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Is the criminal justice system just?

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Abstract

A frequent criticism of the United States' system of criminal justice is that it is biased toward the rich who can afford better legal representation. This study accepts the premise that additional defense spending is productive but finds no reason to expect that this is unfair. When the quality of legal defense is heterogeneous any system that promotes equality of treatment is either prohibitively expensive or must restrict the rights of an individual to defend herself. Recent advances in the concept of "fairness" expand the set of distributions that can be claimed to be fair. Within this set is a distribution of defense expenditures and quality of representation that protects individual freedoms, is not overly costly and is fair.

By recognizing that defense expenditures are a cost for the accused a system of prosecutorial responses to increased defense spending that removes unfairness from the system are developed. The appropriate response is found to be a less than equal proportional increase. There is some archival and much anecdotal evidence to be presented to support the premise that this is how our present system works.

The system of public defenders serves as a baseline for "fair" treatment, it defines the kind of defense you can get for nothing. The system of plea bargaining, with certain convictions and bargained sentences, provides more equality than the system of trials since there is less opportunity for the defendant to use wealth.

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1. Introduction

We know that the criminal justice system is not perfect. It sometimes fails to convict the guilty or acquit the innocent. Were the criminal trial system without error, conviction would result

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from the choice to commit a crime and acquittal from the choice to obey the law. However, when there is error, how the error is distributed is important. Several recent high-profile criminal trials have caused many to question the fairness[1] of the United States' system of criminal justice trials. Most critics implicitly assume that a necessary condition for fairness is that the probability of acquittal at trial be independent of the wealth of the defendant. Yet we observe that wealthy defendants can and typically do spend more on their defense than less wealthy defendants, and this spending appears to increase the likelihood of acquittal. Therefore, it seems to many people almost self-evident that the system is unfair,[2] favoring the wealthy over the poor.

What makes this conclusion especially disturbing is that there is no obvious remedy. One possibility is to restrict the ability of wealthy defendants to use their wealth to defend themselves. Yet this policy would seem unconscionable and almost certainly would be unconstitutional. A second alternative is to subsidize the defense expenditures of less wealthy defendants so that each could spend, say, as much as O. J. Simpson spent on his defense. The subsidies, however, would claim an inordinate share of our national income and would undoubtedly allow many guilty defendants to go free. This, in turn, would reduce the expected cost of crime to potential criminals, and, thereby, lead to more criminal activity.

A third alternative, which we explore in this paper, is to reallocate the resources of the prosecution in an attempt to offset the advantage that wealth conveys. Consider a number of defendants charged with similar crimes in similar circumstances, but who possess different levels of wealth. Given the defendants' commitment of resources and given a sufficient prosecution budget, we show that prosecutors can allocate their budget in order to create equal probabilities of conviction for all defendants. Moreover, if a proportional increase in the resources used by both adversaries leaves the probability of acquittal unchanged (homogeneity condition), any prosecution budget can be allocated to produce this equi-probability result, regardless of the amounts spent by the defendants.

The observation that prosecutors *can* generate equal probabilities of conviction for defendants with different levels of defense spending, does not mean that they *should* try to do so. There are two problems with this solution. First, equi-probability outcomes are not equilibrium outcomes. If defendants are free to adjust their spending, they will always do so. Second, this solution would result in too much spending on the prosecution of the wealthy and too little on the non-wealthy from the perspective of efficiency. It would commit the state to spend funds for the prosecution of wealthy defendants that would have higher productivity in deterring crime if spent, say, on police investigation or expanding prison capacity. Conversely, too little would be spent on the prosecution of less wealthy defendants.[3]

We offer a different and intuitively more appealing concept of fairness that offers a way out of this dilemma. Fairness is embodied in an Indifference Principle that does not require that two situations be identical to be fair, but only that an individual brought before the criminal justice system be indifferent between them. If a wealthier (poorer) defendant is indifferent between the level of defense spending and probability of acquittal arrived at voluntarily and the outcome that would have obtained had they been less wealthy (wealthier), we shall call the system "fair." Put another way, a distribution of probabilities of acquittal and defense spending across wealth is fair if the defendant is indifferent between each of these outcomes and the outcome that would have obtained had he or she been constrained to an equal probability of conviction.

In this light, fairness can be consistent with the observation that wealthier defendants spend more on their defense and have higher probabilities of acquittal.

What is needed to satisfy the fairness condition is a prosecutor with the incentive to raise or lower prosecution spending in response to changes in defense spending so as to keep the defendant at the same level of utility. Under these circumstances differences in utility would be solely due to differences in the initial wealth of the accused and not due to any features of the criminal justice system itself. We are able to show that a prosecutor with a large enough budget can in principle produce this result. If the homogeneity condition holds, any prosecutor's budget can be allocated to satisfy the principle. Because we do not observe indifference mapping, we do not know how faithful the current system is to the Indifference Principle. However, we explore conditions under which prosecutor behavior is consistent with the principle.

The concept of fairness incorporated in the Indifference Principle is consistent with the traditional justifications for punishing criminal behavior, including retribution and deterrence.[4] If an individual is indifferent between outcomes, he suffers equally and is equally deterred. The concept is also consistent with the idea that incremental fairness exists when no participant has cause to envy the treatment of any other participant in the system (Baumol, 1986). Adherence to the Indifference Principle allows only envy that is due to initial differences in the distribution of wealth and eliminates envy that arises from differential treatment of defendants.[5]

The Indifference Principle is also consistent with, and helps us refine, the notion of efficient deterrence of crime. The previous literature focuses on the decision to commit a crime and for the most part ignores the role of wealth. Deterrence is accomplished by imposing costs on those who choose to commit crimes and the dominant question is how to balance the probability and severity of punishment to minimize the social cost of deterrence (Becker, 1968; Polinsky & Shavell, 1979; Shavell, 1985). However, as Becker has recognized, the cost of committing a crime includes the cost of defending one's self. If potential criminals acquire wealth and know they can use it to lower the probability of conviction once arrested and indicted, this knowledge can reduce the expected cost of crime. To offset this outcome application of the Indifference Principle insures that wealth, even if ill-gotten, conveys no additional advantage to a criminal over and beyond the command over more resources that exists in noncriminal life.

The literature on defendant wealth and criminal justice makes the observation that wealth is used to buy a higher probability of acquittal (Lott, 1987, 1992; Polinsky & Shavell, 1991). This is justified on efficiency grounds when the punishment is incarceration and the wealthy have a higher opportunity cost of time (Lott, 1987), or when a conviction damages one's reputation and the value of reputation is greater for the wealthy (Lott, 1992). In each case, efficiency with lower probabilities of conviction for the wealthy posits differences in the value of time and/or reputation across wealth. The Indifference Principle allows us to dispense with this assumption, because the value defendants attach to time and reputation will be reflected in the resources they commit to their defense.

Following Tullock (1975, 1980), Goodman (1978) showed that a trial can be modeled as a two-person game in which both adversaries can invest resources to improve their probability of victory. We build on that model and also extend it to the case of one prosecutor and many defendants. We introduce the notion of symmetry in order to formalize what it means for defendants to be "in similar circumstances." If two defendants are symmetrical they are interchangeable: if they switch spending levels, they switch probabilities of acquittal. In general, when symmetrical games are in equilibrium, the prosecutor will be spending more to convict the defendant who spends the most on his defense. This result is consistent with the Principle of Indifference.

Even if defendants are not symmetrical, comparative static results for the case of two defendants show that increased spending by one of them generally induces the prosecutor to spend more on that defendant's prosecution and less on the other defendant. Other things equal, therefore, poor defendants are made better off by the presence of a wealthy defendant who attracts scarce prosecution resources.

2. Defendant utility analysis

Let P be the probability of acquittal for one accused of a crime and brought before the criminal justice system. Probability is determined by a wide variety of factors, including evidence in the case, the relevant law, and the selection of the judge and jury, in addition to the efforts of the defendant and the state's prosecutor.[6] We assume P is a positive function of defense expenditure, D, a negative function of the state's prosecution expenditures, S, and P is continuously differentiable and subject to decreasing returns. Thus,

$$P = P(D, S), \tag{1}$$

with $P_D > 0$, $P_{DD} < 0$, $S < 0$ and $P_{SS} > 0$.[7]

For simplicity, and without loss of generality, assume that there are two future states of the world: acquittal, A, and conviction, C. The expected utility, EU, of the accused is a function of the defendant's expenditure on consumption, G, in each future state, and on the probability of being in each state. Thus,

$$\text{EU} = P(D, S)U(G : A) + [1 - P(D, S)]U(G : C). \tag{2}$$

Expenditures on G and D are constrained by wealth according to $W = G + D$, where G and D have the same units of measurement. We assume that utility is a positive function of consumption in both states, that G and D are normal goods and that the utility of consumption is always higher in state A than in state C.[8]

Maximizing expected utility subject to the wealth constraint requires[9]

$$\frac{\mathrm{d(EU)}}{\mathrm{d}D} = P_D[U(A) - U(C)] - PU_G(A) - (1 - P)U_G(C) = 0. \tag{3}$$

Rearranging terms gives

$$\frac{PU_G(A) + (1 - P)U_G(C)}{U(A) - U(C)} = P_D. \tag{4}$$

The left-hand term represents the willingness of the defendant to substitute between the probability of acquittal and the consumption of other goods and services. The right-hand term represents the ability of the defendant to substitute between the two, given the effort of the prosecution. Eq. (4) and Note 9 ensure that the expected utility maximizing choice of the accused is unique for each level of wealth, holding the parameters of the justice system constant. Note 8 assures us that there is a set of well-behaved indifference curves that make comparisons across wealth possible.

The appropriate setting for fairness analysis is *ex ante* the court's determination of guilt or innocence. It is at this time that the defendant commits resources to his or her defense, changing the probability of acquittal. If the probability of acquittal is a normal good, defendants with greater wealth will devote more resources to defense (and to consumption) than if their wealth were less, and their expected utility, expressed in Eq. (2), will be greater. We wish to know if the higher level of expected utility enjoyed when wealth increases is dependent on the administration of the justice system, or whether it is solely a function of the unequal initial distribution of wealth.

Figure 1 shows the potential advantages of wealth. Consider a poor defendant with wealth W_p. Given the level of prosecution spending, S, this individual's choice set is the concave frontier in P and G defined by $P(D : S) = P(W - G : S)$. Faced with this constraint, the poor defendant maximizes expected utility at point 'a' by devoting D^* resources to defense spending and realizes probability of acquittal P_p^*, and consumption $W_p - D^*$. Point 'a' satisfies condition (4). The poor defendant has expected utility of

$$\mathrm{EU}^p = P_p^* U(W_p - D^* : A) + (1 - P_p^*)U(W_p - D^* : C). \tag{5}$$

Now consider the same defendant at a higher level of wealth, W_r. Holding prosecution spending, S, constant the defendant's choice set is now $P(W_r - G : S)$. The frontiers of the two choice sets are horizontally parallel implying that for equal defense spending there is an equal probability of acquittal. If we were to constrain the wealthy defendant to the same level

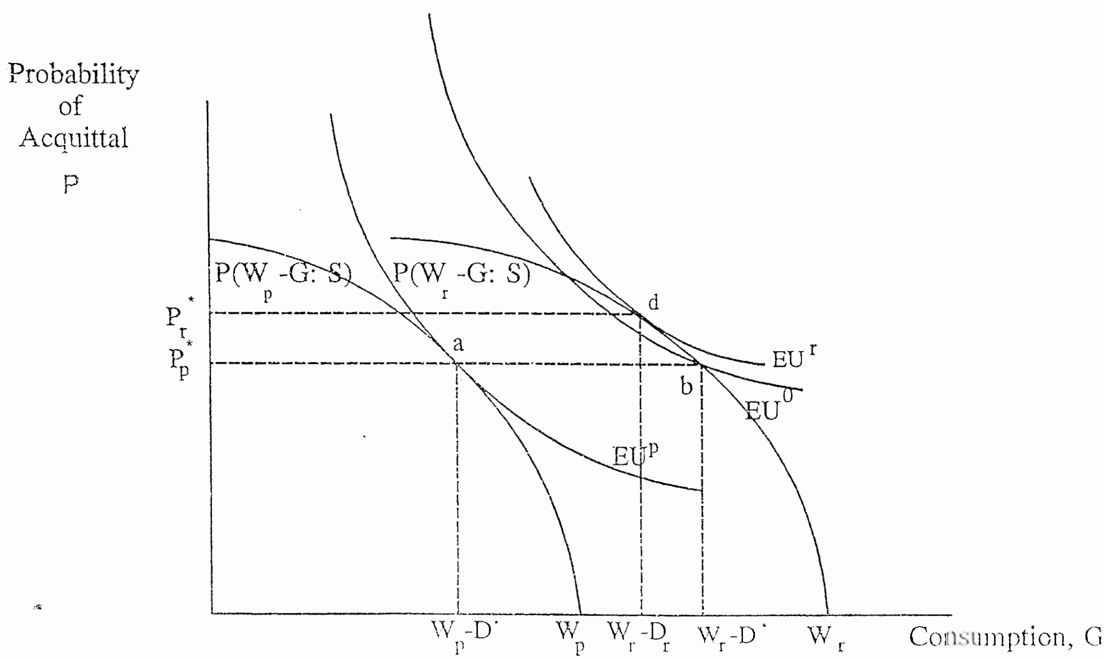

Figure 1. The advantages of wealth.

of defense spending, D^*, and resulting probability of acquittal, P_p^*, that would be chosen were the poor, his expected utility would be

$$\mathrm{EU}^0 = P_p^* U(W_r - D^* : A) + (1 - P_p^*) U(W_r - D^* : C) \tag{6}$$

placing the defendant at point 'b' in Figure 1. Since the defense expenditure and probability of acquittal in Eqs. (5) and (6) are equal, any difference in expected utility is produced solely by the initial difference in wealth, $W_r - W_p$ and not by any feature of the criminal justice system. As such the distribution of P and D at point 'b' satisfies the equi-probability of acquittal rule and therefore by our criteria is fair. The underlying distribution of income may, or may not, be fair, but its lack of fairness is not attributable to the criminal justice system.

However, when one is free to allocate wealth to defense spending, greater wealth leads to higher levels of defense spending and higher probabilities of acquittal. With greater wealth the individual maximizes expected utility at point 'd' and achieves utility level EU^r. The difference between EU^0 and EU^p, where the individual is held to the same level of defense spending and probability of acquittal at different levels of wealth, reflects only the utility difference derived from initial wealth. But, without constraint, the wealthy can do better than EU^0. The difference between EU^0 and EU^r reflects the advantage of wealth in a system of criminal justice when the prosecution treats all defendants alike.

Is it possible to allow the wealthy to freely spend resources on their defense and still keep wealth from conferring an unfair advantage? *The Principle of Indifference* states that, if (D^*, P^*) is a fair (and efficient) outcome then any other combination of D and P that satisfies

$$P(D, S)U(W_r - D : A) + [1 - P(D, S)]U(W_r - D : C) = \mathrm{EU}^0 \tag{7}$$

is also a fair (and efficient) outcome. The Principle of Indifference expands the definition of fairness to embrace not only equi-probable outcomes in criminal justice, but also any other outcome to which the defendant is indifferent.[10] When condition (7) holds, any increase in P, produced by greater defense effort, is offset by a decrease in G, leaving expected utility unchanged.

3. Options for prosecutors

In order to explore the options open to prosecutors, we introduce the concept of *bias*. Even before prosecutors and defendants commit resources to the trial, the underlying weight of the evidence may strongly favor one side or the other. Bias may also exist because of the selection of the judge and the pool from which the jury is chosen. In this context, we intend for bias to be a value-neutral concept and we propose to place minimal constraints on how it operates. Accordingly, consider the following definition.

Definition 1. A criminal court is said to be *less than totally biased for the defendant* (LTB) if, for any increment of defense spending, $d > 0$, there exists a finite increment of prosecution spending, $s(d) < \infty$, such that $P[D + d, S + s(d)] = P(D, S)$.

Definition 2. A criminal court is said to be *linearly unbiased* (LU) if $P(cD, cS) = P(D, S)$ for all $c, D, S > 0$.

The LTB condition puts a limit on how biased a proceeding can be. For every one dollar increase in spending by a defendant there is some amount of prosecution spending (perhaps very large) that can exactly offset whatever advantage the defendant buys. The LU condition states that the probability of conviction is homogeneous of degree 0: a doubling of resources used by both adversaries leaves the probability of acquittal unchanged.[11] Now consider the following proposition.

Proposition 1. (*a*) *If criminal courts are less than totally biased for the defendant, there exists a prosecution budget and allocation among the set of similar cases which yields an equal probability of acquittal for all defendants regardless of their defense spending.* (*b*) *If the courts are linearly unbiased any prosecution budget can be so allocated.*

Proof. (a) Let defense expenditures for k defendants be D_i with the least being D_L and define $d_i = D - D_L$ $(i = 1, 2, \dots, k)$. LTB implies $P[D_i, S + s(d_i)] = P(D_L, S)$ for all i and any $S > 0$. Therefore, a state's prosecution budget of $\Pi = kS + \sum s(d_i)$ with allocation $S + s(d_i)$ to case i satisfies Proposition 1 (a).

(b) Let total defense spending on all cases be $\Delta = \sum D_i$ and define $b_i = D_i/\Delta$ as the portion of Δ made by defendant i. Given any state's prosecution budget, Π, allocation to case i as $S_i = b_i\Pi$ satisfies Proposition 1 (b) since LU implies $P(D_i, S_i) \equiv P(b_i\Delta, b_i\Pi) = P(\Delta, \Pi)$ for all i. ■

This result is illustrated in Figure 2 for two defendants with different levels of initial wealth. We begin with the result depicted in Figure 1, where the wealthy and poor defendant each chose

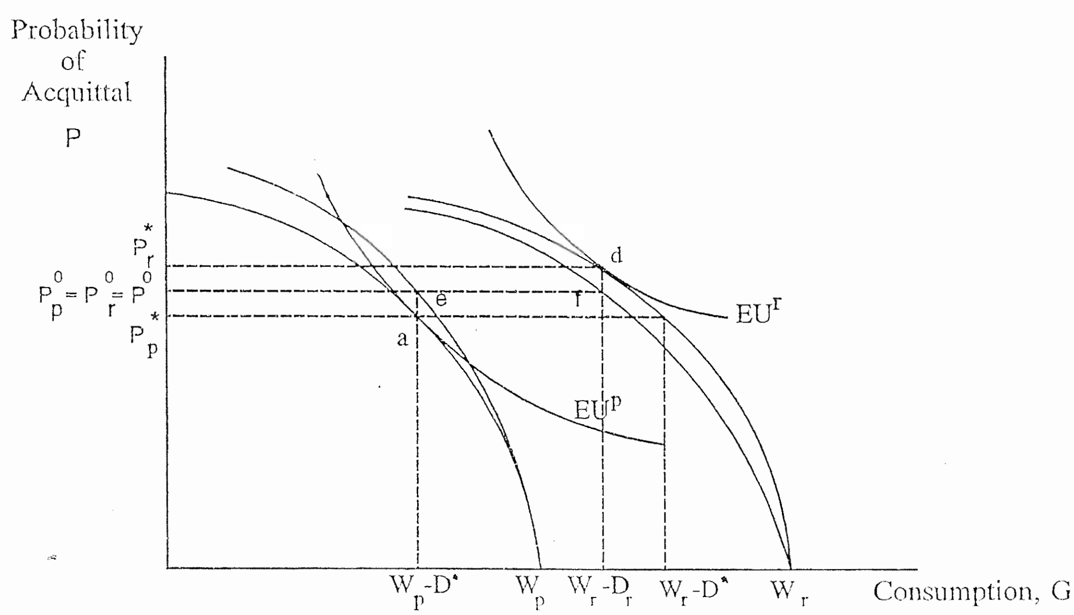

Figure 2. Equi-probable outcomes without equilibrium.

equilibrium points 'a' and 'd' and realized probability of acquittal P_r^* and P_p^*, respectively. From this point, the prosecution can reallocate resources away from the prosecution of the less wealthy defendant (thus raising the height of his $P - G$ frontier) toward the prosecution of the wealthier defendant (lowering the height of his $P - G$ frontier). Proposition 1 states that for any defense spending, and in particular for spending levels D_r and D^* depicted in Figure 2, there is a reallocation or prosecution resources that generates points like 'e' and 'f', where the probability of acquittal for each defendant is equal, $P_r^0 = P_p^0 = P^0$. However, points 'e' and 'f' will not be equilibrium outcomes if the defendants can also reallocate resources and change strategies. This is because the action of the prosecutor has changed the relative price of the probability of acquittal, raising the price of P for the wealthier defendant and lowering it for the poorer defendant. This will induce the wealthier defendant to spend less on P (and more on G) and the poorer defendant to spend more.

Now consider the indifference approach. Indifference would permit the defense expenditures to purchase a higher probability of acquittal, but only at a price so high the defendant is no better off (a pricing scheme similar to that of a first-degree price discriminating monopolist). Such a pricing scheme requires a prosecution committed to keeping the defendant at the same level of expected utility. For example, in Figure 3 increased prosecution effort, $S^0 > S$, constricts the opportunity set open to the defendant. Given his choice set, the wealthy defendant maximizes expected utility at point 'c'. Since the defendant is indifferent between this outcome and the equi-probable outcome identified in Figure 1 as point 'b', this outcome satisfies the Indifference Principle.

Can this outcome be achieved? Consider the following proposition.

Proposition 2. *For any level of wealth, W_i, let D_i^* maximize expected utility given S_i. (a) If the courts are less than totally biased for the defendant, there exists a state's prosecution*

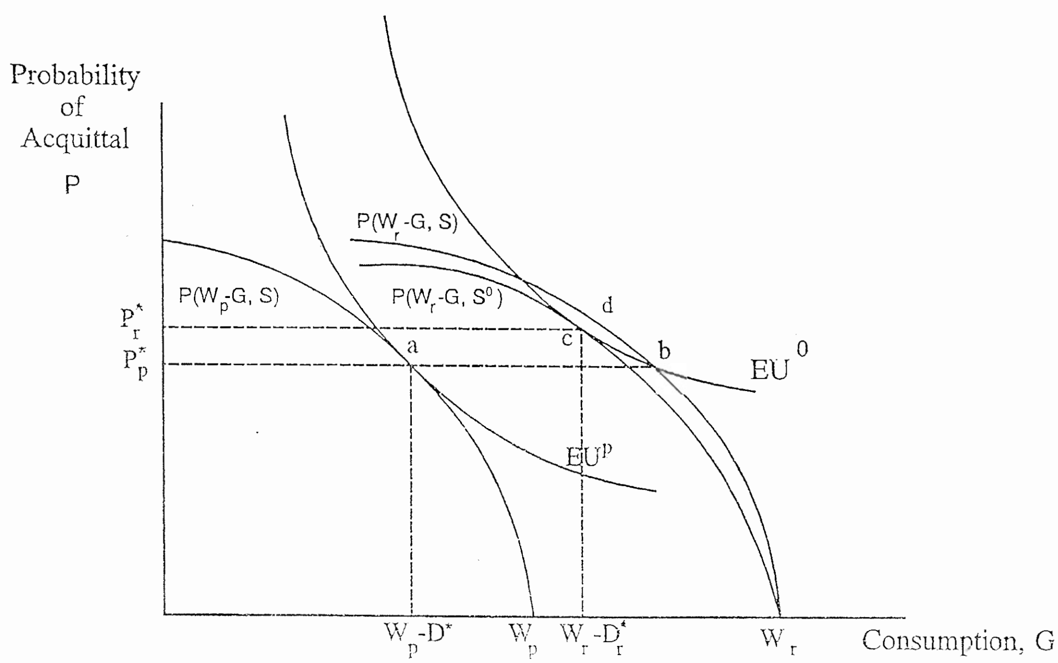

Figure 3. Optimum expenditures for prosecution.

budget, Π*, and an allocation,* S_i $(i = \mathrm{p}, \mathrm{r})$*, such that the wealthy defendant will be indifferent between his chosen allocation* $(P_\mathrm{r}^*, W_\mathrm{r} - D_\mathrm{r}^*)$ *and that chosen by the poor defendant* $(P_\mathrm{p}^*, W_\mathrm{r} - D_\mathrm{p}^*)$*. (b) Moreover, if criminal courts are linearly unbiased any state's prosecution budget can be so allocated.*

Proof. (a) Note that for any S_p and $d_\mathrm{r} = D_\mathrm{r} - D_\mathrm{p}$,

$$\max \mathrm{EU}(W_\mathrm{r}, D_\mathrm{r} : S_\mathrm{p}) > \mathrm{EU}(W_\mathrm{r} : D_\mathrm{p}, S_\mathrm{p}) > \max \mathrm{EU}[W_\mathrm{r}, D_\mathrm{r} : S_\mathrm{p} + s(d_\mathrm{r})]. \tag{8}$$

The first inequality holds because D_r ($>D_\mathrm{p}$) maximizes EU given W_r and S_p. The second inequality follows from Proposition 1 (a). D_r and $S_\mathrm{p} + s(d_\mathrm{r})$ produce the same probability of acquittal as D_p and S_p, but because the cost is higher ($D_\mathrm{r} > D_\mathrm{p}$), utility falls. Since $P(\cdot)$ and $U(\cdot)$ are assumed to be continuous in their arguments, there exists a S_r in the interval $(S_\mathrm{p}, S + s(d_\mathrm{r}))$, such that

$$\max \mathrm{EU}(W_\mathrm{r}, D_\mathrm{r} : S_\mathrm{r}) = \mathrm{EU}(W_\mathrm{r} : D_\mathrm{p}, S_\mathrm{p}). \tag{9}$$

(b) By Proposition 1 (b), LU implies that any state's prosecution budget, Π, allocated in proportion to defense spending yields an equal probability of conviction for all cases. Then, by the logic of the preceding proof,

$$\max \mathrm{EU}(W_\mathrm{r}, D_\mathrm{r} : S = b_\mathrm{p}\Pi) > \mathrm{EU}(W_\mathrm{r} : D_\mathrm{p}, S = b_\mathrm{p}\Pi) > \max \mathrm{EU}(W_\mathrm{r}, D_\mathrm{r} : S = b_\mathrm{r}\Pi) \tag{10}$$

and, with continuity, there exists a $S_\mathrm{r} < b_\mathrm{r}\Pi$ that is within the state budget and satisfies Eq. (9). ■

Proposition 2 states that it is possible to allocate a prosecution budget to satisfy the Indifference Principle. Since the wealthy face a higher price to purchase any given probability of acquittal than do the less wealthy, their increased defense expenditures, while producing a higher probability of acquittal, do not convey any unfair advantage within the system of criminal justice.

4. Equilibrium with multiple defendants

We wish to explore the conditions for a Nash equilibrium with multiple defendants to see if an equilibrium allocation is likely to approximate the conditions for a fair system. Consider a prosecutor with budget Π to be allocated across k cases. We assume the prosecutor's objective, when allocating the State's budget, is to maximize a value function whose arguments are the probabilities of convicting each defendant.[12] That is,

$$\max V(\Phi_1, \Phi_2, \ldots, \Phi_k) \quad \text{subject to } \Pi = \sum_{i=1}^{k} S_i, \tag{11}$$

by the choice of $S_1, S_2, \ldots, S_k$. For each case, i, the probability of conviction $(\Phi_i) = 1 - P_i$ is given by $(\Phi_i) = \Phi_i(D_1, D_2, \ldots, D_k, S_1, S_2, \ldots, S_k)$. We assume that V is a positive, concave function of S.

For each defendant the constrained objective is to maximize expected utility by the choice of D_i given the spending decisions of all other defendants and given an allocation of the prosecutor's budget.[13] An equilibrium exists if there are vectors of prosecution and defense spending, S and D, such that no participant can improve his position by any unilateral move.[14]

In order to evaluate outcomes for defendants who are "in similar circumstances," we need added specificity. For two defendants i and j (ignoring all other defendants) consider the point (D_i, D_j, S_i, S_j). For $S_i = S_j = \bar{S}$, we write $(D_i, D_j \bar{S})$. For $D_i = D_j = \bar{D}$, we write $(\bar{D}, S_i, S_j)$. Now consider the following definition.

Definition 3. Defendants i and j are *symmetrical with respect to each other* if $P_i(a, b, \bar{S}) = P_j(b, a, \bar{S})$ and they are *symmetrical with respect to the prosecution* if $V(a, b, \bar{S}) = V(b, a, \bar{S})$ and $V(\bar{D}, a, b) = V(\bar{D}, b, a)$.

When the prosecution is spending equal amounts on the two defendants, if the defendants switch expenditures, they will switch probabilities of acquittal and the prosecutor's valuation function will remain unchanged. When defendants spend equal amounts, switching the prosecution's levels of spending leaves the prosecution's valuation function unchanged. In other words, being in similar circumstances means the defendants are interchangeable, both with respect to their defense allocations and with respect to the prosecution's valuation.

Now consider the following conditions:

$$\frac{\Delta P}{\Delta D_i} > \frac{\Delta P_j}{\Delta D_i} \geq 0 \tag{12}$$

$$\frac{\Delta(\Delta V/\Delta S_i)}{\Delta D_i} > \frac{\Delta(\Delta V/\Delta S_j)}{\Delta D_i} \geq 0 \tag{13}$$

When i and j have similar cases, it is possible that increased defense spending by i not only raises i's probability of acquittal but j's as well. For example, when i establishes a legal precedent that also bears on j's case. Condition (12) says that i's increased spending raises his own probability of acquittal more than it raises j's.

Suppose that $S_i = S_j$. Then condition (12) insures that if defendants are symmetrical, the defendant who spends the most will have the higher probability of acquittal. Consider spending levels a and b, with $a > b$. Condition (12) requires that $P_i(a, b, \bar{S}) - P_i(b, b, \bar{S}) > P_j(a, b, \bar{S}) - P_j(b, b, \bar{S})$. From the symmetry requirement, we have $P_i(b, b, \bar{S}) = P_j(b, b, \bar{S})$. Therefore, $P_i(a, b, \bar{S}) > P_j(a, b, \bar{S})$.

Increased spending by a defendant lowers his probability of conviction and therefore lowers V. However, there are reasons to think that the marginal value of S for the prosecution will rise. For example, if the defendant calls additional witnesses the opportunities to attack the credibility of these witnesses represent new and expanded uses for prosecution spending—making S more productive at the margin than before. Condition (13) says that i's increased spending increases the marginal value to the prosecutor of S_i more that S_j.

Provided that (12) and (13) are satisfied, we can show that if an equilibrium exist it has desirable properties.

Proposition 3. *Let* $(D_i^*, D_j^*, S_i^*, S_j^*)$ *be an equilibrium point for the game. Then if i and j are symmetrical defendants,* $D_i^* > D_j^*$, *implies* $S_i^* > S_j^*$.

Proof. Let $V(S^*)$ represent the equilibrium value of V for S_i^* and S_j^* and let $V(\bar{S})$ equal the value of V when $S_i = S_j = \bar{S}$. From the concavity of V in S, it follows that $V(\bar{S}) \leq V(S^*) + V_{S_i}(\bar{S})(S_i^* - (\bar{S}) + V_{S_j}(\bar{S})(S_j^* - \bar{S})$, where V_{S_i}, and V_{S_j} are the marginal products of V with respect to S_i and S_j, respectively. By hypothesis $V(S^*) \geq (\bar{S})$ unless $S_i = S_j$ and since $S_i^* - \bar{S} = -(S_i^* - \bar{S})$, we have

$$\begin{array}{ll} S_i^* > S_j^*, & \text{iff } V_{S_i}(\bar{S}) > V_{S_j}(\bar{S}) \\ S_i^* = S_j^*, & \text{iff } V_{S_i}(\bar{S}) = V_{S_j}(\bar{S}) \\ S_i^* < S_j^*, & \text{iff } V_{S_i}(\bar{S}) < V_{S_j}(\bar{S}) \end{array} \tag{14}$$

Now consider the equilibrium values of defense spending D_i^* and D_j^*. Note that if $D_i^* > D_j^*$, condition (13) requires

$$V_{S_i}(D_i^*, D_j^*, \bar{S}) - V_{S_i}(D_j^*, D_j^*, \bar{S}) > V_{S_j}(D_i^*, D_j^*, \bar{S}) - V_{S_j}(D_j^*, D_j^*, \bar{S}). \tag{15}$$

From symmetry, it follows that

$$V_{S_i}(D_j^*, D_j^*, \bar{S}) = V_{S_j}(D_j^*, D_j^*, \bar{S}). \tag{16}$$

Therefore,

$$V_{S_i}(D_j^*, D_j^*, \bar{S}) > V_{S_j}(D_i^*, D_j^*, \bar{S}) \tag{17}$$

and from condition (14), $S_i^* > S_j^*$. ■

Proposition 3 states that, under very general and reasonable assumptions about the prosecution's objective and the productivity of defense and prosecution spending, increases in defense spending associated with greater wealth will be met with increases in prosecution spending. The importance of Proposition 3 is increased by the realization that defendant utility (and indifference) cannot be observed. Thus, an affirmative commitment to fairness as embodied in the Indifference Principle cannot be pursued as a prosecutorial objective. However, Proposition 3 shows that the incentive is in place for prosecutors to make the kind of responses that are consistent with our notion of fairness embodied in the Indifference Principle.

Defendants are not symmetrical with respect to each other when characteristics not related to the case are allowed to influence the probability of conviction. Thus, if race or gender influences the decisions of the judge or jury, the system may be tainted by its reliance on biased human judgement.[15] Non-symmetry with respect to the prosecution may also arise because the value system of the prosecutor motivates the allocation of prosecutorial resources. When the conviction of one defendant is more or less valuable to the prosecutor than the conviction of another—perhaps because of media attention, a desire for vengeance, bribery, or prejudice—the resulting allocation may not approximate fairness.

5. Comparative static analysis

Even if two defendants are not symmetric, increased spending by one will generally be to the advantage of the others. Consider the case of a prosecutor facing two defendants and a fixed budget. The first-order conditions for an interior maximization of the prosecutor's constrained objective function given in (11) are

$$V_{S_1} - \lambda = -V_1\left(\frac{\partial P_1}{\partial S_1}\right) - V_2\left(\frac{\partial P_2}{\partial S_1}\right) - \lambda = 0, \tag{18}$$

$$V_{S_2} - \lambda = -V_1\left(\frac{\partial P_1}{\partial S_2}\right) - V_2\left(\frac{\partial P_2}{\partial S_2}\right) - \lambda = 0, \tag{19}$$

$$\Pi - S_1 - S_2 = 0, \tag{20}$$

where λ is the Lagrangian multiplier. Let A be the negative-definite bordered Hessian for this maximization problem and $|A|$ be the determinant of A. Using Cramer's rule, we have

$$\frac{\mathrm{d}S_1}{\mathrm{d}D_1} = -\frac{\mathrm{d}S_2}{\mathrm{d}D_1} = \frac{V_{S_1,D_1} - V_{S_2,D_1}}{|A|}. \tag{21}$$

Condition (13) guarantees that the term in the parenthesis is positive. Thus, $\mathrm{d}S_1/\mathrm{d}D_1$ is positive and $\mathrm{d}S_2/\mathrm{d}D_1$ is negative. Increased spending by defendant 1 induces the prosecution to spend more to convict him, drawing resources away from the prosecution of the other defendants.

6. Conclusion

Provided that minimal conditions are satisfied, prosecution behavior will at least be broadly consistent with the Principle of Indifference. When wealthier defendants spend more on their defense, the state responds by devoting more resources to the effort to prosecute, but not so much as to completely offset the productive efforts of the defense.

The authors have found little data on the allocation of State criminal prosecution budgets across cases, but some tantalizing hints that the system approximates fairness are available. For cases pursued by the Federal Trade Commission, Posner (1972) found that more resources were devoted to each large case than to each small case. Furthermore, the dismissal rate was lower for large cases than for small cases. Lower acquittal rates for blacks have been observed by Glaeser and Sacerdote (2000) and in the media's portrayal of the disproportionate number of blacks on death row. The tendency is to characterize this as a manifestation of racial bias. Our analysis suggests that, to the extent race is correlated with income, there may be a different explanation of the result: it may reflect the response of prosecutors to defendants with different levels of wealth. Finally, we note that outside the United States some nations have moved to institutionalize an idea of fairness in their system. In Finland, fines for those convicted of traffic violations, where, presumably, there is little room for extravagant defense expenditures, are made proportionate to income.

Even if the Principle of Indifference is not exactly satisfied, the criminal justice system has other features that commend it. We have shown that the likely response of the prosecutor to increased spending on behalf of a wealthier defendant is to increase resources used in their prosecution—partially offsetting the advantages of wealth. This benefits poorer defendants because the shift of resources away from their prosecution raises their probability of acquittal. In general, defendants are made better off, not worse off, by the existence of wealthy defendants in the criminal justice system.

This paper suggests avenues for empirical research into the allocation of prosecution and defense resources. To our knowledge, expenditure data has never been collected and analyzed. The paper also serves as a normative guide to prosecutorial behavior and presents a more appropriate way to judge fairness in the criminal justice system. No one believes the criminal justice system is perfect. But on the basis of the reasoning developed here we conclude that if changes are warranted, they are only changes of degree, not changes of kind.

Notes

1. Throughout this paper we use the term fair to describe outcomes that could also be called equitable or just.
2. Herein we concern ourselves only with fairness in trial outcomes *ex ante* the rendering of the verdict. Fairness in the distribution of punishments is another interesting question.
3. The optimum deterrence strategy chooses that combination of the probability and severity of punishment that minimizes the social cost of achieving a given level of expected punishment (Becker, 1968; Polinsky & Shavell, 1979, 1984). If the probability of punishment is constrained by an equi-probability consideration, the social cost of deterrence must rise.
4. For a summary of the role of retribution and deterrence in the evolution of law, see Posner (1992, Chapter 8).
5. The proper setting for fairness analysis, incorporated in this approach, is *ex ante* the rendering of the verdict. *Ex post* the convicted always envy the acquitted. For a critique of the importance of this perspective in fairness analysis, see Holcombe (1983).
6. One very important determinant of the probability of acquittal is the actual guilt or innocence of the accused (Reinganum, 1988). Error in this determination fuels the economic literature. When the probability of convicting a criminal falls, the severity of the punishment can be increased to maintain proper deterrence (see Note 2). Knowing that innocent persons might be found guilty increases the demand for resources to make more accurate determinations (Polinsky & Shavell, 1979) and raises the standard for the proof of guilt (Posner, 1992, p. 553).
7. Fairness is determined by the distribution of P and D across individuals accused of the same crime and faced with the same evidence, but possessing different levels of wealth. Differences in P and D for different crimes and different evidence is not necessarily unfair. Hence, for analytical purposes we consider a single probability of conviction function.

8. Holding EU constant, the expected-utility-constant indifference curves in G and P are negatively sloped and convex, if

$$\frac{\mathrm{d}P}{\mathrm{d}G} = \frac{-[PU_G(A) + (1-P)U_G(C)]}{U(A) - U(C)} < 0 \quad \text{and}$$

$$\frac{\mathrm{d}^2 P}{\mathrm{d}G^2} = \frac{-[PU_{GG}(A) + (1-P)U_{GG}(C) + (U_G(A) - U_G(C))\,(\mathrm{d}P/\mathrm{d}G)]}{[U(A) - U(C)]} + \frac{[U_G(A) - U_G(C)][PU_G(A) + (1-P)U_G(C)]}{[U(A) - U(C)]^2} > 0.$$

Here, and in the text, the consumption argument in the utility function is suppressed when convenient to save space. $U_G(A) > U_G(C)$ is sufficient to guarantee convexity and satisfy the second-order sufficient condition in Note 10.
9. The second-order sufficient condition for a maximum is satisfied $\mathrm{d}^2(\mathrm{EU})/\mathrm{d}D^2 = P_{DD}[U(A) - U(C)] - 2P_D[U_G(A) - U_G(C)] + PU_{GG}(A) + (1-P)U_{GG}(C) < 0$.
10. Increasing the set of fair distributions to include all points on an indifference curve is necessary because being accused costs the individual in more than one way: by the certain expenditure of D and by the probability of conviction $1 - P$. Were there only the probabilistic dimension, fairness would require an equal probability of conviction. With two elements, a distribution of different "bundles" to different people is fair if the individuals are indifferent to which bundle they receive, because the bundles convey no personal gain.
11. Because the burden of proof on the prosecutor is guilt beyond a reasonable doubt, there may be bias that favors the defendant. A defendant's argument that there is doubt in several areas of a case need only succeed in one while the prosecution must dispel doubt in all areas.
12. A linear function is suggested by Landes (1971) and Rhodes (1976). Landes and Rhodes assume the prosecutor maximizes expected man-years of punishment, i.e., $\sum \Phi_i T_i$, where T is years of punishment. For the value aspect of a case, see Posner (1992, p. 602) where the expected value of a case is where V is the prosecutor's value of conviction.
13. We assume throughout that the system is not corrupt, i.e., that defendants cannot bribe prosecutors.
14. The game will posses an equilibrium if the expected utility functions are concave, since concave games always have equilibriums (Rosen, 1965). If, in addition, each player's payoff is convex in the strategy of all other players, the equilibrium will be unique (Goodman, 1980). The probability of acquittal functions for the defendants are convex in prosecution spending. However, for reasons given in the text, they are likely to be positive, concave functions of the amount spent by other defendants. Kobayashi and Lott (1996) assume the probability of acquittal in a criminal case is convex in prosecution spending and independent of the spending of defendants in other cases. Katz (1988) makes similar assumptions about plaintiff and defendant spending in civil trials.
15. Glaeser and Sacerdote (2000) note that defendant and victim characteristics appear to matter in conviction and sentencing.

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References

Baumol, W. (1986). *Superfairness: Applications and theory*. Cambridge: MIT Press.

Becker, G. S. (1968). Crime and punishment: An economic approach. *Journal of Political Economy*, *76*, 169–217.

Glaeser, E. L., & Sacerdote, B. (2000). The determinants of punishment: Deterrence, incapacitation and vengeance. NBER Working Paper 7676, National Bureau of Economic Research.

Goodman, J. C. (1978). An economic theory of the evolution of common law. *Journal of Legal Studies*, *7*, 393–406.

Goodman, J. C. (1980). A note on existence and uniqueness of equilibrium points for concave n-persons games. *Econmetrica*, *48*(1), 251.

Holcombe, R. G. (1983). Applied fairness theory: Comment. *American Economic Review*, *73*, 1153–1156.

Katz, A. (1988). Judicial decision-making and litigation expenditure. *International Review of Law and Economics*, *8*, 127–143.

Kobayashi, B. H., & Lott, J. R. (1996). In defense of criminal defense expenditures and plea bargaining. *International Review of Law and Economics*, *16*, 397–416.

Landes, W. M. (1971). An economic analysis of the courts. *Journal of Law and Economics*, *14*, 61–107.

Lott, J. R. (1987). Should the wealthy be able to buy justice? *Journal of Political Economy*, *95*(6), 1307–1316.

Lott, J. R. (1992). Do we punish high income criminals too heavily? *Economic Inquiry*, *30*(4), 583–608.

Polinsky, A. M., & Shavell, S. (1979). The optimal tradeoff between the probability and magnitude of fines. *American Economic Review*, *69*, 880–891.

Polinsky, A. M., & Shavell, S. (1984). The optimal use of fines and imprisonment. *Journal of Public Economics*, *24*, 89–99.

Polinsky, A. M., & Shavell, S. (1991). A note on optimal fines when wealth varies among individuals. *American Economic Review*, *81*(3), 618–621.

Posner, R. A. (1972). The behavior of administrative agencies. *Journal of Legal Studies*, *1*, 305–347.

Posner, R. A. (1992). *The economics of justice* (4th ed.). Cambridge: Harvard University Press.

Reinganum, J. F. (1988). Plea bargaining and prosecutorial discretion. *American Economic Review*, *78*, 713–728.

Rhodes, W. M. (1976). The economics of criminal courts: A theoretical and empirical analysis. *Journal of Legal Studies*, *5*, 311–340.

Rosen, J. B. (1965). Existence and uniqueness of equilibrium point for concave N-person games. *Econometrica*, *33*, 520.

Shavell, S. (1985). Criminal law and the optimal use of nonmonetary sanctions as a deterrent. *Columbia Law Review*, *85*, 1232.

Tullock, G. (1975). On the efficient organization of trials. *Kyklos*, *28*(2), 2.

Tullock, G. (1980). *Trials on trial: The pure theory of legal procedure*. New York: Columbia University Press.