CASE QUOTAS
IN THE COURT:
AN ANALYSIS OF
THE ALLOCATION OF
JUDICIAL RESOURCES

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The paper develops analytic criteria for the selection of the optimal "mix" of trials in a congested court system. It describes a model generating case quotas for major categories of crime that maximizes the reduction in the overall social losses due to crime. The empirical results for the District of Columbia suggest that scarce court time should be heavily allocated to trials for robbery and burglary.

This paper deals with the optimal mix of case categories in a congested court system, with respect to reducing the social losses from crime. Although it concentrates on criminal cases, a similar analysis can be applied to civil cases and to proceedings before administrative agencies.

According to popular belief, a criminal defendant's guilt is determined through trial, by a judge or jury. Actually, with the congestion in most big-city criminal justice systems, very few defendants are tried. Court time is a precious commodity, to be used on rare occasions only; most cases are disposed of in other ways. Given the scarcity of court time, it is important to consider how this resource ought to be used.

Despite the practical significance of the question, it has received only little meaningful or systematic analysis by lawyers or court administrators (ABA, 1959; Hazard, 1965). If the issue is addressed at all, the discussion typically consists merely of a listing of different factors, including the severity of the offense (a criterion that means different things to different people),¹ the probability that the prosecutor will be successful in a trial (even though the probability of winning a trial is very similar for the major offense classes²), the anticipated cost of a

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¹ Seriousness scales are robust, however, across various populations surveyed (Figlio, 1975).

² However, the probability that indicted cases will result in a conviction varies among offense categories. (See Administrative Office of U.S. Courts, 1960:81ff.)
trial, and the frequency of the offense. These factors are listed without systematic connection.

The most sophisticated example of this approach is a study by the National Center for Prosecution Management (Jacobi, 1973). That work describes a method of assigning score points according to several characteristics of a case. The points are added up to determine the importance of the case. However, there is no explanation of the criteria used for ranking the characteristics, nor are the weights assigned to them explained.

The scarcity of case priority analysis by prosecutors or court administrators is attributable in part to the realities of procedure, custom, and public policy, which militate against adopting explicit case quota policies. But this should not prevent methodological research. Analysts such as Landes (1971) and Rhodes (1976) have contributed to an understanding of the prosecutor’s allocation of resources. Forst and Brosi (1977), carrying the discussion a step farther, 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 intention is to permit a maximization of the success of the prosecutor weighted by the importance of the case, or to maximize the prosecutor's utility by the rational use of limited prosecutorial resources.

This paper is primarily concerned with the allocation of cases for trials according to categories of offenses, rather than with the strategy for individual cases. 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 "mix" must be selected among different offense categories, to maximize the court’s role in reducing social losses from crime. The emphasis is thus on the offense class rather than on the individual offense.

The paper defines a model of several equations that can be solved for case assignment. Empirical data for the District of Columbia are used in this study to demonstrate the optimal felony case mix for that jurisdiction.

A word of caution should accompany the analysis. The model approach, by necessity, is abstract and omits many real-world variables (Blumstein and Larson, 1970; Carr-Hill and Stern, 1973; Downs, 1969; Nagel, 1963; Votey and Phillips, 1972). Hence, practitioners should view the model primarily as a potentially useful framework for guiding broad prosecutorial and judicial policy. Its aim is to stimulate an awareness of organizing principles that integrate different criteria in criminal case processing and adjudication, rather than to generate definitive numbers for actual use.
THE MODEL

A basic assumption of the analysis is that the existence and the frequency of trials have a certain effect on crime. By selecting the proper "mix" of cases to pursue, given the available court resources, one can maximize that effect. The operational problem is defined as reducing the total net losses \( Z \) that are attributable to crime \( C \) by choosing a set of cases \( \mu_i \), where each \( \mu_i \) denotes the "quota" \( \mu \) of cases for an offense category \( i \). In limiting the analysis to the crime-reducing effect of trials, other societal functions of trials are, of course, ignored; for example, trials perform a valuable role in visibly upholding laws and justice. However, for the purposes of the model, the prosecutor is assumed to be concerned with reducing social losses attributable to crime.

An optimal mix of cases will be achieved when the marginal benefits of crime loss reductions per unit of trial time are equalized. Thus,

\[
\frac{dZ_1}{d\mu_1g_1} = \frac{dZ_2}{d\mu_2g_2} = \ldots = \frac{dZ_n}{d\mu_ng_n},
\]

where \( g_i \) is a factor that adjusts for different trial lengths, and \( d \) denotes derivatives. This optimization is subject to the constraint of total available court trial time:

\[
T = \Sigma \mu_ig_i.
\]

By selecting a case from one crime category over that from another, the criminal justice system influences the "price" of a crime (i.e., its expected sanction). There are two elements to that measure: the severity of punishment and its probability.

A change in the expected sanction has a marginal effect on the crime rate. Although there are many environmental factors that are believed to contribute to crime (e.g., poverty and unemployment), it is assumed here that the expected magnitude and probability of punishment for committing a crime have some effect, in terms of both deterrence and incapacitation. A prosecutor can influence these variables, while he must take environmental factors as unchangeable. The concept of deterrence is controversial, but for "crimes of property" (as opposed to "crimes of passion"), its existence appears plausible although its magnitude remains unclear. A research panel of the National Academy of Sciences (1978:96) has reported:

Numerous analyses, generally econometric, have also attempted to investigate the deterrent effect of criminal sanctions. With one important exception (Forst 1976) inverse associations are found between crime rates and several sanction measures, primarily clearance rates, imprisonment probability and time served.
Thus, some criminal activity, on the margin, may be reduced if its “price” increases. Let us first discuss the probability effect of a trial. By taking a case from category \( i \) and trying it, the probability \( P_i \) that such a crime will result in a conviction is changed by the “marginal” trial, \( d\mu_i \); thus,

\[
\frac{dP_i}{d\mu_i} = \frac{h_i}{C_i}
\]

where \( h_i \) is the probability that a case will result in a conviction.

Furthermore, let \( \alpha \) be defined as the elasticity of the per capita crime rate with respect to conviction probability \( P_i \):

\[
\alpha_i = \frac{dC_i}{dP_i} \cdot \frac{P_i}{C_i},
\]

such that

\[
\frac{dC_i}{dP_i} = \frac{\alpha_i C_i}{P_i} = \frac{\alpha_i C_i^2}{\mu h_i}.
\]

Furthermore, let social losses corresponding to crime \( C \) be defined as

\[
Z_i = C_i r_i k_i,
\]

where \( r_i \) is a factor that adjusts for nonreported crime, and \( k_i \) is the equivalent dollar value for the economic and psychic losses that are due to a crime of class \( i \), on the average.

The probability effect of a trial on crime losses is, therefore, by the chain rule,

\[
\frac{dZ_i}{d\mu_i} = \frac{dP_i}{d\mu_i} \cdot \frac{dC_i}{dP_i} \cdot \frac{Z_i}{C_i} = \frac{h_i}{C_i} \cdot \frac{\alpha_i C_i^2}{\mu h_i} \cdot r_i k_i = \frac{\alpha_i C_i}{\mu_i} r_i k_i.
\]

It is more difficult to conceptualize the effects of a trial on the severity of punishment. In a congested court system, only a limited number of cases can be tried; the majority must, by necessity, be disposed of by inducing the defendant to plead guilty. Such a plea will be offered by a defendant in return for a promise of a reduced sentence over what he could expect to receive after a trial. The average reward that is necessary to induce defendants to plead guilty constitutes the price paid by the prosecutor to obtain a guilty plea; this price is related to the relative quantity of guilty pleas that are demanded, just as prices in other areas are usually associated with some quantities. Practically, if the prosecutor needs more guilty pleas to reduce the caseload (since guilty pleas take considerably fewer prosecutorial resources and less court time than do trials), he will have to offer, on the average, better terms; thus the average effective sentences will tend to be lower. It is
now hypothesized, and later empirically verified, that there is a direct relation between the degree of congestion within a court system and the substantial sentence “discount” that is given for pleading guilty. The degree of congestion can be expressed as the ratio of trial capacity \( \mu \) and the rate of case flow \( \lambda \). \( \lambda \) tends to be much larger than \( \mu \), because court trial capacity is severely limited. The direct functional relationship can be expressed as the dependence of the average incarcerative sentence \( W_i \) (which includes both trial and plea bargain sentences), relative to average trial \( V_i \), on the “congestion ratio” \( \mu/\lambda \). The higher the congestion, the smaller that ratio, and the relatively smaller the effective sentence \( W_i \).

\[
W_i = b \frac{\mu}{\lambda} \cdot V_i,
\]

where \( b \) is a coefficient.

The implication of equation (8) is that an additional trial has the marginal impact of relieving court congestion for that offense class, and thereby affecting sentence severity indirectly. Formally,

\[
\frac{dW_i}{d\mu_i} = b \frac{\mu}{\lambda_i} \cdot V_i.
\]

Let us now define \( \alpha \) as the elasticity of per capita crime with respect to sentence severity, analogous to the elasticity of crime with respect to probability, such that

\[
\frac{dC_i}{dW_i} = \beta_i \cdot \frac{C_i}{W_i}.
\]

The severity effect of an additional trial, for those convicted, will therefore be, by the chain rule,

\[
\frac{dZ_i}{d\mu_i} = \frac{dW_i}{d\mu_i} \frac{dC_i}{dW_i} = b \frac{\mu_i}{\lambda_i} \cdot \frac{\beta_i C_i}{b \mu_i V_i} \cdot r_i k_i = \frac{\beta_i C_i r_i k_i}{\mu_i}.
\]

The total benefits of crime loss reduction, due to a trial category \( i \), is the sum of probability and severity benefits

\[
\frac{dZ_i}{d\mu_i} = \alpha_i \left( \frac{C_i}{\mu_i} \right) r_i k_i + \beta_i \left( \frac{C_i}{\mu_i} \right) r_i k_i = \frac{C_i r_i k_i}{\mu_i} (\alpha_i + \beta_i).
\]

Let us recall that the maximization criterion is, from before,

\[
\frac{dZ_1}{d\mu_1 g_1} = \frac{dZ_2}{d\mu_2 g_2} = \ldots = \frac{dZ_n}{d\mu_n g_n} = A,
\]

where \( A \) is some positive value, subject to total trial capacity \( T \)

\[
T = \sum \mu_i g_i.
\]
This system can now be readily solved. If, from (12) and (1)

$$\mu_i g_i = \frac{C_i r_i k_i}{A} (\alpha_i + \beta_i),$$

then

$$T = \sum \mu_i g_i = \frac{1}{A} \sum C_i r_i k_i (\alpha_i + \beta_i),$$

so that marginal benefits $A$ are given by

$$A = \frac{1}{T} \sum C_i r_i k_i (\alpha_i + \beta_i).$$

With $A$ known, the $\mu_i$ can be found by simply setting

$$\mu_i = \frac{C_i r_i k_i}{A g_i} (\alpha_i + \beta_i).$$

Thus one can determine the “quota” of cases for each offense category.

**EMPIRICAL RESULTS**

The jurisdiction that is investigated is the District of Columbia; the crimes are the five major FBI index felonies. Their frequency for 1976 is given in column 1 of Table 1.

$k$ is the loss to society due to an average felony. Its estimation presents some conceptual and practical problems. One method of calculation is to use the direct economic loss due to crime, a procedure chosen by the 1967 presidential commission (1967:42). A superior method, however, is to go beyond private economic losses and estimate the societal “disutility” that is associated with a crime. To do so, we employ the results of the Wolfgang-Sellin study (1964:69), which surveyed different population samples to find the public perception of the social “seriousness” of different crimes. In that study, the seriousness of a nonviolent, nondisruptive “taking” of different sums of money was surveyed, and a “power function of money” was estimated (p. 285) that describes the perception of seriousness, $X$, as a function of the amount of money $Y$ that is lost: $X = f(Y)$. These findings can be used by an inversion of $f(Y)$. If the severity perception $X$ of an offense is known, the equivalent dollar $Y$ for that severity is

$$Y = F^{-1} (X), \text{ or, specifically, } Y_i = \left( \frac{X_i}{16.93} \right)^{.165}.$$

Using the seriousness scores for the five index crimes, the associated dollar figures can be found. (These are given in column 4 of Table 1.)
### TABLE 1. Frequency of Index Felonies, District of Columbia

<table>
<thead>
<tr>
<th>Crime Type</th>
<th>Frequency of Reported Crime (C)</th>
<th>Real Crime Incidence in % of Reported Crime ($r_i$)</th>
<th>Severity Index Score</th>
<th>Societal Harm Due to Crime ($k_i$)</th>
<th>Trial Time as % of Average ($g_i$)</th>
<th>Elasticities of Crime Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burglary</td>
<td>11,869</td>
<td>1.754</td>
<td>40.62</td>
<td>200.48</td>
<td>.866</td>
<td>-.724</td>
</tr>
<tr>
<td>Robbery</td>
<td>7,044</td>
<td>1.587</td>
<td>52.25</td>
<td>919.48</td>
<td>1.220</td>
<td>-.1603</td>
</tr>
<tr>
<td>Larceny</td>
<td>24,506</td>
<td>2.041</td>
<td>35.62</td>
<td>89.30</td>
<td>1.180</td>
<td>-.371</td>
</tr>
<tr>
<td>Auto theft</td>
<td>2,972</td>
<td>1.315</td>
<td>27.19</td>
<td>17.61</td>
<td>.630</td>
<td>-.407</td>
</tr>
<tr>
<td>Assault</td>
<td>2,659</td>
<td>2.272</td>
<td>45.91</td>
<td>420.12</td>
<td>.905</td>
<td>-.724</td>
</tr>
</tbody>
</table>

A verification of the existence and the magnitude of the relationship (see eq. 8) was estimated empirically from data for a cross-section of federal district courts (those with heavy criminal workloads). To that purpose, data for all federal criminal cases, containing the actual sentences for each case, were obtained for the year 1973. Results for the OLS regression across district courts were found, with the result \( W = 2.88 (\mu/\lambda) V \), at the .01 level of statistical significance (see Noam, 1981).

\( \alpha_i \) and \( \beta_i \), the elasticities of per capita crime rate \( C_i/P \) with respect to probability and severity, are obtained from the estimations by Ehrlich (1973:521) and Vandaele (1978), as reported by the Department of Justice (1980). \( T \), the trial capacity, is given by the prorated number of judgeship equivalents available for criminal trials (District of Columbia, 1961:33) times the national average of criminal trials (U.S. Senate, 1977:9), resulting in \( T = 900 \). Solving equation (15), we then find

\[
A = \frac{1}{T} \Sigma C_i r_i k_i (\alpha_i + \beta_i) = 40,017. \tag{18}
\]

With \( A \) known, the trial quotas \( \mu_i \) can be determined by equation (16). The following trial quotas are then found (in percentage of total trials):

- Burglary: 26.9%
- Robbery: 47.2%
- Larceny: 11.1%
- Auto Theft: .3%
- Assault: 14.4%

These results show that nearly three-quarters of the trial resources should be concentrated on two classes of cases, robberies and burglaries, while nearly no resources should be used for auto thefts. For the latter, deterrent effects 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 (e.g., murder and rape).

Because of the probabilistic element in the magnitude of the deterrence elasticities, it is useful to look at the sensitivity of our results to changes in these parameters. From the functional form one can see that

3. Defined as those courts with more than one criminal trial per day; the Middle District of Florida was omitted because of problems with its data.
4. Administrative Office of United States Courts, James A. McCafferty, Chief, Statistical Analysis and Reports Branch. Part of the computations were provided by the Criminal Justice Research Center in Albany.
5. One advantage of using Ehrlich's figures is that his results have been thoroughly scrutinized, retested, and, at least for property crimes, confirmed within his model in Vandaele's paper, commissioned by the National Academy's Panel on Research.
if all of the deterrence parameters are altered by the same proportion, no change in the optimal trial allocations will result. If, on the other hand, the changes in parameters are nonuniform, calculations show that the associated changes in the optimal trial quotas are roughly the same as the percentage changes in the parameters. For example, a 30 percent increase in the deterrence elasticities for burglary and a 30 percent decrease in those for robbery result in changes of the trial quotas by, respectively, +28 percent and −34 percent of the previous quota. The changes in the other three crime categories are, for this case, negligible. The results suggest an approximately unitary elasticity of the quotas with respect to the deterrence parameters, which indicates a fair degree of robustness.

It is interesting to compare the 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 actual allocations for two available time periods in columns 2 and 3.

The results show a substantial similarity between the predicted optimal allocation and the actual mix. Thus it seems that the prosecutor’s office, at least in Washington, behaves quite rationally, at least according to the model. That this is not coincidental, based on other factors, at least the most obvious ones, can be seen from the following columns. In column 4, cases are distributed according to their

### TABLE 2. Trial Quotas

<table>
<thead>
<tr>
<th></th>
<th>Actual: D.C., 1967–71</th>
<th>According to Case Frequency (% of 5 felony crimes)</th>
<th>By Sentences</th>
<th>By Wolfgang-Sellin Index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model Values</td>
<td>Actual: D.C., 1977 (Average)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Robbery</td>
<td>47.2</td>
<td>54.7</td>
<td>14.5</td>
<td>37.8</td>
</tr>
<tr>
<td>Burglary</td>
<td>28.2</td>
<td>23.2</td>
<td>24.2</td>
<td>21.2</td>
</tr>
<tr>
<td>Larceny</td>
<td>11.7</td>
<td>5.0a</td>
<td>49.6</td>
<td>10.6</td>
</tr>
<tr>
<td>Auto theft</td>
<td>.3</td>
<td>5.0a</td>
<td>8.4</td>
<td>6.1</td>
</tr>
<tr>
<td>Assault</td>
<td>14.4</td>
<td>12.6</td>
<td>17.2</td>
<td>5.4</td>
</tr>
</tbody>
</table>

Sources: Actual Allocations: 1976 District of Columbia Superior Court, Clerk’s Office; Hypothetical Distribution of Cases: see Table 1, cols. 1 and 3.  

aEstimated.
frequency, and the difference to trial distribution is apparent. In columns 5 and 6, cases are allocated according to their frequency weighted by severity, and again the allocation is different, although it is more similar.

CONCLUSIONS

The aim of the paper is to develop an analytic model that establishes a methodology for the systematic selection of cases in a congested court system. The objective criterion of the model is defined as maximizing the reduction of losses due to crime, with the variable being the mix of cases.

The illustrative empirical investigation suggests that, among the five major crime categories, a heavy priority ought to be given to robbery, and, to a lesser extent, to burglary. On the other hand, auto theft merits only a very small quota.

The heavy emphasis on robbery trials is due to the relatively high deterrence elasticities of that offense, the large number of cases, and its perceived high social harm. On the other hand, auto theft trials seem to be quite unimportant, because of the lower perception of harm and because of the low deterrence elasticities. As mentioned, however, the results should be viewed as an illustrative expression of a framework of analysis rather than as definitive numbers for practical use.

A look at the actual allocation of trials in the District of Columbia shows it to have a surprising similarity to the model-generated optimal quotas. This similarity cannot be explained on the basis of frequency or severity of the offense categories. It therefore seems that without means of systematic case selection, the prosecutor’s office behaves quite rationally.

This paper was concerned primarily with priority among offense classes. There are further factors to be considered that are more individual in nature, such as age, prior record, and risk of recidivism. The inclusion of these factors (e.g., by defining subcategories of cases within each crime classification) should be possible. To broaden the analysis in such a way is a next step for research.

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