RESOURCE ALLOCATION AND ACCESS TO CRIMINAL COURTS: AN ECONOMIC MODEL

Eli Noam*

Cost to society, scarcity of resources and effectiveness are recurrent if not omnipresent themes in scholarly analyses of the criminal justice system. In this article Professor Noam offers an economic analysis of judicial dispositions in criminal cases. After employing a mathematical model, calculus and statistical illustrations, Professor Noam concludes that the phenomenon of plea-bargaining in a crowded court-system yields not only a cheaper method of disposition but the more effective one in terms of reduced crime. Professor Noam’s analysis is confined to a maximization of this economic benefit, while admitting that important social factors not similarly amenable to economic investigation are also involved.

The same analytical tools are applied to the corollary issues of optimal court size (number of judges), the economic benefits associated with reduced crime and the allocation of available court time. Here the approach is to look for the optimal “mix” of cases which go to trial. The optimal mix will be determined in the light of categories of offence and the marginal benefits of the trial itself as a means for reducing criminal activity within each category.

L’allocation de ressources et l’accès aux tribunaux de juridiction criminelle: un modèle économique

Le coût social, le manque de ressources et l’efficacité sont des thèmes qu’on retrouve souvent, sinon toujours, dans les analyses savantes du système judiciaire criminel. Dans cet article le professeur Noam offre une analyse économique de la résolution judiciaire en instances criminelles. Se servant d’un modèle mathématique, du calcul et des illustrations statistiques, le professeur conclut que le phénomène du ‘plea-bargaining’ dans un système judiciaire encombré résulte non seulement dans une méthode de résolution moins coûteuse mais que cette méthode est aussi plus efficace en terme de réduction du taux de criminalité. L’analyse du professeur Noam se limite à porter au maximum ce bénéfice économique; il admet pourtant que d’autres facteurs sociaux importants, non pareillement possibles d’examen économique, sont aussi présents.

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(1982), 2 Windsor Yearbook of Access to Justice 208
Les mêmes outils analytiques sont employés pour analyser les questions corollaires telles que le nombre format optimal de tribunaux (nombre de juges), les bénéfices économiques résultant d'un taux de criminalité réduit et l'allocation du temps disponible à la cour. En abordant ces questions, le professeur Noam tente de trouver le "mélange optimal" de causes qui seront entendues par le tribunal. En tel mélange s'établirait sur la base de catégories d'infraction et des bénéfices marginaux du procès comme moyen de réduire l'activité criminelle dans chaque catégorie.

1. Introduction

Access to criminal courts is not simply an issue of legal procedure. It is also a question of the resources that society is prepared to expend for the processing and trial of cases. Hence the discussion of some aspects of access to courts can be subject to economic analysis much as other worthy causes with claims to public funds are.

It is therefore the aim of this paper to use an economic methodology and to describe a model of criminal courts, which is then applied to the analysis of three issues. These are: first, the relative costs and benefits of disposing criminal cases by trial or by guilty plea; second, the optimal total number of trials in a criminal court; and third, the optimal allocation of criminal trials among offenses within a given court capacity.

A number of qualifications should be stressed at the outset. Such a model is, by necessity, a highly simplified reflection of reality, and the results must be viewed with this in mind. They are intended as a framework for analysis rather than as operational numbers and rules. Furthermore, the definition of benefits that is used in this paper is a restricted one, limited to the value of reduced crime. Clearly, in determining criminal justice policy there are important considerations beyond the cost of crime, and the greater cost-effectiveness of one form of

2 John Harris, "On the Economics of Law and Order" (1970), 78 J. of Pol. Econ. 165.
disposition does not imply its overall superiority. Finally, the empirical investigation of this paper relies largely on data from one U.S. jurisdiction (the District of Columbia); it must therefore be seen as primarily illustrative.

2. Trial Versus Guilty Plea Dispositions

The traditional view of criminal justice accords to the judge a pre-eminent role; it is he who applies the law, evaluates the admissibility of evidence, determines guilt or innocence and metes out punishment. To many observers, this traditional "judicial" model of criminal justice has been superseded by a "prosecutorial" one. The latter holds that most decision making has shifted from the courtroom to the prosecutor's office. A major manifestation of this move is the prevalence of guilty pleas, a form of case disposition in which the prosecutor, after some bargaining, recommends a sentence which is almost invariably accepted by the court, thus reducing the role of the judiciary in most cases to mere ratification. In New York City, for example, the percentage of criminal dispositions by trial, rounded off to the nearest integer, is actually zero.

While decisions on whether to plea bargain with a defendant or to pursue the case to trial are partly based on the merits of a case, they are also grounded in the resource constraints of the prosecutor's office; that is they are related to the economics of court operation. In most instances, a prosecutor can make a tactical choice between seeking to convict a defendant through a trial or attempting to obtain a guilty plea. Normally it is


easier — and hence cheaper — to obtain a plea. But such a disposition may be less effective — in terms of reduced crime due to the disposition — because it is usually accompanied by a reduced sentence. On the other hand, guilty pleas lead to an assured conviction, whereas some trials end in acquittal. Furthermore, trials have a hidden cost: they tend to take up much of a court's time, and the resultant court congestion has undesirable side effects on the treatment of other cases.

While the analysis directly concerns U.S. courts, it would be false to believe that it is not applicable in other jurisdictions, even if they do not have a formalized plea bargain system. To the extent that sentencing leniency is granted in return for a defendant's cooperation, which is nearly universally true, the model that is described is general.

(a) The Model

It is assumed that the crime rate is influenced by the probability and by the severity of sanction. Of course, these are not the only factors that determine crime, since many social, cultural, and economic conditions may be said to contribute to it. The prosecutor is assumed to have no control over these other elements; they are a "given", but he does have some influence over the probability and severity of punishment, and hence, to some extent, over deterrence. The existence of deterrence is, of course, controversial. A recent panel report of the United States National Academy of Sciences concludes that "[n]umerous analyses, generally econometric, have also attempted to investigate the deterrent effect of criminal...

sanctions. With one important exception\textsuperscript{13} inverse associations have been found between crime rates and several sanction measures, primarily clearance rates, imprisonment probability and time served\textsuperscript{14}. Deterrence can be expressed mathematically as the relation

\[ \frac{C}{N} = AW^\beta \pi \delta \]  \hspace{1cm} (1)

where \(C/N\) is per capita crime, and is a function of the average sentence \(W\), and of the probability of conviction \(\pi\).\textsuperscript{15} The parameters \(\beta\) and \(\delta\) are the "sensitivities" of crime with respect to severity and probability, and \(A\) is a coefficient that encompasses the other factors contributing to crime.

A cost benefit analysis compares the relation of inputs — the cost of processing the different forms of dispositions — with the outputs, which are defined as the value of reduced crime. While this may be a restrictive definition of output, it is not an unreasonable one from the point of view of a prosecutor. To proceed, we look at the effects of trials and guilty pleas on equation (1).

First let us define \(\pi\), the probability of conviction. This probability is the percentage of convictions \(K\) relative to crimes \(C\). If we define the case load \(\lambda = P + T\), with \(P\) as the number of plea dispositions and \(T\) the number of trials, and if we let \(\phi\) be the probability of a trial resulting in a conviction, then the overall probability of a crime resulting in conviction is

\[ \pi = \frac{K}{C} = \frac{\phi T + P}{C} \]  \hspace{1cm} (2)

Economic analysis is heavily based on concepts of "marginal" effects or costs. The "marginal" effect of a trial on the probability of conviction is given by the first derivative of equation (2),

\[ \frac{d\pi}{dT} = \frac{\phi}{C} \]  \hspace{1cm} (3)

Similarly, the "marginal" effect of guilty plea disposition on the probability of conviction is

\[ \frac{d\pi}{dP} = \frac{1}{C} \]  \hspace{1cm} (4)


\textsuperscript{15}Following the Ehrlich specification: Issac Ehrlich, "Participation in Illegitimate Activities: A Theoretical and Empirical Investigation" (1973), 81 J. Pol. Econ. 521.
The impact of a disposition on the severity of conviction is considered next. This effect is more indirect in nature. Most courts are characterized by acute congestion, and a decision to go to trial with case A has an effect on the treatment of cases B and C. Because it is impossible to hold trials for more than a small fraction of pending cases, most of the others must be disposed of through the guilty plea process. In order to induce a defendant to give up his right to a jury trial and the chance for acquittal that goes with it, he normally receives a reward in the form of a shorter sentence than he would have expected to receive after a jury trial conviction (that is, taking into account also the probability of an acquittal). This sentence reduction for guilty pleas has become essential for case disposition. It is given to defendants in exchange for a guilty plea as the "price" for such a plea, and one can expect that the number of guilty pleas is related to the attractiveness of the sentence reduction. Therefore, in a congested court system where many cases must, by necessity, be disposed of without a trial, the sentence reduction can be expected to be higher than in a court without a heavy workload. Thus, sentence "discount" levels at a rate that clears the case docket tend to develop. Actual sentence levels — as contrasted to the statutory ones — are therefore functionally related to court congestion. This can be expressed by a function

\[ W = b_X^T V \]  

where

\[ W = \text{average effective sentence} \]


An intuitive description of how an increased case load reduces sentences is described in National Research Council, Panel of Research on Deterrence and Incapacitation Effects, in Deterrence and Incapacitation, supra note 12, 39.


Alschuler, supra, note 6.


See also Feeley, supra, note 10; for a contrary view, see Milton Heumann, "A Note on Plea Bargaining and Case Pressure" (1975), 9 Law & Soc. Rev. 515.
\[ V = \text{average jury sentence} \]
\[ T = \text{trial capacity of court} \]
\[ \lambda = \text{case load} \]
\[ b = \text{coefficient}. \]

\( \frac{T}{\lambda} \) is the ratio of trial capacity in the court to the case load, and a measure for court congestion. The smaller this expression, the more congested the court, and the smaller, according to equation (3), the average sentence \( W \). The implications of this relationship are different for pleas than they are for trials. If trial capacity is fully utilized, the prosecutor's decision to go for a trial is equivalent to reducing the available trial capacity for the remaining defendants by one trial unit (and similarly reducing the case load by one unit). This can be expressed mathematically as:

\[
\frac{dW}{dT} = -\frac{b\lambda p}{\lambda^2}. \tag{4}
\]

When a guilty plea is sought instead, the trial capacity is not affected, but the remaining case load is reduced by the plea disposition. Hence, the court is less congested than before, and the effective sentencing level can be expressed by:

\[
\frac{dW}{dP} = \frac{b\lambda T}{\lambda^2}. \tag{5}
\]

The pieces of the model can now be put together. Recalling the probability of convictions as \( \pi = \frac{K}{C} \), we have:

\[
C = NAW^\beta \lambda^\gamma = (NAW^\beta K^\gamma)^\gamma + \delta. \tag{6}
\]

The effect of trial is then, by calculus, and after substitutions of (2), the derivative

\[
\frac{dC}{dT} = C \cdot \left( \frac{1}{1 + \delta T} \cdot \beta \cdot \frac{\lambda - T}{\lambda} + \frac{\delta \phi}{K} \right). \tag{6}
\]

Similarly, for a plea disposition we find that the marginal effect on crime is, mathematically

\[
\frac{dC}{dP} = C \cdot \left( \frac{\beta + \delta}{\lambda + K} \right). \tag{5}
\]

We can now introduce the costs of inputs and the value of outputs. If the average expenditure of a disposition of type \( i \) to the prosecutor is defined by \( E_i \), and the social harm due to a crime is \( k \), the marginal effect of a budget dollar \( B_i \) spent on a disposition \( D_i \) on the total loss due to crime \( Z \), is therefore

\[
\frac{dZ}{dB_i} = \frac{1}{E_i} \cdot \frac{dC}{dD_i} \cdot k. \tag{8}
\]

(b) **Empirical Illustration**

The empirical parts of this study are based on data from the District of Columbia; some of the parameters, which are based on cross-national studies, must rely on nationwide U.S.
figures. (The results are robust to variations in these parameters.) As crimes, the five most prevalent of the seven FBI index crimes are used—burglary, robbery, larceny, auto theft and assault; murder and rape are excluded as crimes of passion or violence. The existence and the magnitude of equation (3) 

$$W = b \frac{TV}{\lambda}$$

was analyzed and shown to be 

$$W_i = 2.88 \frac{T_i V_i}{\lambda_i}$$

with a high degree of explained variance ($R^2 = .9032$) and statistical significance at the .01 level ($t = 8.7760$), that is of very high significance.

The social loss due to an average index crime $k$, is calculated as $k = 593$, using the Wolfgang-Sellin index of crime severity for each crime and converting severity into a money "equivalent." The elasticities of crime with respect to severity and probability, are obtained from estimations by Ehrlich and Vandaele. Weighted averages, for the 5 index crimes, are $\beta = .6206$ and $\delta = .7015$.

The inflow $\lambda$ is $\lambda = 3737$ for 1976. $N$, the population for Washington, D.C. is $N = 741,582$ in 1970. $V$, the average

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23 Using data for all cases in those Courts with 300 or more criminal trials per year; the Middle District of Florida was omitted because of problems with its data. Data provided by Administrative Office of U.S. Courts, James A. McCafferty, Chief, Statistical Analysis and Reports Branch. Part of the computation of the data was done at the Criminal Justice Research Center in Albany. The data contains for each case the actual sentence as well as its transformation into a general sentence severity index. Court trial capacity figures from Administrative Office of U.S. Courts, *Management Statistics For U.S. Courts*, 1973. See also Eli Noam, "A Cost Benefit Analysis of the Courts" (1981), *3 Research in Law & Econ.* 173.


25 Sellin and Wolfgang define a "power function of money to derive the index seriousness of money losses. By inverting that function we obtain a dollar equivalent function for index severity.

$$R = \frac{W-S \text{ Index}}{16.93}$$

Id.

26 I. Ehrlich, *supra*, note 15. One advantage of using Ehrlich's figures is that his results have been thoroughly scrutinized, retested, and, at least for property crimes, confirmed within a model in a paper commissioned by the National Research Council's Panel on Research on Deterrent and Incapacitative Effects, article by Walter Vandaele, "Participation in Illegitimate Activities: Ehrlich Revisited", in *Deterrence and Incapacitation, supra*, note 12.


trial sentence index severity, is \( V = 17.45 \) for the five index crimes.\(^9\) The probability of conviction by trial is \( \phi = .74,^{10} \) the number of jury and bench trials\(^11\) \( T = 900. \) The average cost per disposition to the prosecutor is estimated, with the help of a time study, for a trial (including its preliminary stages) as \( E_T = \$2538, \) and for a guilty plea disposition, including preliminary stages, as \( E_p = \$284.^{12} \)

These parameters are substituted into the equations (6) and (7). The results for the marginal benefits — in terms of the value of reduced crime — for trials and pleas, and disregarding for the moment the different cost of these dispositions, are

\[
\frac{dC}{dT} = -5.62 \tag{6'}
\]

and

\[
\frac{dC}{dP} = -12.40. \tag{7'}
\]

If the costs are also taken into account, the effects of a dollar spent on a trial or plea disposition are found to be

\[
\frac{dZ}{dE_T} = -1.30 \tag{8'}
\]

\[
\frac{dZ}{dE_p} = -25.80. \tag{8''}
\]

Thus, a plea bargain disposition is found to be more effective than a trial, even when cost is not considered. This is so because the severity impact of a trial partly offsets that of probability, while for a plea disposition both the severity and probability effects are negative. When the relative cost of the dispositions is also considered, the cost-effectiveness of a plea is high in comparison to that of a trial. Given limited resources and a congested court, a plea bargain is thus the obvious strategy where the reduction of crime is the prosecutor's primary goal. Of course, it has been long clear that a plea is the cheaper method of disposition. But given the more complex interactions of probabilities and severities for these dispositions, their relative effectiveness was not obvious. The results here clarify this relation and point to the great efficiency of a plea disposition in a congested court, even when costs are disregarded, with the implication that the existence of plea


\(^11\) Id.

bargaining need not be viewed as a necessarily negative phenomenon.

3. The Optimal Size of the Court

The second question that is addressed by the model is the economically optimal trial capacity of a criminal court. Congestion and delay in the criminal courts have received increased attention in past years. While the rising crime rate is usually held responsible, the problem is actually quite old. In 1849, for example, the New York Commissioners on Pleading and Practice reported:

> It is well known that in New York City the Court is weighed down... Unless relieved of that load, it can never perform its proper function in respect to occurring business.\(^{33}\)

Half a century later, in 1904, a similar report noted the "conditions of congestion and delay which embarrass the courts and menace their usefulness and authority," characterizing their nature as "not temporary and of recent origin but chronic."\(^{33}\)

How is court size normally determined? Additional judges are usually appointed when the courts cannot cope with their case load; when congestion seems to become intolerable, a few judgeships are added. In some jurisdictions attempts are made to go beyond such an *ad hoc* approach, and systems have been adopted that are called, with a certain exaggeration, "scientific." Ohio, for example, "scientifically" allocates judgeships by population, at the statutory rate of one judge per 30,000 inhabitants.\(^{35}\) Others allocate judgeships according to case load. Iowa assigns one judgeship per 450 or 550 "filings."\(^{36}\) California has pioneered a "weighted" case load system that takes into account average lengths of trials.\(^{37}\) For the U.S. federal court system, no statutory rule exists;\(^{38}\) but there is an unofficial standard, endorsed cautiously in a Senate report,\(^{39}\) of 400 case filings per year per judge.

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\(^{34}\) Id., 19. See also Jay Wishingrad, "Comment, The Plea Bargain in Historical Perspective" (1974), 23 *Buffalo L. Rev.* 499.

\(^{35}\) Ohio Rev. Code Ann. 1907.041.

\(^{36}\) Iowa Code, 604.8 (1971).


\(^{39}\) U.S. Senate, Committee on the Judiciary, Report 95-117, *Omnibus Judgeship Bill*, 95th Congress, March 28, 1977, p. 10. The Committee was helped by a sophisticated forecast of cases in each district. See Battelle Pacific Northwest Laboratories, *District Court Caseload Forecasting*, Executive Summary, Federal Judicial Center 75-7 (4 Vols.) (October, 1975).
What these guidelines have in common is their lack of analytical content. They follow essentially a containment strategy: the goal is to make the court's workload manageable by increasing judgeships. The real question, however, may not be whether one can succeed in preventing congestion by adding some judgeships, but rather what the right social investment in the court system should be. This is a problem that has not been adequately raised. One reason for that omission has been the difficulty of conceptualizing, in an operationally useful way, the benefits of changes in the court system.40

A criminal court, besides its other functions, is concerned with the enforcement of law;41 its operation will affect crime, either directly or indirectly. How much of its resources should be spent on this function? Of course, despite society's ardour for law enforcement,42 it seems unrealistic to expect courts to be financed without limits, or to the point of miniscule marginal benefits.43 To answer the question, we can use our court model.

The expense of operating a criminal court system is a social cost that is due to crime; but this expense affects crime itself. A larger court system adds budget expenditures, but may, through its activity, reduce crime related losses.

Society's total loss \( L \) that is due to crime is the sum of direct crime losses \( Z \) and of budget costs \( B \) of the court

\[
L = Z + B. \tag{9}
\]

\( L \) can be varied, to an extent by changes in \( B \), trading budget expenditures for direct crime losses. In terms of economic efficiency, the court budget \( B \) should be chosen so that it minimizes total crime losses \( L \). Total crime related losses will be minimized where the marginal cost to the court system is equal to the marginal benefit in reduced crime losses, \( \frac{dZ}{dB} = -1 \).

Recall, from before, that the marginal benefit of a trial is

\[
\frac{dZ}{dT} = \frac{1}{E_T} \cdot \frac{dC}{dK} \cdot k \tag{10}
\]

and that \( C = NAW \cdot \pi^4 \). Substituting equations (2) and (3) from section 2 above, and recalling that the case load is equal to trials \( T \) plus plea dispositions \( P \), we have

\[
C = (NA) \left( \frac{bTV}{k} \right) \frac{1}{1 + \delta} \cdot (T + \phi - 1 + \lambda) \frac{1}{1 + \delta}.
\]

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40 One exception is Landes, _supra_, note 9.
If we differentiate this equation with respect to $T$, we have the marginal effect of a trial $\frac{dC}{dT}$. The results can be calculated by using the parameters that were described before. The calculation is straightforward, though tedious; it results in an equation where only $T$, the number of trials, is a variable. We find that the optimizing $T$ is described by

$$\frac{dZ}{dB} = aT^b = 2.3727 \cdot 10^{10} \cdot T^{-3.079} = 1.$$ 

This solves for an optimum number of trials of $T = 2299$. Contrasting these results with the actual number of trials in the District of Columbia, the results show that the optimal capacity is approximately 2.5 times larger than the existing one.

4. The Optimum Mix of Cases

The third use of the model looks at the allocation of court time among different categories of criminal cases. As has been discussed, given the realities of congestion in big-city criminal justice systems, very few defendants stand trial. Court time is a scarce commodity, and it is an important issue how this resource ought to be allocated.44

Despite the practical significance of this question, it too, has received little systematic analysis by lawyers or court administrators.45 When the issue is addressed, a set of different factors is typically listed according to which case selection proceeds, such as the "severity" of the offense, the probability of winning the case (even though the probability of winning a trial is nearly identical for the major offense classes), the anticipated length of trial or the frequency of the offense. But these factors are left without a systematic connection.

The best example of this approach is a study by the National Center for Prosecution Management.46 That work describes a method of assigning score points according to several characteristics of the case and adds them up. There is no explanation of the criteria used for ranking the characteristics or for the weights assigned to them.

44 District of Columbia, Superior Court, Clerk's Office 1976 Annual Report (Washington, D.C., 1976), 33. Allocated according to the distribution of criminal cases in total case load, weighted by the relative average time of criminal trials.


46 American Bar Association, Special Committee on Court Congestion, Ten Cures for Court Congestion (1959); Hazard, Jr., supra, note 45.


criminal courts, it is nevertheless a dimension that is all too frequently ignored.

The paper has dealt with three related questions. First, it has shown the relative cost-effectiveness of trials as opposed to guilty plea dispositions. The empirical results for the District of Columbia show that plea dispositions are not only more cost-effective because they are cheaper — which is fairly obvious — but also more effective in reducing crime even when cost is not considered. This, however, does not imply that dispositions by trial should be curtailed beyond their present number. On the contrary, the second section of the paper analyzed a particular criminal court in the District of Columbia and found that the optimal size, for this court was 2.5 times larger than its present capacity. The final section of the paper examined the optimum mix of trials among different categories of offences. Here it was found that for maximum reduction of crime losses, the bulk of trials should be allocated to robbery and burglary cases.

There are other questions that could be addressed by this model and the preceding applications are an example of such an approach. These results are not to be interpreted in terms of operationally applicable numbers, but rather as the demonstration of a particular methodology which can clarify conceptual issues with regard to resource allocation in criminal courts.

What are some of the implications of these findings? Quite frequently, the debate on how to allocate funds to the criminal justice system is often characterized by "hard-liners" and "due process" advocates. The former emphasize law and order and the importance of police enforcement as the necessary means to reduce crime. "Due process" advocates, on the other hand, stress the importance of courts and the inherent dignity of a society that upholds civil liberties, even at considerable cost. They do not usually claim that that approach is more efficient, but rather that it is morally superior. However, the foregoing analysis suggests that effectiveness in terms of reduced crime and improvements in the equality of justice rendered, may not be mutually exclusive or even conflicting goals; at least, this appears to be the case in the context of overcrowded courts in the criminal justice system. Thus, it is quite effective, in terms of crime reduction, to devote effort and resources to those institutions which may have been viewed primarily as being conducive to improving the quality of justice. Giving priority to the criminal courts may therefore contribute to the realization of both the effectiveness and the quality of law enforcement.

One reason for the scarcity of trial priority analysis by the prosecutors or court administrators is that they are constrained by the practical realities of law, procedure, custom, and public policy from adopting explicit priority or case quota policies. These institutional constraints, binding as they may be for practitioners, should not, however, prevent an academic analysis. Researchers such as William Landes, William Rhodes, and Judith Lachman have contributed to an understanding of resource allocation by a prosecutor. In another paper, Brian Forst and Kathleen Brosi investigated a strategy that takes recidivism into account. Despite some important differences in approach, these studies stress the strategic interaction of prosecutor and defendant; their underlying assumption is a weighted success maximization of the prosecutor, or the utility associated with it.

The following application of the model, in contrast, is primarily concerned with the trial allocation among categories of offenses rather than with individual trial strategy. It assumes that even after a preliminary selection of individual cases by "quality", there are still far too many cases left for the available trial time. Out of the pool of possible cases an optimal trial "mix" must be selected among different offense categories. The emphasis is on the type of offense rather than the offender.

One basic assumption of the analysis is that the existence and the frequency of trials affects crime. By selecting the proper "mix" of cases one can maximize that effect, within the available court resources. The operational problem is defined as reducing the total net losses Z that are attributable to crime C by choosing a proper allocation of trials. This allocation is the set T i, where each T i denotes the "quota" of trials for the offense category i.

The solution of this objective is similar to the previous uses of the model, where the marginal benefits of a trial were calculated. Now, however, we distinguish between the effects of different categories of crimes, by considering their separate elasticities of deterrence, the average lengths of their trials, and their different social harms.

An optimal mix of trials is achieved when the marginal benefits of crime loss reductions due to a trial are equalized for the trials of each category.

51 Brian Forst and Kathleen Brosi, "A Theoretical and Empirical Analysis of Prosecutors" (1977), 6 J. Legal Studies, 177.
\[
\frac{dZ}{d(g_jT_j)} = \frac{dZ}{d(g_jT_j)}
\]

(12)

where \( g_j \) is a weight for the length of a trial of offense category \( i \). This maximization is subject to the constraint that the sum of trial allocations \( T_i \), weighted by their time \( g_i \), is equal to total court capacity \( T \), i.e., that \( \Sigma T_i g_i = T \). To solve these equations, the disaggregated deterrence elasticities \( \beta_i \) and \( \delta_i \) are obtained from the same sources as before and listed in Table 1. Similarly, the losses due to crime are calculated from the Wolfgang-Sellin index and listed in that table, together with the average lengths of trials.

### Table 1

<table>
<thead>
<tr>
<th></th>
<th>Elasticities of Crime Rate</th>
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<tr>
<td></td>
<td>Real Crime Incidence in % of Reported Crime</td>
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<tr>
<td>----------------</td>
<td>----------------------------</td>
</tr>
<tr>
<td>Burglary</td>
<td>11869</td>
</tr>
<tr>
<td>Robbery</td>
<td>7044</td>
</tr>
<tr>
<td>Larceny</td>
<td>24506</td>
</tr>
<tr>
<td>Auto Theft</td>
<td>12972</td>
</tr>
<tr>
<td>Assault</td>
<td>2659</td>
</tr>
</tbody>
</table>

It is then possible to calculate the optimal "quotas" of trials by solving a set of equations of type (6), for five categories of crime according to the criterion (12), and subject to the constraint \( \Sigma g_j T_j = T \). The results of such calculation are (in percent of total):

- Burglary 28.2%
- Robbery 47.2%
- Larceny 11.7%
- Auto Theft 0.3%
- Assault 14.4%

These results show that for a maximization of a reduction in crime losses, nearly three quarters of the trial resources should...
be concentrated on two classes of cases, robberies and burglaries, while nearly no court resources should be used for auto thefts. For the latter, deterrence and monetary losses are so low as to make an occasional trial useful only as a "price-setter" for plea bargaining. Of course, additional trials must be allocated for the types of cases that are not included in the five categories, as, for example, murder and rape.

It is interesting to compare these results of the model with the actual allocation of trials in the courts of Washington, D.C. Table 2 shows the model's optimal quotas in Column 1, and the real allocations for two available time periods, in Columns 2 and 3.

Table 2
Trial Quotas

<table>
<thead>
<tr>
<th>Hypothetical Distribution of Cases</th>
<th>Model Values</th>
<th>Actual D.C. 1975</th>
<th>Actual D.C. 1967-1971 (Average)</th>
<th>Frequency According to Severity Weights</th>
<th>By Sentence</th>
<th>By Wolfgang-Sellin Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model Values</td>
<td></td>
<td>Actual D.C.</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Robbery</td>
<td>47.2</td>
<td>54.7</td>
<td>50.1</td>
<td>14.5</td>
<td>37.8</td>
<td>26.0</td>
</tr>
<tr>
<td>Burglary</td>
<td>28.2</td>
<td>23.2</td>
<td></td>
<td>24.2</td>
<td>21.2</td>
<td>20.2</td>
</tr>
<tr>
<td>Larceny</td>
<td>11.7</td>
<td>5.0*</td>
<td>24.4</td>
<td>49.6</td>
<td>10.6</td>
<td>17.6</td>
</tr>
<tr>
<td>Auto Theft</td>
<td>.3</td>
<td>5.0*</td>
<td>8.4</td>
<td>6.1</td>
<td>12.7</td>
<td>13.5</td>
</tr>
<tr>
<td>Assault</td>
<td>14.4</td>
<td>12.6</td>
<td>17.2</td>
<td>5.4</td>
<td>17.8</td>
<td>22.8</td>
</tr>
</tbody>
</table>

*Estimated

The results show a substantial similarity of the predicted optimal allocation with the actual mix. Thus it seems that the prosecutor's office, at least in Washington, behaves in its intuitive fashion quite rationally, at least according to the model. That this is not simply based on frequency and severity distributions can be seen from the following columns. In column 4, trials are distributed according to the frequency of the cases, and the difference to trial distribution is apparent. In columns 5 and 6, trials are allocated according to the frequency of the cases, weighted by their relative severity (from Table 1, columns 1 and 3); again the allocation is different, although it is more similar.

5. Summary and Conclusion

The aim of this paper has been to demonstrate the uses of an economic model of resource allocation to questions of court access. While it should be emphasized that such an economic analysis deals with only one dimension of the problems facing

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