CLASSIFYING PUNISHMENT DECISIONS WITHIN PRISONS

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We analyze punishment decisions made by state correctional officers. We want to know if certain inmates are punished more severely than others. While there is extensive political science and sociology literature on imprisonment (Beckett and Western 2001; Greenberg and West 2001; Jacobs and Carmicheal 2001; Jacobs and Helms 1996; Smith 1994; Taggart and Winn 1993; Weidner and Frase 2003; Yates and Fording 2005), there is very little on the treatment that inmates receive while incarcerated (but see Percival 2009; Olson and Fording 2011). We focus on punishment while incarcerated.

Why look at prisons? There are several reasons why a political scientist would look at prisons. The correctional population in the United States is massive, with one out of one hundred Americans under some sort of correctional supervision (including prison, parole and probation). Prisons have lasting negative effects on future political participation once inmates are released (Weaver and Lerman 2010; Western 2006). Treatment inside prison effects psychological well-being, future criminal activity and recidivism (Chen and Shapiro 2007; Drago, Galbiati and Vertova 2008; Selke 1993). Incarceration has a disproportionate effect on the minority population (Yates and Fording 2005; Western 2006). It is possible that racial discrimination also occurs inside the prison facilities.

Prisoner treatment has important normative implications. Philosophers as diverse as Feodor Dostoyevsky, Mahatma Gandhi1 and Jesus Christ2 suggested that a society will be judged by how it treats its weakest members. Dostoyevsky said ‘The degree of civilization in a society can be judged by entering its prisons’. Our research helps fill an important void in the literature and examines an overlooked area of government policy.

The prison environment offers a great avenue to test the impact of bureaucratic discretion. Correctional officers have similar reward and punishment powers as school teachers (Liebling 2000). Correctional officers also experience many of the same temporal, cognitive and financial resource constraints as other street-level bureaucrats (Brehm and Gates 1997; Lipsky 1980; Schaufeli and Peeters 2000). While correctional workers share many similarities with other bureaucrats, one key feature stands out. Due to the negative social construction of prison inmates (Schneider and Ingram 1993), we might expect punishment preferences to be homogenous. Therefore we chose an environment that is less likely to confirm a null hypothesis that bureaucratic discretion has an effect.

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1 ‘A nation’s greatness is measured by how it treats its weakest members.’ Mahatma Gandhi
2 ‘They also will answer ‘Lord, when did we see you hungry or thirsty or a stranger or needing clothes or sick or in prison and did not help you?’ He will reply ‘I tell you the truth, whatever you did not do for one of the least of these, you did not do for me.’ Matthew 25:44-45
In order to test for bureaucratic discretion, we use an interdisciplinary approach. We use three methods; support vector machines, decision tree/clustering and logistic regression. We will discuss what previous political science research has found, describe our three methodological techniques and then present our results.

Bureaucratic Discretion
While executive and legislative bodies design public policy, implementation of public policy is performed by government agencies (Matland 1995; O’Toole 2000; Schofield 2001). Authority is delegated to agencies, which can then perform legislative, executive and judicial functions. (Kerwin, 2003, p. 3). Federal and state agencies play an important role in shaping public policy, and the policy goals of government agencies do not always perfectly match the policy goals of legislative, executive and judicial bodies. Even when the goals of the political actors and the goals of the agency are in congruence, routine decision-making is delegated to the agency. Through the delegation of authority, agencies are able to exercise discretion in policy implementation.

Government agencies are given discretion over day-to-day decision-making and eligibility decisions for many policies. An agency may be given different kinds of discretion. For example, the Environmental Protection Agency may be responsible for setting specific regulation levels. Congress may pass a Clean Air Act that requires regulations in a certain range, but the Environmental Protection Agency may be given discretion over the exact level. In the case of the 1996 welfare reform act, states received a wide amount of discretion over welfare benefits and sanctions. In the case of law enforcement, the state or local government may provide resources and emphasize what crimes to investigate, but local law enforcement makes the decision of what individuals to investigate.

There are many reasons why agencies receive discretion. Agencies have expertise and are able to respond quickly to new situations (Kerwin, 2003, p. 30). Agencies have organizational resources that are not available to legislative or executive decision makers and agencies have the ability to concentrate sustained attention to a single problem (Rourke, 1969, p. 39). Information asymmetries may exist when the agency has more or better information than the legislature (Miller 1993). As a practical matter, legislative oversight may be difficult in policy arenas that are technically complex and non-salient (Smith 2010). Discretion may occur in acknowledgment that political actors cannot completely control agencies. In addition, active political control is only necessary if the preferences of the agent are far away from the preferences of the executive and legislative branches (Calvert, McCubbins and Weingast 1989).

While agencies have discretion when setting rules or policies, individual members of governmental agencies also have discretion when dealing with specific situations. Individual employees are thought of as street-level bureaucrats. Police officers, welfare caseworkers, and teachers are all street-level bureaucrats. While a state legislature may set a speed limit and a state agency may prioritize law enforcement objectives, it is the decision of an individual police officer whether to write a ticket or give an offending motorist a warning.

Street-level bureaucrats have “considerable discretion in determining the nature, amount, and quality of benefits and sanctions provided by their agencies” (Lipsky, 1980, p. 13). Street-level bureaucrats workers receive discretion for two main reasons; first, work situations can be complicated and flexibility may be necessary. Second, there are human dimensions of a situation that may require more lenient or stringent responses, based on the circumstances (Lipsky, 1980, p. 15). As a practical matter, street-level bureaucrats receive a certain amount of discretion
because the agency is unable to control every action of its employees. Discretion gives street-level bureaucrats flexibility and the ability to exercise their best judgment. Implementation of public policy is especially important given the dominant position of street-level bureaucrats vis-à-vis their clients. Clients are in a “non-voluntary” position when dealing with front-line workers, and cannot refuse the decisions of staff members. Street-level bureaucrats have discretion over the use of sanctions and/or benefits. In some cases, front-line workers have nothing to lose by upsetting clients and in some settings any failure to reach a desired outcome results in blaming the client rather than the staff. For example, a teacher may receive a great deal of blame if their students under perform. However, a prison official is unlikely to receive much blame if an inmate is a recidivist. An inmate has already been determined to be a bad person, while a child is not (Lipsky, 1980, p. 54-58; Schneider and Ingram 1993).

Street-level bureaucrats face large caseloads and demands for quick decisions. These decisions may decide which clients benefit from particular programs and which clients are left out. Assuming resource constraints and a non-entitlement decision formula, only a certain number of clients can benefit from a particular program. For example, only a certain number of inmates can participate in a job training or substance abuse program, unless the prison makes participation universally available (Lipsky, 1980, p. 58). This paper attempts to find patterns in this decision-making process.

According to Steven Maynard-Moody and Michael Musheno, street-level bureaucrats make decisions based on perceptions of client worth. Worthy clients are seen as victims of circumstance, or as basically good people. Extra efforts are made to help worthy clients. Conversely, front-line workers will make extra efforts to punish unworthy clients. Unworthy clients have not just done bad things, unworthy clients are seen as bad people (Maynard-Moody and Musheno, p. 144-151). Clients who are deemed responsible for their own plight, such as those on general assistance welfare, are viewed more negatively than clients who are not responsible for their own condition, such as those who suffer from a disability (Barrilleaux and Bernick, 2003). In addition, clients who are viewed as unmotivated or lazy are deemed unworthy (Maynard-Moody and Musheno, p. 104), and clients who are viewed as constant troublemakers are also deemed unworthy (Maynard-Moody and Musheno, p. 99-102). Finally, clients that are disconnected from family are seen as unworthy.

One crucial heuristic that front-line workers may use to delineate worthiness is race and ethnicity. Racial explanations have a rich history in the political science literature. Race provides a framework for understanding policy variation in the states (Hero and Tolbert, 1996; Tolbert and Hero, 2001). Race has significant explanatory value for state imprisonment policy (Percival, 2009; Western, 2006; Yates and Fording 2005) and for state welfare policy (Soss, Fording and Schram, 2008; Keiser et al, 2004). Simply being black increases the probability of a citizen being incarcerated or receiving welfare sanctions. In addition, police may see blacks as less deserving and may be more likely to escalcate situations when dealing with blacks (Maynard-Moody and Musheno, p. 65-66 and p. 99-102).

Heuristics based on racial stereotypes affect judgments of client worth. In a series of experiments, respondents were more likely to view blacks as guilty of crimes, to envision that blacks would commit more crimes in the future and to suggest harsher punishments for blacks. White respondents who stereotyped blacks offered harsher judgments of black welfare recipients and drug suspects (Hurwitz and Peffley 1997; Peffley, Hurwitz, and Sniderman, 1997). There is also a significant evidence of police offers giving disparate treatment to minority suspects during
traffic stops, the most common interaction between police and citizens (see Bradbury and Kellough 2011; Close and Mason 2006, 2007; Ridgeway 2006; and Theobald and Haider-Markel 2009). Finally, state level measures of racial attitude and racial diversity affect the treatment outcomes of inmates (Percival 2009).

There is significant evidence that street-level bureaucrats use their discretion to reward and punish certain clients. Race is often an important heuristic that influences treatment. We now turn to our empirical tests.

**Data and Methods**

We use survey data from the Bureau of Justice Statistics 2004 Survey of Inmates in State and Federal Correctional Facilities, which includes questions about inmate punishment. The survey is a nationally representative sample of nearly fourteen thousand inmates. Three measures of punishment are used; write-ups, disciplinary actions and single cell confinement. A write-up is an official misconduct report, most often written by a correctional officer. Write-ups occur for offenses ranging from possessing a weapon to disobeying orders to assaulting another inmate. Some offenses, such as possessing a weapon, are straightforward. However, disobeying orders and other minor offenses offer more discretion to a correctional officer.

The second inmate punishment variable is a disciplinary action. Not all write-ups lead to a disciplinary action. In fact, only about half of all write-ups lead to a formal disciplinary sanction. Disciplinary actions can include anything from a loss of privileges to additional time served in prison to single cell confinement. A disciplinary action is a more intense sanction than a simple write-up. The final inmate punishment variable is for single cell confinement. In most cases, single cell confinement involves an inmate placed in an administrative segregation cell, commonly known as solitary confinement. In most cases, this involves being locked down 23 hours a day, with an hour for exercise and showering. In many cases, inmates only have contact with correctional officers, even exercising on enclosed prison yards. Single cell confinement represents one of the harshest inmate punishments. All punishment variables are dichotomous, measured by whether the inmate receives a sanction.

Our explanatory variables include a variety of demographic, socio-economic and criminal history variables. The inmate’s age, race and gender are included. Education levels, former employment and participation in prison programs also have explanatory value. Finally, we include multiple measures of an inmate’s criminal history, as a proxy for their proclivity to misbehave. Three methods are used to analyze the data; decision tree/clustering, support vector machines and logistic regression.

**Decision tree/Clustering**

Decision trees and clustering follow the concept of statistical classification. The purpose of classification is applied so as to place an individual inmate into groups based on quantitative information on one or more attributes. The inmates are classified based on the severity of their punishment. It was possible to have no punishment, a write-up, disciplinary action or single cell confinement order. By definition, inmates who received more severe punishment also received the lesser punishments (an inmate sent to single cell confinement also received a disciplinary action and a write up).

The goal of decision tree method is to create a model that predicts the value of a target variable based on several input variables. This is a very effective method while dealing with large data sets (like the one we are using). As the decision tree method is a visual, easy-to-understand
alternative in comparison to other decision analysis methods, it is a preferred method, especially in an interdisciplinary environment. There are several decision tree methods that could be used to build an effective decision tree from the given dataset. We use the C4.5 Algorithm, which has been there for a long time and is fairly effective. This algorithm was developed by Ross Quinlan. The pseudo code is as given below:

1. Check for base cases
2. For each attribute a
3. Find the normalized information gain from splitting on a
4. Let a_best be the attribute with the highest normalized information gain
5. Create a decision node that splits on a_best
6. Recurse on the sublists obtained by splitting on a_best, and add those nodes as children of node

Clustering is a statistical method, in which an object is assigned to an appropriate group of objects, based on its attributes. Clustering is not an algorithm as such but it is a collection of statistical methods, which identifies groups of samples that behave similarly or show similar characteristics. In particular we opted for k-means clustering method for this analysis. The pseudo code is:

1. Choose some manner in which to initialize the m, to be the mean of each group (or cluster), and do it.
2. For each example in your set, assign it to the closest group (represented by m).
3. For each m, recalculate it based on the examples that are currently assigned to it.
4. Repeat steps 2-3 until m converge.

Two software programs were used for the decision tree and cluster analysis, R and C4.5. ‘R’ is widely used for statistical software development and data analysis. Being a freeware, with most needed functions built-in and its user interface makes R an obvious choice while dealing with problems in statistics. The k-means clustering algorithms script was written in R for this project.

Results
Total number of Inmates in consideration: **13888**
No Action taken: **7393 (~53%)**
Only write-up: **628 (~4.5%)**
Disciplinary action: **2900 (~21%)**
Single Cell Confinement: **2967 (~21.5%)**

<table>
<thead>
<tr>
<th>Race</th>
<th>No. of Inmate</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>7212</td>
<td>52%</td>
</tr>
<tr>
<td>Black</td>
<td>3693</td>
<td>27%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>1947</td>
<td>14%</td>
</tr>
<tr>
<td>American Indian</td>
<td>787</td>
<td>5%</td>
</tr>
<tr>
<td>Asian</td>
<td>138</td>
<td>1%</td>
</tr>
<tr>
<td>Hawaiian</td>
<td>111</td>
<td>1%</td>
</tr>
</tbody>
</table>
Table 2- Punishment by Race

<table>
<thead>
<tr>
<th>Race</th>
<th>No Action Taken</th>
<th>Write-ups</th>
<th>Disciplinary Action</th>
<th>Single Cell Confinement</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>66%</td>
<td>3%</td>
<td>23%</td>
<td>18%</td>
</tr>
<tr>
<td>Black</td>
<td>14%</td>
<td>8%</td>
<td>39%</td>
<td>39%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>43%</td>
<td>9%</td>
<td>25%</td>
<td>23%</td>
</tr>
<tr>
<td>American Indian</td>
<td>64%</td>
<td>3%</td>
<td>18%</td>
<td>15%</td>
</tr>
<tr>
<td>Asian</td>
<td>72%</td>
<td>12%</td>
<td>13%</td>
<td>3%</td>
</tr>
<tr>
<td>Hawaiian</td>
<td>76%</td>
<td>9%</td>
<td>11%</td>
<td>4%</td>
</tr>
</tbody>
</table>

Clear patterns exist, based on racial demographics. Black and Hispanic inmates are sanctioned more than any other inmates, consistent with the political science literature. Black inmates are twice as likely to be placed in single cell confinement. Although there are multiple possible intervening variables, it is important to note that blacks and whites do not differ significantly on criminal behavior. The logistic regression results included at the end of the paper will help verify this. Suffice it to say, there is significant anecdotal evidence that infractions inside prison, particularly gang activity are not race specific.

Support Vector Machines Using Weka

Weka is a powerful toolbox which is relevant to our area of research because of its wide variety of classifying techniques. Due to time constraints (these models can often take a long time to run), lack of processing power, and the often very in-depth and highly customizable nature of the Weka algorithms, we were unable to create a useful model. We realized that we were out of our depth in the complexity of Weka. However, we were able to learn about the benefits of Weka and why it will be useful in future research.

The versatility of Weka as a set of tools is balanced by the massive number of options you are presented with. There are a wide variety of algorithms, from Bayes nets to support vector machines (SVMs). Support vector machines were the aspect under consideration in this case and we discuss its applicability and detail an approach to using SVMs to gain new insights into the data.

Weka supports a few different SVM functions including LibSVM, SMO, and SMOreg (slightly different, being support vector machine regression), complete with k-fold validation. These require a training set and testing set for your data which Weka will create for you from a csv file of your complete data set if you ask very nicely. Once you have divided your training set and
testing set and determined which attributes you want to consider, it’s simply a matter of selecting the algorithm you want and running it. This part is tricky because there are a variety of parameters you can set beforehand which vary from selection to selection. For example, using libsvm includes options to normalize or to fill in empty data entries but SMO does not. In addition to these fairly straightforward parameters, however, there are also things labeled “epsilon” and “gamma” with no further information immediately obvious. Clearly these are related to the algorithm itself but this provides a practical learning point. In spite of its power none of the Weka algorithms are of any use without an understanding of the finer points of the specification.

Once you have trained the model on your training data you will run your test data through the model to see if it works as you expected. Using k-fold validation and the results from your test data you begin to get an idea of the accuracy of your model. Depending on your selection you can have the model continue “learning” as it receives new data or it can remain static after the original modeling. At this point, however, we can run a hypothetical entry through the model with the attributes we selected as relevant to the decision and the model will give us its best guess as to the category that entry belongs in—in this case, what sort of punishment a given inmate with certain demographic traits and behavioral patterns can expect to receive. Dependent upon the accuracy of the model, this could give us some insight into the potential future of certain types of inmates, whether those “certain types” happen to be categorized by race or ethnicity, education, marital status, or some other factor.

Weka is a powerful, flexible, extensive tool set well suited for a variety of tasks in the world of classifying and data mining. These strengths, when applied to our data, will potentially allow us to identify patterns and anticipate unfair treatment in the prison system simply by knowing a little about the demographic information of the inmate. With proper tweaking of the parameters (and increases in processing power), this could be a very accurate and helpful model in the world of political science.

**Logistic Regression**

The final method is logistic regression. Logistic regression is appropriate for dichotomous (0 or 1) dependent variables. Linear and logistic regression are two of the most common procedures in political science. The benefits include an ability to include multiple explanatory variables and ease of use. Linear and logistic regression are packaged into several statistical software programs, including SPSS and Stata. We use Stata, the dominant software program among political scientists.
The logistic regression results match the patterns suggested by the decision tree and clustering methods. Inmate race is a significant predictor of punishment, as expected. Even after controlling for an inmate’s criminal history (violent offense, number of arrests and total number of incarcerations), race is still a statistically significant predictor. Other interesting patterns also exist, with older inmates, married inmates and female inmates being less likely to receive a punishment. It is hypothesized that correctional officers use race as a heuristic, but it is clear that other important heuristics are used.

**Final Thoughts and Plans for Future Research**

The treatment of state prison inmates is an important and overlooked subject. It is also an area where interdisciplinary collaboration is especially helpful. Knowledge of new methodological techniques can add a robustness check and potentially find new patterns. By nature of our differing training, some of us can specialize in theory building, and some in...
computation. Collaboration enables us all to specialize, and interdisciplinary work is the best way to benefit from that specialization. Specialization and collaboration is an old idea, going back to Adam Smith (who was a trained political scientist). Too often, scholars do not communicate and the potential for synergy is unrealized. It is as if we are all working in a car factory, but no one thinks to put the engine, the frame and the other components together. Specialization without collaboration is inefficient or worse. But with interdisciplinary work, there is no telling what we can build.

References

Statistical Packages
- Stata
- R (http://www.r-project.org/)
- C4.5 (http://www2.cs.uregina.ca/~dbd/cs831/notes/ml/dtrees/c4.5/tutorial.html)
- Weka (weka.wikispaces.com)

Political Science References
Close, Billy R. and Patrick L. Mason. 2007. “Searching for efficient enforcement: Officer characteristics and racially biased policing” Review of Law and Economics 3 (2)


