

Center



Discussion Paper

No. 2007–10

**IN LITIGATION: HOW FAR DO THE “HAVES” COME OUT
AHEAD?**

By Jun Zhou

January 2007

ISSN 0924-7815

In Litigation: How Far Do The “Haves” Come Out Ahead?

*A Game Theoretical Study**

JUN ZHOU

Tilburg Law and Economics Center, Tilburg University[†]

and

Department of Economics, University College London[‡]

January 11, 2007

Abstract

This paper studies the consequences of asymmetric litigation costs. Under three different protocols: static legal process, dynamic legal process with exogenous sequencing and dynamic legal process with endogenous sequencing, solutions are obtained for the litigation efforts and the expected value of lawsuits on each side. Outcomes are evaluated in terms of two normative criteria: achieving ‘justice’ and minimizing aggregate litigation cost. The theory implies that a moderate degree of asymmetry may improve access to justice. The dynamics of legal process may accentuate or diminish the effect of asymmetry. The endogenous sequencing protocol minimizes cost and may improve access to justice. *Journal of Economic Literature* Classification Numbers: C72, D63, D72, K41.

Keywords: access to justice, endogenous sequencing, dynamics of litigation process, resource dissipation.

*The research was supported by Netherlands Organisation for Scientific Research. I am very grateful to Maurits Barendrecht, Jan Boone, Albert Choi, Eric van Damme, Nuno Garoupa and Wieland Müller for their helpful comments. I would like to thank Eric van Damme for his careful reading of various versions of the paper and his patient instructions.

[†]P.O. Box 90153 NL-5000 LE Tilburg, The Netherlands; Email: j.zhou@uvt.nl; Tel: 31 13 466 3682; Fax: 31 13 466 3042

[‡]WC1E 6BT, Drayton House, Gower street, London, The United Kingdom

1. Introduction

IN ECONOMIC ANALYSIS of legal contests, researchers often assume that access to court intervention is equally costly for both parties and that the parties choose their legal effort levels only once and simultaneously. In this paper my main objectives are to study the influence of asymmetric litigation costs on litigants' legal investment incentives and the subsequent equilibrium of the 'litigation game' and consider the dynamics of legal process. This is worthwhile, because my model generates significantly different efficiency and distributional implications than symmetric, static models. Moreover, when we are directly evaluating the performance of legal institutions and making policy recommendations for litigation-system reform, it is useful to proceed within a framework that is fully consistent with various asymmetry and timing considerations.

Litigants often vary substantially in their litigation costs and parties with cost advantages tend to come out ahead in litigation and adjudication.¹ This idea is an old one, but it has received renewed attention in the last three decades. Galanter's seminal work (1974) made a compelling case for the proposition that the advantaged players, who are called the "haves", tend to come out ahead in litigation. Galanter argues that the "haves" tend to win more often because they are likely to enjoy superior material resources and have access to lawyers capable of making superior arguments on their behalf. Superior resources enable the "haves" to purchase the best available legal assistance and expert witnesses, that may improve the chances of victory at trial. Second, Galanter contends, "repeated players," who tend to be "haves", will come out ahead because they are usually more adept at conforming their claims to the requirements of the law; hence less experienced individuals ("one-shotters") with grievances will be deterred from initiating lawsuits against repeat players or contesting legal claims submitted by them. It is this aspect of Galanter's theory that I will focus on, that is, on *consequences of asymmetry* in the parties' adeptness at handling lawsuits.

The question of 'how just is the justice system in the presence of asymmetry' is the most important question I seek to answer in this paper. Drawing from Galanter's work, I study the effect of asymmetry on the payoffs of advantaged players, the "haves", and disadvantaged players, who are called the "have nots". I will be generating a game theoretical model of litigation and give a quantitative impression on the effect of asymmetry. While no single paradigm can fully capture the intricacies of litigation process, for the purpose of this paper three different litigation protocols come ready for use: static legal process, dynamic legal process with exogenous sequencing and dynamic legal process with endogenous sequencing. The static protocol is

¹For empirical evidence see, e.g. Wheeler et al. (1987), Eisenberg and Farber (1996) and Songer et al. (1999). Wheeler et al. (1987) provide evidence from 5,904 U.S. supreme court cases from 1870 to 1970 that confirms the hypothesis that financially and organizationally stronger parties tend to prevail in litigation against weak parties, for different types of cases, time period and types of legal representation. Using data on over 200,000 U.S. federal civil litigations, Eisenberg and Farber (1996) show that the distribution of litigation costs for individuals has more variation than the distribution of litigation costs for corporations. Lawsuits where the plaintiff is an individual and the defendant a corporation are found to have lower plaintiff win rates. Songer et al. (1999) provide evidence from U.S. courts of Appeals from 1925 to 1988 in support of the hypothesis that appellate litigants with significant organizational strength are much more likely to win than less organized litigants who are lack of litigation expertise and economies of scale.

most often seen in the litigation literature. Although this is a good approximation in a variety of legal contests with either no opportunity of exchanging information granted by procedural requirement or significantly high costs associated with observing opponent's legal action, usually during a litigation, the development and presentation of evidence occurs sequentially in a sequence of discovery process. Therefore, my contention has been that the dynamic litigation protocol with multiple stages, in which the plaintiff having the first move and both sides react to each other's choices, is closer to the usual sequence of litigation process. In addition, I contend that very often in legal disputes either party may put forward (or defend against) a claim and precommit his/her effort. Examples of such litigation games include custody, divorce and business contract disputes. It is my purpose in this paper to endogenise the decision to initiate a lawsuit and study the equilibrium sequence of legal efforts. Furthermore, and for the first time in literature, I establish a *measure of justice distortion* for comparative static exercises: I compare the degree of distortion of justice within a given litigation protocol across different magnitude of asymmetry; I also compare trial outcomes across different protocols with the same degree of asymmetry. To summarize my results, I find that when the parties are unevenly matched, the plaintiff wins more often and earns higher payoff in a dynamic legal process than in static play. Further analysis suggests that in a dynamic process, a moderate degree of asymmetry may work to improve access to justice. The theory also implies that in disputes such as divorce, patent and contract, where either side can make or defend claims, the "have nots" will initiate the litigation to challenge the "haves". The "haves" go along with this and scale back expenditure. Endogenous sequencing minimizes litigation cost and may improve access to justice. Its outcome Pareto-dominates static play outcome.

The remainder of the paper is organized as follows: section 2 represents the background of the paper. Section 3 sets up the model and introduces the normative criteria. Section 4.1 analyzes static litigation game. Section 4.2 analyzes dynamic litigation game with exogenous timing. Section 4.3 endogenizes the choice of timing. Section 5 concludes.

2. Background

I contribute to the existing economic literature on litigation with endogenous legal expenses. The first novelty of this paper is that I consider *sequential* legal contests with *multiple* stages. There is a large literature on contest theory, originating from Tullock's seminal work (1980). Tullock studies rent-seeking contest with symmetric players choosing their effort levels *only once* and *simultaneously*. This game theoretical model has since served as the starting point for numerous extensions, owing to its stylized feature and great simplicity.² While the early literature on litigations has predominantly studied such a static one-shot game,³ there is a growing strand of this literature recognizing the sequential nature of litigation where one party exerts efforts after the other. Hirshleifer and Osborne (2001) compares the effort levels of the one-shot simultaneous play with those of two-stage sequential plays. They find that given the (exogenous) opportunity to exert effort first, the advantaged player overcommits to his effort

²Nitzan (1994) provides a survey of this literature.

³See, e.g. Kobayoshi and Lott (1996) and Farmer and Pecorino (1999).

with respect to his one-shot simultaneous Nash equilibrium level while the disadvantaged undercommits. These interesting results however rely critically on the assumption that litigants can exert effort only once. While this is a good approximation in a variety of lawsuits with either a large fixed cost of investing in litigation or a one-time opportunity of presenting one's case in court granted by the particular legal procedure, in many other legal contests litigants can exert effort multiple times.

This paper extends Hirshleifer and Osborne (2001) and captures the four main elements present in a litigation game. Firstly, litigants can exert effort in *multiple* periods before the litigation ends. Secondly, they do so by observing their opponent's recent effort in an intermediate period; Thirdly, the probability of courtroom success depends on the cumulative effort levels; Finally, litigants exert effort sequentially rather than simultaneously in each period. It is the first element that distinguishes my study from that of Hirshleifer and Osborne (2001). By focusing on the subgame perfect equilibria, I find that in an asymmetric litigation, there are multiple equilibrium paths, all leading to the same legal outcome. Several empirically relevant observations emerge from these equilibria. Firstly, distortion to justice and total effort are typically greater (resp. lower) than that of static litigation model when the 'have' (resp. 'have not') leads. Secondly, the flexibility of multiple actions neither benefits nor harms the litigants. Thirdly, in all equilibria where the 'have' is the plaintiff, all actions of the 'have' are necessarily taken in the first period only, while the 'have not' defendant may allocate her actions throughout all the periods; in all equilibria where the 'have not' is the plaintiff, both parties may exert effort multiple times, but all leads to the same trial outcomes. This implies that the Stackelberg outcome can be sustained as an equilibrium at which the litigation only lasts for two rounds.

The second novelty of this paper is that I consider dynamic legal contests with *endogenous sequencing*. In models of litigation with endogenous legal expenses, timing sequences are usually specified *exogenously*.⁴ However, very often in a legal dispute, either party may initiate as the plaintiff. Examples abound. In a custody case, when both the mother and the father want the custody of their children, both sides may put forward (or defend against) a claim. When a divorce agreement cannot be reached between a spouse, both the husband and the wife can initiate the lawsuit. When a contractual dispute has taken place between a big company purchaser and a small business supplier, both sides may act as a claimant. It is my purpose in this paper to provide a more general game, which includes several of these models as subgames, and in which the timing of play can be influenced by the two parties. I then determine which pattern of timing emerge as a consequence of equilibrium play. This is done by letting the litigants choose both the timing of their moves and their effort level. In the announcement stage of the game, the litigants simultaneously decide whether to invest early or late. If both parties make the same timing decision, the game is played with simultaneous moves. If the timing decisions of the parties differ, the game is played sequentially. I find that in an unevenly matched litigation contest, the Stackelberg outcome in which the 'have not' (or disadvantaged player or 'underdog') leads will emerge as the only equilibrium outcome when the sequencing is

⁴See, e.g. Hirshleifer and Osborne (2001), Braeutigam et al. (1984), Katz (1988), Hause (1989), Kobayashi and Lott (1996), and Farmer and Pecorino (1999).

endogenous. The theory implies that endogenous sequencing protocol minimizes litigation cost and may work to improve access to justice.

3. Model of Litigation

Consider two litigants, party 1 and party 2, who are involved in a civil dispute over the damage award of value V , which has to be divided over two parties. V is common knowledge. An example of this situation is a car accident in which two cars collide. The court has to decide how much fault of each car-driver contributed to the accident. Assume that the “legally right decision” will be the one that the court would accurately reach after extensive investigation of the causes of the accident and the amount of damages. With knowledge on the genuine cause of the accident and the amount of damage due, a legal decision would be available. I assume that the parties in dispute are risk neutral.

3.1. Legal entitlement and Justice

Let θ_1 (with $0 \leq \theta_1 \leq 1$) (resp. θ_2 (with $0 \leq \theta_2 \leq 1$ and $\theta_1 + \theta_2 = 1$)) denote party 1’s (resp. 2’s) (exogenous) *legal entitlement* to the disputed asset. $\theta_1 = 0$ indicates that party 1 is not legally entitled to the asset; $\theta_1 = \theta_2 = 0.5$ indicates that 1 and 2 are each entitled to 50 percent of the asset. I assume that θ_1 and θ_2 are common knowledge among the litigants but not known by the court. Therefore the court’s decision is subject to the influence of legal efforts. I define a litigation system as *just* if the system allocates a *net* payoff of $\theta_1 V$ (resp. $\theta_2 V$) to 1 (resp. 2) in equilibrium. The 2-vector

$$\theta = (\theta_1, \theta_2)$$

is called the *right legal decision*. For the purpose of the current study, it suffices to simplify the discussion and study a particular transparent case, where the two parties have equal legal entitlement, i.e., $\theta_1 = \theta_2 = \frac{1}{2}$. This normalization allows me to focus my attention on the sole effect of asymmetry on parties’ legal decisions and the subsequent litigation outcomes.

3.2. Solution concept

I require equilibrium of this model to be subgame perfect. The effort level of 1 (resp. 2) at period t in subgame perfect Nash equilibrium is denoted by \tilde{e}_1^t (resp. \tilde{e}_2^t). The aggregate effort level of 1 (resp. 2) in subgame perfect Nash equilibrium is denoted by $\tilde{\mathbf{E}}_1$ (resp. $\tilde{\mathbf{E}}_2$).

3.2. Value of the case

For simplicity, assume the American rule is applicable, i.e., each party pays his own legal bills regardless of the outcome. The *value of the case*⁵ to party 1 (resp. 2) given the effort of his

⁵Skaperdas (1996) and Clark and Riis (1998) give axiomatic foundations for contest success functions having this form.

adverse party is

$$u_1 = \begin{cases} \frac{aE_1}{aE_1+E_2}V - E_1 & \text{if } E_1 + E_2 > 0 \\ \frac{1}{2}V & \text{otherwise,} \end{cases} \quad \text{and } u_2 = \begin{cases} \frac{E_2}{aE_1+E_2}V - E_2 & \text{if } E_1 + E_2 > 0 \\ \frac{1}{2}V & \text{otherwise,} \end{cases} \quad (1)$$

where E_1 (resp. E_2) denotes the *aggregate legal effort* expended by party 1 (resp. 2) on presenting a convincing case. I assume the court is equally likely to recognize either party if neither has presented quality evidence. This specification in equation (1) provides a simple and tractable way of illustrating the different efficiency and distributional implications of the asymmetric, dynamic model and the symmetric, static model. More general models will not change my conclusion qualitatively.

3.3. Adeptness and Asymmetry

Let a ($a \geq 0$) denote the degree of *asymmetry* in 1 and 2's *adeptness* or *cost efficiency* in conforming their claims to the requirements of the law. For example, $a = 1$ implies the parties are equally adept with handling the case; $a = 2$ means that party 1 is twice as adept as 2. Using Galanter's (1974) terminology and without loss of generality, when the parties are unevenly matched, I call the more adept party the "*have*" and the less adept party the "*have not*". This parameter, which controls the magnitude of asymmetry, will play a central role in my analysis.

3.4. Win rate

The *trial success probability* or *win rate* of party 1 (resp. 2) is given by

$$w = \frac{aE_1}{aE_1 + E_2} \quad \text{and} \quad 1 - w = \frac{E_2}{aE_1 + E_2} \quad (2)$$

Note that there is a positive but diminishing marginal effect of each party's effort on his own win rate,

$$w_1 > 0, \quad w_{11} < 0, \quad w_2 < 0, \quad w_{22} > 0,$$

where subscripts denote partial derivatives and the arguments (E_1, E_2) are omitted for brevity. These conditions also ensure that an increase in each party's effort level hurts the other, and therefore makes it strategically desirable for each to precommit his/her effort level in such a way as to induce a lower effort from the other in response. Whether this implies a commitment at a higher or a lower level of ones' own effort depends on whether the other's best response function is downward sloping or upward sloping.⁶

3.5. Measure of litigation intensity

I measure the intensity of legal competition by the *rate of dissipation*:

$$r := \frac{E_1 + E_2}{V},$$

⁶The general significance of the slopes of reaction functions has been extensively discussed by Fudenberg and Tirole (1984), Bulow et al. (1985) and Eaton and Grossman (1986).

which is the total legal investment made by both parties discounted by the value of the stake in dispute, i.e., the proportional resources dissipated in legal competition is r .

3.6. Measure of justice distortion⁷

Let 2-vector $\mathbf{u} = (\frac{1}{V}u_1, \frac{1}{V}u_2)$ be the (normalized) *trial outcome*. The *measure of justice distortion* δ in this paper is simply given by the *Euclidean distance* between the trial outcome \mathbf{u} and the right legal decision θ :

$$\delta := \|\mathbf{u} - \theta\|.$$

Once we are equipped with the measure of justice distortion, we can put it to use in comparative static exercises. In the following section, I will examine the comparative statics of equilibrium justice distortion with respect to the changes in magnitude of asymmetry for the static litigation protocol, the dynamic protocol with exogenously determined sequencing and the dynamic protocol with endogenous sequencing, respectively. I will also examine the comparative statics of equilibrium distortion with respect to the changes in the timing of litigation process.

4. Analysis

4.1. Static Litigation Game

Typically, the static, simultaneous-decision protocol is adopted in litigation literature. Although this is a good approximation in a variety of litigation with either no opportunity of exchanging information granted by legal procedure requirement or significantly high costs associated with observing opponent's legal actions, usually during the litigation, the development and presentation of evidence occurs sequentially in a sequence of discovery process. Therefore, my contention has been that the sequential decision protocol with multiple stages, in which the plaintiff having the first move and both sides react to each other's choices, is closer to the usual sequence of litigation process. As a benchmark, though, this section first studies simultaneous choices in a one-shot game.

The sequence of the game is, in period 1 party 1 chooses his legal effort level. In period 2, without knowing 1's effort level, 2 makes her decision. Then the game ends. The unique Nash equilibrium is given by

$$E_1^c = E_2^c = \frac{a}{(a+1)^2}V.$$

where the superscript c stands for simultaneous, or "Cournot", decisions.

Litigation Intensity The *rate of rent dissipation* is given by

$$r^c(a) := \frac{E_1^c + E_2^c}{V} = \frac{2a}{(a+1)^2}, \quad (3)$$

⁷See my companion paper for an extensive discussion on the properties of this measure along with other more sophisticated measures of access to justice.

which indicates that, a fraction of $\frac{2a}{(a+1)^2}$ of the total stakes is dissipated in the litigation process.

Figure 1 depicts the variations of equilibrium rate of rent dissipation as the degree of asymmetry changes. The legal battle is most fierce ($\max r^c(a) = \frac{1}{2}$) when both sides are evenly matched ($a = 1$). The magnitude of resource dissipation drops as the degree of asymmetry enlarges ($\frac{dr^c(a)}{da} > 0$, for $a < 1$ and $\frac{dr^c(a)}{da} < 0$ for $a > 1$). The intuition is straightforward: facing too strong an opponent, the “have not” is pessimistic about her victory and subsequently invests less than when she would if her strength was in close range with the “have”. The “have” exploits the “have not”’s pessimism by investing less as well. The total legal effort level falls.

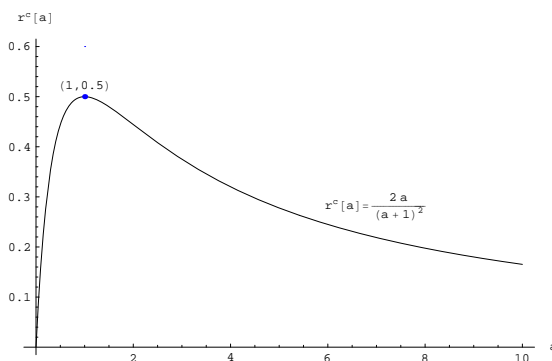


Figure 1: Rent Dissipation (Static Litigation)

Note that the “have” and the “have not” are equally “aggressive” in pursuing trial victory - irrespective of the asymmetry - they invest the same amount of legal efforts to win the case. This symmetric expenditure in rent-seeking games with “bias” has been discussed by Tullock (1980).

Win rate and Trial payoff These legal expenses determine the weight of evidence, the win rate and subsequently the court decision on the division of interests and obligations among the parties:

$$w^c(a) = \frac{a}{a+1} \quad \text{and} \quad 1 - w^c(a) = \frac{1}{a+1}, \quad (4)$$

$$u_1^c(a) = \frac{a^2}{(1+a)^2}V \quad \text{and} \quad u_2^c(a) = \frac{1}{(1+a)^2}V. \quad (5)$$

Obviously, asymmetry influences litigants’ payoffs in equilibrium. When litigants are symmetric ($a = 1$), they split the pie equally ($w = 1 - w = \frac{1}{2}$ and $u_1^c = u_2^c = \frac{V}{4}$). When asymmetry is present, the “have” achieves a more favorable trial outcome ($w^c > 1 - w^c$ and $u_1^c > u_2^c$ for $a > 1$).

Justice distortion According to my measure, the degree of distortion amounts to,

$$\delta^c(a) = \frac{\sqrt{2}(1+a^2)}{2(1+a)^2}. \quad (6)$$

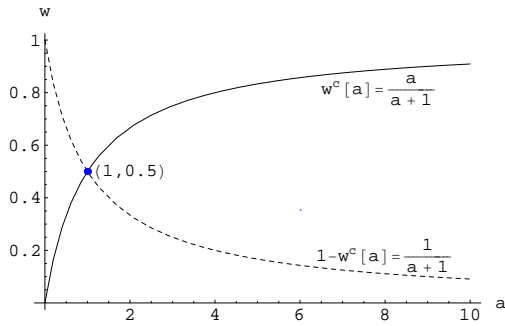


Figure 2: Win Rates (Static Litigation)

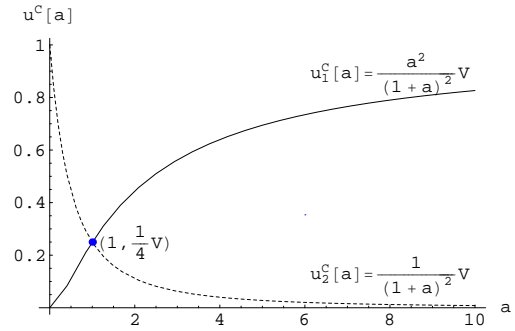


Figure 3: Trial Payoffs (Static Litigation)

Figure 4 depicts the effect of asymmetry on distortion to justice in a simultaneous-move equilibrium. The degree of distortion significantly drops as asymmetry vanishes. The distortion is minimized ($\min \delta^c = \frac{\sqrt{2}}{4} \approx 0.35$) when the parties are evenly matched ($a = 1$). Note that, in equilibrium, the distortion can never be fully eliminated. This is because the parties necessarily incur costs to receive their entitlements.

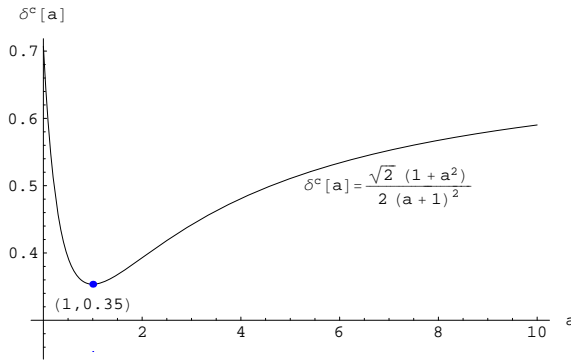


Figure 4: Distortion to Justice (Static Litigation)

4.2. Dynamic Litigation Game – Exogenous Sequencing

In reality, we often observe that litigants expend effort in several periods to win a lawsuit. They have the flexibility to add to their previous efforts after observing their rival’s most recent effort in an intermediate stage. In this section, I study the strategic interactions and the associated outcomes of such dynamic litigation process. The key questions in this section are:

- (i) Will it be profitable for parties to commit?
- (ii) In which way does asymmetry influence parties’ commitment decisions?
- (iii) How does asymmetry alter the parties’ equilibrium payoffs when commitment has taken place?
- (iv) How does the flexibility of multiple actions alter the parties’ litigation behavior and their trial payoffs?

4.2.1. *Two-stage litigation*

I start with a simple case where the litigation takes place in two rounds. Without loss of generality, let party 1 be the plaintiff and 2 the defendant. The plaintiff commits first to a level of litigation effort E_1 – after which it is observed and the defendant responds with E_2 . Later on, I will extend my analysis to litigation games with multiple rounds.

With backward induction, let's first consider the decision of the defendant, who has the opportunity to decide on her legal effort after observing the quality of the plaintiff's case. The defendant's optimal legal effort as a function of the plaintiff's observable legal effort is given by

$$E_2(E_1) = \begin{cases} (aE_1V)^{\frac{1}{2}} - aE_1 & \text{if } E_1 \leq \frac{V}{a} \\ 0 & \text{otherwise,} \end{cases} \quad (7)$$

that is, the defendant only invests to prepare a counter claim if the plaintiff's effort level falls below $\frac{V}{a}$.

Taking into account of the defendant's reaction pattern $E_2(E_1)$, the plaintiff would decide on his observable legal efforts after accessing the likely response of the defendant given E_1 . The plaintiff maximizes his expected trial payoff

$$u_1(E_1, E_2) = \frac{aE_1}{aE_1 + E_2(E_1)}V - E_1 \quad (8)$$

substituting (9), we have

$$u_1(E_1, E_2) = \begin{cases} (aE_1V)^{\frac{1}{2}} - E_1 & \text{if } E_1 \leq \frac{V}{a} \\ V - E_1 & \text{otherwise,} \end{cases} \quad (9)$$

In analyzing the impact of asymmetry on the litigants' investment incentives, it will be helpful to discuss separately two ranges for the parameter a : where $0 \leq a \leq 2$ and where $a > 2$.

In equilibrium of the two-stage game the plaintiff invests

$$E_1^P = \begin{cases} \frac{a}{4}V & \text{if } 0 \leq a \leq 2 \\ \frac{V}{a} & \text{if } a \geq 2. \end{cases} \quad (10)$$

In response, the defendant invests

$$E_2^D = \begin{cases} \frac{a(2-a)}{4}V & \text{if } 0 \leq a \leq 2 \\ 0 & \text{if } a \geq 2, \end{cases} \quad (11)$$

where the superscript P and D indicates "plaintiff" and "defendant", respectively.

Note that, when the parties are unevenly matched and the plaintiff is the “have” (resp. “have not”),⁸ he overcommits (resp. under-commits) to his effort with respect to his one-shot simultaneous Nash equilibrium level ($E_1^P > E_1^c$ when $a > 1$ and $E_1^P < E_1^c$ when $a < 1$). Figure 5 develops the corresponding intuition using best response functions. In the neighborhood of the one-shot simultaneous Nash equilibrium N , the “have nots” defendant’s best response function (BR^2) is downward sloping. That is, when $a > 1$, in the neighborhood of the one-shot simultaneous Nash equilibrium, we have

$$u_{21} = \frac{aV(E_2 - aE_1)}{(aE_1 + E_2)^3} < 0.^9$$

Then party 1 (plaintiff) has the incentive overcommit to a higher E_1^P as the Stackelberg leader, curbing the incentive of his rival. Similarly, $u_{21} > 0$ when the “have” is a defendant ($a < 1$).¹⁰ In the neighborhood of N , his best response function (BR^1) is upward sloping. Then the “have nots” plaintiff has the incentive to commit to a lower E_1^P as the Stackelberg leader. This softens competition. The “have” defendant goes along with this. This insight is important as it demonstrates how unevenly matched litigants significantly differ in their investment strategies when they can precommit their efforts.

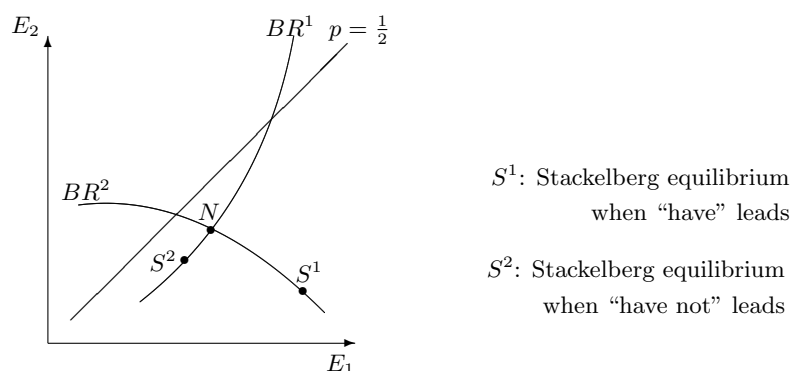


Figure 5: Best response functions

Further note that, $E_1^P = E_2^D = E_1^c = E_2^c = \frac{a}{(a+1)^2}V$ when $a = 1$. The reason for this has been discussed in Warneryd (2000). As alluded to in the Introduction, Warneryd studies a symmetric two-payer contest. He finds that the unique pure-strategy equilibrium outcome under simultaneous decisions coincides with the unique subgame perfect equilibrium outcome

⁸This is often the situation when a litigation game is played between a finance cooperation and an individual debtor, between a condemnor and a property owner, between a tax agency and a tax payer, or between a prosecutor and a criminal accused, where the former acts as a plaintiff. Compared to the disadvantaged defendants, these plaintiffs usually have extensive experience in the type of cases they bring into court; over time, they have developed expertise and have ready access to specialists. Therefore, they enjoy economy of scale and have lower start-up cost for any lawsuit.

⁹Recall that in one-shot simultaneous Nash equilibrium, $E_1^c = E_2^c$.

¹⁰This is usually the case when a litigation game is played between an auto dealer and a manufacturer, between an injury victim and an insurance company, or between a bankrupt consumer and a creditor, where the former takes the role of a claimant.

of a two-stage game where one player’s decision is observed by the other player. The intuition is that when players are evenly matched ($a = 1$), the derivatives of both best response functions vanish at the simultaneous-move equilibrium, which is a sufficient condition for timing of decisions to be irrelevant. 1 cannot gain from precommitment, because the equilibrium under simultaneous moves already occurs at 1’s favorite point on 2’s best response curve, where the latter is tangential to 1’s indifference curve.

Litigation Intensity In a dynamic litigation process of finite even periods, the rate of dissipation is

$$r^s(a) = \frac{E_1^P + E_2^D}{V} = \begin{cases} \frac{a(3-a)}{4} & \text{if } 0 \leq a \leq 2, \\ \frac{1}{a} & \text{if } a \geq 2, \end{cases} \quad (12)$$

where the superscript s stands for sequential, or “Stackelberg”, decisions. A fraction of $\frac{a(3-a)}{4}$ (resp. $\frac{1}{a}$) of the stake is wasted in litigation when the plaintiff is no more than (resp. at least) twice as adept as the defendant.

Figure 6 depicts the relation between the equilibrium rate of dissipation and asymmetry. In general, the total resources dissipated is negatively correlated with asymmetry. This result is intuitive: deterred by her rival’s advantage, the “have not” refrains from investing actively. The “have” exploits his rival’s passiveness by subsequently exerting less effort.

The most intensive litigation will exhaust more than half of the value in dispute ($\max r^s(a) = 0.56$). This takes place when a “have” plaintiff makes an aggressive move to deter its opponent. Refer to figure 5, the marginal payoff of the “have not” defendant is decreasing with respect to the plaintiff’s effort level. Therefore, a “have” plaintiff can curb the defendant’s incentive by overcommit to a higher level of effort and thereby gaining bigger victory in litigation. However, when the difference on both sides is not significantly large, the “have not” defendant would not be adequately deterred and would react aggressively. The result is a very intensive legal combat.

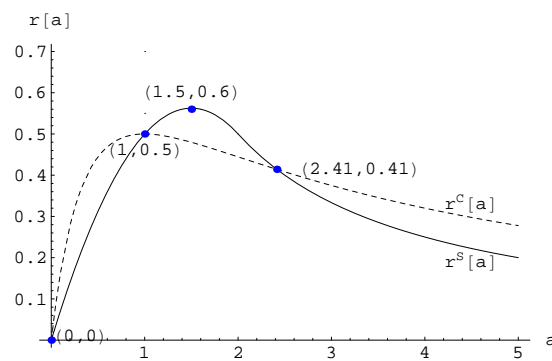


Figure 6: Rent Dissipation (Exogenous Sequencing vs. Static Process)

Figures 6 also illustrates the distinct influences of asymmetry on the intensity of legal investment as the dynamics of legal process differ. When $1 < a < 2.41$, the aggregate legal effort levels

with exogenous sequencing is higher than that in simultaneous decisions ($r^c(a) < r^s(a)$). When $0 < a < 1$ or $a > 2.41$, sequential decision gives rise to less intensive a litigation ($r^s(a) < r^c(a)$). The results under the two protocols coincide when the parties are evenly matched ($a = 1$), or when they are extremely asymmetric ($a = 0$ or $a = \infty$).

Win rate and Trial payoff

$$w^s(a) = \begin{cases} \frac{1}{3-a} & \text{if } 0 \leq a \leq 2, \\ 1 & \text{if } a \geq 2. \end{cases} \quad \text{and} \quad 1 - w^s(a) = \begin{cases} \frac{2-a}{3-a} & \text{if } 0 \leq a \leq 2, \\ 0 & \text{if } a \geq 2. \end{cases} \quad (13)$$

Proposition 1 *In a dynamic legal process with exogenous sequencing, a plaintiff (resp. defendant) wins more (resp. less) often.*

Proof. Proposition 1 can be directly derived by comparing equations (4) and (13). ||

Figure 7 depicts the effect. Further we have,

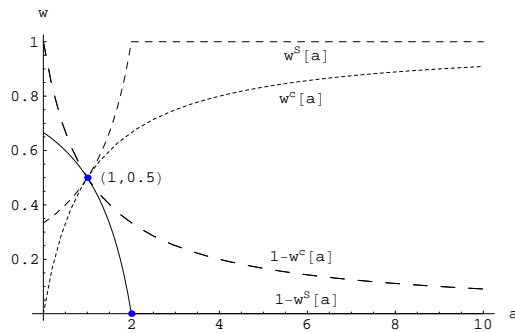


Figure 7: Win Rates (Exogenous Sequencing vs. Static Process)

$$u_1^P(a) = \begin{cases} \frac{a}{4}V & \text{if } 0 \leq a \leq 2, \\ \frac{a-1}{a}V & \text{if } a \geq 2. \end{cases} \quad \text{and} \quad u_2^D(a) = \begin{cases} \frac{(2-a)^2}{4}V & \text{if } 0 \leq a \leq 2, \\ 0 & \text{if } a \geq 2. \end{cases} \quad (14)$$

Proposition 2 *A plaintiff's trial payoff in the dynamic legal process (weakly) exceeds his payoff in the static play. That is, $u_1^P(a) \geq u_1^c(a)$ for all a , where the equality holds if and only if $a = 0$ or $a = 1$ or $a = \infty$.*

Proposition 2 is immediate. Figures 8 shows the result graphically. The intuition is easily conveyed. Consider the plaintiff's trial payoff in the two protocols. Refer to figure 5, we see that the Nash equilibrium N of the static protocol is the intersection of the two best response functions. In a dynamic protocol, the plaintiff chooses his most preferred point on the defendant's best response function. Therefore, the Nash equilibrium of the static play is feasible for the plaintiff. When the static play Nash equilibrium differs from that when the

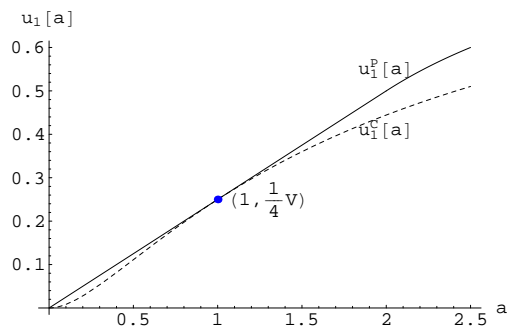


Figure 8: Plaintiff Payoff (Exogenous Timing)

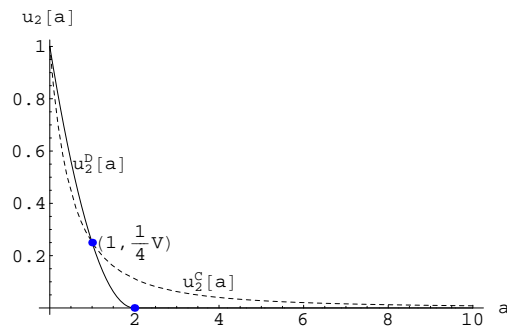


Figure 9: Defendant Payoff (Exogenous Timing)

plaintiff has the first move, which is the case when parties are unevenly matched, the plaintiff does strictly better as a first mover.¹¹ ||

Proposition 3 *A defendant's trial payoff in the dynamic legal process exceeds her payoff in the static play if and only if she is a "have". That is, $u_2^D(a) \geq u_2^c(a)$ for $a \geq 1$ and $u_2^D(a) \leq u_2^c(a)$ for $a \leq 1$ where the equality holds if and only if $a = 0$ or $a = 1$ or $a = \infty$.*

Proof. Proposition 3 can be derived by comparing equations (5) and (14). ||

Corollary 1 *The exogenous sequencing outcome Pareto-dominates the static play outcome if and only if the defendant is a stronger player.*

Proof. Corollary 1 is directly implied by propositions 2 and 3.

Justice distortion The degree of distortion to justice is given by

$$\delta^s(a) = \begin{cases} \frac{1}{4}[8 + 5a(a - 4) + a(a - 4)^2]^{\frac{1}{2}} & \text{if } 0 \leq a \leq 2, \\ (\frac{1}{2} + \frac{1}{a^2} - \frac{1}{a})^{\frac{1}{2}} & \text{if } a \geq 2. \end{cases} \quad (15)$$

Figure 10 depicts the influence of asymmetry on access to justice when timing is exogenous. The distortion reaches its minimum when the plaintiff is (approx.) 80 percent as adept as the defendant rather than when both sides are evenly matched. The dynamics of legal process may accentuate or diminish the effect of asymmetry in terms of access to justice. In general, the degrees of distortion differ under the two protocols. Interestingly, the figure shows that in a dynamic litigation protocol, a moderate degree of asymmetry may work to mitigate the distortion of justice ($\delta^s(a) < \delta^c(a)$ when $0.43 < a < 1$). The distortions converge when the parties are evenly matched ($a = 1$) or extremely unevenly matched ($a = 0$ or $a = \infty$), where timing has absolutely no effect on the outcome of the game.

¹¹A player in a game becomes a "first mover" when he can commit to an effort level, that is, choose a effort level irrevocably and reveal it to the opponent.

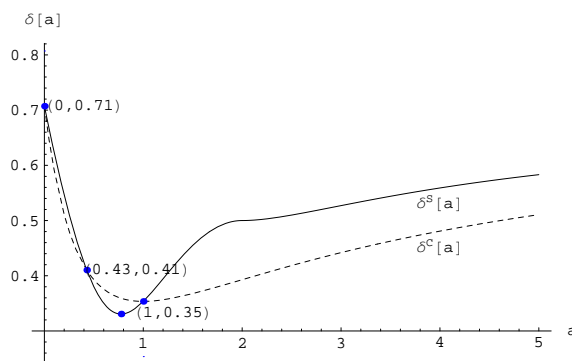


Figure 10: Distortion to Justice (Exogenous Sequencing vs. Static Process)

4.2.2. Litigation with multiple stages

Now suppose the parties expend irreversible effort in $2T$ periods (where T is a natural number). Plaintiff 1 (resp. Defendant 2) chooses his effort level in odd periods (resp. even periods). I require equilibrium of this model to be subgame perfect. That is, starting from any point in the game tree, the player to move selects the effort that maximizes his expected payoff given the subsequent strategies of his opponent and himself. The aggregate effort level of 1 (resp. 2) in subgame perfect Nash equilibrium is denoted by E_1^{SP} (resp. E_2^{SP}). I am ready to present the first main result.

Theorem 1. *For litigations of any finite even stages, and the sequencing of move is exogenous, in subgame perfect equilibrium, the aggregate effort levels of the plaintiff (party 1) and the defendant (party 2) are*

$$E_1^{SP} = E_1^P \text{ and } E_2^{SP} = E_2^D.^{12}$$

In subgame perfect equilibrium, the “have” necessarily takes all action in the first period as a plaintiff; the “have not” can allocate her effort throughout all the periods as a plaintiff. A defendant, being either a “have” or a “have not”, may distribute investment throughout all the periods.

Proof. See Zhou (2006). ||

Several insights emerge from Theorem 1. The flexibility of multiple actions neither benefits nor harms the litigants. In subgame perfect equilibrium, the “have” necessarily takes all action in the first period as a plaintiff, thereby curbing the “have not” defendant’s incentive. This is because a lower effort by a “have” plaintiff in the first period would trigger a more aggressive response by the defendant, which is unfavorable. In contrast, the “have not” can allocate her effort throughout all the periods as a plaintiff as for her there is no need to overcommit. A defendant, being either a “have” or a “have not”, may distribute investment throughout all the periods because there is virtually no opportunity and therefore, no incentive for her to commit.

¹² E_1^P and E_2^D are given in equations (10) and (11).

This result implies that the Stackelberg outcome can be sustained as an equilibrium at which both parties exert all their effort in the first two periods of their moves.

Before turning to endogenous sequencing litigation protocol, let us summarize the results so far. We have seen that unevenly matched litigants significantly differ in their investment strategies when they can precommit their efforts: the “have” plaintiff will overcommit effort compared with the Nash equilibrium in static play. An important implication of the “have” overcommitting effort is that strategic behavior can lead to greater litigation cost and higher distortion to justice. The opposite holds if the “have not” acts as the plaintiff in litigation. Moreover, Theorem 1 shows that unevenly matched litigants significantly differ in their investment strategies when the litigation has multiple stages. The trial outcome, however, is invariant to the number of litigation stages.

4.3. *Dynamic Litigation Game – Endogenous sequencing*

Now assume that, the legal procedure does *not* prescribe which party exerts effort first and which party responds, that is, either party may initiate as the plaintiff in a litigation. This is often the case in legal disputes such as custody, divorce and contract:

(i) In custody litigation, who will put forward (or defend against) a claim if one partner has superior ability to manipulate and intimidate the children regarding their statements to the custody evaluator?

(ii) If a divorce agreement cannot be reached between a spouse, who will initiate the lawsuit when gender bias in family courts works to the female’s (or male’s) advantage?

(iii) Legal costs are typically higher for foreign firms in business contract disputes. They incur higher costs in communications and in translating business documents into a form that will be understood by a domestic court. Will the domestic firm act as a claimant given its typical advantage?

These questions will be answered in this section.

4.3.1. *Equilibrium Sequence of Two-stage Litigation with Announcement*

Now consider the *extended litigation with announcement stage*.¹³ Parties 1 and 2 first decide and announce the rounds in which they will choose their effort levels. This is done simultaneously. The parties then choose their effort levels, knowing when the opponent does so, in the rounds to which they were committed in the announcement stage. If both parties choose to exert efforts in the same rounds, a simultaneous play subgame occurs; if the litigants choose to exert efforts at different rounds, then the party choosing to exert efforts in odd (resp. even) rounds becomes the plaintiff (resp. defendant), giving rise to a sequential play subgame.

Same as before, I start with a simple case: the litigation takes place in two rounds after the announcement stage. Our previous analysis reduces the problem in this section to the analysis of the following normal form game in which parties decide simultaneously on their timing.

¹³Hamilton and Slutsky (1990), Baik and Shorgen (1992) and Leininger (1993) endogenize the sequence of moves in two-stage, two-player contests. Their models are similar to mine.

1 \ 2	Invest early	Invest late
Invest early	(u_1^c, u_2^c)	(u_1^P, u_2^D)
Invest late	(u_1^D, u_2^P)	(u_1^c, u_2^c)

I am now ready to state the second main result.

Theorem 2. *In extended two-stage litigation with announcement stage, when the parties are unevenly matched ($a \neq 1$), in the unique subgame perfect equilibrium, the “have not” emerges as the plaintiff; when the parties are evenly matched ($a = 1$) or extremely unevenly matched ($a = 0$ or $a = \infty$), there are multiple subgame perfect equilibria. The parties are indifferent between exerting effort first, second or simultaneously.*

Proof. When $0 < a < 1$, by comparing equations (5) and (14), we obtain $u_1^P > u_1^c > u_1^D$ and $u_2^D > u_2^P > u_2^c$. In this subgame, it is a *dominant strategy*¹⁴ for the “have not” party 1 to take the role of a plaintiff and invest early and that the “have” party 2 is better off observing then reacting to 1’s action than competing for the first-mover-advantage.¹⁵ The unique subgame perfect equilibrium is (*Invest early*, *Invest late*); Similarly when $a > 1$, the unique subgame perfect equilibrium is (*Invest late*, *Invest early*); When $a = 1$ or $a = 0$ or $a = \infty$, from propositions 3 and 4, we obtain $u_i^P = u_i^c = u_i^D$ for $i = 1, 2$. Therefore, the parties are indifferent among investing in litigation first, second or simultaneously and there exists multiple equilibria.||

Litigation Intensity

$$r^E(a) = \begin{cases} \frac{a(3-a)}{4} & \text{if } 0 \leq a \leq 1, \\ \frac{3a-1}{4a^2} & \text{if } a \geq 1. \end{cases} \quad (16)$$

where E stands for endogenous sequencing decision.

Proposition 5 *The litigation intensity in endogenous sequencing decision falls below that under simultaneous decision. That is, $r^E(a) \leq r^c(a)$ for all a . When and only when asymmetry vanishes or become extremely severe, litigation intensities under both protocols converge. That is, $r^E(a) = r^c(a) = 0.5$ when $a = 1$; $r^E(a) = r^c(a) = 0$ when $a = 0$ or $a = \infty$.*

Proof. This proposition can be derived by comparing equations (3) and (16). ||

Figure 11 illustrates the effect of asymmetry on litigation cost.

¹⁴A strategy is called dominant if it always earns a higher payoff for the one uses it.

¹⁵The first-mover advantage states that a player who can become a first mover is not worse off than in the original game where the players move simultaneously.

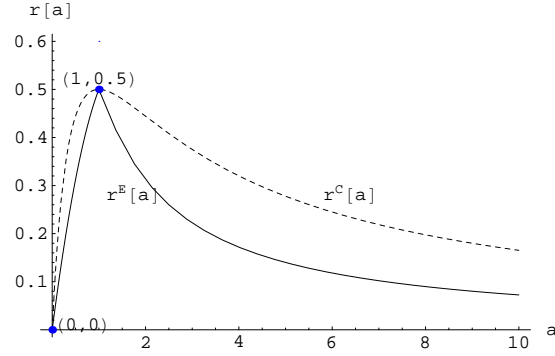


Figure 11: Rent dissipation (Endogenous Sequencing vs. Static Process)

Win rate and Trial payoff

$$w^E(a) = \begin{cases} \frac{1}{3-a} & \text{if } 0 \leq a \leq 1, \\ \frac{2a-1}{3a-1} & \text{if } a \geq 1. \end{cases} \quad \text{and} \quad 1 - w^E(a) = \begin{cases} \frac{2-a}{3-a} & \text{if } 0 \leq a \leq 1, \\ \frac{a}{3a-1} & \text{if } a \geq 1. \end{cases} \quad (17)$$

Proposition 6 *The “have” (resp. “have not”) wins less (resp. more) often in a dynamic protocol than in a static play. That is, $w^E(a) > w^C(a)$ when $0 \leq a < 1$ and $w^E(a) < w^C(a)$ when $a > 1$.*

Proof. This proposition can be derived by comparing equations (4) and (17). ||

When the sequence of moves is endogenously determined, the dynamics of legal process diminishes the effect of asymmetry in terms of win rates. Figure 12 illustrates the difference between the two protocols.

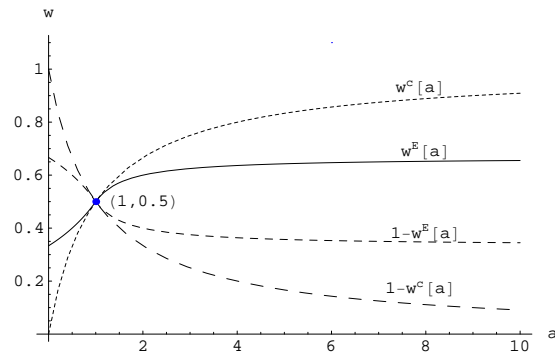


Figure 12: Win Rates (Endogenous Sequencing vs. Static Process)

$$u_1^E(a) = \begin{cases} \frac{a}{4}V & \text{if } 0 \leq a \leq 1, \\ \frac{(2a-1)^2}{4a^2}V & \text{if } a \geq 1. \end{cases} \quad \text{and} \quad u_2^E(a) = \begin{cases} \frac{(2-a)^2}{4}V & \text{if } 0 \leq a \leq 1, \\ \frac{1}{4a}V & \text{if } a \geq 1. \end{cases} \quad (18)$$

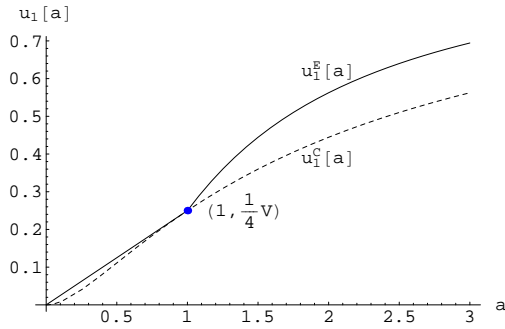


Figure 13: 1's Trial Payoff (Endogenous Timing)

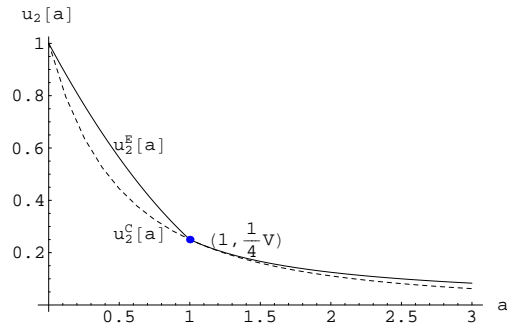


Figure 14: 2's Trial Payoff (Endogenous Timing)

Proposition 7 *The endogenous sequencing outcome Pareto-dominates the static play outcome. That is, $u_i^E \geq u_i^C$ for all a for $i = 1, 2$.*

Proof. This proposition can be directly derived by comparing equations (5) and (18). ||

Justice distortion The degree of distortion to justice is given by

$$\delta^E(a) = \begin{cases} \frac{1}{4}[8 + 5a(a - 4) + a(a - 4)^2]^{\frac{1}{2}} & \text{if } 0 \leq a \leq 1, \\ \frac{1}{4}[8 + (1 + a)(1 - 4a)a^{\frac{1}{3}}]^{\frac{1}{2}} & \text{if } a \geq 1. \end{cases}$$

Figure 15 depicts the influence of asymmetry on access to justice when timing is endogenous. The distortion reaches its minimum when one litigant is (approx.) 80 percent as adept as the other. The figure also illustrates the different impacts that asymmetry would exert on justice as the timing changes. Note that, $\delta^E(a) < \delta^C(a)$ for some a . The enhanced access to justice stems from the parties' flexibility in coordinating their legal actions to soften competition: the "have not" would always has the first move and commit to a low effort level; the "have" goes along and scales back expenditure. Both sides can therefore save a significant amount of effort and avoid fierce litigation.

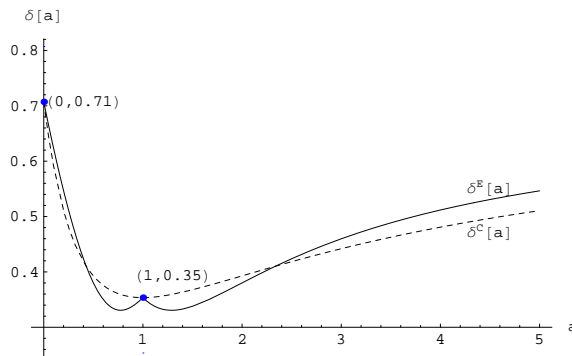


Figure 15: Distortion to Justice (Endogenous Sequencing vs. Static Process)

4.3.2. Equilibrium Sequence of Multiple-stage Litigation

Now suppose after the announcement stage, the parties expend irreversible effort in $2T$ rounds (where T is a natural number).

Theorem 3. *In extended litigation game of any finite even stages, in subgame perfect equilibrium, the aggregate effort levels of the plaintiff (party 1) and the defendant (party 2) are*

$$E_1^{SP} = E_1^P \text{ and } E_2^{SP} = E_2^D.$$

There exists a continuum of subgame equilibrium play path where the weak party initiates the lawsuits and moves in odd rounds and the strong party moves in even rounds.

Proof. The proposition is implied by theorems 1 and 2.

Thus I can answer the questions raised in the beginning of this section: my model predicts that in a dispute where the roles of the plaintiff and the defendant are left to be determined by the players themselves, the “have not” would bring the case to the court to sue the other. The “have” goes along with this. When the parties are evenly matched, they are indifferent between investing early, late or simultaneously.

5. Conclusions

In a game theoretical model, the findings of this study reaffirm Galanter’s thesis that the “haves come out ahead.” The parties with superior strength in litigation consistently fared better than their weaker opponents and the disparity in success rates was greatest when the disparity in strength was greatest. The total legal costs are always low toward the extremes of disparity in strength (where a is close to 0 or ∞) and highest for intermediate values of disparity in strength. Distortions to access to justice are always high toward the extremes of asymmetry and lowest for intermediate values of asymmetry.

Several notable additions of this analysis to the fairly extensive literature that has been built on Galanter’s insights are the discovery that

[1] in a dynamic litigation protocol where the roles of the plaintiff and the defendant are exogenously determined, the tendency of the “haves” to achieve greater trial victory and win more frequently than their less advantaged opponents through aggressive litigation investment is remarkably higher when he “haves” are plaintiffs than when they defendants;

[2] while the dynamics of legal process *always* benefits the plaintiff, it hurts the defendant when she is disadvantaged and the sequencing of move and countermove is exogenous;

[4] in lawsuits such as custody, patent and contract, where the roles of the plaintiff and the defendant are left to be determined by the parties themselves, the “have not” will initiate the lawsuit to challenge the “have” as to soften litigation intensity. The “have” goes along with this and scales back expenditure.

[5] in both static legal process and dynamic process with endogenous sequencing, the extent of rent dissipation is decreasing in the disparity in adeptness; however, in dynamic legal process with exogenous sequencing, this is not necessarily the case.

[6] the outcome of endogenous sequencing litigation protocol Pareto dominates the outcome of the static play;

[7] The flexibility of multiple actions neither benefits nor harms the litigants.

References

- [1] Baik, K. H. and Shorgen, J. F. (1992). Strategic behavior in contests: comment. *American Economic Review* 82: 359-362.
- [2] Bulow, J., Geanakoplos, J. and Klemperer, P. (1985). Multimarket oligopoly: Strategic substitutes and complements. *Journal of Political Economy* 93: 488-511.
- [3] Braeutigam, R., Owen, B. and Panzar, J. (1984). An economic analysis of alternative fee shifting systems. *Law and Contemporary Problems* 47: 173-185.
- [4] Clark, D. and Riis, C. (1998). Contest success functions: An extension. *Economic Theory* 11: 201-204.
- [5] van Damme, E. and Hurkens, S. (1999). Endogenous Stackelberg leadership. *Games and Economic Behavior* 28: 105-129.
- [6] Dixit, A. (1987). Strategic behavior in contests. *American Economic Review* 77: 891-898.
- [7] Dotan, Y. (1999). Resource Inequalities in Ideological Courts: The Case of the Israeli High Court of Justice, *Law and Society Review* 33: 1059-1080.
- [8] Dunworth, T. and Rogers, J. (1996). Corporations in court: big business litigation in U.S. federal courts, 1971-1991. *Law and Social Inquiry* 21: 497-592.
- [9] Eaton, J. and Grossman, G. (1986). Optimal trade and industrial policy under oligopoly. *Quarterly Journal of Economics* 101: 383-406.
- [10] Eisenberg, T. and Farber, H. S. (1996). The litigious plaintiff hypothesis: Case selection and resolution. *NBER Working Papers*, 5649, National Bureau of Economic Research, Inc.
- [11] Farmer, A. and Pecorino, P. (1999). Legal expenditure as a rent seeking game. *Public Choice* 100: 271-288.
- [12] Fudenberg, D. and Tirole, J. (1984). The fat-cat effect, the puppy-dog ploy, and the lean and hungry look. *American Economic Review Proceedings* 74: 349-364.
- [13] Galanter, M. (1974). Why the 'haves' come out ahead: speculations on the limits of legal change. *Law and Society Review* 9: 95-160.

- [14] Gal-Or, E. (1985). First mover and second mover advantages. *International Economic Review* 26: 649-653.
- [15] Gradstein, M. (1991). Intensity of competition in strategic contests. *Mimeo.* (Ben-Gurion University, Beersheva).
- [16] Hamilton, J. and Slutsky, S. (1990). Endogenous timing in duopoly games: Stackelberg or Cournot equilibria. *Games and Economic Behavior* 2: 29-46.
- [17] Hause, J.C. (1989). Indemnity, settlement and litigation, or I'll be suing you. *Journal of Legal Studies* 13: 157-179.
- [18] Hillman, A.L. and Riley, J.G. (1989). Politically contestable rents and transfers. *Economics and Politics* 1: 17-39.
- [19] Hillman, A.L. and Samet, D. (1987). Dissipation of rents and revenues in small number contests. *Public Choice* 54: 63-82.
- [20] Higgins, R. S., Shughart, W. F. and Tollison, R. D. (1985). Free entry and efficient rent-seeking. *Public Choice* 46: 247-258.
- [21] Hirshleifer, J. and Osborne, E. (2001). Truth, efforts, and the legal battle. *Public Choice* 108: 169-195.
- [22] Kinsey, K. and Stalans, L. (1999). Which 'haves' come out ahead and why? Cultural capital and legal mobilization in frontline law enforcement. *Law and Society Review* 33: 993-1024.
- [23] Katz, A. (1988). Judicial decision making and litigation expenditure. *International Review of Law and Economics* 8: 127-143.
- [24] Kobayashi, B. H. and Lott, J. K., Jr. (1996). In defense of criminal defense expenditures and plea bargaining. *International Review of Law and Economics* 16: 397-416.
- [25] Kritzer, H. and Silbey, S. (2003). In litigation : do the "haves" still come out ahead? *Stanford Law and Politics*, Stanford, Calif.
- [26] Lanjouw, J. and Schankerman, M. (2001). Characteristics of patent litigation: a window on competition. *Rand Journal of Economics* 32: 129-151.
- [27] Leininger, W. (1993). More efficient rent-seeking – a Munchhausen solution. *Public Choice* 75: 43-62.
- [28] Morgan, J. (2003). Sequential contests. *Public Choice* 116: 1-18.
- [29] Nitzan, S. (1994). Modelling rent-seeking contests. *European Journal of Political Economy* 10: 41-60.
- [30] Parisi, F. (2002). Rent-seeking through litigation: adversarial and inquisitorial systems compared. *International Review of Law and Economics* 22: 193-216.

- [31] Saloner, G. (1987). Cournot duopoly with two production periods. *Journal of Economic Theory* 43: 182-187.
- [32] Schelling, T. C. (1960). The strategy of conflict. *Oxford University Press*, Berlin. 39.
- [33] Skaperdas, S. (1996) Contest success functions, *Economic Theory* 2: 283-290.
- [34] Songer, D., Sheehan, R. and Haire, S. (1999). Do the haves come out ahead over time? Applying Galanter's framework to decisions of the U.S. courts of appeals, 1925-1988. *Law and Society Review* 33: 811-832.
- [35] Tullock, G. (1967). The welfare costs of tariffs, monopolies and theft. *Western Economic Journal* 5: 224-232.
- [36] Tullock, G. (1980). Efficient rent-seeking. In J.M. Buchanan et al. (Eds.), *Toward a theory of the rent-seeking society*. College Station: Texas A. and M. University Press. 97-112.
- [37] Tullock, G. (1985). Back to the Bog. *Public choice* 46: 259-263.
- [38] Warneryd, K. (2000). In defense of lawyers: Moral hazard as an aid to cooperation. *Games and Economic Behavior* 33: 145-158.
- [39] Wheeler, S., Cartwright, B., Kagan, R. and Friedman, L. (1987). Do the "haves" come out ahead? Winning and losing in state supreme courts, 1870-1970. *Law and Society Review* 21: 403-445.
- [40] Yildirim, H. (2005). Contests with multiple rounds. *Games and Economic Behavior* 51: 213-227.
- [41] Zhou, J. (2006). Sequential contests with multiple rounds: A note.
- [42] Zhou, J. (2006). Notes on Measures of Justice and Fairness.