Pretrial negotiation behind open doors versus closed doors:  
Economic analysis of Rule 408  

Jeong-Yoo Kim\textsuperscript{a,}\textsuperscript{*,} Keunkwan Ryu\textsuperscript{b}  

\textsuperscript{a}Department of Economics, Dongguk University, Seoul, South Korea  
\textsuperscript{b}Department of Economics, Seoul National University, Seoul, South Korea  

Abstract  
In this paper, we examine the economics of Rule 408 of the Federal Rules of Evidence, whereby the negotiation processes at the pretrial stage are made inadmissible to prove the amount of liability. It is asserted that under Rule 408 a settlement offer is less inclined to be rejected since the judge is expected to make a lower award given the signal he observes. Also, we derive a sufficient condition for Rule 408 promoting settlement. © 2000 Elsevier Science Inc. All rights reserved.

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1. Introduction  
The litigiousness of American society has been a growing social concern. Time-series data show that, over the course of the 20th century, there is an upward trend in civil cases filed as percentage of the population in many American jurisdictions.\textsuperscript{1} This has recently drawn the attention of economists as well as legal scholars into the area of litigation process.

Many legal devices have been designed to reduce court congestion and legal expenditures. These devices include fee-shifting rules such as Rule 68 of the Federal Rules of Civil
Procedure, discovery requirements, a shift in a certain tort from a rule of negligence to a rule of strict liability and Rule 408 of the Federal Rules of Evidence. The purpose of this paper is to examine whether Rule 408 of the Federal Rules of Evidence can promote settlement and thus reduce the number of actual trials.

The idea of protection against the admissibility of conducts made in compromise negotiations goes back prior to the adoption of the Federal Rule of Evidence in 1975. The rationale relied upon by courts at common law in excluding evidence of the actual compromise offer was that they were irrelevant to the substantive issues; such conduct implied merely a desire for peace, not a concession of weakness of position. Another rationale was that it was improving social welfare to encourage the out-of-court resolution of disputes (Brazil, 1988). To promote this purpose, the Advisory Committee, in drafting Rule 408, expanded its range of protection considerably; specifically, the rule offered protection not just to offers or demands, but also to conduct or statements made in compromise negotiations.

Economic analysis of Rule 408 was first attempted by Daughety & Reinganum (1995). By analyzing a model where the informed plaintiff makes a take-it-or-leave-it offer, they show that making a pretrial demand admissible will increase the expected number of cases that go to trial, since the defendant must reject the plaintiff’s offer more often in order to counteract the plaintiff’s incentive to inflate their demand with intent to influence the judge’s beliefs under admissibility. However, we think that their analysis of Rule 408 is partial, in the sense that it only involves the effect of protection against the admissibility of pretrial demands. The analysis would be completed when one considers the effect of protection against admissibility of other kinds of conduct made in compromise negotiations as well.

In this paper, we will show that Rule 408 can increase the rate of settlement by making inadmissible the pretrial evidence that settlement offer of a certain amount has been rejected by the plaintiff, in an alternative model where the uninformed defendant makes a take-it-or-leave-it offer. The intuitive reason is that a plaintiff would be more likely to reject the defendant’s settlement offer to influence the judge’s belief on his damage amount upward.

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2 The rule requires that if a plaintiff rejects a settlement offer and is later awarded a less favorable judgment at trial, he compensates the defendant for certain costs incurred by the defendant after the offer has been made. For an economic analysis of Rule 68, see Spier (1994).

3 For an economic analysis of mandatory discovery, see Sobel (1989).

4 The negligence rule requires the plaintiff to prove an additional element (the defendant’s negligence), which is usually the private information of the defendant. Thus, adopting the strict liability rule might reduce the information asymmetry between the parties and consequently increase the likelihood of settlement. However, some also argue that this may actually increase the number of cases filed because it is easier to prove a claim under strict liability.

5 Rule 408 provides that evidence of (a) furnishing or offering or promising to furnish, or (b) accepting or offering or promising to accept a valuable consideration in compromising or attempting to compromise a claim that was disputed as to either validity or amount, not be admissible to prove liability for or invalidity of the claim or its amount.

6 Daughety & Reinganum (1993) discuss endogenous sequencing in settlement negotiations. Unfortunately, their result supports neither the model of Daughety & Reinganum (1995) nor ours, in which only the plaintiff has private information.
and to make his award at court higher without Rule 408. Considering this alternative model will be especially important and worthwhile when a policy maker is preparing a similar rule protecting the confidentiality of pretrial negotiations. The analysis offers useful policy implications regarding the extent to which the protection should be given.

Our model has much in common with that of Daughety & Reinganum (1995) but is distinguished in several respects. In their model, the judge could elicit useful information on the plaintiff’s actual damage amount from the pretrial settlement demand of the plaintiff, while in our model the judge can update his information on the plaintiff’s damage amount by using the fact that a settlement offer of a certain amount has been rejected. Also, Daughety & Reinganum (1995) assume that the trial reveals either perfect information or no information at all to the judge, while we assume that the judge can discover some noisy additional information during the trial. Consequently, their model exhibits the feature that, if there is a very high likelihood that the trial reveals no information, all the cases go to trial under admissibility. By contrast, in our model, such an unrealistic feature does not appear.

The rest of the paper is organized as follows. In Section 2, we set up the model. We analyze the case in which pretrial negotiations are not admissible as evidence in Section 3, and the case in which pretrial negotiations are admissible in Section 4. Comparison of the two cases is made in Section 5. Section 6 contains discussion and concluding remarks.

2. The model

Suppose a risk-neutral plaintiff (P) has brought suit against a risk-neutral defendant (D). P suffers an injury of size \( x \), which is his private information. We denote by \( P(x) \) the plaintiff whose private information is \( x \). D does not know the true value of \( x \) but knows that \( x \) is distributed over \([ \bar{x}, \tilde{x}]\) with a density function \( f(x) \) and a cumulative distribution function \( F(x) \). The distribution of \( x \) is assumed to be mutual knowledge between \( P \) and \( D \) but not known to the judge (J). Generally, J has inferior information on the damage amount in comparison to \( D \), who has been actually involved with the legal dispute. So, for expositional simplicity, we assume that J has no prior knowledge about the distribution of \( x \), i.e., J has an improper prior belief that \( x \) is uniformly distributed over \([0, \infty)\). Also, for the sake of convenience, we assume that \( P \) will prevail with certainty if the case goes to trial.

\( P \) and \( D \) may either settle out of court or go to court. The procedure of the negotiation prior to a trial is as follows. The uninformed \( D \) makes a settlement offer \( s \) on a take-it-or-leave-it basis. After observing \( s \), the informed \( P \) decides whether to accept it or not. If it is rejected, the case goes to court, and \( P \) and \( D \) should bear litigation costs \( c_p, c_d \) respectively. At court, J may err in estimating the true damage amount \( x \), so that he receives only a noisy signal \( z \) on \( x \). Given \( x, z \) is realized according to the density function \( k(z|x) \), and, based on \( z \), J believes that \( x \) is distributed according to \( h(x|z) \) over \( X(z) \subset [\bar{x}, \tilde{x}] \).\(^7\) \( k(z|x), h(x|z) \) are common knowledge among all players, \( P, D \) and \( J \). Based on the signal \( z \), J makes an award \( y \) to \( P \). J’s objective is assumed to make the

\(^7\) Since we do not assume that the joint density function of \( x \) and \( z \) is known, \( h(x|z), k(z|x) \) cannot be calculated from the joint density function, but are a priori given.
award as close as possible to the true damage amount, i.e., to minimize the mean squared error given his belief on $x$, 

$$E[(y - x)^2 | z] = \int_{x}^{x'} (y - x)^2 h(x|z) dx.$$ 

Also, we exclude the possibility of a nuisance suit, i.e., we assume that $x > c_p$, so that the plaintiff who has rejected the settlement offer by $D$ will never drop the case.

The game is depicted as a tree form in Fig. 1.

Notice that $z$ is not known to $P$ at the time that $P$ has to decide whether to accept the defendant’s settlement offer, but becomes common knowledge at the end of the trial.

For later analyses, we make the following assumptions.

**Assumption 1:** $F(x)/f(x)$ is strictly increasing in $x$ on $[\bar{x}, \tilde{x}]$.

**Assumption 2:** $h(x|z)$ and $k(z|x)$ possess monotone likelihood ratio property (MLRP). In other words, $h(x'|z)/h(x|z)$ is increasing in $x$ if $z' > z$ and $k(z'|x)/k(z|x)$ is increasing in $z$ if $x' > x$. MLRP implies that under higher $z$ (or $x$, respectively), higher $x$ (or $z$, respectively) is more likely. It is well known that MLRP implies the first-order stochastic dominance (FOSD). That is, for all $x \in [\bar{x}, \tilde{x}]$, $H(x|z)$ is decreasing in $z$ and, for all $z \in [\underline{z}, \tilde{z}]$, $K(z|x)$ is decreasing in $x$, where $H(\cdot | \cdot)$, $K(\cdot | \cdot)$ are conditional distribution functions. We can easily check that if MLRP is satisfied, $dE(x|z)/dz > 0$ and $dE(z|x)/dx > 0$. That is, the judge who observes a high $z$ expects a high $x$, and the plaintiff who suffers from severe damage expects the judge to receive a high signal at court.

### 3. Case of the inadmissible evidence (rule 408)

In this case, the moves of the players in the pretrial stage are not admissible as evidence. Then, $J$’s inference on $x$ is solely based on the signal $z$.\(^{8}\)

To characterize the equilibrium, the following lemma will be useful.

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\(^{8}\) $J$ may be able to infer $D$’s settlement offer by computing the equilibrium strategies based on his own belief about $x$ without observing the actual pretrial negotiation process in the case of inadmissible evidence. However, as long as $J$’s prior knowledge is assumed to be uninformative at all, $J$ must recognize that his inference will be far from accurate, so that it will not be in his interest to depend on the inference.
**Lemma 1:** Let $y_1(z) = \mathbb{E}(x|z)$ and $y_2(z) = \arg \min E[(y - x)^2|z]$. Then, $y_1(z) = y_2(z)$ with probability one.

**Proof:** See the Appendix.

First, consider the $J$'s decision. Let $y_I(z)$ denote $J$'s award to $P$ in the case of inadmissible evidence. By Lemma 1, $J(z)$, whose objective is to minimize the mean square error between the award and the damage amount, will choose $y_I(z) = \mathbb{E}(x|z) = \int x h(x|z) dx$.

Next, consider $P$'s decision. $P(x)$ will accept $s$ if and only if $s \geq \mathbb{E}[y_I(z)|x] - c_p$, where $\mathbb{E}[y_I(z)|x] = \int y_I(z) k(z|x) dz$. That is, letting $x_I(s)$ be $P$'s type who is indifferent between accepting and rejecting $s$ in the case of inadmissible evidence, $x_I(s)$ is determined by $\mathbb{E}[y_I(z)|x_I] = s + c_p$.

The following lemma will prove useful in characterizing the plaintiff's decision.

**Lemma 2:** $\mathbb{E}(y_I(z)|x)$ is increasing in $x$, i.e., $E(y_I(z)|x_2) > E(y_I(z)|x_1)$ for all $x_2 > x_1$.

**Proof:** direct from Assumption 2.

Then, we have the following propositions.

**Proposition 1:** For any $s$, if $P(x_1)$ rejects $s$, $P(x_2)$ with $x_2 > x_1$ rejects $s$, too.

**Proof:** See the Appendix.

This proposition implies that the behavior of the plaintiff is dichotomized by the borderline type $x_I(s)$, so that $P(x)$ with $x < x_I(s)$ accepts $s$ whereas $P(x)$ with $x \geq x_I(s)$ rejects it.

**Proposition 2:** $dx_I(s)/ds > 0$.

**Proof:** direct from Lemma 2 (Fig. 2.)

Now, consider the defendant’s decision. Letting $D$’s settlement offer in the case of inadmissible evidence be $s_I, s_I$ can be determined from

![Fig. 2. Effect of an increase in $s$.](image-url)
\[
\min s \int_{x(s)}^x f(x) \, dx + \int_{x(s)}^x [c_d + E(y_j(z) | x)] f(x) \, dx.
\]  

(1)

Assuming that there is an interior solution, the first-order condition implies that

\[
\frac{F(x_j(s))}{f(x_j(s))} = (c_p + c_d) \frac{dx_j(s)}{ds}.
\]  

(2)

By Assumption 1, this first-order condition determines the unique equilibrium settlement offer \(s_p\).

4. Case of the admissible evidence

In this case, the moves of the players in the pretrial stage are admissible as evidence. Therefore, \(J\) can infer \(x\) by using all the relevant information elicited from pretrial negotiation as well as by utilizing \(z\).

Let \(\Omega\) be the information observed through the pretrial negotiation that is admissible to the judge as extra evidence in addition to \(z\). Then, the information set of the judge in the admissible case is \(\{\Omega, z\}\). For this information set, the counterparts of Lemma 1, Lemma 2 and Proposition 1 still hold. The proofs are similar, and thus are omitted.

**Lemma 3:** Let \(y_1(z, V) = E(x | z, V)\) and \(y_2(z, V) = \arg \min E[(y(z, V) - x)^2 | z, V]\). Then, \(y_1(z, V) = y_2(z, V)\) with probability 1.

**Lemma 4:** In the case of admissible evidence, \(E[y_A(z, \Omega) | x]\) is increasing in \(x\), i.e., \(E[y_A(z, \Omega) | x_2] > E[y_A(z, \Omega) | x_1]\) for all \(x_2 > x_1\).

**Proposition 3:** In the case of admissible evidence, for any \(s\), if \(P(x_1)\) rejects \(s\), \(P(x_2)\) with \(x_2 > x_1\) rejects \(s\), too.

We can summarize the above results in the following proposition.

**Proposition 4:** In the case of admissible evidence, the equilibrium outcome is characterized as follows. Given \(s\), (a) \(P(x)\) with \(x < x_A(s)\) accepts \(s\), and \(P(x)\) with \(x \geq x_A(s)\) rejects it. (b) After observing that \(s\) is rejected, \(J\) updates his belief to \(h(x | z, x \geq x_A(s))\) and, accordingly, determines the award as \(y_A(z, \Omega) = E[x | z, x \geq x_A(s)]\).

Hereafter, for notational convenience, let us write \(y_A(z, \Omega)\) simply as \(y_A(z)\). Now, we need to compute \(x_A(s), y_A(z)\) explicitly. They are determined simultaneously from two equations, each characterizing the incentive compatibility condition of \(P\) and \(J\), respectively. From \(J\’s\) decision, we have

\[
y_A(z) = E[x | z, x > x_A(s)].
\]  

(3)

From \(P\’s\) decision, we have
Notice that $x_A(s)$ is increasing in $s$ by Lemma 4.

Now, consider $D$’s decision. Letting $s_A$ be the settlement amount in case of admissible evidence, $s_A$ can be determined by the following optimization problem

$$\min s \int_s^{x_A(s)} f(x)dx + \int_{x_A(s)}^{\tilde{x}} \left[ c_d + E(y_A(z)|x) \right] f(x)dx.$$  

(5)

Assuming that an interior solution exists, the first-order condition implies

$$\frac{F(x_A(s))}{f(x_A(s))} = \left( c_p + c_d \right) - \frac{1}{f(x_A(s))} \int_{x_A(s)}^{\tilde{x}} \frac{dE[y_A(z)|x]}{dx_A(s)} f(x)dx \frac{dx_A(s)}{ds}.$$  

(6)

Notice that $dE[y_A(z)|x]/dx_A(s) > 0$ by Lemma 4.

One point deserves to be mentioned. In the case of admissible evidence, $J$’s belief is determined both by the realization of $z$ and by the fact that $P$ has rejected $s$. Specifically, if $P$ rejects $s$, $J$ infers that the plaintiff’s type satisfies $x \geq x_A(s)$, that is, rejecting $s$ adjusts $J$’s belief upward. Therefore, we may suspect that a plaintiff with $x$ smaller than $x_A(s)$ may have an incentive to reject $s$ in order to induce a higher award at court by making $J$’s belief adjusted upward. Of course, this incentive is inherent, but in equilibrium a plaintiff with $x$ smaller than $x_A(s)$ will not reject $s$ since the expected award net of his court cost is smaller than $s$. This can be easily seen from Lemma 4 as $E[y_A(z)|x] - c_p < E[y_A(z)|x_A(s)] - c_p = s$. Essentially, the plaintiff with low $x$ has to bear a higher chance of low $z$ being realized because of the MLRP of $k(z|x)$, which prevents him from cheating on his type.

5. Comparison

Now, we are in position for comparing the outcomes across inadmissible and admissible cases.

First, it is easy to establish the following results.

**Theorem 1:** For all $z$, $y_I(z) < y_A(z)$.

**Proof:** See the Appendix.

This theorem says that, in the case of admissible evidence, the judge makes a higher award, given his signal $z$. This is a natural consequence of the fact that his belief is adjusted upward under admissibility.

**Theorem 2:** For all $s$, $x_I(s) > x_A(s)$.

**Proof:** See the Appendix.

This theorem implies that a plaintiff is more likely to reject a settlement offer $s$ in the case of admissible evidence. This is because under admissibility rejecting, $s$ can signal a higher $x$ to the judge, leading to a higher award amount. However, this theorem does not imply that trial is more likely in the case of admissible evidence, since the equilibrium settlement amounts under the two modes may differ. So, first, we need to compare the equilibrium
settlement amounts in the two modes. Unfortunately, however, we cannot say that one is greater than the other between $s_I$ and $s_A$ under general distribution functions. To make possible the comparison of the settlement rates across admissible and inadmissible cases without relying on the sign of $s_I - s_A$, we adopt the following additional assumption.

**Assumption 3:**
\[
E[y_A(z) | x_A(s)]/dx_A(s) \equiv E[y_I(z) | x_I(s)]/dx_I(s).
\]

Intuition tells us that this assumption will be generally satisfied. As $x_A(s)$ is increased, $E[y_A(z) | x_A(s)]$ is increased by two forces. One is through a higher chance of drawing large $z$, and the other is through a higher truncation point in computing $y_A(z)$. On the other hand, as $x_I(s)$ is increased, $E[y_I(z) | x_I(s)]$ is increased only by a single force; a higher chance of drawing large $z$. We can easily check that this assumption is satisfied by most distributions, including uniform distributions and normal distributions.

Then, we have the following lemma.

**Lemma 5:** Under Assumption 3, $dx_I(s)/ds \geq dx_A(s)/ds$.

**Proof:** See the Appendix.

This lemma suggests that the borderline type or, equivalently, the settlement probability is less responsive to the settlement offer as the judge becomes more informed, as in the case of admissible evidence. Due to this lemma, we can establish our main theorem.

**Theorem 3:** Under Assumption 3, trial is more likely in the case of admissible evidence, i.e., $x_I(s_I) > x_A(s_A)$.

**Proof:** See the Appendix.

The intuition is as follows. When the defendant offers a lower settlement amount and thus induces more types of plaintiffs to go to trial, the borderline type for the plaintiff decreases and the decrease in the amount awarded to the plaintiff is expected to be larger under Assumption 3 in the case of admissible evidence than in that of the inadmissible case. Therefore, $D$ will pick settlement offers in such a way that the borderline type is lower in the admissible evidence case, which results in the higher trial rate under admissibility.

6. Discussion and concluding remarks

In this paper, we have shown that Rule 408 can promote settlement by making conduct in pretrial settlement negotiations inadmissible in court, leading to less litigation.

Our work addresses a similar issue as that of Daughety & Reinganum (1995), but differs from theirs on two fronts. First, we consider a model in which the uninformed defendant makes a take-it-or-leave-it settlement offer to the informed plaintiff, contrary to their model in which the informed plaintiff is the first mover. By adopting such an alternative model, we demonstrated the signaling effect of rejecting an offer at the pretrial stage on the settlement rate under admissibility, while Daughety & Reinganum (1995) showed the signaling effect of the pretrial settlement demand. Second, the court error is modeled in a different fashion in the two models. In our model, the judge is assumed to receive a continuously distributed signal, whereas, in their model, the judge is assumed to be either completely informed of the true value or absolutely ignorant. Since their assumption of binary information revelation is rather restrictive compared with our continuous distributional assumption, our interpretation
of the court error seems more natural. In view of these differences, our model complements and improves on Daughety & Reinganum (1995).

Our model can be extended in various directions. We may consider a model of two-sided uncertainty in which both the defendant and the plaintiff have private information of their own. But, the analysis of such a model appears quite complicated and lies beyond the scope of this paper.\(^9\) Also, it may be more realistic to assume that settlement offers are made not on a take-it-or-leave-it basis, but take place over periods. We believe, however, that the extended feature will not change the qualitative nature of the results in this paper, since, in many dynamic settlement models, the settlement procedure does not last for more than one period in equilibrium.\(^{10}\) Finally, it would be possible to consider a larger game in which the defendant’s ex ante care level is incorporated explicitly into the model. This is indeed an interesting extension, but it also widens the scope of the paper significantly. So, it will be left for future research.

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Appendix: Proofs

Proof of lemma 1

\[ E[(y(z) - x)^2] = E[(E(x|z) - x)^2] + (y(z) - E(x|z))^2, \]

which is obviously minimized by taking \(y(z) = E(x|z)\) with probability one.

Proof of proposition 1

If \(P(x)\) rejects \(s\), it implies that the expected net award of \(P(x)\) at court exceeds \(s\). Then, we have only to show that the expected net award of \(P(x')\) at court is greater than or equal to the expected net award of \(P(x)\) at court for all \(x' > x\). This follows directly from Lemma 2.

Proof of theorem 1

Obviously, \(E[x|z, x \geq x_A(s)] > E[x|z]\) for all \(z\).


\(^{10}\) See, for example, Wang, Kim, & Yi (1994).
Proof of theorem 2

Observing that $x_I(s)$ and $x_A(s)$ are determined by $E[y_I(z)|x_I(s)] = s + c_p$, $E[y_A(z)|x_A(s)] = s + c_p$, $x_I(s) > x_A(s)$ follows from Lemma 2, Lemma 4 and Theorem 1.

Proof of lemma 5

By differentiating the incentive compatibility conditions of the plaintiff, we obtain $dx_A/ds = [dE[y_A(z)|x_A(s)]/dx_A(s)]^{-1}$ and $dx_I/ds = [dE[y_I(z)|x_I(s')]/dx_I(s')]^{-1}$. Therefore, by Assumption 3, we have $dx_A/ds < dx_I/ds$.

Proof of Theorem 3

Comparing the first-order conditions (2) and (6), we readily notice that the right-hand side of (6) is smaller than the right-hand side of (2) due to Lemma 5. Therefore, by Assumption 1, we have $x_I(s_I) > x_A(s_A)$.

References

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