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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 by 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, American rule, and some recently proposed legal reforms are special cases of our model.

Keywords: Auctions, contests, litigation, fee-shifting

JEL Classification: D8, K4

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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 Qualye), 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

[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).

rules), also require losers to compensate winners for a portion of their legal costs.[3]

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, $f/(1-F)$. Schweizer (1989) considers a model where 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

[3] Under the British system, 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.

to each party from a trial. In particular, under the American rule the plaintiff's expected payoff from trial is $pA - x$, where p is her belief concerning the likelihood of winning an amount A in trial, and x is the amount the plaintiff must spend to litigate the case. In contrast, under the British rule the plaintiff's expected payoff is given by $pA - (1 - p)(x + y)$, where y is the amount the defendant must spend to defend the litigation. Based on this model, Hughes and Snyder conclude that when p is greater than 0.5 and litigation expenditures are symmetric ($x = y$), the British Rule leads to a lower expected payoff for the plaintiff than the American rule. As a consequence, plaintiffs will litigate fewer cases: 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 several respects. First, we focus on a symmetric trial environment rather than pre-trial negotiation and settlements. In situations where the court and/or parties can readily observe the underlying merits of the case, one would expect the parties to reach a settlement or otherwise the court to issue summary judgement. In our model, cases brought to trial have the property of being symmetric in the sense that the observable merits of each side's position are roughly the same, at least initially.

Secondly, we assume that the parties in such a suit can influence the observable merits of their case (and thus their probability 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 (among the parties and the court) 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 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 justice is always served – how much you pay an attorney is irrelevant; all that matters is the quality of

[4] As noted by Klemperer (2000), auction theory is a powerful tool for analyzing a host of economic problems, including litigation.

the case presented at trial. We show that these two views need not be inconsistent.

More specifically, we examine symmetric trial environments where (1) legal expenditures increase the quality of the case presented; (2) justice is always served, and (3) litigation costs are neither subsidized nor taxed in the aggregate. Here, symmetric means that the initial endowments of evidence make the case equally meritorious in the eyes of the law, and furthermore, each party has access to equally qualified attorneys to present their side of the case to the court. To be concrete, consider a divorced couple engaged in a nasty custody battle over a child. When the initial endowments are symmetric (for instance, both parent's work and are on good terms with the child), there is no *a priori* basis for determining the "correct" or "incorrect" decision. All the court can do is evaluate the arguments presented by each side, and award custody to the party presenting the best case. Thus, the assumption that "justice is always served" 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.

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. Our Proposition 1 shows that, in any litigation environment where justice is always served, players have symmetric access to "quality" legal representation, and where legal expenditures increase the quality of the case presented to the court, then the player spending the most on attorneys always wins. Thus, "just outcomes" are not inconsistent with the observation that the winning party spent the most on attorneys.

Section 3 uses auction-theoretic tools to characterize the equilibrium legal expenditures that arise for the parameterized class of legal systems, while Section 4 offers several Propositions which may be used to compare the expenditures that arise under alternative fee-shifting rules. We also identify a legal system that results in minimal legal expenditures per trial while guaranteeing that the judicial outcome is both "just" and efficient. We find that, in equilibrium, the American system results in lower expected legal costs 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. However, the incentive to go to trial is actually higher under the American system than the Continental or British System. A testable implication is that there are more trials in the U.S. than in Britain or on the Continent, but that less is spent on a per-trial basis in the United States. Litigation incentives under the Quayle and American systems are identical, so we may conclude that the Council's proposal does not represent an improvement over the status quo. More generally we find that there is a trade-off between the expected legal expenditures per trial and the number of trials: Legal systems that result in lower expenditures per trial result in a greater number of trials.

2 A 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 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

[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).

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 $(\beta, \alpha) \geq 0$, with strict inequality for at least one element. This implies that, given the judicial decision, a party's utility is non-increasing 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 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.

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. Obviously, in some legal environments one party may have a stronger claim to the asset than the other party. Cases such as these are typically settled out of court or otherwise dismissed on summary judgement by the court.[6] Regardless, our focus on situations where both parties are on equal footing permits us to compare expenditures in a meaningful way across 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 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, in many disputes regarding ownership, each side believes that they have a 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. Second, since our objective is to compare the amount spent for legal services under

[6] Waldfogel (1998) presents evidence which suggests that the pretrial adjudication process tends to weed out parties with observable asymmetries, so that parties actually going to trial (and trial outcomes) tend to be symmetric.

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.

Since we are assuming that the true ownership of the item in dispute is unknown, "justice" reduces to the situation where the court weighs the evidence presented and awards the asset to the party with the most meritorious case.

(A2) Justice is Always Served 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 judicial mistakes and jury nullification whereby the court rules in favor of the party presenting the weakest case.

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.

We are now in a position to characterize the players' payoff functions.

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

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

Proof: 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) yields

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

But by $A1$, $q_i = \phi(e_i)$ and ϕ is monotonic. This implies that $q_i \geq q_j$ if and only if $e_i \geq e_j$, which yields the form of payoffs in equation (2). **QED**

Several aspects of Proposition 1 are worth noting. First, in symmetric environments where legal expenditures enhance the quality of the case presented to the court and justice is always served, 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 justice being served; indeed, these legal environments imply such outcomes. The contrapositive of Proposition 1 implies that, if the party spending the most does not win, then there were either judicial mistakes or the parties were endowed with different technologies for making their case. The latter might occur due to differences in access to "quality" legal counsel or different initial endowments of "evidence." While our focus on symmetric legal environments where justice is always served 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 ($\alpha = \beta = 1$): Each party pays their own legal expenses, and the party presenting the highest quality case wins. In this case, the payoff functions in equation (2) simplify to

$$u_i(e_i, e_j, v_i) = \begin{cases} v_i - e_i & \text{if} \quad e_i > e_j \\ v_i/2 - e_i & \text{if} \quad e_i = e_j \\ -e_i & \text{if} \quad e_j > e_i \end{cases}$$

British System ($\alpha = 1; \beta = 0$): The party presenting the best case wins, and the loser pays her own legal expenses as well as those of the winning party. With this parameterization, the payoff functions in equation (2) are:

$$u_i\left(e_i, e_j, v_i\right) = \begin{cases} v_i & \text{if} \quad e_i > e_j \\ v_i/2 - e_i & \text{if} \quad e_i = e_j \\ -e_i - e_j & \text{if} \quad e_j > e_i \end{cases}$$

Continental System ($\alpha = 1$; $\beta \in (0, 1)$). The loser pays his own costs and, in addition, pays a fraction $(1 - \beta)$ of the winner's expenses:

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

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

$$u_i(e_i, e_j, v_i) = \begin{cases} v_i - e_i + e_j & \text{if} \quad e_i > e_j \\ v_i/2 - e_i & \text{if} \quad e_i = e_j \\ -2e_i & \text{if} \quad e_j > e_i \end{cases}$$

[7] 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.

Marshall System[8] **($\alpha = 0; \beta = 1$):** 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:

$$u_i(e_i, e_j, v_i) = \begin{cases} v_i - e_i - e_j & \text{if} \quad e_i > e_j \\ v_i/2 - e_i & \text{if} \quad e_i = e_j \\ 0 & \text{if} \quad e_j > e_i \end{cases}$$

Matthew System[9] **($\alpha = 1$; $\beta \in (1, \infty)$):** The winner is required to "go the 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 $\beta > 1$:

[8]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.

[9]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.

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

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 continuous and strictly positive on its support, $[0, \overline{v}]$, where $0 < \overline{v} < \infty$.

3 Equilibrium Outlays for Legal Services

Let $e_i(v_i)$ denote the legal expenditures of a party who values the item in dispute at v_i. It is natural to assume that legal expenditures are a strictly increasing function of the amount a litigant stands to gain by winning: $e_i'(v_i) > 0$. 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:

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

Differentiating with respect to e_i gives the first order condition for player i's optimal level of legal expenditures:

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

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

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

The solution to this differential equation is given by

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

Straightforward manipulation (and noting Lemma 1 in the Appendix) yields

Proposition 2 *Suppose the litigation environment satisfies* $(A1)$ *through* $(A4)$*. Then in a symmetric equilibrium, the legal expenditures of a party who values the item in dispute at* v *is*

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

Notice that under assumptions $A1$ though $A4$, the item in dispute is always awarded to the party presenting the best case (justice is always served), 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 Lemma 1).

Table 1 shows how Proposition 2 can be used to obtain closed form expressions for the equilibrium legal expenditures that arise under various legal systems. In each case, the resulting expenditures are obtained simply by substituting specific parameter values for (α, β) into the general expression in Proposition 2.

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	$\alpha = 1, \beta \in (1, \infty)$	$\frac{\int_0^v sf(s)[1-(1-\beta)F(s)]ds}{(1-(1-\beta)F(v))^2}$

4 The Cost of Litigation per Trial

In order to compare the equilibrium levels of legal expenditures that arise under different legal systems, we first establish

Proposition 3 *Under assumptions A1 through A4, the equilibrium expenditures of a litigant who values the item at $v \in (0, \overline{v})$ are strictly decreasing in β.*

Proof:

Inspection of the equilibrium expenditure function in equation (4) reveals that it is sufficient to show that

$$\frac{(\alpha-(\alpha-\beta)F(s))}{(\alpha-(\alpha-\beta)F(v))^2}$$

is strictly decreasing in β for $0<s<v<\overline{v}$. Since and $(\alpha,\beta)\geq 0$ with at least one strictly positive element:

$$\begin{aligned}\frac{d}{d\beta}\left(\frac{(\alpha-(\alpha-\beta)F(s))}{(\alpha-(\alpha-\beta)F(v))^2}\right) &= \frac{F(s)\alpha+\alpha F(s)F(v)-\beta F(s)F(v)-2\alpha F(v)}{(\alpha(1-F(v))+\beta F(v))^3}\\ &\leq \frac{F(v)\alpha+\alpha F(v)F(v)-\beta F(s)F(v)-2\alpha F(v)}{(\alpha(1-F(v))+\beta F(v))^3}\\ &= \frac{-\alpha F(v)(1-F(v))-\beta F(s)F(v)}{(\alpha(1-F(v))+\beta F(v))^3}\\ &< 0\end{aligned}$$

for $0<s<v<\overline{v}$. **QED**

Thus, other things equal, litigants spend less on legal services in legal systems where β is higher. This result stems from two effects of an increase in β. First, 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. Second, 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.

Proposition 3 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. 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, the following result follows directly from Proposition 3.

Proposition 4 *Under assumptions A1 through A4, 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 4 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.

More generally, let $L(\varepsilon) = \{v | v \in (0, \varepsilon]\}$ and $H(\varepsilon) = \{v | v \in [\overline{v} - \varepsilon, \overline{v}]\}$ denote neighborhoods of the lowest and highest possible valuations of the item in dispute.

Proposition 5 *If assumptions A1 through A4 hold and $\varepsilon > 0$ is sufficiently small:*

(a) For $v \in L(\varepsilon)$:

$$e(v)^{Quayle} < e(v)^{American} < e(v)^{Marshall}$$

(b) For $v \in H(\varepsilon)$:

$$e(v)^{Quayle} > e(v)^{American} > e(v)^{Marshall}$$

Proof:

Part (a). We establish the first inequality as follows. Choose $\varepsilon \in \left(0, F^{-1}\left(2 - \sqrt{2}\right)\right)$. Comparison of $e(v)^{Quayle}$ and $e(v)^{American}$ in Table 1 reveals that it is sufficient to show that for all $v \in (0, \varepsilon]$ and $s \in (0, v)$:

$$\frac{2 - F(s)}{(2 - F(v))^2} < 1.$$

But this is easily satisfied, since

$$(2 - F(v))^2 \geq (2 - F(\varepsilon))^2 > \left(2 - F\left(F^{-1}\left(2 - \sqrt{2}\right)\right)\right)^2 = 2.$$

To establish the second inequality, note that, by Lemma 2 in the Appendix, the expenditures of a litigant who values the item at $v = 0$ is zero under both the American and Marshall systems. Since $e(v)$ is continuous in v, it is sufficient to show that at $v = 0$, the slope of the expenditure function under the American system is less than that under the Marshall system. Lemma 3 shows that this is indeed the case, thus completing the proof of part (a). Part (b). Both inequalities for this part of the Proposition follow from the continuity of $e(v)$ and Lemma 4. **QED**

Proposition 5 reveals that the American, Quayle, and Marshall systems have quite different implications for different types of litigants. Litigants who do not value the disputed item very highly will tend to spend less under the Quayle system than under the American system. In contrast, litigants who value the item highly spend more under the Quayle system than under the American system. These results stem from differences in payments by winners and losers under the two systems. Since the legal expenditures of party j (and thus the quality party j's case) are increasing in v_j, both systems imply that a party with a low valuation is unlikely to win. Under the Quayle system, losers pay not only their own attorney fees, but also must reimburse the winner up to the loser's legal expenditures. Relative to the American system (where losers only pay their own legal fees), the Quayle system thus provides litigants with low valuations an incentive to spend less on attorneys, and litigants with high valuations an incentive to spend more.

Why didn't the U.S. adopt the Quayle system? One possibility is that the median voter valued items in dispute quite highly, and realized that her expected legal costs would rise in moving from the American system to the Quayle system. A more compelling reason for its failure is that, on average, the Quayle system does not lead to an improvement over the current U.S. system. As we will see below, even though some types prefer the Quayle system to the American System and others prefer the American system to the Quayle system, these effects average out across all types. More generally, if we compare the *expected* total expenditures that arise under each system in Table 1, a complete ranking of expenditures is possible and furthermore, the American, Quayle, and Marshall systems generate identical total expected legal expenditures.

To see this, let TC denote the total expected legal expenditures that arise in a symmetric equilibrium:

$$TC \equiv E[e_1(v_1) + e_2(v_2)] = 2E[e(v)].$$

These expenditures generally vary depending on the fee-shifting parameters of the legal system. Legal systems that result in lower expected legal expenditures are most desirable from the viewpoint of the litigants; from the viewpoint of attorneys, legal systems that result in the highest expected legal expenditures are most desirable.

Proposition 6 *Under assumptions $A1$ through $A4$, total expected legal expenditures can be ordered as follows:*

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

Proof:

Since the rankings in Proposition 4 hold for all v, they also hold in expectation. Thus, it is sufficient to show that $TC^{American} = TC^{Marshall} = TC^{Quayle}$. Under assumptions $A1$ through $A4$, $e(v)$ is symmetric and (by Lemma 1) strictly increasing. This means that for all $(\alpha, \beta) \geq 0$, the court's allocation of the item in dispute is efficient in the sense that the winning party values the item most highly. By the Revenue Equivalence Theorem (see Myerson, 1981), this implies that the expected total legal expenditures under a given legal system depends solely on the expected payoff earned by a litigant with the lowest possible valuation.[10] Using equation (3), the payoff of a litigant who values the item at v_i is

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

so the equilibrium payoff of the party with the lowest possible valuation is

$$EU(0) = -\alpha e(0) - \int_0^{\overline{v}} (1-\beta) e(s) f(s) ds.$$

[10]We are indebted to Paul Klemperer for suggesting this proof.

Under the American, Marshall and Quayle systems, $\beta = 1$; thus for these legal systems,

$$EU(0) = -\alpha e(0).$$

Thus, it is sufficient to show that the expenditures of a litigant who values the disputed item at $v = 0$ are equal under the American, Marshall, and Quayle systems. Since Lemma 2 shows that the lowest valuation type spends zero in equilibrium under all three systems, we conclude that $TC^{American} = TC^{Marshall} = TC^{Quayle}$. This establishes the result. **QED**

While Proposition 6 provides a complete ranking of the total expected legal expenditures that arise for the litigation rules in Table 1, a natural question is whether one can rank the expected expenditures induced by legal systems with *arbitrary* fee-shifting parameters, (α, β). To address this issue, we first show that a litigant's expected legal expenditures are independent of α.

Proposition 7 *Under assumptions A*1 *through A*4*, a litigant's expected equilibrium legal expenditures are given by*

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

Proof.

From Proposition 2 we have

$$e(v) = [\alpha - (\alpha - \beta)F(v)]^{-2}H(v),$$

where

$$H(v) \equiv \int_0^v sf(s)[\alpha - (\alpha - \beta)F(s)]ds.$$

The expected legal expenditures can therefore be written as:

$$\begin{aligned} E[e(v)] &= \int_0^{\overline{v}} e(v)f(v)dv \\ &= \int_0^{\overline{v}} [\alpha - (\alpha - \beta)F(v)]^{-2} H(v)f(v)dv. \end{aligned}$$

Integration by parts gives

$$\begin{aligned} E[e(v)] &= (\alpha - \beta)^{-1}[\alpha - (\alpha - \beta)F(v)]^{-1}H(v)|_0^{\overline{v}} \\ &\quad - \int_0^{\overline{v}} (\alpha - \beta)^{-1}[\alpha - (\alpha - \beta)F(v)]^{-1}\frac{\partial H(v)}{\partial v}dv \\ &= \frac{1}{\beta(\alpha - \beta)}H(\overline{v}) - \frac{1}{(\alpha - \beta)}\int_0^{\overline{v}} vf(v)dv, \end{aligned}$$

since $H(0) = 0$ and

$$\frac{\partial H(v)}{\partial v} = vf(v)[\alpha - (\alpha - \beta)F(v)].$$

Simplifying further gives

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

QED.

Thus, although a litigant's actual legal expenditures generally depend on both α and β, her *expected* legal expenditures are independent of α. The intuition for this result is as follows. In a symmetric equilibrium, all litigants adjust their expenditures to account for their likelihood of winning: litigants with high valuations spend more and litigants with lower valuations spend less. Regardless of the value of α, a litigant with the lowest possible valuation knows he will lose for sure, and thus in equilibrium spends nothing on legal services. In light of the payoff structure in equation 2, this means that when the loser has the lowest possible valuation, neither the winner nor loser's payoff depends on α. Since equilibrium expected payoffs are determined by the expected payoff of the lowest valuation type and legal expenses are internalized, expected equilibrium expenditures are independent of α.

Since total expected legal expenditures are given by $TC = 2E\left[e\left(v\right)\right]$, Proposition 7 implies that total expected legal expenditures are not only independent of α, but are strictly decreasing in β. To summarize,

Proposition 8 *Under assumptions $A1$ through $A4$, total expected legal expenditures 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.

5 Expected Payoffs and the Incentive to Litigate

Proposition 6 reveals that expected legal expenses are highest under the British system and lowest under the Matthew system. In fact, Proposition 8 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 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 flawed, 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 (denoted EU) of litigants are higher in systems where expected expenditures are lower. It follows from Proposition 8 that

Proposition 9 *Under assumptions* $A1$ *through* $A4$, *the expected payoffs of litigants 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 8 and 9 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 maximize the number of cases brought to trial. Factoring in the increased number of trials, it is not at all clear that a movement to the Matthew system would result in lower social outlays on legal services.

Regardless, the above results do suggest that a movement from the American to the Continental or British systems would reduce the incentives of parties to litigate, while a movement from the American to the Quayle system would have no impact on litigation incentives. Testable implications of Propositions 6 and 9 include the hypotheses that more cases are brought to trial under the American system than under the British or Continental systems, and that less is spent per trial under the American system. We note that Hughes and Snyder (1995) provide empirical evidence that the American system indeed results in fewer trials than the British system. We are unaware of any empirical evidence regarding per-trial expenditures under different legal systems.

To summarize, the effective costs to society of a given legal system depend not only on the expected expenditures per trial under each system, but 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.

6 Conclusion

Our auction-theoretic framework considered a symmetric litigation environment in which the legal ownership of the disputed asset is unknown by 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. Even though the parties and the court are asymmetrically informed, in equilibrium the court's decision is always just and efficient. 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).

Our framework provides a complete ranking of a continuum of different legal 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.

Our analysis also reveals 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 in the U.S., a movement toward the Continental or British system might improve matters by reducing the number of suits and the strain on the court system. Unfortunately, such a move would result in higher expected legal costs on a per-trial basis. While our analysis ignores the impact of budget constraints, one undesirable feature of such a move might be to make courts a playing field for only the wealthy. 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.

A Appendix

The heuristic argument used to derive the expression in equation (4) assumes that $e_j(v_i) > 0$ and $e'_j(v_i) > 0$ for $v_i \in (0, \overline{v})$. The following Lemma shows that these conditions are satisfied by the expression in equation (4).

Lemma 1 *$e(v)$ in equation (4) satisfies the following properties for all $v \in (0, \overline{v})$:*

(a) $e(v) > 0$;

(b) $e'(v) > 0$.

Proof.

(a) This part follows from the fact that $\alpha(1 - F(s)) + \beta F(s) > 0$ for $v \in (0, \overline{v})$, and $(\alpha, \beta) \geq 0$ with at least one element strictly positive. (b) To see that $e'(v) > 0$, differentiate (4) to obtain

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

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

$$\begin{aligned} Q(v) &= -2\beta \int_0^v s f(s) \beta F(s) ds + v\beta^2 F(v)^2 \\ &= \beta^2 \int_0^v F(s)^2 ds > 0. \end{aligned}$$

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

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

■

Let $e^A(v)$, $e^M(v)$, and $e^Q(v)$ denote the equilibrium expenditures arising under the American, Marshall, and Quayle systems.

Lemma 2 *Under assumptions A1 through A4,*

$$\lim_{v\to 0} e^A(v) = \lim_{v\to 0} e^Q(v) = \lim_{v\to 0} e^M(v) = 0.$$

Proof. The first two equalities follow directly, since

$$\lim_{v\to 0} e^A(v) = \lim_{v\to 0} \int_0^v sf(s)ds = 0$$

and

$$\lim_{v\to 0} e^Q(v) = \lim_{v\to 0} \frac{\int_0^v sf(s)[2-F(s)]ds}{(2-F(v))^2} = 0.$$

For the last equality, use L'Hospital's rule to obtain

$$\lim_{v\to 0} e^M(v) = \lim_{v\to 0} \frac{\int_0^v sf(s)F(s)ds}{F(v)^2} = \lim_{v\to 0} \frac{vf(v)F(v)}{2F(v)f(v)} = 0.$$

■

Lemma 3 *Under assumptions A1 through A4,*

$$\lim_{v\to 0} \frac{de^M(v)}{dv} > \lim_{v\to 0} \frac{de^A(v)}{dv} = 0$$

Proof. Note that

$$\frac{de^M(v)}{dv} = f(v)\left[\frac{F(v)^2 v - 2\int_0^v sf(s)F(s)ds}{F(v)^3}\right]$$

and

$$\frac{de^A(v)}{dv} = vf(v).$$

Clearly,

$$\lim_{v\to 0}\frac{de^A(v)}{dv} = 0.$$

Using L'Hospital's Rule,

$$\begin{aligned}
\lim_{v\to 0}\frac{de^M(v)}{dv} &= \lim_{v\to 0} f(v) \lim_{v\to 0}\left[\frac{2vf(v)F(v) + F(v)^2 - 2vf(v)F(v)}{3F(v)^2 f(v)}\right] \\
&= f(0)\lim_{v\to 0}\left[\frac{1}{3f(v)}\right] \\
&= \frac{1}{3} > 0,
\end{aligned}$$

and the result follows.

■

Lemma 4 *Under assumptions* A1 *through* A4,

$$\lim_{v\to\overline{v}} e^Q(v) > \lim_{v\to\overline{v}} e^A(v) > \lim_{v\to\overline{v}} e^M(v) > 0$$

Proof. The last inequality follows from the fact that

$$\begin{aligned}
e^M(\overline{v}) &\equiv \lim_{v\to\overline{v}} e^M(v) \\
&= \lim_{v\to\overline{v}} \frac{\int_0^v sf(s)F(s)ds}{F(v)^2} \\
&= \int_0^{\overline{v}} sf(s)F(s)ds > 0.
\end{aligned}$$

To establish the middle inequality, note that

$$\begin{aligned} e^A(\overline{v}) &\equiv \lim_{v \to \overline{v}} e^A(v) \\ &= \lim_{v \to \overline{v}} \int_0^v s f(s) ds \\ &= \int_0^{\overline{v}} s f(s) ds \\ &> e^M(\overline{v}). \end{aligned}$$

Finally, we establish the first inequality:

$$\begin{aligned} e^Q(\overline{v}) &\equiv \lim_{v \to \overline{v}} e^Q(v) \\ &= \lim_{v \to \overline{v}} \frac{\int_0^v s f(s)[2 - F(s)] ds}{(2 - F(v))^2} \\ &= \int_0^{\overline{v}} s f(s)[2 - F(s)] ds \\ &= 2e^A(\overline{v}) - e^M(\overline{v}) \\ &> 2e^A(\overline{v}) - e^A(\overline{v}) \\ &= e^A(\overline{v}). \end{aligned}$$

■

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