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Comparative Analysis of Litigation Systems: An Auction-Theoretic Approach*

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Abstract

A simple auction-theoretic framework is used to examine symmetric litigation environments where the legal ownership of a disputed asset is unknown to the court. The court observes only the quality of the case presented by each party, and awards the asset to the party presenting the best case. Rational litigants influence the quality of their cases by hiring skillful attorneys. This framework permits us to compare the equilibrium legal expenditures that arise under a continuum of legal systems. The British rule, European rule, American rule, and some recently proposed legal reforms are special cases of our model.

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Keywords: Auctions, Contests, Litigation, Fee-Shifting.

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1 Introduction

Why is the United States internationally scorned as the "litigious society?" Are judicial reforms, such as those proposed by the President's Council on Competitiveness, justified or misguided? More generally, can one rank the legal expenditures induced by legal systems such as the American, British, and Continental rules, and if so, do systems that result in lower expenditures per trial necessarily reduce the social cost of litigation? This paper uses an auction-theoretic framework to address these and other questions.

Our paper is motivated in part by the growing policy debate over the need for reform of the American justice system.[1] For instance, as early as 1991 the President's Council on Competitiveness (chaired at that time by Vice President Dan Quayle), proposed to modify the American legal system (in which all litigants pay their own legal expenditures) by requiring that the loser reimburse the winner for legal fees up to the amount actually spent by the loser.[2] The rationale for the proposed "Quayle system" was that it would reduce legal expenditures and the number of cases brought to court, since every dollar the loser paid its attorneys would ultimately result in two dollars paid by the loser. Other legal systems (such as the British and Continental rules), also require losers to compensate winners for a portion of their legal costs.[3]

More recently, the 2004 edition of the *Economic Report of the President* devoted an

[1]A number of recent papers provide important insights into the impact of reforms designed to deter frivolous suits (Che and Earnhart, 1997; Bebchuk and Chang, 1996; Polinski and Rubinfeld, 1996, 1998) or affect settlement incentives (Spier,1994; Gong and McAfee, 2000).

[2]This was proposed in the Council's *Agenda for Civil Justice Reform in America* (1991).

[3]Under the "classic" interpretation of the British system (see, for example, Hughes and Snyder, 1995), the loser pays its own legal costs and, in addition, reimburses the winner for all of its costs. The Continental system requires the loser to pay its own legal costs, plus a fixed fraction of the winner's legal fees. Note that under this interpretation, the British system may be viewed as a limiting case of the Continental system.

entire chapter to the issue of tort reform, and noted that Americans collectively spend more than twice as much on tort expenditures than they spend on new automobiles. As shown in Figure 1, these litigation expenditures (as a percentage of GDP) are over 3 times greater than those in the United Kingdom, and are significantly higher than those in other industrialized countries. The per-capita number of suits filed in the United States is also comparatively high. On an annual basis, 3.3 tort suits are filed in the United States for each 1,000 inhabitants, compared to only 1.2 per 1,000 in England (see Posner,1997).

In modeling litigation, simplifying assumptions are typically made to facilitate the analysis. One approach, common to the literature on pre-trial negotiation and settlement, assumes that legal expenditures during a trial do not have any effect on the trial's outcome. For instance, Spier (1992) assumes that it is costly for a plaintiff to go to court but that these costs do not influence the court's decision. In her model, the plaintiff always wins, but the amount won is a random variable from a distribution $f(v)$ with a strictly increasing hazard rate, $f/(1-F)$. Reinganum and Wilde (1986) and Schweizer (1989) consider models in which both the plaintiff and defendant might win, but the probability of winning is exogenous and independent of the legal expenditures of the parties. While these modeling assumptions are useful for understanding why parties in a dispute have an incentive to settle out of court rather than going to trial, they do not permit a comparative analysis of the equilibrium legal expenditures that arise in situations where parties can improve their chances of winning a trial by hiring better attorneys or experts.

Another approach, called the optimism model (cf. Hughes and Snyder, 1995), assumes that each party has exogenous beliefs regarding the merits of their case.

These beliefs determine not only whether the parties settle, but the expected payoff to each party from a trial. Hughes and Snyder conclude that, for exogenously given legal expenditures per trial and exogenous subjective probabilities of winning a case, the British rule leads to lower total legal outlays than the American system.

Our analysis differs from this existing literature in that we endogenize parties' decisions to go to trial as well their expenditures on legal representation. Specifically, we examine a non-cooperative game where parties in the dispute rationally choose whether to settle or go to trial. Absent pre-trial settlement, the parties go to court and can influence the observable merit of their respective sides of the case (and thus their probabilities of winning) by purchasing legal services. Thus, unlike the existing literature which assumes either that there is an *a priori* "correct" verdict or that the probability of winning is independent of the quality of legal services purchased by the litigants, we examine the *equilibrium* expenditures that arise under various legal systems. Equilibrium requires, among other things, that expenditures on legal services be based on rational beliefs regarding the probability of winning: Subjective beliefs are correct in equilibrium.

As we will see, these modeling differences enable us to use auction-theoretic tools to examine how rational litigants respond to the incentives created by various fee-shifting rules.[4] In addition, we are able to examine the impact of asymmetric information on equilibrium litigation expenditures and outcomes under a continuum of legal settings, including the Quayle system. This is in contrast to existing work that provides pairwise comparisons of the American and British rules (cf. Shavell (1982), Braeutigam, Owen, and Panzar (1984)), or models such as those by Cooter

[4]As noted by Klemperer (2003), auction theory is a powerful tool for analyzing a host of economic problems, including litigation.

and Rubinfeld (1989) and Hause (1989) which are based on different informational and/or rationality assumptions.

Our simple model also sheds light on two competing views of the justice system. One view, held by many Americans, is that winners and losers in court cases are determined by how much the parties spend on high-priced attorneys – not on the intrinsic merits of the case. At the other extreme is the view that the amount paid to an attorney is irrelevant; all that matters is the quality of the case presented at trial. We show that these two views need not be inconsistent.

More specifically, we examine the symmetric equilibrium of a litigation game where (1) legal expenditures increase the quality of the case presented; (2) the party putting forth the best case wins, and (3) litigation costs are neither subsidized nor taxed in the aggregate. We then show that, taking into account the expected payoffs that arise conditional on litigation, there is a sort of "prisoner's dilemma" that induces litigation even though, collectively, players would be better-off not doing so. More specifically, we show that "strong" players have incentives to litigate and "weaker" types have incentives to settle (concede) when our litigation game is preceded by binary decisions to litigate or settle.

Section 2 presents a parameterized litigation model that subsumes the American, British, and Continental systems as special cases. Novel systems like the Quayle system, the Matthew system (where the winner pays the loser an amount that is proportional the winner's legal expenditures), and the Marshall System (where the winner graciously picks up the loser's legal bill), all obtain as special cases. We show that, in any litigation environment where the best case wins, players have symmetric access to "quality" legal representation, and where legal expenditures increase the quality of the case presented to the court, the player spending the most on attorneys always wins.

Section 3 uses auction-theoretic tools to characterize the equilibrium legal expenditures and payoffs at trial that arise for the parameterized class of legal systems. We find that, conditional on going to trial, the American system results in lower expected legal expenditures per trial than either the Continental or British system, and furthermore, that the Quayle system leads to precisely the same expected legal expenditures as the American system. These results are used in Section 4 to examine incentives to litigate in the first place. We show that settlement is more prevalent in the British and Continental systems than under the American or Quayle system. Taking into account both litigants' incentives to go to trial rather than settle as well as their expected legal expenditures conditional on going to trial, we find that the British system results in the lowest expected legal expenditures while the American and Quayle systems result in the highest. Finally, Section 5 points out some of the limitations of our model and discusses extensions. The Appendix provides proofs for various assertions contained in the text, and shows how the results change when "luck" can also influence decisions at trial.

2 An Auction-Theoretic Model of Litigation

Two parties are unable to settle a dispute regarding the ownership of an indivisible asset. Each party i values the asset at v_i, and these valuations are independent random draws from a continuous density f with distribution function F.[5] Each

[5]The analysis can be extended to the case of correlated values and/or the case where litigants receive affiliated signals of values; see Baye *et al.* (1998). Obviously, this different information structure changes some of the results, since revenue equivalence does not generally hold in the case

party's valuation is private information, unobserved by the other party and the court. The distribution of valuations is assumed to be common knowledge.

The legal ownership of the asset in dispute is unknown. The role of the court is to examine the evidence presented at trial and, based on the evidence, award the asset to one of the parties. It is costly for the parties to gather evidence and present their case. We assume that the quality of the case presented by a party (q_i) is a function of her expenditures on legal services. The court observes only the quality of the case presented by each party (q_1 and q_2).

The litigation environment requires the two parties to simultaneously commit to legal expenditures, $e_i \geq 0$. Of course, different litigation systems have different implications for ultimate payoffs of the parties. For instance, the American system requires the winner and loser to pay their own legal expenditures, while the British system requires the loser to reimburse the winner for her legal expenditures. To capture the effects of different legal environments, assume that the payoff to party i depends on whether she wins or loses the trial as well as the fee-shifting rules implied by the justice system:

$$u_i(e_i, e_j, v_i) = \begin{cases} v_i - \beta e_i - \delta e_j & \text{if} \quad \text{party } i \text{ wins} \\ -\alpha e_i - \theta e_j & \text{if} \quad \text{party } i \text{ loses} \end{cases} \tag{1}$$

Here, $(\beta, \alpha, \delta, \theta)$ are fee-shifting parameters that summarize the amount of legal expenditures borne by each party in the event of a favorable or unfavorable judgement. We assume that $(\beta, \alpha) > 0$. This implies that, given the judicial decision, a party's utility is decreasing in her legal expenditures. In contrast, the parameters (δ, θ) may be positive or negative, depending upon whether the winner and loser pay or receive

of affiliation.

a transfer based on the other party's legal expenditures. This formulation permits us to examine a variety of legal environments. For instance, when $\beta = \alpha = 1$ and $\delta = \theta = 0$, the model captures the American system where each party pays her own legal expenses regardless of the outcome. The case where $\alpha = \theta = 1$ and $\beta = \delta = 0$ corresponds to the British system, where the loser pays its own legal costs as well as those of the winner.[6]

To complete the model, we assume that the court's decision is influenced by the quality of the case presented by each party. The quality of party i's case, in turn, is a continuous, strictly increasing function of her legal expenditures. We focus on environments where parties are endowed with symmetric technologies for producing a favorable case. In other words, neither party has a distinct advantage with respect to the evidentiary or legal merits of her claims to the disputed asset, nor access to an attorney capable of making superior legal argument on her behalf. This is a strong assumption; obviously, in some legal environments one party may have a stronger claim to the asset than the other party. [7] Nonetheless, the symmetric case is a natural benchmark, and as discussed below, permits one to make *ceteris paribus* comparisons of the expenditures induced by different fee allocation mechanisms.

More formally, let q_i denote the quality of party i's case and ϕ denote the production function that maps each player's legal expenditures into that player's case quality. We assume

(A1) Monotonic Legal Production Function The quality of the case presented

[6] For notational convenience, we will use the notation $\beta = 0$ and $\alpha = 0$ to refer to the cases where $\lim \beta \rightarrow 0$ and $\lim \alpha \rightarrow 0$, respectively.

[7] An interesting (but complicated) extension would be to allow for such asymmetries. One possible justification for the symmetry assumption is the evidence provided by Waldfogel (1998) which suggests that the pretrial adjudication process tends to weed out parties with observable asymmetries, so that parties actually going to trial tend to be fairly symmetric.

by player i is given by $q_i = \phi(e_i)$, where ϕ is a continuous and strictly increasing function of player i's expenditures on legal services.

Notice that we are taking an agnostic position with respect to any notion of the "truth" underlying the case. Our motivation for this is two-fold. First, "truth" is typically unobservable; all the court can do is evaluate observable evidence presented at trial. Second, in many disputes regarding ownership, each side believes that they have the legal right to the item in dispute. Each side presents arguments supporting a decision in their favor, and the court's role is to weigh the case presented by the parties and render its decision. Third, since our objective is to compare the amount spent for legal services under various fee-shifting rules, it is important to restrict attention to environments where legal expenditures do not distort the truth. While situations do arise where a party expends hefty legal expenditures to "wrongfully" win a case, a comparative analysis of fee-shifting rules in such environments would be misguided. In particular, if one fee-shifting system resulted in lower expenditures than another system but resulted in more "incorrect" judicial decisions, the relative merits of the two systems would depend on the social trade-off (if any) between "justice" and legal costs. Our focus on the expected expenditures arising under different systems is meant to provide a positive analysis of the outlays induced by different systems – not a general normative analysis of which system is "best."

Since we are assuming that the true ownership of the item in dispute is unknown, "justice" or "fairness" reduces to the situation where the court weighs the observable evidence presented at trial, and awards the asset to the party with the most meritorious case. For example, consider a divorced couple engaged in a nasty custody battle over a child and suppose that there is no *a priori* basis for determining the "correct" or "incorrect" decision (both parent's work and are on good terms with the child). All the court can do is evaluate the arguments presented by each side at trial, and award custody to the party presenting the best case. Thus, the assumption that the "best case wins" does not mean that absolute "truth" is realized, but rather that the court awards custody to the most deserving party, given the evidence presented at trial.

(A2) Best Case Wins If party i presents the best case ($q_i > q_j$), party i wins with probability one. If the two parties' cases are of identical quality ($q_i = q_j$), each party wins with probability 1/2.

This assumption rules out, for example, "jury nullification" whereby the court relies on non-trial evidence or other "unobservables" to rule against the party presenting the most meritorious case at trial; the Appendix relaxes this assumption.

Finally, we focus on environments where the two litigants' legal expenditures are neither subsidized nor taxed by an outside party. Thus, while the loser and/or winner might be required to reimburse the other party for some portion of her legal expenditures, the sum of the expenditures of the two litigants exactly equals the aggregate amount spent on legal services. We formalize this assumption as

(A3) Internalized Legal Costs There are no subsidies or taxes; all legal expenses are borne by the litigants.

Note that assumption $A3$ implies that $\alpha + \delta = \beta + \theta = 1$, so $\delta = (1 - \alpha)$ and $\theta = (1 - \beta)$. By $A2$, party i wins if $q_i > q_j$, loses if $q_j > q_i$, and wins with probability $1/2$ if $q_i = q_j$. Substituting these relations into equation (1) and noting that $A1$ implies that $q_i \geq q_j$ if and only if $e_i \geq e_j$ yields:

Proposition 1 *Suppose assumptions A1 through A3 hold. Then the payoff functions for the two parties are given by*

$$u_i(e_i, e_j, v_i) = \begin{cases} v_i - \beta e_i - (1-\alpha)\, e_j & \textit{if} \quad e_i > e_j \\ v_i/2 - e_i & \textit{if} \quad e_i = e_j \\ -\alpha e_i - (1-\beta)\, e_j & \textit{if} \quad e_j > e_i \end{cases} \tag{2}$$

Two aspects of Proposition 1 are worth noting. First, in symmetric environments where legal expenditures enhance the quality of the case presented and the best case wins, the party spending the most on legal services always wins. Outcomes where parties appear to "buy justice" by hiring superior (and more costly) attorneys are, in fact, consistent with the court determining the winner based purely on the observable evidence presented at trial. While our focus on trial environments that are symmetric in the eyes of the court and where the best case wins is not without loss of generality, it is the natural benchmark to use in comparing the relative merits of different fee-shifting rules.

Second, the form of payoff functions in Proposition 1 permits us to vary the fee-shifting parameters to capture a variety of different litigation rules as special cases. For instance, the following litigation rules are included as important special cases:

American System[8] **(** $\alpha = \beta = 1$**).** Each party pays their own legal expenses, and the party presenting the highest quality case wins.

Continental System ($\alpha = 1$; $\beta \in (0,1)$**).** The loser pays his own costs and, in

[8] We have adopted this terminology from the economics and legal literatures, which uses the terms "American System" and "American Rule" to refer to legal environments where each party pays his or her own legal expenses. It is important to note, however, that in practice it is not this black and white. Kritzer (2002) notes that many U. S. jurisdictions have adopted "one-way" fee-shifting regimes, whereby a successful *plaintiff* may recover a fraction of its attorneys' fees from the losing defendant, but a winning defendant cannot recover its legal expenses. One such example stems from the *Equal Access to Justice Act*, which allows a successful nongovernmental party to recover a fraction of its legal outlays in cases involving federal agencies.

addition, pays a fraction $(1-\beta)$ of the winner's expenses.

British System[9] **($\alpha = 1; \beta = 0$).** Technically, this is the limit of the Continental System as β tends to zero. Here, the party presenting the best case wins, and the loser pays her own legal expenses and virtually all of those of the winning party.

In addition to these well-known systems, our parameterization permits us to examine more exotic systems, such as ones we call the Quayle, Marshall, and Matthew systems:

Quayle System[10] **($\alpha = 2$; $\beta = 1$):** The loser pays his own costs and reimburses the winner up to the level of the loser's own costs.

Marshall System[11] **($\alpha = 0; \beta = 1$):** Technically, this is the limit of the Continental system as α tends to zero. The Marshall system is the reverse of the British system: the *winner* pays her own costs and, in addition, reimburses the loser for all of its legal costs.

Matthew System[12] **($\alpha = 1$; $\beta \in (1, \infty)$):** The winner is required to "go the

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[9] Once again, we adopt this terminology from the relevant literatures which use the terms "British System" and "English Rule" to refer to environments where the loser pays the winner's legal expenses. Even in England, this rule is not generally applied in its pure form (see Kritzer, 2002 and Davis, 1999).

[10] As noted in introduction, we call this parameterization the "Quayle system" because Dan Quayle chaired the President's Council on Competitiveness, which recommended that the U.S. adopt this mechanism in its *Agenda for Civil Justice Reform in America* (1991). Smith (1992) analyzed this system in a model where parties' subjective probabilities of winning may not be consistent, and in which the determination of legal expenditures is exogenous.

[11] We call this the Marshall System in honor of George Catlett Marshall who, as U.S. Secretary of State, organized the *European Recovery Program* (better known as the *Marshall Plan*). He is not to be confused with Thurgood Marshall or John Marshall, both of whom served on the U.S. Supreme Court.

[12] We call this the Matthew system because Matthew 5: 39-41 states:

> "But I say unto you, that ye resist not evil: but whosoever shall smite thee on thy right cheek, turn to him the other also. And if any man will sue thee at the law, and take away thy coat, let him have thy cloak also. And whosoever shall compel thee to go a mile, go with him twain."

Loosely translated: If you are forced to spend \$1 defending yourself in court, go the extra mile and pay an additional amount to your adversary.

extra mile" and transfer an amount to the loser that is proportional to the winner's legal expenditures. This is, in a sense, the reverse of the Quayle system which requires the *loser* to transfer an amount to the winner. The payoffs for the Matthew system are similar to the Continental rule, except $\beta > 1$.

The auction-like structure of the these payoffs, and more generally the payoffs in equation (2), permits us to use auction-theoretic tools to analyze this parameterized class of legal systems. For the remainder of the analysis, we also assume:

(A4) Regularity Conditions on the Distribution of Valuations The density of valuations is bounded, continuous and strictly positive on its support, $[0, \overline{v}]$, where $0 < \overline{v} < \infty$.

3 Legal Outlays at Trial

This section characterizes the equilibrium expenditures on legal services that arise when both parties opt to litigate their dispute in court. The first subsection provides closed-form expressions for the equilibrium expenditures that arise at trial, while the second subsection shows how the cost of litigation per trial varies across different legal systems.

3.1 Equilibrium Legal Outlays

Let $e_i(v_i)$ denote the legal expenditures of a party who values the item in dispute at v_i. If legal expenditures are a strictly increasing function of the amount a litigant stands to gain by winning: $e_i'(v_i) > 0$, then e_i^{-1} exists, and the expected payoff

$EU(e_i, v_i)$ of a party who expends e_i on legal services is:

$$\begin{aligned} EU(e_i, v_i) &= \int_0^{e_j^{-1}(e_i)} [v_i - \beta e_i - (1-\alpha) e_j(v_j)] f(v_j) dv_j \\ &\quad + \int_{e_j^{-1}(e_i)}^{\overline{v}} [-\alpha e_i - (1-\beta) e_j(v_j)] f(v_j) dv_j. \end{aligned} \tag{3}$$

The first term represents the payoffs arising when player i puts forth a higher-quality case than player j and thus wins the item valued at v_i, while the second term represents the payoff from losing. Notice that the expected payoff from litigation critically depends on the fee-shifting rules of the legal system.

Differentiating with respect to e_i gives the first-order condition for player i's optimal level of legal expenditures, given the level e_j of the rival. Using standard auction-theoretic methods (see the Appendix for a detailed proof) we obtain

Proposition 2 *Suppose the litigation environment satisfies* (*A*1) *through* (*A*4). *In the unique symmetric equilibrium in differentiable strategies, the legal expenditures of a party who values the item in dispute at* v *is*

$$e(v) = [\alpha - (\alpha - \beta) F(v)]^{-2} \int_0^v s f(s) [\alpha - (\alpha - \beta) F(s)] ds. \tag{4}$$

Notice that under assumptions $A1$ though $A4$, the item in dispute is always awarded to the party presenting the best case, and furthermore, the allocation of the item is efficient since it is always awarded to the party valuing it most highly (this follows from the symmetry and monotonicity of the equilibrium expenditures in equation (4); see the Appendix).

As a corollary to Proposition 2, one may obtain closed form expressions for the equilibrium legal expenditures that arise under various legal systems by simply substituting specific parameter values for (α, β) into the general expression in Proposition 2. These are presented in Table 1.

Table 1: Equilibrium Legal Expenditures for Selected Legal Systems

Legal System	α, β	Expenditures $(e(v))$
American	$\alpha = 1, \beta = 1$	$\int_0^v sf(s)ds$
British	$\alpha = 1, \beta = 0$	$\frac{\int_0^v sf(s)[1-F(s)]ds}{[1-F(v)]^2}$
Continental	$\alpha = 1, \beta \in (0,1)$	$\frac{\int_0^v sf(s)[1-(1-\beta)F(s)]ds}{[1-(1-\beta)F(v)]^2}$
Marshall	$\alpha = 0, \beta = 1$	$\frac{\int_0^v sf(s)F(s)ds}{F(v)^2}$
Quayle	$\alpha = 2, \beta = 1$	$\frac{\int_0^v sf(s)[2-F(s)]ds}{[2-F(v)]^2}$
Matthew	$\alpha = 1, \beta \in (1,\infty)$	$\frac{\int_0^v sf(s)[1-(1-\beta)F(s)]ds}{[1-(1-\beta)F(v)]^2}$

3.2 The Cost of Litigation per Trial

Proposition 2 permits us to compare the expenditures arising under several of the litigation systems in Table 1. To see this, note that the only differences in the American, British, Continental, and Matthew systems is β, as $\alpha = 1$ for all of these systems. It is straightforward to establish that the equilibrium expenditures of a litigant who values the item at $v \in (0, \overline{v})$, given in equation (4), are strictly decreasing in β. Thus, other things equal, litigants spend less *per trial* in systems where β is higher. The intuition is that legal systems with higher β's require the winner to pay a greater share of her own legal expenditures. This reduces the benefits of winning, and therefore induces parties to spend less on attorneys. Furthermore, an increase in β increases the payoff to the loser by reducing the amount of the winner's expenses the loser is required to pay. In fact, when β increases above unity, the loser actually receives a direct payment from the winner. In short, an increase in β reduces the benefit of winning relative to losing, and this leads to less vigorous legal battles in court.

Since β is highest under the Matthew system and lowest under the British system, it follows that, regardless of her valuation, a litigant will spend more under the British system than under the Continental, American, or Matthew systems. To summarize,

Proposition 3 *Under assumptions A*1 *through A*4*, the equilibrium expenditures of a litigant who values the item at* $v \in (0, \overline{v})$ *can be ordered as follows:*

$$e(v)^{British} > e(v)^{Continental} > e(v)^{American} > e(v)^{Matthew}$$

Unfortunately, Proposition 3 does not provide a complete ranking of all of the legal systems in Table 1. This stems from the fact that the equilibrium expenditure functions under the American system and the Quayle system cross, as do expenditures under the American system and Marshall system. In situations where the expenditure functions cross, unambiguous expenditure rankings are not possible. To see this, consider the special case where the distribution of values is uniformly distributed on the unit interval ($F(v) = v$ for $v \in [0, 1]$). In this case, equilibrium expenditures under the American and Marshall systems are given by

$$e^A(v) = \frac{1}{2}v^2$$

and

$$e^M(v) = \frac{1}{3}v,$$

respectively. These functions cross at $v = \frac{2}{3}$: Litigants with valuations below $\frac{2}{3}$ spend less under the American system, while those with valuations above $\frac{2}{3}$ spend more under the American system.

It is possible, however, to unambiguously rank the *expected* legal outlays induced by legal systems with arbitrary fee-shifting parameters. Indeed, the expected legal outlays induced by a litigation system are independent of α and decreasing in β. A simple and elegant way of seeing this is to apply arguments based on the Revenue Equivalence Theorem.[13]

Let $U(v)$ denote the expected utility of a litigant of type v in the unique symmetric equilibrium in differentiable strategies, and $P(v)$ denote the corresponding probability she wins the suit. Note that, since the litigant with the higher valuation always wins, $P(v) = F(v)$ for all $v \in [0, \overline{v}]$. Hence, the expected utility of a litigant of type v is the probability she wins the suit times her valuation of the item in dispute, less her expected net payment. Since the internalization of legal costs ($A3$) implies that the expectation of net payments across all types is simply $E[e(v)]$,

$$E[U(v)] = E[F(v)v] - E[e(v)]. \tag{5}$$

[13]In our 1997 working paper, we provide an alternative analytic proof that expected legal outlays are independent of α and decreasing in β. Paul Klemperer, in private communication and subsequently in Klemperer (2003), suggested a proof based on the Revenue Equivalence Theorem (RET). We are indebted to Paul Klemperer for this insight and use the RET approach in what follows.

Note that, by standard results in mechanism design (cf. Klemperer, 1999), $U(v) = U(0) + \int_0^v F(x)\,dx$. Hence

$$E[U(v)] = U(0) + E\left[\int_0^v F(x)\,dx\right]. \tag{6}$$

Furthermore, since the litigant with the higher valuation always wins, the expected utility of a litigant with the lowest possible valuation is $U(0) = -(1-\beta)E[e(v)]$. Substituting this expression for $U(0)$ in equation (6) and taking expectations yields

$$E[U(v)] = -(1-\beta)E[e(v)] + \int_0^{\overline{v}}\left[\int_0^v F(x)\,dx\right] f(v)\,dv \tag{7}$$

Equating equations (5) and (7) and integrating reveals that

$$E[e(v)] = \frac{1}{\beta}\int_0^{\overline{v}} vf(v)[1-F(v)]dv.$$

To summarize:

Proposition 4 *Under assumptions* $A1$ *through* $A4$, *a litigant's expected equilibrium legal expenditures at trial are given by*

$$E[e(v)] = \frac{1}{\beta}\int_0^{\overline{v}} vf(v)[1-F(v)]dv. \tag{8}$$

Thus, while a litigant's actual legal expenditures generally depend on both α and β, her *expected* legal expenditures are independent of α. The above proof essentially utilizes a version of the RET that applies to litigation systems in which the expected utility of a litigant with the lowest possible valuation is non-zero (as is the case in the British legal system). The RET implies that equilibrium expected utility depends on the underlying litigation parameters only through their effect on the expected utility of a litigant with the lowest possible valuation. Regardless of the magnitude of α, a litigant with the lowest possible valuation knows she will lose for sure, and thus in equilibrium spends nothing on legal services. Hence, the expected utility of a litigant with the lowest possible valuation is simply $-(1-\beta)$ times the expected equilibrium expenditures induced by the litigation system. These observations induce the structure of equation (7), which when combined with equation (5), implies that expected equilibrium expenditures are independent of α, but are strictly decreasing in β.

In addition, since total expected legal expenditures per trial are given by $TC = 2E\left[e\left(v\right)\right]$, Proposition 4 implies that total expected legal expenditures per trial are not only independent of α, but are strictly decreasing in β. Thus we immediately have the following result as corollary to Proposition 4:

Proposition 5 *Under assumptions $A1$ through $A4$, total expected legal expenditures per trial are given by*

$$TC\left(\beta\right) = \frac{2}{\beta}\int_0^{\overline{v}} vf(v)[1-F(v)]dv.$$

Thus, regardless of the value of α, legal systems with higher β's result in unambiguously lower total expected legal expenditures per trial. In particular:

$$TC^{British} > TC^{Continental} > TC^{American} = TC^{Marshall} = TC^{Quayle} > TC^{Matthew}$$

Since the American, Marshall and Quayle systems all have the same β, they result in the same expected legal expenditures at trial. As we show in the Appendix, this result critically depends on our assumption ($A2$); if random effects also influence the court's decision, the Marshall, Quayle, and Matthew systems will result in different expected expenditures at trial.[14]

Proposition 5 reveals that, conditional on both players litigating, expected legal expenses per trial are highest under the British system and lowest under the Matthew system. In fact, Proposition 5 implies that by choosing β arbitrarily large in the Matthew system, one can make total expected legal expenditures arbitrarily small. Thus, one might be tempted to conclude that, given the assumptions of the model, the Matthew system is the "optimal" litigation system; after all, the judicial outcome is both efficient and just, and furthermore, the system can be devised in a manner that "minimizes" legal expenditures on a per-trial basis. This reasoning is incomplete, however, as the following analysis reveals.

By assumption $A3$, litigation costs are internalized, so total expected legal expenditures equal the total expected utility loss from litigation. Thus, the expected payoffs from litigating (denoted EU) are higher in legal systems where expected expenditures per trial are lower. It follows from Proposition 5 that

Proposition 6 *Under assumptions $A1$ through $A4$, the expected payoffs of litigants*

[14] We are indebted to an unusually insightful referee for pointing this out and for providing a sketch of the treatment we provide in the Appendix.

can be ordered as follows:

$$EU^{British} < EU^{Continental} < EU^{American} = EU^{Marshall} = EU^{Quayle} < EU^{Matthew}$$

More generally, the expected payoffs of the litigants are independent of α and strictly increasing in β.

Together, Propositions 5 and 6 illustrate an important trade-off. On the one hand, legal systems with higher β's result in lower expected equilibrium legal expenditures per trial, and the Matthew system results in the lowest possible expected expenditures per trial. On the other hand, legal systems with higher β's result in higher expected payoffs from litigation, thus making it more attractive for parties to bring suits in the first place. Thus, while the Matthew system results in lower expenditures per trial, adopting such a system would likely increase the number of cases brought to trial.

Factoring in the increased number of trials, it is not at all clear which legal system results in the lowest expected total legal expenditure from an *ex-ante* standpoint. Furthermore, for litigation systems in which expected payoffs are negative at trial, it is not at all clear rational players would opt to litigate in the first place. We address these two important issues in the next section.

4 Why Litigate in the First Place?

The total expected expenditures induced by a given legal system depend not only on the expected expenditures per trial under each system, but also on the number of trials induced by each system. *Ceteris paribus*, systems that generate lower expected expenditures per trial provide greater expected payoffs from litigation, and therefore result in more cases being brought to trial. The ranking across legal systems of the *ex ante* expected total costs of litigation depend upon this trade off. We now provide a simple model that captures these basic forces, and also show that litigation results in a sort of "prisoner's dilemma" when one endogenizes players' decisions to litigate or settle in the first place.

To illustrate these issues, consider a two stage game where in the first stage, players simultaneously but independently make a decision whether to litigate or to concede. If both players decide to litigate, they enter a second stage in which they simultaneously decide how much to spend on legal effort (the game analyzed above). If one party concedes while the other opts for litigation, the litigating party is awarded the item in summary judgement. If both parties concede, the payoffs to the parties depend on the nature of the dispute. For example, if the item in dispute is a parcel of land, the absence of clearly defined property rights might result in the land remaining fallow and each party receiving a payoff of $U^C(v_i) = 0$. Alternatively, property rights in this case might be allocated on the basis of a coin flip or an unmodeled administrative process which – from the standpoint of the disputants – resembles a fair randomizing device. In this case party i's expected payoff is $U^C(v_i) = v_i/2$.

The expected payoff to player i (with value v_i) from entering the litigation stage depends on the set of values v_j for which player j chooses to litigate, the beliefs that player j has about the set of values for which player i litigates, the beliefs of player i concerning these beliefs of player j, and so on. If players have common beliefs regarding the distribution of litigants' valuations in the litigation stage (so that the environment is symmetric and our previous results apply), the incentives of the two parties in the first stage of the game are as illustrated in the matrix below.[15] Here $U^L(v_i, F^*)$ and $U^L(v_j, F^*)$ refer to the expected payoffs to i and j, respectively, from entering the litigation game described in the sections above when the distribution of valuations of those opting to litigate is F^*.[16] We will show that there exists a symmetric perfect Bayesian equilibrium with a cutoff value $\widehat{v}$, such that each player litigates if and only if his realized value is greater than or equal to his respective cutoff value, and thus $F^*(v) = (F(v) - F(\widehat{v})) / (1 - F(\widehat{v}))$.

Player j

Player i		Litigate	Concede
	Litigate	$U^L(v_i, F^*), U^L(v_j, F^*)$	$v_i, 0$
	Concede	$0, v_j$	$U^C(v_i), U^C(v_j)$

Note first that if $U^C(v_i) < v_i$, player i has an incentive to litigate if he expects his rival to concede. This implies, among other things, that there does not exist an equilibrium in which all types of players concede, so that $\widehat{v} < \overline{v}$. Since player

[15] Note that, due to the asymmetric information, player i knows v_i but perceives that v_j is a random draw from F^*.

[16] Note that, while the results in the previous section assume valuations are drawn from a common distribution F on $[0, \overline{v}]$, it is trivial to extend the results to the case where the support is $[\underline{v}, \overline{v}] \subset R_+$. All we require here is that, given an initial distribution of values, F, each litigant perceives that valuations (conditional on litigation) are *iid* draws from some distribution, F^*. As shown below, there exists an equilibrium in which F^* is a simple truncation of F.

valuations are private information, this implies that, in a symmetric equilibrium, a positive fraction of players will be engaged in litigation games of the sort examined in Sections 2 and 3. Expressed differently, even if litigation is socially inefficient (due to wasteful expenditures on attorneys), one would expect to observe a positive level of litigation. Furthermore, if $U^L(v_i, F^*) \geq 0$ for all i, endogenizing players' decisions to litigate in the first place leads to a sort of "prisoner's dilemma."

To illustrate, consider the special case where $U^C(v_i) = v_i/2$. Suppose there exists a symmetric equilibrium in which players with valuations $v \geq \widehat{v}$ choose to litigate and those with valuations below $\widehat{v}$ do not. Hence,

$$\begin{aligned} U^L(v_i, F^*) &= U^L\left(v_i, \left(F(v) - F(\widehat{v})\right) / \left(1 - F(\widehat{v})\right)\right) \\ &\equiv EU^L\left[v_i|\widehat{v}\right]. \end{aligned}$$

In this case, a player with a valuation $\widehat{v}$ is indifferent between litigating and not, so $\widehat{v}$ must satisfy

$$[1 - F(\widehat{v})]\, EU^L[\widehat{v}|\widehat{v}] + F(\widehat{v})\,\widehat{v} = \frac{1}{2}\widehat{v}F(\widehat{v}), \tag{9}$$

where $EU^L[\widehat{v}|\widehat{v}]$ refers to the expected payoff of a player whose valuation is $\widehat{v}$, given that it is common knowledge that each player litigates if and only if his value is greater than or equal to $\widehat{v}$. Rearranging this expression yields

$$EU^L[\widehat{v}|\widehat{v}] = \frac{-\widehat{v}F(\widehat{v})}{2\left[1 - F(\widehat{v})\right]}. \tag{10}$$

For a given $\widehat{v}$, we know from Proposition 6 that the left-hand-side of equation (10) depends only on β and F, and furthermore, is increasing in β. It follows that $\widehat{v}$ is a decreasing function of β, and thus there exists a symmetric perfect Bayesian equilibrium where players with valuations below $\widehat{v}$ concede while those higher valuations go to trial and play a game analogous to that described in Sections 2 and 3.

Imposing additional structure enables one to explicitly solve for the set of types who will rationally engage in litigation. For instance, suppose v is uniformly distributed on $[0, 1]$ (so that $F(v) = v$) and $\alpha = \beta$. Straightforward calculations (see the Appendix) reveal that the *ex ante* expected legal outlays – taking into account both the incentives to litigate and expected expenditures per trial – are maximized when $\beta = 1$. The relationship between expected expenditures and β is shown in Figure 2. In this case, taking into account not only ex-post expenditures per trial but also the incentives to litigate in the first place, the ex ante expected legal expenditures are maximized under the American System ($\alpha = \beta = 1$). Under this system, litigation dominates conceding for any player with valuation $v > 0$, and total expected expenditures are

$$\begin{aligned} 2E\left(e\left(v\right)\right) &= 2E\left(\int_0^v sf(s)ds\right) \\ &= 2\int_0^1 \frac{1}{2}v^2 dv = \frac{1}{3}. \end{aligned}$$

We may conclude that, for this parameterization with endogenous litigation choice, the American system results not only in more litigation, but greater *ex ante* expected legal outlays than a system in which $\beta < 1$. Furthermore, all types litigate under the American system, so increases in β above 1 do not increase the incidence of litigation. Since total legal expenditures conditional upon litigating decrease in β, the American legal system leads to the highest possible *ex ante* total expected legal expenditures.

Since the expected legal expenditure of the litigant with the lowest valuation is invariant with respect to α, any legal system satisfying $(A1)$ through $(A4)$ and $\beta = 1$ will generate the same *ex ante* expected legal expenditure as the American system. Hence, in particular, the Quayle System also results in higher *ex ante* expected expenditures than legal systems where $\beta \neq 1$.

In concluding this section, we stress that these findings are based on a discrete two stage game in which any attempts to settle the case out of court must occur in the first stage. The second stage represents the point at which there is insufficient time for further settlement discussions, and players must commit (through the irreversible payments to attorneys required at this stage) to the court's mechanism for resolving the dispute. One may readily extend the settlement stage to include multiple periods, so long as there exists a "drop dead date" at which players must *simultaneously* commit *all* legal expenditures. An interesting extension of our model would be to examine settlement and litigation with flow expenditures in continuous time or to extend the model to allow for preemption by one of the parties.

5 Discussion

Our auction-theoretic framework considered a symmetric litigation environment in which the legal ownership of the disputed asset is unknown to the court. The court observes only the quality of the case presented by each party, and awards the asset to the party presenting the best case (justice is always served). Litigants can influence the quality of their case by hiring skillful attorneys. The class of litigation systems considered includes standard systems (such as the American, British, and Continental systems), as well as more exotic ones (which we call the Quayle, Marshall, and Matthew systems). Equilibrium legal expenditures per trial are increasing in the proportion of the winner's attorney fees that must be paid by the loser, while the expected payoffs of the litigants are a decreasing function of this proportion. This results in a trade-off: litigation systems with lower equilibrium legal expenditures per trial (such as the American, Quayle, and Matthew systems) provide a greater incentive for parties to sue than systems that entail higher equilibrium legal expenditures (such as the British and Continental systems). Expected legal expenditures per trial, as well as litigation incentives, are independent of the proportion of the loser's legal fees paid by the winner and loser.

Notice that if one's objective is solely to reduce wasteful expenditures on attorneys, one might contemplate imposing a tax on legal expenditures. This can easily be analyzed within our framework by altering assumption ($A3$) to permit taxes on legal services. For example, suppose a proportional tax rate of, say τ, is imposed on the parties' legal expenditures. Given the payoff structure in equation (1), the invariance of expected utility with respect to affine transformations implies that the ultimate effect is to reduce each litigant's valuation of the disputed item by the same factor. In particular, for any tax rate τ imposed on the parties' litigation expenditures, the incentives confronting a player with valuation v are equivalent to a no-tax regime in which the disputed item's value is $v_\tau \equiv v/(1+\tau)$. Thus, it follows that for any given τ, the rankings derived in Propositions 3 through 6 still apply.

Importantly, however, even a casual reading of the literature makes it clear that the "best" legal system is not necessarily the one that minimizes expected legal expenditures. Indeed, equity, equal access to the law, fairness, and a host of other factors (such as the probability of a wrong verdict) are also important considerations. Furthermore, different legal systems induce different asymmetries; in some jurisdictions, a defendant is presumed innocent until proven guilty, while in others the burden is on the defendant. Even within a given country, some types of cases have different burdens of proof, ranging from "beyond reasonable doubt" to merely a "preponderance of the evidence." In short, alternative legal systems have a plethora of advantages and disadvantages, and are far more complex than those analyzed in any theoretical model. Our analysis of the expected expenditures arising under different legal systems is but one small piece of a much larger puzzle.

With these caveats, our analysis suggests that a movement from the American system to the Quayle system would neither reduce expected legal expenditures on a per-trial basis nor reduce the incentives for parties to litigate. To the extent that America's reputation for being a litigious society is based on the shear number of suits brought to trial,[17] a movement toward the Continental or British system might reduce the number of suits and the strain on the court system. Furthermore, while our analysis suggests that such a move would result in higher expected legal costs on a per-trial basis, under plausible conditions the *ex ante* legal expenditures (taking into account both incentives to litigate and expected expenditures to trial) would be lower.

Unfortunately, there are relatively few empirical studies that shed definitive light on whether these predictions are consistent with the evidence. As Kritzer (2002) notes, cross-country comparisons, such as studies comparing litigation expenditures in the United States with those in Britain, are problematic because of other substantive differences between the countries.[18] Snyder and Hughes (1990) attempt to avoid these problems by using data from a "natural experiment" within the United States in which Florida shifted from the American system to the British system for resolving medical malpractice suits. They provide evidence that is consistent with the predictions of our model: The shift from the American to the British system significantly reduced

[17]Branham (1998), reports that product liability suits are, on a per-capita basis, 8 times more prevalent in the U.S. than in Britain.

[18]For example, contingency fees—the practice whereby attorneys do not bill clients for attorney's fees but instead receive a fraction of any winnings—are common in the U.S. but absent in most other countries (cf. Davis, 1999).

the incidence of litigation, but increased expenditures at trial by over 61.3 percent. Further empirical research in this area, perhaps combining our theoretical framework with empirical auction techniques, might be a fruitful avenue for future research.

Finally, it is also important to stress that our findings are based on a stylized model that incorporates a number of simplifying assumptions. For instance, our assumption $A1$ restricts attention to environments where neither party has an advantage with respect to the evidentiary or legal merits of her claims to the disputed asset, nor access to an attorney capable of making superior arguments on her behalf. While the empirical evidence provided by Waldfogel (1998) suggests that the pretrial adjudication process tends to weed out cases with observable asymmetries, one can certainly imagine trials in which one party has a distinct advantage with respect to the intrinsic legal merits. An interesting extension would be to capture differences in intrinsic merit by allowing for asymmetric legal production functions.

Our analysis also ignores the impact of budget constraints. One undesirable feature of the British system is that it might make courts a playing field for only the wealthy. Under the British system, the prospect of having to pay the winner's legal expenses might preclude the poor from seeking justice through the court system. This may explain why there are significant differences across countries in government subsidies designed to aid low-income litigants. For example, Houseman (2003) notes that, as a fraction of GDP, Britain's expenditures on civil legal aid is about 12 times greater than that in the United States. The simple auction-theoretic litigation framework set forth in this paper, coupled with recent work by Che and Gale (1998) on auctions with budget-constrained players, may serve as a useful starting point for a more complete analysis of these issues.

Appendix

Proof of Proposition 2.

Suppose first that the equilibrium legal expenditures are a strictly increasing function of the amount a litigant stands to gain by winning: $e_i'(v_i) > 0$; this supposition will be verified below. Under this assumption, e_i^{-1} exists, and the expected payoff $EU(e_i, v_i)$ of a party who expends e_i on legal services is as in (3) in the main text. Differentiating $EU(e_i, v_i)$ in (3) with respect to e_i gives the first order condition for player i's optimal level of legal expenditures:

$$\frac{1}{e_j'(e_j^{-1}(e_i))}\left[v_i - \beta e_i - (1-\alpha)e_j(e_j^{-1}(e_i))\right] f(e_j^{-1}(e_i)) - \int_0^{e_j^{-1}(e_i)} \beta f(v_j)dv_j$$
$$-\frac{1}{e_j'(e_j^{-1}(e_i))}[-\alpha e_i - (1-\beta)e_j(e_j^{-1}(e_i))]f(e_j^{-1}(e_i)) - \int_{e_j^{-1}(e_i)}^{\overline{v}} \alpha f(v_j)dv_j = 0.$$

In a symmetric equilibrium, $e_i(v) = e_j(v) = e(v)$, so we may simplify the last expression to obtain the differential equation:

$$e'(v) = \frac{vf(v)}{\alpha - (\alpha-\beta)F(v)} + \frac{2(\alpha-\beta)f(v)}{\alpha - (\alpha-\beta)F(v)}e(v). \tag{11}$$

The solution to this differential equation is known as

$$e(v) = \int_0^v \frac{sf(s)}{\alpha - (\alpha-\beta)F(s)} \exp\left[\int_s^v \frac{2(\alpha-\beta)f(u)}{\alpha - (\alpha-\beta)F(u)}du\right] ds \tag{12}$$

Straightforward manipulation (12) yields (4) from the main text.

Note that the equilibrium expenditures $e(v)$ in (4) are strictly positive for all $v \in (0, \overline{v})$ since $\alpha(1 - F(s)) + \beta F(s) > 0$ for $v \in (0, \overline{v})$, and $(\alpha, \beta) > 0$. We also verify that

$e'(v) > 0$. Substituting (4) in the RHS of (11) yields

$$\frac{de(v)}{dv} = \frac{f(v)}{[\alpha(1-F(v)) + \beta F(v)]^3} Q(v),$$

where

$$\begin{aligned} Q(v) &= 2(\alpha - \beta) \int_0^v s f(s)[\alpha(1-F(s)) + \beta F(s)] ds \\ &\quad + v[\alpha(1-F(v)) + \beta F(v)]^2. \end{aligned}$$

Evidently, for $\alpha \geq \beta$, $Q(v) > 0$ and hence $e'(v) > 0$. When $\alpha = 0$, $Q(v)$ can be simplified to

$$Q(v) = \beta^2 \int_0^v F(s)^2 ds > 0.$$

Thus if $\alpha = 0$ and $\beta > 0$ then $e'(v) > 0$. For the case $0 < \alpha < \beta$, we note that the factors multiplied by $2\alpha\beta$ can be rewritten as

$$\begin{aligned} & \int_0^v s f(s) F(s) ds - \int_0^v s f(s)(1-F(s)) ds + v(1-F(v))F(v) \\ = & \int_0^v F(s)(1-F(s)) ds > 0. \end{aligned}$$

Hence, $e'(v) > 0$ for $v \in (0, \overline{v})$.

Next, we verify that the second order condition holds. We follow Matthews' (1995) analysis for the first price auction and show that there is no incentive to misrepresent one's type, given that the opponent uses the equilibrium strategy. If a litigant bids as if his valuation is z while his true valuation is v, his expected payoff (3) becomes

$$\begin{aligned} EU(e(z), v) &= vF(z) - \beta e(z)F(z) - E[e(v)] + \alpha \int_0^z e(v) f(v) dv - \alpha e(z)\{1 - F(z)\} \\ &\quad + \beta \int_z^{\overline{v}} e(v) f(v) dv. \end{aligned}$$

Compare this to the payoff when bidding according to his valuation $EU(e(v), v)$. Define the difference in payoffs

$$\Delta(z, v) = EU(e(z), v) - EU(e(v), v).$$

Differentiating this difference Δ yields

$$\frac{d\Delta(z, v)}{dz} = vf(z) - \{\alpha - (\alpha - \beta)F(z)\}e'(z) + 2(\alpha - \beta)e(z)f(z).$$

Using (11) we can substitute out $e'(z)$

$$\frac{d\Delta(z, v)}{dz} = (v - z)f(z).$$

Integration then yields

$$\Delta(z, v) = (v - z)F(z) - \int_z^v F(x)dx \leq 0$$

since $F(x)$ is non-decreasing.

Finally, we establish uniqueness. Since $\min\{\alpha(1-F(v))+\beta F(v)\} \geq \min\{\alpha, \beta\} > 0$, and the boundedness of the density imply that the linear differential equation (11) satisfies a Lipschitz condition. This implies existence and uniqueness, see Coddington and Levinson (1955, Theorems 2.3 and 2.2). Moreover, the solution can be continued to the boundaries $v = 0, \overline{v}$, see Coddington and Levinson (1955, section 1.4). Q.E.D

Random Merit

Here we relax assumption $(A2)$. Suppose exogenous circumstances also affect the quality of the case. In particular, suppose that with probability π the quality of the case is determined as in the text, but with probability $1-\pi$ the quality is determined by an independent random variable that awards the case to either party with probability 1/2. Payoffs are as follows (cf. equation 3) when $e_i > e_j$:

$$\begin{aligned} & \pi\{v_i - \beta e_i - (1-\alpha)e_j\} + (1-\pi)\frac{1}{2}\{v_i - \beta e_i - (1-\alpha)e_j\} \\ & +(1-\pi)\frac{1}{2}\{-\alpha e_i - (1-\beta)e_j\} \\ = \; & \frac{1+\pi}{2}v_i - \{\beta\frac{1+\pi}{2} + \alpha\frac{1-\pi}{2}\}e_i - \{(1-\alpha)\frac{1+\pi}{2} + (1-\beta)\frac{1-\pi}{2}\}e_j. \quad (13) \end{aligned}$$

Similarly, if $e_i < e_j$ the payoffs are

$$\frac{1-\pi}{2}v_i - \{\alpha\frac{1+\pi}{2} + \beta\frac{1-\pi}{2}\}e_i - \{(1-\beta)\frac{1+\pi}{2} + (1-\alpha)\frac{1-\pi}{2}\}e_j. \quad (14)$$

Differentiating the implied expected payoff function yields the analogue of equation (3) relevant in the case of random merit:

$$e'(v) = \frac{\pi v f(v)}{\alpha\frac{1+\pi}{2} + \beta\frac{1-\pi}{2} + \pi(\beta-\alpha)F(v)} + \frac{2\pi(\alpha-\beta)f(v)}{\alpha\frac{1+\pi}{2} + \beta\frac{1-\pi}{2} + \pi(\beta-\alpha)F(v)}e(v).$$

Solving this differential equation gives the analogue to (4)

$$e(v) = \frac{\pi}{[\alpha\frac{1+\pi}{2} + \beta\frac{1-\pi}{2} + \pi(\beta-\alpha)F(v)]^2}H(v)$$

where

$$H(v) = \int_0^v sf(s)[\alpha\frac{1+\pi}{2} + \beta\frac{1-\pi}{2} + \pi(\beta-\alpha)F(s)]ds.$$

The expected legal expenditures can therefore be written as:

$$E[e(v)] = \int_0^{\overline{v}} \frac{\pi}{[\alpha\frac{1+\pi}{2} + \beta\frac{1-\pi}{2} + \pi(\beta-\alpha)F(v)]^2} H(v) f\,(v)\,dv.$$

Integrating by parts and simplifying yields

$$E[e(v)] = \frac{2\pi}{\alpha(1-\pi)+\beta(1+\pi)} \int_0^{\overline{v}} sf(s)[1-F(s)]ds. \tag{15}$$

Comparing this expression to (8) (which obtains as a special case when $\pi = 1$), notice that α enters the expression for the expected equilibrium expenditures when $\pi \neq 0$. In this case, the American system and the Quayle proposal are no longer equivalent; under the latter the expected equilibrium expenditures are indeed lower (as hoped by the President's Council), since

$$TC^{Marshall} > TC^{American} > TC^{Quayle}.$$

Thus, assumption $(A2)$ is not innocuous.

Ex Ante Expected Expenditures in the Two-Stage Game: The Uniform Case

We now provide the details underlying the example presented in Section 4 and Figure 2. Here, v is uniformly distributed on $[0,1]$ and $\alpha = \beta$. In this case, only players with valuations in excess of $\widehat{v}$ will litigate, so conditional on being in the litigation stage, the opponent's valuation is uniformly distributed on the interval $[\widehat{v}, 1]$. Thus, in instances where both parties litigate, the legal expenditure of a player with valuation $v \in [\widehat{v}, 1]$ is

$$\begin{aligned} e(v) &= \beta^{-2}\beta \int_{\widehat{v}}^{v} s \frac{1}{1-\widehat{v}} ds \\ &= \frac{1}{2\beta} \frac{\widehat{v}^2 - v^2}{\widehat{v} - 1}. \end{aligned}$$

Notice that a player with valuation $\widehat{v}$ loses with probability one, but he none-the-less is willing to litigate because the rents earned if the rival had conceded exactly offsets any loss in the litigation stage. At trial, his own expenditures are zero by the above calculation, but he pays the fraction $(1-\beta)$ of the expenditures of his rival. The expected expenditures of his rival are

$$\begin{aligned} E\left[e\left(v\right)|\widehat{v}\right] &= \int_{\widehat{v}}^{1} \frac{1}{2\beta} \frac{\widehat{v}^2 - v^2}{\widehat{v} - 1} \frac{1}{1-\widehat{v}} dv \\ &= \frac{1}{6\beta}\left(2\widehat{v} + 1\right). \end{aligned}$$

Thus, the expected utility of a player of type $\widehat{v}$ in the litigation stage is (using equation 3),

$$\begin{aligned} EU^L\left[\widehat{v}|\widehat{v}\right] &= -\beta e_i\left(\widehat{v}\right) - \left(1-\beta\right) E\left[e\left(v\right)|v > \widehat{v}\right] \\ &= -\frac{\left(1-\beta\right)}{6\beta}\left(2\widehat{v} + 1\right) \end{aligned}$$

Consequently, the critical value $\widehat{v}$ in equation (10) satisfies

$$-\frac{\left(1-\beta\right)}{6\beta}\left(2\widehat{v} + 1\right) = \frac{-\widehat{v}^2}{2\left(1-\widehat{v}\right)}$$

so

$$\widehat{v} = \widehat{v}\left(\beta\right) = \frac{1}{\beta+2}\left(\left(\frac{1-\beta}{2}\right) + \frac{1}{2}\sqrt{3}\sqrt{\left(\beta+3\right)\left(1-\beta\right)}\right)$$

Notice that $\widehat{v}(\beta)$ is decreasing in β with $\widehat{v}(0) = 1$ and $\widehat{v}(1) = 0$. It follows that the *ex ante* fraction of players opting to litigate, $1 - F(\widehat{v}(\beta)) = 1 - \widehat{v}(\beta)$, tends to zero as β tends to zero. In contrast, all players opt for litigation when $\beta \geq 1$.

We may use these results to calculate the *ex ante* expected legal expenditures for a legal system with parameter $\alpha = \beta$ that takes into account both the incentives to litigate and the expected legal outlays conditional upon litigation. Since litigation expenditures arise only if both parties litigate, and this event occurs with probability $[1 - F(\widehat{v}(\beta))]^2$, we have for $\beta \in [0, 1]$ that $[1 - F(\widehat{v}(\beta))] \in [0, 1]$. For the uniform case $(F = v)$, for instance,

$$\begin{aligned} \Pr(i \ \& \ j \text{ litigate}) E(\text{Legal Outlays}|i \ \& \ j \text{ litigate}) &= [1 - F(\widehat{v})]^2 (2Ee(v|v > \widehat{v})) \\ &= (1 - \widehat{v}(\beta))^2 \frac{2}{6\beta} (2\widehat{v}(\beta) + 1). \end{aligned}$$

When $\beta > 1$, all types will choose to litigate and thus $\widehat{v} = 0$. In this case,

$$\begin{aligned} \Pr(i \ \& \ j \text{ litigate}) E(\text{Legal Outlays}|i \ \& \ j \text{ litigate}) &= [1 - F(0)]^2 2Ee(v|v > 0) \\ &= 2Ee(v) \\ &= \frac{1}{3\beta} \end{aligned}$$

It follows from these equations that *ex ante* expected legal expenditures – taking into account both the incentives to litigate and expected expenditures per trial – are maximized when $\beta = 1$.

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Figure 1: Tort Expenditures as a Percentage of GDP. Source: *Economic Report of the President, 2004.*

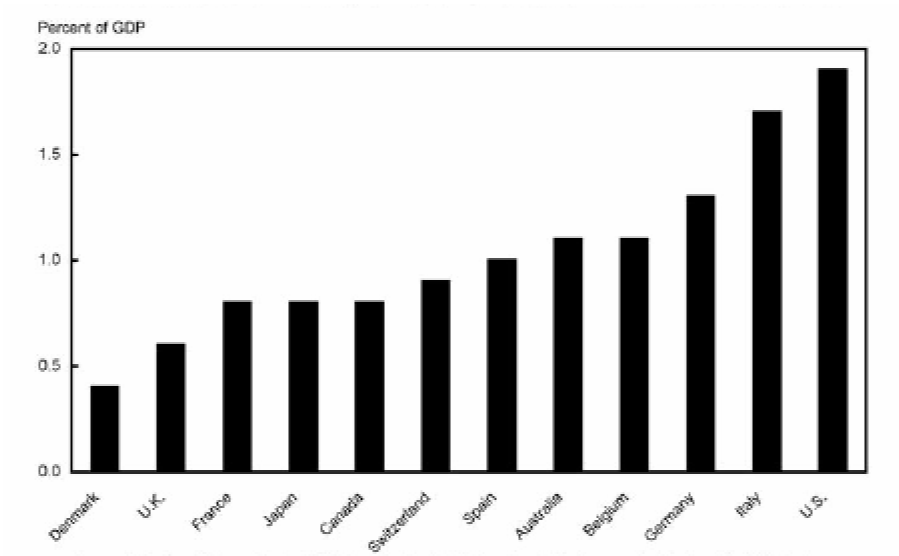

Figure 2: Taking into account expected expenditures at trial as well as the incentive to litigate, the American system ($\beta = 1$) maximizes *ex ante* expected legal outlays.