University of Connecticut

Department of Economics Working Paper Series

Litigation and the Product Rule: A Rent Seeking Approach

by

Jef De Mot
Research Foundation Flanders
University of Ghent

Thomas J. Miceli
University of Connecticut

Working Paper 2015-13
October 2015

365 Fairfield Way, Unit 1063
Storrs, CT 06269-1063
Phone: (860) 486-3022
Fax: (860) 486-4463
http://www.econ.uconn.edu/

LITIGATION AND THE PRODUCT RULE: A RENT SEEKING APPROACH

Jef De Mot
Center for Advanced Studies in Law and Economics
Research Foundation Flanders
University of Ghent
Jef.DeMot@UGent.be

and

Thomas J. Miceli
Department of Economics
University of Connecticut
Storrs, CT 06269
Ph: (860) 486-5810
Fax: (860) 486-4463
Thomas.Miceli@UConn.edu

October 2015

Abstract: This paper examines the suppression of the product rule in litigation from a rent seeking perspective. We show that there are some important arguments in favor of not applying the product rule. First, only when the product rule is suppressed is the plaintiff's equilibrium probability of winning equal to the product of the inherent quality of the several issues at stake. The probability of winning is always lower when the product rule is used, and this is especially so for relatively strong cases. Second, for many of the weakest cases, the expected value of the plaintiff is larger when the product rule is used. Third, for relatively strong cases, the litigation expenditures are typically larger when the product rule is used. This further decreases the plaintiff's expected value for strong cases.

Keywords: product rule, litigation costs, rent seeking
JEL codes: K13, K41

LITIGATION AND THE PRODUCT RULE: A RENT SEEKING APPROACH

1. Introduction

Deciding a legal case often requires combining estimates about two or more elements of interest to law. For example, if the law holds an injurer liable when he or she is negligent and when his or her negligence can be said to have (proximately) caused the injury, a fact finder must evaluate and somehow combine the likelihood of the injurer's negligence and the likelihood of the causal link between his negligent behavior and the injury. The mathematics of the matter tells us that, following what is known as the "product rule" for combining independent probabilistic assessments,[1] the two probabilities need to be multiplied.[2] The injurer should only be held liable if this product of the two probabilities is larger than the hurdle established by the standard of proof (e.g. preponderance of the evidence, or 0.5). However, the law does not seem to abide by this rule. In the example above, most lawyers think that the law calls for liability as soon as *each* element of the plaintiff's case is established by the relevant standard of proof.[3] Imagine for example that the fact finding generates a conclusion that there is an 80 percent chance of negligence and a 60 percent chance of causation. If the product rule is used, the defendant will not be held liable under the preponderance of the evidence standard (i.e., 0.8 x 0.6 = 0.48 < 0.5), whereas if each element is assessed separately, the defendant will be held liable (i.e., 0.8>0.5 and 0.6>0.5).

The suppression of the product rule is a puzzling legal phenomenon which has no easy explanation (Cohen, 1977). For that reason, it has provoked an extensive scholarly debate during the last four decades (see e.g. Kaye, 1979; Levmore, 2001; Stein, 2001; Allen and Stein, 2013; Cheng, 2013; Clermont, 2013). When fact finders are not instructed to multiply the probabilities attached to discrete elements of a lawsuit, the law allows plaintiffs to win cases upon aggregate probabilities

---

[1] In reality, the issues will not always be independent.
[2] See Cohen (1989).
[3] See Stein (2001) at 1204 n.6 (citing case law and pattern jury instructions that suppress the product rule).

that fall well below fifty percent. Consequently –so goes the argument—courts deliver, over the run of cases, more incorrect decisions than correct ones (Kaye, 1979; Schoeman, 1987; Robertson and Vignaux, 1993). Some authors have tried to rationalize the suppression of the product rule. For example, Levmore (2001) relies on Condercet's theorem and Clermont (2013) on fuzzy logic and belief functions as justifications. Others, however, have criticized these justifications (see e.g. Allen en Jehl, 2003).

In this article, we explore the differences in rent seeking behavior of litigants when the product rule is and is not used and show that there are some important arguments in favor of suppressing the product rule. First, when the product rule is suppressed the plaintiff's equilibrium probability of winning is equal to the product of the inherent qualities of the several issues at stake. The probability of winning is always lower when the product rule is used, and this is especially so for relatively strong cases. Second, for many of the weakest cases, the expected value of the plaintiff's case is larger when the product rule is used. Third, for relatively strong cases, the litigation expenditures are typically larger when the product rule is used. This further decreases the plaintiff's expected value for strong cases.

This article unfolds as follows. In the next section, we provide some theoretical background regarding the existence of multiple tests to determine liability. Section 3 then takes a formal approach to both rules (suppression and no suppression of the product rule) and determines the equilibrium litigation expenditures of both parties. Given these results, Section 4 then uses simulations to compare the two rules in terms of the expected judgment, litigation expenditures and the expected value of the parties' cases. Finally, section 5 concludes.

2. Theoretical Background

In the context of accident law, the general question before the court is whether, in the event of an accident, the injurer should be held responsible for the victim's losses. The law has evolved various ways of answering this question. Under a negligence standard, the victim generally has to prove that the injurer was both negligent, and that his or her negligence was proximate cause of the accident. From an economic perspective, however, one can show that either test alone should be sufficient for assigning liability in an efficient manner.

To see why, consider a simple unilateral care model in which x=the cost of injurer care; $p(x)$= the probability of an accident, with $p'<0$ and $p''>0$; and L=the victim's loss from an accident.[4] The cost-minimizing level of injurer care, x^*, therefore solves the equation $1=-p'(x^*)L$. According to the marginal Hand test for negligence, the injurer would be found negligent if, for some actual choice of care, x, the court determines that

$$1 < -p'(x)L, \qquad (1)$$

which will be true if and only if $x<x^*$.[5] As has been shown by standard economics models of accident law, no further inquiry is needed.

But suppose that, for whatever reason, the court adds the additional requirement that the injurer's negligence must also be proximate cause of the victim's harm. One test for proximate cause is to ask whether the injurer could have reasonably foreseen that his or her negligence would result in an accident. In formal terms, this question concerns the functional relationship between injurer care and accident risk as embodied in the probability function $p(x)$. Thus, we might formulate a test along these lines which says that, for any given choice of care by the injurer, he or she is proximate cause of the accident if and only if

$$-p'(x) > T \qquad (2)$$

---

[4] Making the model bilateral care would not qualitatively alter the present argument.
[5] The Hand test is usually stated as $B<PL$. Here, B=1 and $PL=-p'(x)L$.

for some threshold T.[6] This amounts to asking whether, from the injurer's perspective prior to the accident, additional care could have reduced the probability of an accident by "enough" for a reasonable person to have foreseen it.

In applying this test for proximate cause, the question is how the threshold T should be determined. Comparison of (1) and (2) immediately reveals that the tests for negligence and proximate cause are equivalent if we set $T=1/L$. Thus, they are, in principle, redundant in the sense that they should arrive at the same result regarding injurer liability (Miceli, 1996). However, if the court treats them as independent tests, then errors are possible.[7] Suppose, for example, that the court sets $T>1/L$. Then some injurers who are negligent according to the Hand test will be absolved of liability by the proximate cause test. And in the opposite case where $T<1/L$, all negligent injurers will also be judged proximate cause, but so will some injurers who are *not* negligent. However, as long as priority is given to the Hand test (i.e., as long as an injurer must be negligent to be liable), then the outcome will be efficient in this case in the sense that no injurers with $x>x^*$ will be held liable.

The preceding analysis has presumed that the two tests, although redundant, can at least be applied deterministically. In reality, this will not be possible because of legal and evidentiary uncertainty. The fact that the tests will be probabilistic in practice raises the question of how the court should combine them—that is the problem posed in the introduction. The remainder of this paper therefore takes as given the existence of multiple tests and examines the consequences for litigant behavior and judicial outcomes of the particular rule the court adopts for combining the tests.[8]

3. **Model of Litigant Behavior**

[6] See, for example, Shavell (1985).

[7] This will necessarily happen if the same T is set for all cases, given that L will vary.

[8] See Shavell (1980) and Miceli (1996) for some possible reasons why the two tests might be desirable.

We look at a tort case with evidentiary uncertainty and with two independent issues at stake. For each issue, we can use Bayes' rule to compute the conditional probability that the court will consider the plaintiff to be right about that issue, denoted $P_{1,i}$, with i=1 or i=2, as follows:

$$P_{1,i} = \frac{P_{0,i}X_iF_i}{P_{0,i}X_iF_i + \left(1 - P_{0,i}\right)Y_i(1 - F_i)} \tag{3}$$

where

$P_{0,i}$ = court's prior probability that the plaintiff's assertions about issue i are correct, $P_{0,i} \in [0,1]$;

F_i = index of the inherent quality of issue i, normalized so that $F_i \in [0,1]$;

X_i = plaintiff's litigation effort for issue i;

Y_i = defendant's litigation effort for issue i.

In this formulation, $P_{0,i}$ can be interpreted as a measure of the court's "bias" regarding issue i. Specifically, if $P_{0,i}$=½, the court is unbiased, whereas if $P_{0,i}$>(<)½, it can be said to have a pro-plaintiff (pro-defendant) bias. Alternatively, one could interpret $P_{0,i}$ as reflecting noise in the court's assessment of the evidence presented at trial. Under such an interpretation, if $P_{0,i}$ = 1/2, the court attaches equal weight to each party's evidence, whereas if $P_{0,i}$ > (<) 1/2, the court gives more weight to the evidence produced by the plaintiff (defendant). This could, for example, be the case when judges think that on average, evidence produced by the plaintiff (defendant) is more reliable. Finally, X_iF_i can be interpreted as the "evidence against" the defendant, which depends positively on both the factual evidence against him and the plaintiff's litigation effort. Likewise, $Y_i(1–F_i)$ is the "evidence for" the defendant.

As noted in the introduction, the specific question of interest here is how the two rules affect the litigation efforts of the parties—that is, the plaintiff's choice of X_i and the defendant's choice of Y_i. To answer this question, we first need to account for the uncertain outcome of a trial. Specifically, the parties have to form an expectation about their chances of winning under either rule. To do this, we suppose that the source of uncertainty at trial is the court's bias. Thus, we assume that F is common knowledge,[9] but that P_0 is a random variable whose distribution is known by both parties. For simplicity, we will assume that P_0 is uniformly distributed on [0,1].

3.1. Product Rule Not Applied

In the situation in which the product rule is not applied, the plaintiff's objective is to choose X_1 and X_2 to maximize

$$P_{NPR}(X_1,X_2,Y_1,Y_2)J - X_1 - X_2, \tag{4}$$

while the defendant chooses Y_1 *and* Y_2 to minimize

$$P_{NPR}(X_1,X_2,Y_1,Y_2)J + Y_1 + Y_2 \tag{5}$$

where $P_{NPR}(X_1,X_2,Y_1,Y_2)$ is the plaintiff's probability of winning, and J is the amount at stake. The first-order conditions defining the reaction functions for the plaintiff and defendant, respectively, are

$$(P_{NPR})_{Xi} J = 1 \tag{6}$$

$$(P_{NPR})_{Yi} J = -1. \tag{7}$$

Simultaneous solution of these four equations determines the Nash equilibrium levels of effort: $(X_1^*,X_2^*,Y_1^*,Y_2^*)$.

The probability of plaintiff victory in the case where the product rule is not applied, given a preponderance-of-the-evidence standard, is given by

$$P_{NPR}(X_1,X_2,Y_1,Y_2) = \text{prob}\ (P_{1,1} > 1/2) \times \text{prob}\ (P_{1,2} > 1/2)$$

$$= \text{prob}\ \left(P_{0,1} > \frac{Y_1(1-F_1)}{Y_1(1-F_1)+X_1F_1}\right) \times \text{prob}\ \left(P_{0,2} > \frac{Y_2(1-F_2)}{Y_2(1-F_2)+X_2F_2}\right) \tag{8}$$

For a uniform distribution of the court's prior, this becomes

$$P_{NPR}(X_1,X_2Y,Y_2) = \left(1-\frac{Y_1(1-F_1)}{Y_1(1-F_1)+X_1F_1}\right)\left(1-\frac{Y_2(1-F_2)}{Y_2(1-F_2)+X_2F_2}\right) = \frac{X_1F_1}{X_1F_1+Y_1(1-F_1)}\frac{X_2F_2}{X_2F_2+Y_2(1-F_2)} \tag{9}$$

Using this expression in (6) and (7), we obtain the Nash equilibrium effort levels

$$X_1^* = Y_1^* = F_1(1-F_1)F_2J \quad \text{and} \quad X_2^* = Y_2^* = F_2(1-F_2)F_1J \tag{10}$$

[9] This can be justified by supposing that the facts of the case are made public during pre-trial discovery.

These values can then be used to calculate the expected judgment at trial, $P_{NPR}(X_1,X_2,Y_1,Y_2)J = F_1F_2J$, the overall expected value of trial to the plaintiff, and the expected cost of trial to the defendant (i.e., the optimized values of the expressions in (2) and (3)). These are $F_1F_2J - F_1(1-F_1)F_2J - F_2(1-F_2)F_1J$ and $F_1F_2J + F_1(1-F_1)F_2J + F_2(1-F_2)F_1J$, respectively. Interestingly, note that the expected judgment turns out to be proportional to the product of the inherent quality of the several issues.

3.2. Product Rule Applied

In a situation in which the product rule is used, the plaintiff's objective is to choose X_1 *and* X_2 to maximize

$$P_{PR}(X_1,X_2,Y_1,Y_2)J - X_1 - X_2, \tag{11}$$

while the defendant chooses Y_1 *and* Y_2 to minimize

$$P_{PR}(X_1,X_2,Y_1,Y_2)J + Y_1 + Y_2 \tag{12}$$

where $P_{PR}(X_1,X_2,Y_1,Y_2) = prob\ (P_{1,1}xP_{1,2} > 1/2)$

$$= prob(P_{0,2} > \frac{1+P_{0,1}(a-1)}{(P_{0,1}ab+a+b-1)-(b-1))}) \text{ with } a = \frac{X_1F_1}{Y_1(1-F_1)} \text{ and } b = \frac{X_2F_2}{Y_2(1-F_2)}$$

For a uniform distribution, the probability equals:

$$(1-\frac{1}{a+1}) - \int_{\frac{1}{a+1}}^{1} \frac{1+P_{0,1}(a-1)}{((ab+a+b-1)P_{0,1}-(b-1))} dP_{0,1}$$

$$= \frac{a}{a+1} - \frac{2ab(\ln(a+1)+\ln(b+1)-\ln 2)+(a-1)ab+\frac{a}{a+1}(a-1)^2}{(ab+a+b-1)^2} \tag{13}$$

Note that the limiting cases (a=0 or b=0 and a=∞ or b=∞) lead to the simple formulas we would expect to find. Specifically, if a=0 or b=0, the plaintiff can't win one of the issues, and so his or her probability of winning the trial should be zero. This is indeed what we find if we set a=0 or b=0 in (11). At the other extreme, when a=∞, we would expect only the second issue to be relevant, and indeed, when we set a=∞ in (11), we find a probability of winning of $\frac{b}{b+1}$, which is exactly the probability of winning if issue 2 were the only issue. A similar argument applies for the case of b=∞.

The first-order conditions for the plaintiff's and defendant's problems can again be solved simultaneously to obtain the Nash equilibrium effort levels, (X_1**,X_2**,Y_1**,Y_2**) (see the Appendix). These equilibrium effort levels can then be used, as above, to compute the expected judgment, the plaintiff's expected value, and the defendant's expected cost, of a trial. The complexity of the expressions precludes drawing conclusions regarding the outcomes under the two rules analytically. However, the next section uses numerical simulations to reveal the key differences.

4. Implications

4.1. Expected judgment

The expected judgment is always lower when the product rule is applied because, compared to non-use of the rule, the plaintiff has to surpass a higher hurdle. Interestingly, the difference in expected judgment is lower for cases in which the inherent quality of both issues is very weak and for cases in which the inherent quality of at least one issue is very high, as compared to cases in which both issues are of intermediate strength (e.g. F_1=0.7 and F_2=0.75). This makes sense since, if the court views *either one* of the two issues as slightly weaker than it actually is, surpassing the evidentiary hurdle becomes very problematic when the product rule is applied, but not when the product rule is eschewed.

The figures below illustrate the preceding conclusions. In the graphs, the X-axis represents the inherent quality of issue 1, and the Y-axis the inherent quality of issue 2. The dark area in Figure 1 shows the cases for which the difference between the expected judgments is smaller than 5 % of the amount at stake. The dark area in Figure 2 shows the cases for which the difference between the expected judgments is smaller than 10 % of the amount at stake. The graphs verify that the product rule lowers the expected judgment most for cases of intermediate strength (i.e., cases in the non-darkened areas).

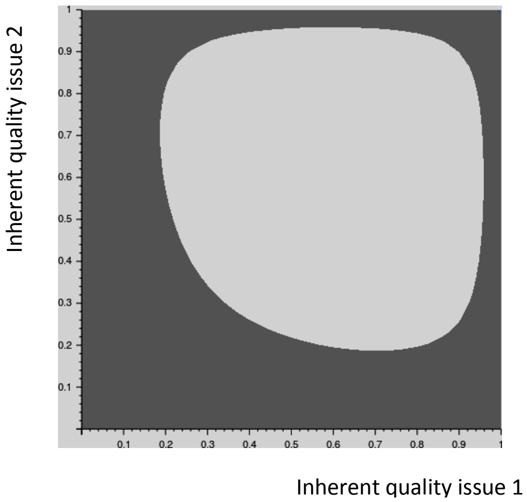

Figure 1. Difference expected judgment < 5 % of the amount at stake (black area).

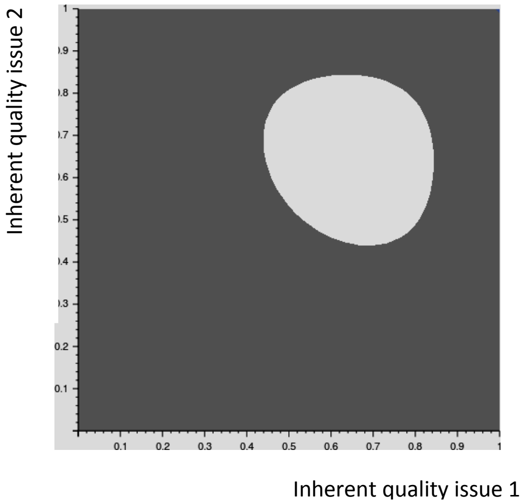

Figure 2. Difference expected judgment < 10% of the amount at stake (black area).

4.2. Litigation expenditures regarding issue 1

The litigation expenditures regarding issue 1 may be either lower or higher when the product rule applies than when it does not. Interestingly, expenditures are higher under the product rule for cases in which the inherent quality of the first issue is relatively large. Figure 3 illustrates this. Intuitively, for these cases, under the product rule, the marginal value of the expenditures is larger because they may partially compensate for the relative weakness of the second issue. Such compensation is not possible when the product rule is not applied. For example, suppose there is an 80 percent chance that the court will consider the posterior probability of issue 2 to be 30 %, and a 20 % chance that it will assess this probability at 60%. Suppose further that the plaintiff can make an investment with respect to issue 1 which may bring the court's posterior assessment of this issue from 80 % to 90 %. When the product rule does not apply, this investment may have little benefit, but when the product rule applies, making this investment is the only way to still have a chance to win the trial (i.e., in case the court considers the posterior probability of issue 2 to be 60%, the combined posterior probability increases from 0.8x0.6=0.48 to 0.9x0.6=0.54).

For cases in which the inherent quality of the first issue is somewhat lower or weaker, expenditures are lower when the product rule is used. Here, the marginal value of expenditures is often lower under the product rule. Suppose that an additional investment by the plaintiff could bring the court's posterior assessment regarding issue 1 from 60 % to 70%. When the product rule is not used, this expenditure has value as long as the court assesses the posterior probability of issue 2 to exceed 50 %. When the product rule is used, however, this expenditure only has value if the court assesses the posterior probability of issue 2 to be at least 71.4 %.

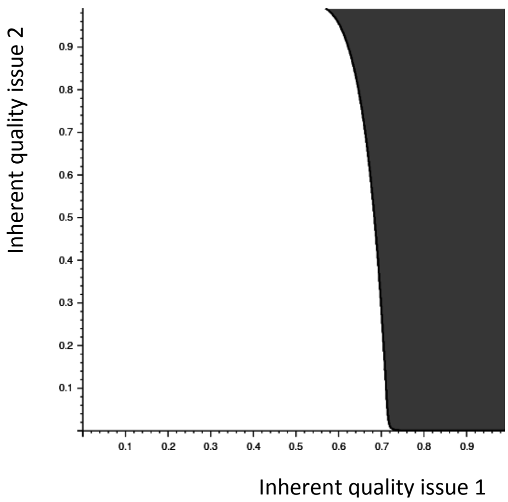

Figure 3. Expenditures of issue 1 are larger under the product rule (black area).

The case regarding issue two is completely symmetrical to the previous case. The litigation expenditures regarding the second issue may be either lower or higher when the product rule applies than when it does not. Expenditures are higher when the product rule is used for cases in which the inherent quality of the second issue is relatively large.

4.3. Total litigation expenditures

For the majority of cases (not taking into account the decision to file), total expenditures are smaller when the product rule is used than when it is not. Expenditures are larger under the product rule when the inherent quality of at least one of the issues is quite large. The black area in Figure 4 represents cases for which total expenditures are larger under the product rule, while the black area in Figure 5 represents the cases for which the difference in total expenditures is larger than 5 % of the amount at stake.

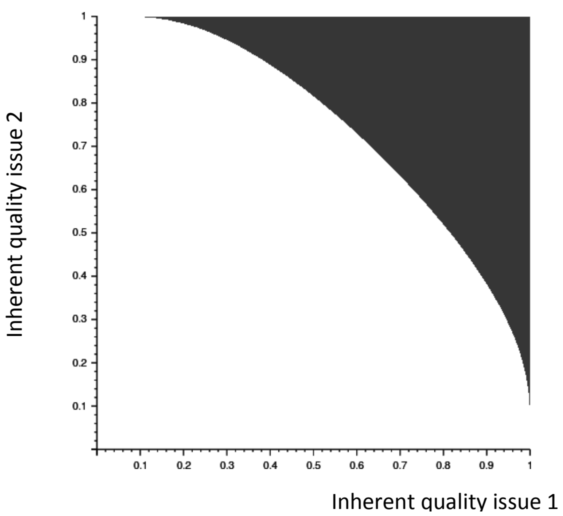

Figure 4. Total expenditures are larger under the product rule (black area)

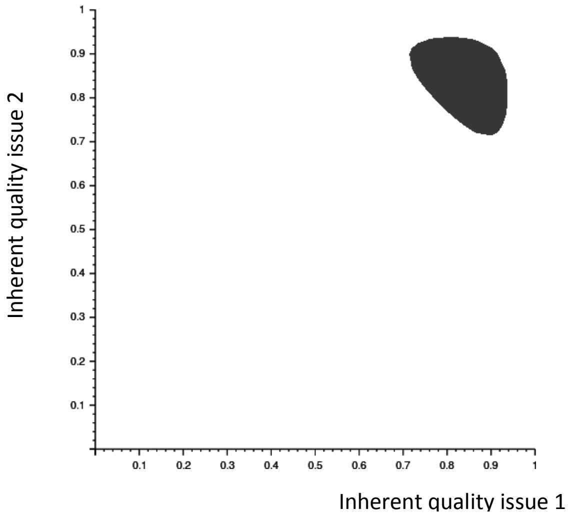

Figure 5. Difference in total expenditures > 5% amount at stake (black area).

4.5. Expected value of the plaintiff

For strong cases, the plaintiff's expected value is typically lower under the product rule. This follows from the analysis above, given that for these types of cases the expected judgment is lower and the expenditures are higher. For many weak cases, especially the weakest ones, the plaintiff's expected value is larger under the product rule. For these cases, the reduction in expenditures outweighs the reduction in the expected judgment. In Figure 6, the dark area represents the cases for which the plaintiff's expected value is larger when the product rule is used.

Note however that these cases will generally not be filed because the plaintiff's participation constraint is not satisfied—i.e., these cases have negative expected value. (Of course, some of these cases may be filed if the plaintiff has an exogenous benefit of going to trial; e.g. having his day in court.) The dark area in Figure 7 shows which cases are filed under the product rule, while Figure 8 shows which cases are filed when the product rule is not applied.

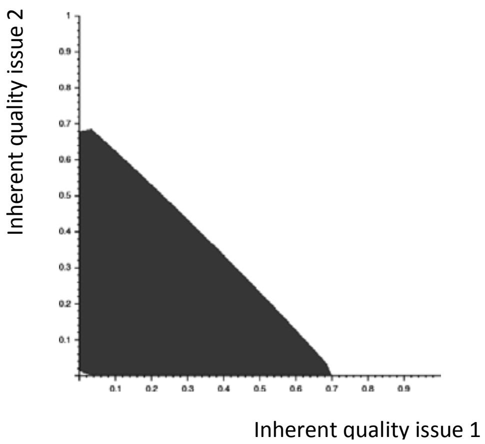

Figure 6. Plaintiff's expected value is larger under the product rule (black area).

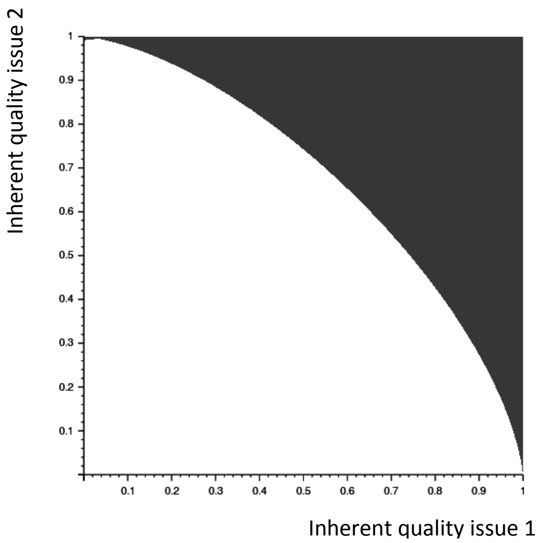

Figure 7. Cases filed under product rule (black area).

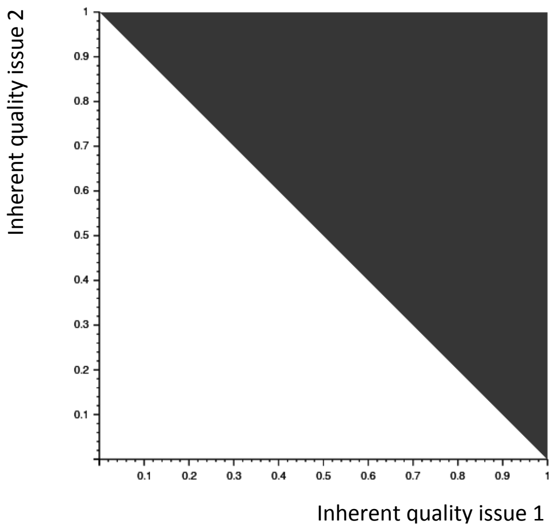

Figure 8. Cases filed with suppression of product rule (black area).

5. Conclusion

In cases where the court must judge multiple legal questions in order to assign liability, the question arises as to whether it should judge them individually or jointly. In the presence of evidentiary uncertainty, this amounts to asking whether the probability of each element separately, or the product of the probabilities, must surpass the legal threshold in order for the plaintiff to win. This question has provoked a large literature debating the two approaches. In this paper, we have contributed to this debate by examining how the two rules affect the amount that plaintiffs and defendants invest in legal expenditures at trial. Our conclusions are as follows. First, when the product rule is not used, the expected judgment is proportional to the product of the inherent quality of the several issues at stake. Second, the expected judgment is always lower when the product rule is used, and especially strong cases suffer from this. Third, due to decreased litigation expenditures, for many of the weakest cases the plaintiff's expected value is larger when the product rule is used. Finally, for relatively strong cases, litigation expenditures are typically larger when the product rule is used. In combination with the lower expected judgment, this may substantially decrease the expected value for plaintiffs with meritorious suits.

Appendix

With the product rule, the equilibrium expenditures equal (proof on file with the authors):

$$X_1{**}=Y_1{**}=F_1(1-F_1)J+F_1(1-F_2)\frac{2F_2(1-F_1)(\ln(1-F_1)+\ln(1-F_2)+\ln 2)-2F_1F_2(1-F_1)-F_2(3F_1-1)-(2F_1-1)^2(1-F_1)(1-F_2)-2F_1(2F_1-1)(1-F_2)}{(F_1+(2F_2-1)(1-F_1))^2}J$$
$$-2F_1{}^2(1-F_2)\frac{2F_2(1-F_1)(\ln(1-F_1)+\ln(1-F_2)+\ln 2)-(2F_1-1)F_2-(2F_1-1)^2(1-F_2)}{(F_1+(2F_2-1)(1-F_1))^3}J$$

$$X_2{**}=Y_2{**}=F_2(1-F_2)J+F_1(1-F_1)\frac{2F_1(1-F_2)(\ln(1-F_2)+\ln(1-F_1)+\ln 2)-2F_1F_2(1-F_2)-F_1(3F_2-1)-(2F_2-1)^2(1-F_2)(1-F_1)-2F_2(2F_2-1)(1-F_1)}{(F_2+(2F_1-1)(1-F_2))^2}J$$
$$-2F_2{}^2(1-F_1)\frac{2F_1(1-F_2)(\ln(1-F_2)+\ln(1-F_1)+\ln 2)-(2F_2-1)F_1-(2F_2-1)^2(1-F_1)}{(F_2+(2F_1-1)(1-F_2))^3}J$$

Note that the limit cases (F_i=0 or F_i=1) lead to the results we should expect to find. For example, regarding the expenditures concerning the first issue, when F_2=1, only the first issue should matter. When we set F_2=1 in (12), we find that $X_1=Y_1=F_1(1–F_1)J$. When F_2=0, the outcome of the case is certain (the defendant will win), and it's no use investing in the first issue. Indeed, when we set F_2=0 in (14), we find that $X_1=Y_1=0$.

List of references

Ronald J. Allen & Sarah A. Jehl, *Burdens of Persuasion in Civil Cases: Algorithms v. Explanations*, 2003 MICH. ST. L. REV. 893, 893–944

Ronald J. Allen & Alex Stein, *Evidence, Probability, and the Burden of Proof*, 55 ARIZ. L. REV. 557, 571–79 (2013)

Edward K. Cheng, *Reconceptualizing the Burden of Proof*, 122 YALE L.J. 1254, 1258–65 (2013)

Kevin M. Clermont, *Death of Paradox: The Killer Logic Beneath the Standards of Proof*, 88 NOTRE DAME L. REV. 1061, 1061–1138 (2013)

Cohen, L. Jonathan, An Introduction to the Philosophy of Induction and Probability 18-19, 1989.

JONATHAN COHEN, THE PROBABLE AND THE PROVABLE 58–62 (1977)

David Kaye, *The Laws of Probability and the Law of the Land*, 47 U. CHI. L. REV. 34, 38–41 (1979)

Saul Levmore, *Conjunction and Aggregation*, 99 MICH. L. REV. 723, 734–45 (2001)

Miceli, Thomas (1996) "Cause in Fact, Proximate Cause, and the Hand Rule: Extending Grady's Positive Economic Theory of Negligence," Int'l Rev. of Lawand Econ., Vol 16, pp. 473-482.

Bernard Robertson & G.A. Vignaux, *Probability—The Logic of the Law*, 13 O.J.L.S. 457, 457–79 (1993)

Ferdinand Schoeman, Ferdinand, *Cohen on Inductive Probability and the Law of Evidence*, 54 PHIL. SCI. 76, 80–82 (1987)

Shavell, Steven M. (1980) "An Analysis of Causation and the Scope of Liability in the Law of Torts," *Journal of Legal Studies*: Vol. 9: No. 3, Article 2.

Shavell, Steven M. "Uncertainty Over Causation and the Determination of Civil Liability," 28 *Journal of Law and Economics* 587 (1985).

Alex Stein "Of Two Wrongs that Make a Right: Two Paradoxes of the Evidence Law and Their Combined Economic Justification", 79 TEX. L. REV. (2001)