Y. \tag{9}$$

Accordingly, solving for the upper limit for p yields

$$p \leq \frac{(kc - c)^{a-1}}{(G + kc)^{a-1} + (kc - c)^{a-1}} \equiv Z. \tag{10}$$

Since by assumption we have $G > c > 0$ and $k > 1$, it follows that the critical beliefs p at the borders of the domain must always be positive, but smaller than 1, independently of variables G and c.[17]

Therefore, before a particular subjective minimum probability of success is exceeded, the plaintiff's expected utility, subject to the constraint $0 \leq h \leq 1$, is maximized by allocation rule $h = 0$. Complete cost-bearing by the prevailing party

[15] The complete Lagrangian solution is referred to Appendix 2.

[16] The sufficient condition for a maximum is met as well. For a proof see Appendix 3.

[17] The probability at the upper limit is in any case higher than the probability at the lower limit, as the comparison of the two beliefs $\frac{(kc)^{a-1}}{(G-c+kc)^{a-1}+(kc)^{a-1}} < \frac{(kc-c)^{a-1}}{(G+kc)^{a-1}+(kc-c)^{a-1}}$ reduces to $G + c(2k - 1) > 0$.

is optimal for the plaintiff if, and only if, his belief lies in the interval $0 \leq p \leq Y$. On the other hand, when exploring the upper limit, the complete coverage of the trial costs by the defeated party, that is $h = 1$, optimizes expected utility of the decision-maker already at beliefs below 100%. So $h = 1$ represents a restricted optimum for all beliefs above the upper limit Z.

Finally, the behavior of the utility-maximizing allocation variable h for subjective probability beliefs of success in the domain $Y < p < Z$ must also be examined. In order to do so, we reinterpret h as a function of belief p and get

$$h(p) = \frac{(1-p)^{\frac{1}{a-1}}kc - p^{\frac{1}{a-1}}(G - c + kc)}{\left(p^{\frac{1}{a-1}}c + (1-p)^{\frac{1}{a-1}}c\right)}. \tag{11}$$

The derivative of h with respect to p is:

$$\frac{dh(p)}{dp} = \frac{(1-p)^{\frac{1}{a-1}}(G + c(2k-1))}{cp^{\frac{1}{a-1}(a-2)}\left((1-p)^{\frac{1}{a-1}} + p^{\frac{1}{a-1}}\right)^2(a-1)(p-1)} \tag{12}$$

This derivative is always positive, i.e. $\frac{dh(p)}{dp} > 0$ for $Y < p < Z$.[18]

Therefore, the optimal allocation rule h in this interval is strictly increasing in belief p of the decision maker. With this result the litigant's optimal decision is completely determined. Depending on belief p, the following three domains emerge[19]:

1. $h = 0$ for $0 \leq p \leq Y$
2. $h = \frac{(1-p)^{\frac{1}{a-1}}kc - p^{\frac{1}{a-1}}(G-c+kc)}{\left(p^{\frac{1}{a-1}}c+(1-p)^{\frac{1}{a-1}}c\right)}$ for $Y < p < Z$
3. $h = 1$ for $Z \leq p \leq 1$

To complete this section, the previous results shall be illustrated by a simple numerical example. We explore the situation of a riskaverse plaintiff ($a = 0.5$), whose case has to be resolved by trial. The value of the claim is $G = \$50,000$. Total trial costs are assumed to be $c = \$15,000$. We further assume that $k = 2$. The initial wealth of the plaintiff is then $2c = \$30,000$. The resulting h(p) function is depicted in Fig. 1.

The figure shows the relationship between the subjective probability of success and the value of the utility-maximizing allocation variable h. It becomes apparent that a plaintiff with rather pessimistic beliefs would prefer a fee shifting rule that exempts the defeated party from any cost bearing. Thus, $h = 0$ is ideal for all $p \in [0; 0.5955]$.

If the plaintiff's belief exceeds $p = 0.5955$, he would prefer a participation of the defeated party in the cost absorption, that is $h > 0$.What is more, h(p) is strictly increasing over the second domain. Finally, if the subjective probability of success lies in the interval $0.69783 \leq p \leq 1$, then the restricted optimum will be $h = 1$.

[18] For the proof see Appendix 4.

[19] As the plaintiff becomes more risk averse, i.e. parameter a declines, the optimality interval of WR widens, while that of ER narrows. See Appendix 5 for the proof.

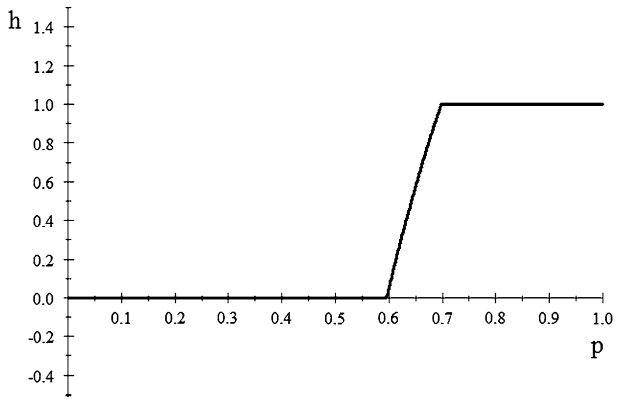

Fig. 1 Utility-maximizing values of h

5 Discrete cost allocation rules

The previous analysis demonstrates that the individually optimal fee shifting rule changes as belief changes. It follows that a single predetermined fee shifting rule cannot be individually optimal for all possible beliefs. In fact, in the general case of a continuous allocation variable, the derivative of the cost allocation variable h with respect to belief p is non-negative and is strictly positive over some interval. This raises the follow-up question of whether an incorporation of litigants' fee shifting preferences into the particular cost allocation arrangement could indeed improve welfare of the parties involved in a legal dispute. From Sect. 3 we know that only rule shifts that limit the liability of the loser improve welfare. However, when offered an infinite set of possible rules, agreement between both parties is rather unlikely. As will be discussed in detail below, it follows that the number of alternatives offered should be limited. For the remainder of this paper we therefore assume that the number of possible alternatives is restricted. In particular, we now limit our analysis to three discrete allocation rules, namely $h = 1$, $h = 0.5$, and $h = 0$. While $h = 1$ approximates the ER, $h = 0.5$ corresponds closely to the AR.[20] As far as we know, the "winner-pays-all" rule $h = 0$, is applied nowhere. Still, even the WR could be preferred by both parties, given that a suit takes place anyway.

In the following Sect. 5.1 we consider the case of individual utility maximization when the parties have to choose between these three discrete fee shifting rules. Based on these results, in Sects. 5.2 and 5.3 we will discuss in detail, when and in which form improvements can be achieved in the legal praxis, should litigants be offered the right to choose between different fee shifting rules.

[20] Therefore, it is implied that attorney fees on both sides are the same. However, this simplification has no qualitative impact on results.

5.1 Individual optimization with discrete allocation rules

To analyze individual optimization with discrete allocation rules, we employ our numerical example from Sect. 4, that is a = 0.5, G = \$50,000, c = \$15,000 and k = 2. These assumptions lead to the following expected utilities:

$$U_{WR} = p(65,000)^{0.5} + (1-p)(30,000)^{0.5} \quad (13)$$

$$U_{AR} = p(72,500)^{0.5} + (1-p)(22,500)^{0.5} \quad (14)$$

$$U_{ER} = p(80,000)^{0.5} + (1-p)(15,000)^{0.5} \quad (15)$$

Similar to the general case of a continuous allocation variable h we now explore the circumstances under which each of the three allocation rules dominates. As the actual decision variable h now assumes discrete values only, simple comparative statics can be applied. A given allocation rule is comparatively best from a litigant's viewpoint only if it leads to a higher expected utility level as compared to its two alternatives. From Sect. 4 we already know that for beliefs p between 0 and a certain limiting probability Y, h = 0 will be optimal. As this was proven in the general case, the finding must also hold for discrete allocation rules. Consequently, WR is comparatively the most advantageous one for pessimistic beliefs starting at $p = 0$. The border of WR's advantageousness interval is located at the point where the expected utility function under WR, U_{WR}, intersects with one of the two other functions U_{AR} or U_{ER}. This intersection marks the probability, from which the perceived superiority of WR will be replaced by one of the other cost allocation alternatives.[21]

Function U_{WR}, which measures expected utility under WR, firstly intersects with U_{AR}, at a belief of $p = 61.86\%$. The intersection of U_{WR} and U_{ER}, the expected utility function under the ER, is located at a probability of approx. 64.52%. Consequently, WR is, relatively speaking, the best alternative up to a belief of $p = 61.86\%$, before -from the plaintiff's point of view- AR represents the better allocation rule. The intersection of U_{WR} and U_{ER} determines that belief, at which ER would begin to dominate WR. However, this intersection is irrelevant, as at this point U_{AR} already lies above U_{WR}. Switching from WR to ER at $p = 64.52\%$ would therefore obviously generate a sub-optimal solution. The remaining question is at what point ER starts to dominate AR. Since expected utilities are linear in p, U_{AR} will never be below U_{WR} in the interval right

[21] An increase in the expected utility at the transition from WR to one of the other alternatives will of course only occur, if the functions increase in p strictly monotonously and have different slopes. This can easily be proven when looking at the first derivatives of the expected utility functions with respect to belief p:

$\frac{dU_{WR}}{dp} = 81.746$

$\frac{dU_{AR}}{dp} = 119.26$

$\frac{dU_{ER}}{dp} = 160.37$

An increase of the subjective probability of success will in any case positively impact expected utility, so gradients of the expected utility functions are always positive and different. As previously mentioned, the general analyses of the ideal cost allocation for a continuous domain of variable h have shown that the optimum at the beginning of the probability interval is determined by $h^* = 0$. Consequently based on the slope of the expected utility functions, the utility occurring for probability on the right side of the two intersections between function U_{WR} with U_{AR} and U_{ER}, must be on a higher level. The corresponding is true for the second relevant intersection between U_{AR} and U_{ER}.

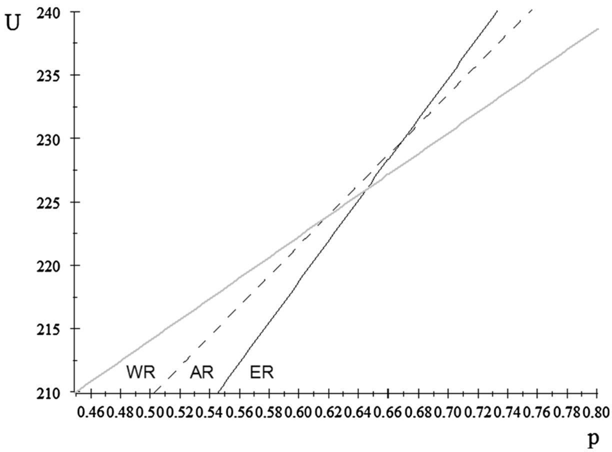

Fig. 2 Expected utility of the fee shifting rules

of $p = 61.86\%$. This means that if AR yields higher expected utility than WR at a given belief, this qualitative relation will also hold for any higher belief. Consequently, the upper limit of the advantageousness interval of AR is implicitly defined by the intersection of U_{ER} and U_{AR}. The corresponding belief is $p = 66.96\%$. Starting from this belief upwards, ER leads to the highest expected utility for the plaintiff. Since, no other cost allocation rules are available by assumption, ER will remain the optimal solution for the remainder of the domain of p. Figure 2 illustrates these results.

The overall picture is that more optimistic beliefs make higher cost bearing of the defeated party more attractive.

5.2 Private rule shifting

The welfare analysis of Sect. 3 has shown that WR always maximizes ex post welfare. Even AR is superior to ER from an ex post welfare point of view. This conclusion raises the question of how, and under what, circumstances such an improvement can be attained.

The first possible method would be private bargaining over the applicable fee shifting rule. Litigants should have strong incentives to agree on a preferred cost allocation rule. If such private agreements could be made without obstacles, then the default regime would be virtually irrelevant. This conclusion is the main proposition of the Coase theorem in its general form. Donohue (1991a, b) points out that the application of the Coase theorem to the standard litigation model must lead to the conclusion that the default rule is irrelevant for the actually implemented rule. If litigation parties believe that an alternative rule would improve their welfare, then they should be expected to select it.[22]

[22] In the case that a regime change is not Pareto- but only Kaldor-Hicks-efficient from an ex ante point of view, hence increasing the overall expected utility of both parties, but possibly positioning one side worse (in comparison to the status quo), then acceptance of a rule change must additionally be bought via side payments, see Donohue (1991a, p. 1106, 1109 f.).

As far as we know, no empirical evidence exists for such privately negotiated rule shifts. However, we cannot assume that a rule change would never result in efficiency gains. In fact, as Sect. 3 has demonstrated, a rule shift to a rule which lowers the cost burden of the loser always improves welfare. However, if potential welfare improvements are acknowledged, the question of which (obviously insurmountable) obstacles prevent private solutions is raised.

According to Coase, the main hindrance to private negotiations is positive transaction costs. However, according to Donohue (1991a, p. 1109 ff.) it is not reasonable to assume that transaction costs associated with a private rule change would be that prohibitive. As dispute resolution via settlement is common practice, the expected increase in cost due to the negotiation of an alternative cost allocation regime should not be that high. Of course, transaction costs could be an obstacle, and may often make agreeing on a basically superior cost rule impossible, but they should certainly not prevent all rule shifting.[23]

Donohue then points out the degree of complexity as an alternative explanation. As he puts it (Donohue 1991a, p. 1119):

"Maximizing wealth is difficult enough when one is able to hold constant all but a few variables; it verges on impossible when must also select, through contract, the optimal levels of all conceivable variables."

This argument clearly has its merits. The marginal analysis in Sect. 4 has shown that, theoretically, any of an infinite number of different cost allocation rules could eventually be optimal. Therefore, a private agreement on one out of an infinite number of alternatives seems unlikely.

Last but not least, strategic considerations of the participants could prevent them from signaling a preference for a specific cost allocation rule. For example, suggesting WR indicates low confidence in success. These strategic implications may make private solutions even more difficult.[24]

For this reason, the overall feasibility of private rule shifting should be considered more critically. However, the lack of empirical evidence for private contractual solutions deviating from the statutory framework rule should not be interpreted as an indication of basically missing private interests in rule changes. But since private agreements are not observed—for whatever reasons—a rule shifting right could be legally institutionalized. When applied correctly, strategic behavior as well as potential problems due to high transaction costs could be neutralized. Naturally, implementing an opportunity to replace the default rule raises a list of design questions. In the next section, we make a first attempt to address these questions.

5.3 Institutionalized rule shifting

The basic principle of the opting-out opportunity envisioned here is to suspend an existing default rule if, and only if, parties unanimously agree to replace the default

[23] Even if an agreement assumes side payments, see fn 22, that cause an additional increase in transaction costs, it is unlikely that the costs involved negate all possibilities of private settlement, see Donohue (1991a, p. 1109 f.).

[24] If only ER and AR are considered as possible alternatives, the strategic factors are far less serious, see Donohue (1991a, p. 1113 f.).

rule by an alternative rule. For example, if the default regime is rule A, and the parties in a specific case would both prefer rule B, then the consensus requirement is met and rule B applies. By contrast, if the parties prefer different alternatives, for example the plaintiff prefers rule B while the defendant prefers C, then default rule A would still apply.

However, the actual design of an opting-out provision[25] initially prompts two central questions: Above all it must be clarified, which alternative or alternatives to the default rule should be offered. The second question is which rule should be chosen as the default rule. In the following we restrict ourselves to the first question.

5.3.1 Design of an institutionalized opting-out provision

One possible design of an institutionalized opting-out opportunity will now be illustrated, employing a particular regime of choice. For the following analyses we assume that ER is the default rule. We treat WR and AR as potential alternatives. While WR is never a sensible default rule, this does not imply that parties should not be allowed to choose WR, given that a trial takes place anyway. Since WR would be applied only if parties agree on this rule, a plaintiff bringing an obviously unmeritorious claim cannot assume that the ex post fee shifting would really be based on WR. Offering an optional WR rule, in conjunction with the requirement of an agreement, will thus not necessarily trigger frivolous lawsuits. On the other hand, offering the WR alternative can in some situations constitute an attractive option for both sides. For example, if both sides equally have doubts about the merits of their arguments, the application of WR could be preferred by all involved. This could be the case in litigation within an unclear legal framework or litigation in new areas lacking precedents. Both plaintiff and defendant may concede a justified interest in legal prosecution or dismissal. However, especially under risk allocation aspects it is questionable whether the risk of having to cover part of the costs, or in the case of ER the entire costs, in addition to the lost litigation, is always the economically desired solution. However, if offered the opportunity to switch to WR, parties could shift financial risk to the winner who is likely to be better equipped to bear it.

When AR, ER and WR are offered as potential cost allocation regimes, ER is the default rule, and opting out requires agreement, the applicable cost regime as given in Table 1 will result.

In Table 1, "Δ" indicates a rule shift away from the default rule, while "=" indicates that the default rule stays in effect. In the case of ER as default rule, a rule shift therefore only takes place if both parties agree on AR or WR.

As stated above one hindrance to an agreement on a rule shift could be strategic considerations. As any vote allows inferences about subjective beliefs, voting certainly has an impact on decision making and trial strategy. Signaling one's own preference by voting could therefore have strategic implications.[26] However, these

[25] Such provisions have already been discussed in Japan, see Wilson (2005, p. 1467 f.). However, the Japanese "fee shifting by agreement" provision was in the end never put into practice, see Kakiuchi (2007, p. 116).

[26] See in the context of above mentioned "fee shifting by agreement" Wilson (2005, p. 1477).

Table 1 Possible opting-out choices and results

Plaintiff	Defendant	Result	Effect
American rule	American rule	American rule	Δ
American rule	English rule	English rule	=
American rule	Winner rule	English rule	=
English rule	American rule	English rule	=
English rule	English rule	English rule	=
English rule	Winner rule	English rule	=
Winner rule	American rule	English rule	=
Winner rule	English rule	English rule	=
Winner rule	Winner rule	Winner rule	Δ

implications hinge critically on the design of the voting procedure. A simple procedure could be that parties submit their concealed votes pretrial and the courts then only disclose the applicable allocation rule. Under these conditions, strategic considerations would have a limited impact. For example, if A has a low belief and individually prefers WR but wants to know whether B really has a corresponding high belief, the only way to find out would be to vote for ER. Then, if ER is disclosed as the applicable allocation rule, A knows that B indeed has a high belief. However, verifying this information comes at the price of suing under A's worst allocation rule. The same logic applies to the opposite case, when A prefers ER and votes for WR in order to verify B‘s belief. We therefore ignore strategic implications in the following, and assume that parties would submit the concealed vote that would maximize their expected utilities. The resulting cost allocation rule is revealed immediately before trial.

5.3.2 Welfare implications of an institutionalized opting-out provision

By returning to our numerical example of Sects. 4 and 5.1 we now demonstrate whether, and if so when, a rule shift will occur. Given the numerical example, AR maximizes expected utility of a litigation party for beliefs between 61.86 and 66.96%. A probability of success above 66.96%, makes ER the ex ante best alternative comparatively, while for beliefs below 61.86%, WR would be preferred. Now, the opting-out concept opens the opportunity of welfare gains. These welfare gains will be achieved, if both sides vote for the same alternative rule instead of ER. Figure 3 illustrates areas of mutual interest graphically.

The figure's coordinates are the litigants' beliefs. Due to assumed symmetry, the particular assignment of the participants to the axes is irrelevant. The squares with different shadings represent those belief combinations which would make both sides select the same cost allocation rule. As is clear, ER is ex ante seen as mutually advantageous if both parties' beliefs lie in the interval (66.96; 100%). However, from Sect. 3 we already know that ER is always the worst possible alternative from an ex post welfare point of view. So while ER may be seen as being mutually beneficial ex ante, it will never be ex post. This implies that a policy maker should be careful when offering opting-out provisions. Offering such provisions is not warranted from a welfare point of view if the offered alternative assigns more of the costs to the loser as compared to the default rule. So if AR is the default rule, ER should eventually not be offered as a feasible alternative.

For any of the other belief combinations outside of this area, ER is regarded as suboptimal by at least one side. If ER is the default rule, a rule shift to AR or WR occurs if both parties have respectively lower beliefs. These beliefs may still be biased, but the resulting rule shift will always improve welfare ex post.

For all other belief combinations, granting a right of choice will not change the initial welfare level under ER. In the case of a non-agreement, represented by white areas in Fig. 3, the utility levels of plaintiff and defendant will be the same in comparison to a regime where opting out is impossible.

5.3.3 Further considerations

Some clarifying remarks regarding the previous results are still in order. Firstly, it could be argued that in the case of low beliefs a settlement should occur anyway. This would render opting-out provisions meaningless. Assume that ER is the default rule and that AR and WR are offered as alternatives: If the affected participants would prefer settlement over trial under ER, then the AR and WR options would of course be unnecessary. Neither the AR nor the WR option would ever be selected, as settlement would be the utility-maximizing alternative. However, this conjecture is not warranted.

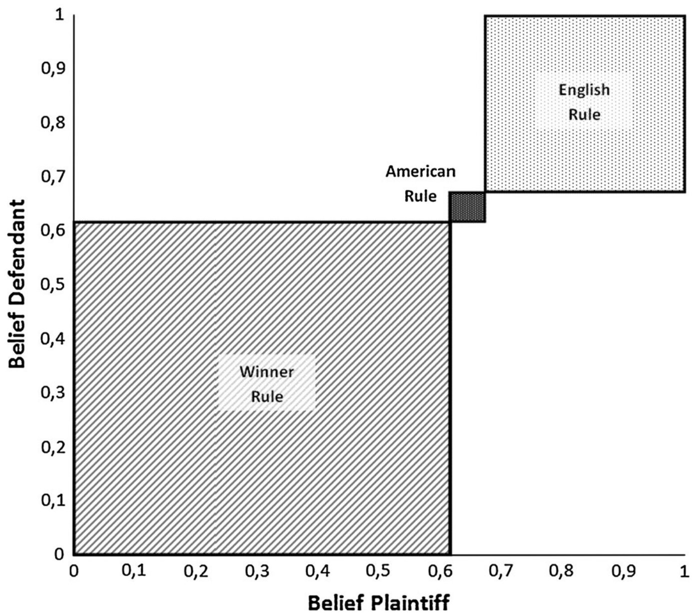

Fig. 3 Optimal ranges of the fee shifting rules

Firstly, there are situations in which WR is better than ER, and still no positive settlement gap exists. Let us assume that total costs c = 6,600, a figure which would result from the Court Fee Act and the Attorney Remuneration Act of Germany for a claim valued at 50,000.[27] If it is assumed that both parties have a belief of about $p = 0.69$ then both parties would prefer WR. In this case the minimum settlement demand of the plaintiff and the maximum offer of the defendant would be 26,262 and 23,738, respectively.[28] Accordingly, no positive settlement gap occurs. Consequently in this scenario, a rule shift from ER to WR strictly improves welfare and is not irrelevant. It follows that WR cannot simply be dismissed on the premise that it would always be irrelevant. This is only one example from German practice. Additional calculations not presented here demonstrate that there are the more scenarios in which WR dominates ER and still no positive settlement gap arises, (1) the more risk averse and, (2) the more impecunious the litigants are, and (3) the smaller the litigation costs relative to the value of the claim are. These effects on the settlement gap are further strengthened if AR is considered to be the opt-out alternative for ER. This is true, since settlement gaps narrow even further for combinations of beliefs that make AR the mutually preferred rule over WR.

Secondly, the mere opportunity of a mutually advantageous settlement does not necessarily mean that it will actually be agreed upon. The existence of a positive settlement gap is admittedly a necessary—but by no means sufficient—condition for a settlement. While it is obvious that a settlement will under some circumstances generate a rent of cooperation, the distribution of that rent may trigger insurmountable conflicts (Mnookin 1993, p. 239 f.; Cooter et al. 1982, p. 228; Cooter 1982, p. 17). For that reason, in some cases the opponents will not agree, and the case will end up in court (Bundy 1989, p. 339).

What is more, the standard litigation model does not cover possible utility effects which directly derive from a court verdict. A verdict may be seen as more than just a financial distribution rule.[29] A verdict may carry some consumption value in its own. Being heard by a judge may be seen as an integral part of procedural justice. In that case, settlements would lose their relative attractiveness in comparison to court decisions.

In summary, the AR as well as the WR option should definitely be considered as possible alternatives to the ER default rule, and WR should be offered as an alternative to the AR default rule.

6 Summary and outlook

In contrast to other contemporary law and economics literature, this paper does not discuss the effects of different given fee shifting rules on the incentives of litigants.

[27] See § 13 Sect. 1 Attorney Remuneration Act (RVG); § 11 Sect. 2 Court Fees Act (GKG).

[28] Refer to Appendix 6 for the derivation of these figures.

[29] See Bundy (1989, p. 338); Hay and Spier (1997, p. 3). Admittedly, this assumption is in contrast to the current assessment that litigation parties conceive litigation as in itself extremely negative, and that they do not wish to extend this painful experience by a lengthy trial, see Korobkin and Guthrie (1994, p. 147).

Instead, we firstly ask which rule would maximize litigants' welfare and which rule would be chosen by the litigants themselves. Until now, the latter has not been addressed by literature. We have demonstrated that rule shifts bring about welfare gains if, and only if, the cost burden of the loser after the shift is lower as compared to the default rule. We then demonstrated under which conditions litigants would agree on such a rule shift. Naturally, the optimal rule of an individual case depends on the subjective assessment of success. In the case of rather pessimistic beliefs, the individually optimal cost allocation rule would be WR while for optimistic beliefs ER becomes optimal. In the general case of a continuous allocation variable, the derivative of the cost allocation variable h with respect to belief p is non-negative and is strictly positive over the relevant interval. Although litigants have basically opposing interests, we have shown that combinations of beliefs may exist under which they would agree on a rule shift, thereby improving their welfare.

We then discussed how an opting-out provision could be designed. The opting-out provision we suggest requires an agreement between litigants on which alternative to choose. However, when offered an infinite set of possible rules, agreement is rather unlikely. Therefore, the number of offered alternatives should be limited. While limiting the number of possible alternatives may come with the cost of potential welfare losses, limitation improves the chances of agreement. The latter effect can be assumed to dominate. One impediment to an agreement may still be considerations of strategic behavior. Opponents might not wish to reveal information through voting for a particular rule, since any vote would carry information about beliefs. Still, as long as it is assumed that a trial will take place anyway, we believe that strategic considerations are less important and can be solved by the design of the opting-out rule. Other possible problems are transaction costs or psychological barriers. No empirical evidence exists to suggest that private agreements on rule shifting have ever been made. The institutionalization of an opting-out rule might therefore be more rewarding. Prior to trial, the parties would have to deliver their concealed votes for one of the available fee shifting rules to the court. As only the court, but not the opposing side, would know about the individual decisions, the risk of strategic exploitation of information should be neutralized. If both sides vote for the same rule, this rule will be applied. If there is no consensus, the default rule will apply.

This paper is a first step only. We feel that it would be worthwhile to incorporate an analysis of the potential welfare effects of side payments. The design discussed so far does not include the opportunity of side payments. However, if for instance the plaintiff strongly preferred WR and the defendant preferred AR—but is almost indifferent between AR and WR—a small side payment from the plaintiff to the defendant could make both sides better off, since now an agreement on WR would be attained. Another potential welfare gain could eventually be identified if litigation costs are not given exogenously. Since WR narrows the wealth difference between winning and losing, the investment incentives after a shift from ER to WR would, for example, be reduced. In that case, litigants would not only benefit from an improved risk allocation of the WR, but they would also benefit from spending less on their case.

However, there may also be severe disadvantages. While we ignore the effects of an opting-out provision on the decision to file a suit, knowing that such a provision exists may have an impact on this decision. It may turn out that less meritorious claims would be filed under the provision, as compared to a regime which offers no choice. The effects on the settlement versus litigation decision are also of interest. Without these refinements to the model it is not possible to evaluate the overall economic effects of an opting-out provision. The clarification of these questions is a subject for future research.

Appendix 1

The ex post welfare of the parties V, which is equivalent to the sum of ex ante expected utilities under consistent beliefs, is given by:

$$V = (G + kc - (1 - h)c)^a + (kc - hc)^a \tag{16}$$

In the following we demonstrate which h maximizes V under constraint $0 \leq h \leq 1$.

The Lagrangian L is:

$$L = (G + kc - (1 - h)c)^a + (kc - hc)^a - \lambda(h - 1) - u(-h) \tag{17}$$

The Kuhn-Tucker conditions are:

$$\frac{dL}{dh} = u - \lambda - ac(kc - hc)^{a-1} + ac(G - c + hc + kc)^{a-1} = 0 \tag{18}$$

$$\lambda \geq 0(= 0, \quad if \quad h < 1) \tag{19}$$

$$u \geq 0(= 0, \quad if \quad h > 0) \tag{20}$$

From (18) it follows that $-ac(kc - hc)^{a-1} + ac(G - c + hc + kc)^{a-1} - \lambda = -u$.

From (20) it follows that $-u \leq 0$ and $-u = 0$, if $h > 0$.

Therefore (18) and (20) together are equivalent to

$$-ac(kc - hc)^{a-1} + ac(G - c + hc + kc)^{a-1} - \lambda \leq 0(= 0, \quad if \quad h > 0). \tag{21}$$

Hence, (21) and (19) define the new Kuhn-Tucker conditions.

Now, the following cases (A)–(C) must be differentiated.

(A) Assume $h > 0$.

Then (21) implies that

$$-ac(kc - hc)^{a-1} + ac(G - c + hc + kc)^{a-1} - \lambda = 0. \tag{22}$$

If additionally $h < 1$ then because of (19) $\lambda = 0$ and because of (21), it follows

$$-ac(kc - hc)^{a-1} + ac(G - c + hc + kc)^{a-1} = 0.$$

Rewriting yields

$$(G - c + hc + kc)^{a-1} = (kc - hc)^{a-1}$$

and

$$\frac{G - c}{-2c} = h. \tag{23}$$

This is obviously negative, which means that within the interval h ∈ (0; 1) no feasible solution exists.

(B) Furthermore, if restriction (19) is binding, $\lambda \geq 0$ has to be met and at the same time –u = 0 must apply.

In this case h equals 1 and the corresponding Lagrange multiplier assumes a value of

$$\lambda = -ac(kc - c)^{a-1} + ac(G + kc)^{a-1}. \tag{24}$$

But since

$$G > -c$$
$$(G + kc) > (kc - c)$$
$$ac(G + kc)^{a-1} < ac(kc - c)^{a-1},$$

it follows that $\lambda < 0$. So, h = 1 does not provide a valid solution to the Langrangian maximization problem.

(C) Finally, $-u \leq 0$ and $\lambda = 0$ is required, if h = 0. Then (21) equals

$$-ac(kc)^{a-1} + ac(G - c + kc)^{a-1} \leq 0. \tag{25}$$

Since

$$G > c$$
$$G - c + kc > kc$$
$$ac(G - c + kc)^{a-1} < ac(kc)^{a-1}$$

inequality (25) holds and h = 0 is a feasible solution.

Taken together, cases (A)–(C) indicate that h = 0 constitutes the unique solution of the Langrangian L. Furthermore it is easily shown that the combined ex post utility of the parties will be maximized and not minimized for h = 0.

The second derivative of V with respect to h reads:

$$\frac{d^2V}{dh^2} = ac^2((G - c + hc + kc)^{a-2} + (kc - hc)^{a-2})(a - 1) \tag{26}$$

with h = 0 we have $\frac{d^2V}{dh^2}|_{h=0} = ac^2((G - c + kc)^{a-2} + (kc)^{a-2})(a - 1)$ which is strictly negative, since (a − 1) < 0. So, the sufficient condition for a maximum is also met.

Appendix 2

The litigant must choose allocation variable h in such a way that his expected utility

$$U = p(G + kc - (1 - h)c)^a + (1 - p)(kc - hc)^a \tag{2}$$

will be maximized under constraint $0 \leq h \leq 1$.

The Lagrangian function L with constraints $0 \leq p \leq 1$ is:

$$L = p(G + kc - (1 - h)c)^a + (1 - p)(kc - hc)^a - \lambda(h - 1) - u(-h) \tag{27}$$

The Kuhn-Tucker conditions are:

$$\frac{dL}{dh} = u - \lambda - ac(kc - hc)^{a-1} + acp(kc - hc)^{a-1} + acp(G - c + hc + kc)^{a-1} = 0 \tag{28}$$

$$\lambda \geq 0(= 0, \quad if \quad h < 1) \tag{29}$$

$$u \geq 0(= 0, \quad if \quad h > 0) \tag{30}$$

From (28) it follows that $-ac(kc - hc)^{a-1} + acp(kc - hc)^{a-1} + acp(G - c + hc + kc)^{a-1} - \lambda = -u$. From (30) it follows that $-u \leq 0$ and $-u = 0$, if $h > 0$.

Therefore (28) and (30) are together equivalent to

$$-ac(kc - hc)^{a-1} + acp(kc - hc)^{a-1} + acp(G - c + hc + kc)^{a-1} - \lambda \leq 0(= 0, \ if \ h > 0). \tag{31}$$

Hence, (31) and (29) define the new Kuhn-Tucker conditions.

Now, the following cases (A)–(C) must be differentiated.

(A) Assume $h > 0$.

Then (31) implies that

$$-ac(kc - hc)^{a-1} + acp(kc - hc)^{a-1} + acp(G - c + hc + kc)^{a-1} - \lambda = 0. \tag{32}$$

If additionally $h < 1$ then because of (29) $\lambda = 0$ and of (31), it follows

$$-ac(kc - hc)^{a-1} + acp(kc - hc)^{a-1} + acp(G - c + hc + kc)^{a-1} = 0. \tag{33}$$

Rewriting yields:

$$-(kc - hc)^{a-1} + p(kc - hc)^{a-1} + p(G - c + hc + kc)^{a-1} = 0$$

$$p^{\frac{1}{a-1}}ch + (1 - p)^{\frac{1}{a-1}}ch = (1 - p)^{\frac{1}{a-1}}kc - p^{\frac{1}{a-1}}(G - c + kc)$$

$$h = \frac{(1 - p)^{\frac{1}{a-1}}kc - p^{\frac{1}{a-1}}(G - c + kc)}{p^{\frac{1}{a-1}}c + (1 - p)^{\frac{1}{a-1}}c}. \tag{34}$$

(B) Furthermore, we have $\lambda \geq 0$, if restriction (29) is binding, where at the same time $-u = 0$ applies. In this case h equals 1 and the corresponding Lagrange multiplier assumes a value of

$$\lambda = -ac(kc - c)^{a-1} + acp(kc - c)^{a-1} + acp(G + kc)^{a-1}, \tag{35}$$

which in the respective probability interval is always greater than or equal to zero.

(C) Finally, $-u \leq 0$ and $\lambda = 0$, if $h = 0$. Then (31) equals

$$-ac(kc)^{a-1} + acp(kc)^{a-1} + acp(G - c + kc)^{a-1} \leq 0, \tag{36}$$

which is always met in the respective probability interval.

The probabilities at the limits of the optimality ranges (A)–(C) finally result from case (A), whose respective derivation can be found in Sect. 4.

Appendix 3

It will be demonstrated that the expected utility of the plaintiff will be maximized and not minimized in the domain $0 < p < 1$, if the allocation of the trial costs will be determined according to

$$h^* = \frac{(1-p)^{\frac{1}{a-1}}kc - p^{\frac{1}{a-1}}(G-c+kc)}{\left(p^{\frac{1}{a-1}}c + (1-p)^{\frac{1}{a-1}}c\right)} \quad (7)$$

where $0 \leq h \leq 1$ applies.

The second derivative of the expected utility function with respect to the allocation variable h reads:

$$\frac{d^2U}{dh^2} = ac^2(a-1)\left(p(G-c+hc+kc)^{a-2} - p(kc-hc)^{a-2} + (kc-hc)^{a-2}\right) \quad (37)$$

If now $h^* = \frac{(1-p)^{\frac{1}{a-1}}kc - p^{\frac{1}{a-1}}(G-c+kc)}{\left(p^{\frac{1}{a-1}}c+(1-p)^{\frac{1}{a-1}}c\right)}$ is inserted into the second order condition, then the following expression emerges:

$$\frac{d^2U}{dh^2} = ac^2(a-1)\left(p\left(G-c+c\frac{(1-p)^{\frac{1}{a-1}}kc - p^{\frac{1}{a-1}}(G-c+kc)}{p^{\frac{1}{a-1}}c+(1-p)^{\frac{1}{a-1}}c} + kc\right)^{a-2} + (1-p)\left(kc - c\frac{(1-p)^{\frac{1}{a-1}}kc - p^{\frac{1}{a-1}}(G-c+kc)}{p^{\frac{1}{a-1}}c+(1-p)^{\frac{1}{a-1}}c}\right)^{a-2}\right)$$

After several transformations, this can be simplified to:

$$\frac{d^2U}{dh^2} = ac^2(a-1) \times \left((1-p)\left(\frac{p^{\frac{1}{a-1}}(G+c(2k-1))}{p^{\frac{1}{a-1}}+(1-p)^{\frac{1}{a-1}}}\right)^{a-2} + p\left(\frac{(1-p)^{\frac{1}{a-1}}(G+c(2k-1))}{p^{\frac{1}{a-1}}+(1-p)^{\frac{1}{a-1}}}\right)^{a-2}\right) < 0 \quad (38)$$

for $0 < p < 1$.

As risk aversion is assumed, exponent a is greater than zero and smaller than 1. Therewith, product $ac^2(a-1)$ is always negative. However, the bracket term $\left((1-p)\left(\frac{p^{\frac{1}{a-1}}(G+c(2k-1))}{p^{\frac{1}{a-1}}+(1-p)^{\frac{1}{a-1}}}\right)^{a-2} + p\left(\frac{(1-p)^{\frac{1}{a-1}}(G+c(2k-1))}{p^{\frac{1}{a-1}}+(1-p)^{\frac{1}{a-1}}}\right)^{a-2}\right)$ is for any belief within the interval $0 < p < 1$ strictly positive. In summary, a negative value of the second order condition will always emerge, so the sufficient condition for a maximum is met.

Appendix 4

We have

$$\frac{dh(p)}{dp} = \frac{(1-p)^{\frac{1}{a-1}}(G+c(2k-1))}{cp^{\frac{1}{a-1}(a-2)}\left((1-p)^{\frac{1}{a-1}}+p^{\frac{1}{a-1}}\right)^2(a-1)(p-1)}. \qquad (12)$$

As already shown, the lower limit $\left(\frac{(kc)^{a-1}}{(G-c+kc)^{a-1}+(kc)^{a-1}}\right)$ and the upper limit $\left(\frac{(kc-c)^{a-1}}{(G+kc)^{a-1}+(kc-c)^{a-1}}\right)$ are positive and smaller than 1. Therefore 0 < p < 1 applies.

Thus it can now easily be shown that

$$\frac{dh(p)}{dp} = \frac{(1-p)^{\frac{1}{a-1}}(G+c(2k-1))}{cp^{\frac{1}{a-1}(a-2)}\left((1-p)^{\frac{1}{a-1}}+p^{\frac{1}{a-1}}\right)^2(a-1)(p-1)} > 0 \quad applies.$$

As per definition we have G + c(2 k − 1) > 0. However, because 0 < p < 1 this is already equivalent to

$$\frac{(1-p)^{\frac{1}{a-1}}(G+c(2k-1))}{cp^{\frac{1}{a-1}(a-2)}\left((1-p)^{\frac{1}{a-1}}+p^{\frac{1}{a-1}}\right)^2} > 0.$$

Based on the risk aversion assumption, 0 < a < 1 applies, hence we have in addition (a − 1)(p − 1) > 0. Therefore:

$$\frac{(1-p)^{\frac{1}{a-1}}(G+c(2k-1))}{cp^{\frac{1}{a-1}(a-2)}\left((1-p)^{\frac{1}{a-1}}+p^{\frac{1}{a-1}}\right)^2(a-1)(p-1)} > 0 \qquad (39)$$

q.e.d.

Appendix 5

The implied risk aversion of the participant corresponds with the assumption 0 < a < 1. An increase in risk aversions is expressed by a decrease of the value of variable a. The probability, up to which WR, hence h = 0, is optimal, is defined by $p = \frac{(kc)^{a-1}}{(G-c+kc)^{a-1}+(kc)^{a-1}}$. If this probability is interpreted as a function of exponent a, and is subsequently differentiated with respect to a, then the following expression emerges:

$$\frac{dp}{da} = \frac{(kc)^{a-1}}{((G-c+kc)^{a-1}+(kc)^{a-1})^2}(G-c+kc)^{a-1}(\ln(kc)-\ln(G-c+kc)) \qquad (40)$$

We have $\frac{(kc)^{a-1}}{((G-c+kc)^{a-1}+(kc)^{a-1})^2}(G-c+kc)^{a-1} > 0$. Moreover, from G > c it follows ln(kc) < ln(G – c + kc) and (ln(kc) < ln(G – c + kc)) < 0. Hence, the derivative is negative. If the risk aversion of the participant increases, hence a decreases, then the optimality interval of WR increases and vice versa.

At the same time, the optimality interval of ER narrows if risk aversion increases. The probability, starting from which ER maximizes expected utility, is given by $p = \frac{(kc-c)^{a-1}}{(G+kc)^{a-1}+(kc-c)^{a-1}}$.

The derivative of this probability with respect to exponent a is:

$$\frac{dp}{da} = -(kc - c)^{a-1}(\ln(G + kc) - \ln(kc - c))\frac{(G + kc)^{a-1}}{((G + kc)^{a-1} + (kc - c)^{a-1})^2} < 0 \quad (41)$$

This derivative is obviously negative. Hence, with increasing degree of risk aversion, the optimality interval of ER narrows.

Appendix 6

Here we assume c = 6,600, a cost figure derived from German fee regulations for a claim valued at G = 50,000. When k = 2, initial wealth of the plaintiff is 2c = 13,200, while initial wealth of the defendant is G + 2c = 63,200. Due to the change in assumed costs, the optimality intervals of WR, AR, and ER, change as well. As demonstrated in 5.1, starting from $p = 0$ WR is the comparatively best allocation rule until starting from a certain boundary probability AR provides the higher expected utility. Consequently, for the following discussion only the intersection between the expected utility function under AR and the function under WR is relevant. Depending on the subjective probability of success p, the following expected utility functions emerge:

$$U_{WR} = 123.02p + 114.89$$
$$U_{AR} = 145.25p + 99.499$$
$$U_{ER} = 170.16p + 81.24$$

The functions U_{WR} and U_{AR} intersect at a probability of approx. 69.235%, which determines the upper limit of the profitability interval of WR. If beliefs are for example $p_i = 0.69$, then the plaintiff's expected utility under ER amounts to $U_p = 198.65$, which due to symmetry is the same for the defendant as well, hence $U_D = 198.65$.

Based on these utility values, the minimum demand of the plaintiff and the maximum offer of the defendant can be determined. To ensure that the plaintiff's situation does not comparatively deteriorate due to a settlement as opposed to trial, the settlement payment S must apply to $(13{,}200 + S)^{0.5} = 198.65$. From this a minimum demand of S = 26,262 is obtained. The indifference condition for the defendant is $(63{,}200 - S)^{0.5} = 198.65$, which results in a maximum offer of S = 23,738.

Hence, the settlement gap is negative. This means that situations exist, in which a shift to WR would actually increase the parties‘ expected utilities beyond what is attainable through settlement.[30]

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[30] This result still holds when AR is the default rule.

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