DO CRIMINALS RESPOND TO INCENTIVES? EVIDENCE FROM THE THREE STRIKES LAW

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I. Introduction

In 1994, California, along with twelve other states enacted the three strikes law. The three strikes law was part of the Department of Justice's Anti-Violence Strategy[1]. The law required that criminals that had committed one severe violent felony, as well as two other previous convictions, must serve a mandatory life sentence in prison. The logic of the law is simple, *by greatly increasing the marginal cost of crime, we should expect to see a decrease in crime*. In the case of the three strikes Law, it is particularly trying to dramatically increase the marginal cost of additional crime, and thus dissuade repeat offenders. After its initial implementation in 1994, many other states followed in adopting the three strikes law. By the beginning of 2019, 25 states, and the federal government have active three strikes laws[2].

With such widespread implementation of the three strikes law, we should expect that it is effective in reducing crime. However, there are 25 states who have not adopted the three strikes law, and many politicians, lawyers, and private citizens who steeply oppose the three strikes law on the basis that it is not effective in decreasing crime or decreasing recidivism. The basis of the belief that the three strikes law is ineffective is that crime, particularly serious and violent crime, are committed irrationally, often in an act of anger. Essentially, opponents of the Three Strikes law assume that the perpetrators are not acting rationally, and are likely not doing a cost benefit

[1] "California's Three Strikes Sentencing Law", California Courts, The Judicial Branch of California, retrieved from https://www.courts.ca.gov/20142.htm

[2] "Three Strikes Laws in Different States", Legal Match, retrieved from https://www.legalmatch.com/law-library/article/three-strikes-laws-in-different-states.html

analysis when committing a serious or violent felony. Thus, a strategy that works to increase the marginal cost of crime may be ineffective. The fact that half of the United States uses the three strikes law, while the other half does not, is a clear indicator that there is some disagreement about its effectiveness.

This research looks to investigate the reality of the effectiveness of the three strikes law. We look at its effectiveness in two different types of crime: *i) violent crime,* and *ii) property crime*. In addition to splitting crime into these two different types, we also look at sub categories within each type. Because under the three strikes law, a third strike of any of the felonies within all of our categories would lead to an equally sever 25 to life sentencing, we can conclude that the marginal cost of any third strike offense is essentially the same. Therefore, any discrepancy in the effect of the Three Strikes law on different types of third strike felonies can be interpreted in two ways, either the marginal benefit of one crime is higher than another, or a perpetrator is acting less rationally when committing a certain type of crime. In looking at the effect of the three strikes law on certain types of crime, we are attempting to observe the level of rationality associated with certain types of crime, and if perpetrators of certain crimes react to incentives with different levels of rationality than others.

II. Literature Review

The Economic literature surrounding this topic serves to guide us in our approach. There does exist a lot of research surrounding the three strikes law, but none that we could find that seek to answer our question in the same way that we do. Perhaps the paper that most closely resembles our research question is *Does Three Strikes Deter? A Nonparametric Estimation* by Eric Helland and Alexander Tabarrok. This is a study which compares the post-sentencing criminal activity of criminals who were convicted of a strikeable offense with those who were tried for a strikeable offense but convicted of a nonstrikeable offense. In this paper Helland and Tabarrok take advantage of what they define to be the randomization of trial outcome, in order to identify the causal effect of two- and three-strikes laws on criminal activity. Rather than examining aggregate crime rates and trying to correlate these with a measure of the three-strike law, they follow a large subset of criminals who were released from prison in California in 1994. Then, they estimate the effect of the law by comparing the subsequent arrest profiles of criminals who were released with two strikeable offenses with those released with two trials for strikeable offenses but only one

conviction for a strikeable offense. They find that the third-strike provision of California's three-strike legislation significantly reduces felony arrests rates among the class of criminals with two strikes by 17 to 20 percent[3]. This paper sites that at least in California, the Three Strikes law is being factored into criminals cost benefit analysis of committing a crime.

Another paper by Jonathan P. Caulkins, serves to give us another perspective on what additional concerns we must address. In a paper written by Jonathan P. Caulkins, titled *How Large Should the Strike Zone Be in "Three Strikes and You're Out" Sentencing Laws?,* Caulkins considers what offenses should count as strikes and what offenses should not. Caulkins looks at how the "strike zone", meaning what types of offenses are considered to be of the type that can earn the offender a strike, are defined differently across different states. Caulkins notes that in the states that define a strike more broadly, there are many more three strike convictions than in other states who define a strike more narrowly. For example, in Pennsylvania every strikeable offense must be a serious violent felony, however in California after one either serious or violent felony has been committed, any felony is strikable. Caulkins also notes that states who define the three strikes law more broadly, have a larger reduction in crime than those who define it more narrowly. This means that we should expect certain states to have larger effects from the three strikes law than others, and we must create a variable to account for this difference[4].

Finally, a paper by Fon and Shäfer (2007) gives us the baseline model for which we will build our assumptions on. The paper concentrates on the incentive effect on a citizen who must decide whether to commit a crime or to be law-abiding, they define a default payoff a person has, without or before committing a crime (A), an additional payoff when the person commits a crime and is not punished (G), and when the person commits a crime and is imprisoned, the loss in payoff is (J). The authors' objective is to prove that state liability mitigates the wrongful conviction

[3] Eric Helland, Alexander Tabarrol. 2007. "Does Three Strikes Deter? A Nonparametric Estimation", The Journal of Human Ressources Vol. 42, No. 2, pp 309-330, University of Wisconsin Press.

[4] Jonathan P. Caulkins. 2001. "How Large Should the Strike Zone Be in 'Three Strikes and You're Out' Sentencing Laws?", Journal of Quantitative Criminology Vol. 17, No. 3, pp. 227-246.

problem, which is beyond the scope of this work, but we will use their mentioned concepts of payoffs[5]. We will define a new variable, net payoff, as (N).

$$N = A + G - J$$

The Three Strikes Law increases the payoff loss (J) for second and a third time felons, such that the net payoff (N) would be much smaller for criminals and for many criminals will be negative, thus it deters them from committing the crime.

III. Economic Model and Empirical Methodology

Our Economic model is used to see how criminals respond to incentives. As described before, we expect criminals to respond to incentives based on the net payoff of a crime (N), which is primarily decided by (G), the benefit of the crime, and (J), the cost of the crime, since (A), is given. We propose that with certain crimes, there is less consideration of the punishment, so even though (J) is present, the consideration of (J) by the perpetrator may not be taken into consideration. Therefore in the following equation which represents the rational cost benefit of a crime, even though (N) may be the same for two different types of felonies, the perpetrator may not act rationally according to this (N).

$$N = A + G - j$$

In the case of the Three Strikes law, If (N) is positive, we expect a crime to be committed. Because the Three Strikes law dramatically increases (J) for Repeat offenders, we should expect a decrease in crime. However, it may be possible that for certain crimes there is less consideration of (J), such as in a crime of passion, the perpetrator may give very little thought to the cost of the crime. In essence this means that criminals will act differently with identical (N) values, thus acting irrationally. In order to test for this we Use an OLS regression with the specification.

$$y_i = \beta_{0,i} + \beta_{1,i} Index + \beta_{2,i} Population + \epsilon$$

In which y_i is all of the following:

[5] Vincy Fon, Hans-Bernd Shäfer. 2007. "State Liability for Wrongful Conviction: Incentive Effects on Crime Levels", Journal of Institutional and Theoretical Economics, Vol. 163, No. 2.

Independent Variables

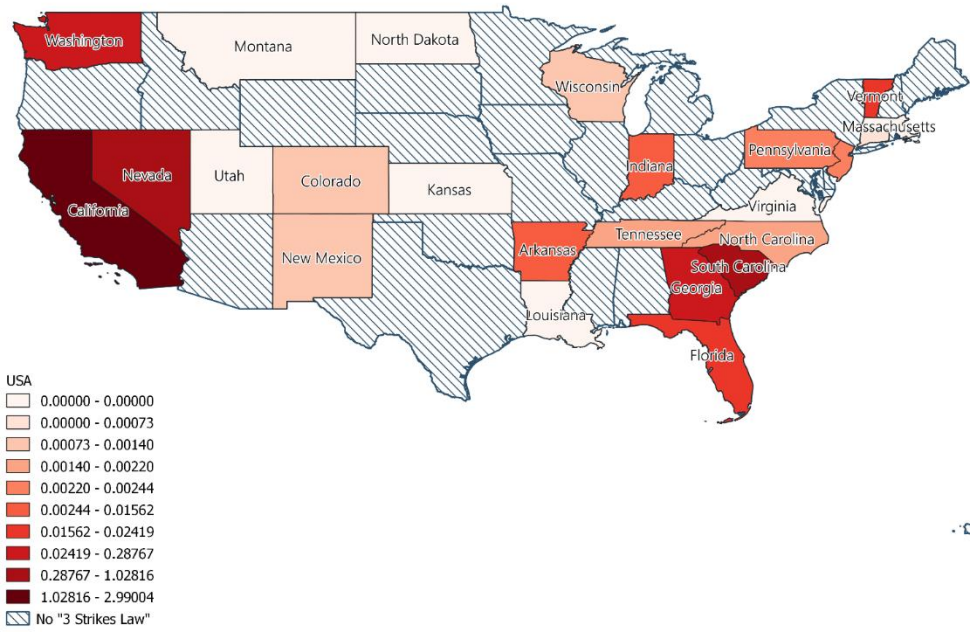
Table 1

Violent crime rate	***Property crime rate***
Murder and nonnegligent manslaughter rate	*Robbery rate table*
Rape rate	*Property crime rate*
Aggravated assault rate	*Burglary rate*
	Larceny theft rate
	Motor vehicle theft rate

Our first dependent variable $\beta_{1,i}Index$ is an index we have created representing how much the three strikes law is used per state. This *Index* variable was necessary to create because there is a large discrepancy in the way that the Three Strikes Law is written and enforced from state to state. Our Index variable captures this difference by looking at the number of annual third strike convictions, and dividing that number by state population, for scaling purposes we multiply by 10,000. Thus we have an Index for annual third strike convictions per capita. It is important to note that there are some states who have a Three Strikes law on the books, but never use it during sentencing. Thus, these states would have a value of zero in our index, the same as those states who do not have a three strikes law. Below is a map we created of all states that have the Three Strikes Law using our Index, hence, a visual scale of how much this law is used.

Three Strikes Law Index

Figure 1



We can see that the highest value for our index is 2.99, with California, and that there are several states who have the law but do not utilize it. Our $\beta_{2,i}Population$ is simply a control variable for state population.

Our data is state level panel data from 1960-2014 from the Federal Bureau of Investigation's Uniform Crime Reporting Program. This data includes the raw numbers of crimes committed in each state as well as their rate. We add our Index variable as a constant value for all the years that the state had the law enacted. Unfortunately, we were unable to find data that specifies whether the offense was committed by a repeat offender. While this is a problem, it does not by any means discredit our analysis. The reason for this is that 76.6% of offenders will have another offence within five years[6]. Therefore, it is safe to assume that any decrease in crime will certainly be in large part because of the decreased crime of those who are subject to the third strike rule. It is also important to note, that in the states with higher Index values (that have a higher weight in the regression because of this high value), such as California, Nevada, and South Carolina, that while the Third Strikes Law mandates a 25-life sentencing for all third strike offenders, it also automatically doubles the sentencing length of any second strike offenders. Because of these factors, we can say that most of the observed decrease in crime is due to repeat offenders, and that any repeat felony offense is greatly disincentivized by the three strikes law.

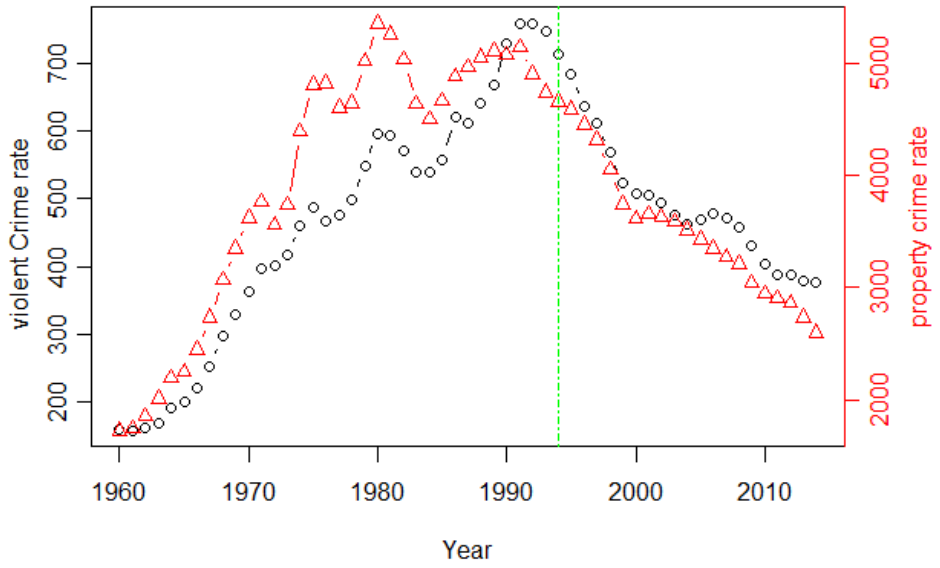
In General, we expect to see negative coefficients for our Index variable. This is because as the marginal cost of committing a crime increases, there should be less people committing that crime. Since the Three Strikes Law punishes all third and second strikes felonies relatively the same, we should expect that the coefficient is always negative for strikeable felonies. Thus, any discrepancy in the coefficient of $\beta_{1,i}Index$, can be interpreted as either the difference in the consideration of punishment, or the difference in marginal benefit of the crime. Thus, our coefficient of $\beta_{1,i}Index$ is in essence telling us how rationally criminals think about each crime, less negative $\beta_{1,i}Index$ indicates that the perpetrator does not rationally consider the severe increase in punishment (J), or that the particular crime has a very high marginal benefit (G).

[6] Durose, Matthew R., Alexia D. Cooper, and Howard N. Snyder. 2014 "Recidivism of Prisoners Released in 30 States in 2005: Patterns from 2005 to 2010", Bureau of Justice Statistics Special Report, NCJ 244205

IV. Findings

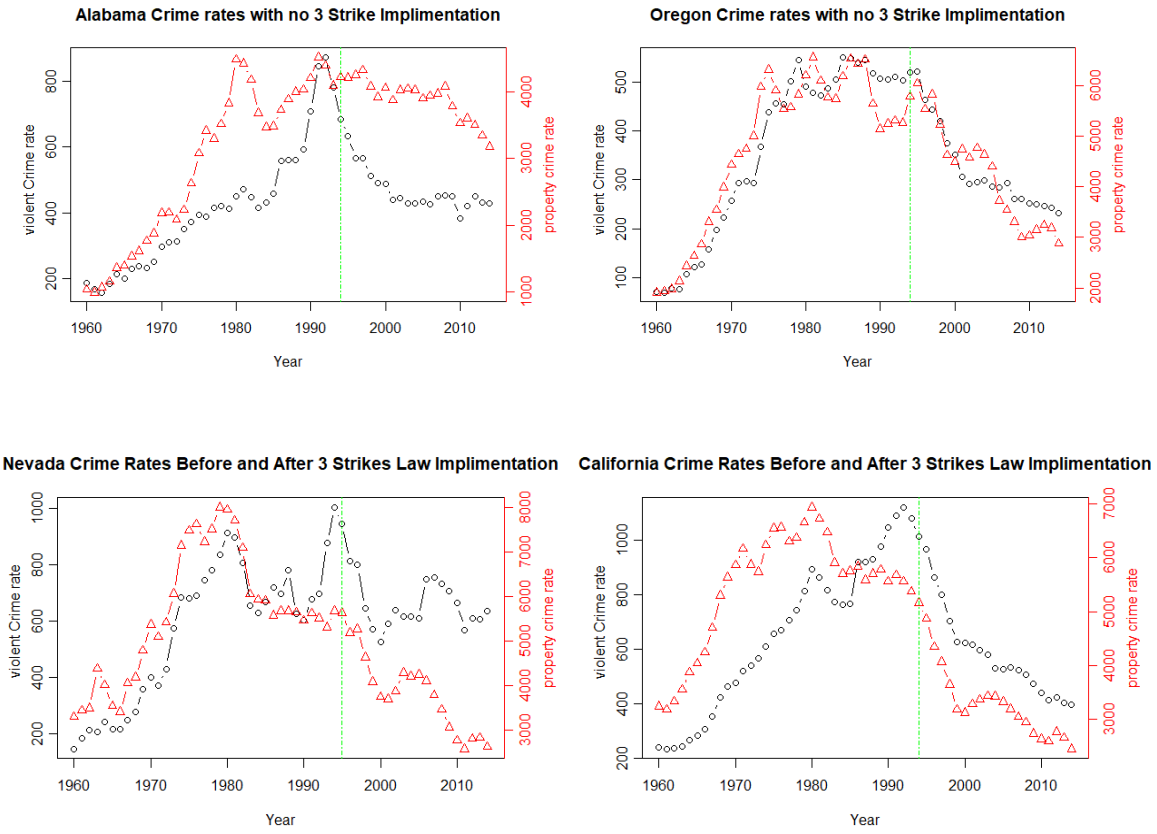
Our initial analysis of the data shows that around the same time that the Three Strikes Law is implemented, most states showed a fairly dramatic drop in both property crime, and violent crime. We can see that the national violent and property crime rates declined a little over 50% each, from the initial implementation in 1994 to 2014. This is shown in the graph below.

Total U.S. Crime Rates Before and After the Three Strikes Law Implementation
Figure 2



It should also be noted that on a national level, that Property crime rates fell faster than violent crime rates. When we look at individual states who did utilize the three strikes law versus those that did, we can see that while all states seem to observe a similar downward trend in crime rates from the mid 1990's on, the share that is made up of violent crime versus property crime differs greatly from one state to the next. This difference is shown below in the following graphs that depict two states Alabama, and Oregon (top), that did not impliment a three strikes law, and two states, California, and Nevada, (bottom), who passed and heavily utilized the three strikes law.

Different States with and without the Three Strikes Law Implementation before and after
Figure 3



As can be seen in the graphs above**,** the two states, California and Nevada, who had high Three Strikes conviction rates had higher drops in property crime proportional to violent crime, than compared to the two states, Alabama and Oregon, who did not implement this change.

This initial evidence suggests that implementing a three strike law has a negative effect on property crime, while the effect on violent crime is a little less clear. Looking at these graphs are suggestive, but in order to have more concrete evidence of how the three strikes law effects different types of crime rates we turn to our OLS regression.

Property Crime Regression Results

Table 2

Dependent Variable	***Independent variable***	***Estimate***	***Std. Error***	***t value***	***Pr (>|t|)***
Property crime rate	*3-Strikes Index*	*-340.10*	*109.30*	*-3.11*	*0.00188 ***
Robbery rate	*3-Strikes Index*	*-44.36*	*11.10*	*-4.00*	*0.0000658 ****
Larceny-theft rate	*3-Strikes Index*	*-153.20*	*70.26*	*-2.18*	*0.029277 **
Motor vehicle theft rate	*3-Strikes Index*	*-6.37*	*16.97*	*-0.38*	*0.708*
Burglary rate	*3-Strikes Index*	*-180.70*	*33.73*	*-5.36*	*0.0000000912 ****

*Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1*

Property Crime Regression Results

Table 3

Dependent Variable	***Independent variable***	***Estimate***	***Std. Error***	***t value***	***Pr (>|t|)***
Violent Crime Rate	*3-Strikes Index*	*-22.53*	*22.19*	*-1.02*	*0.31*
Murder and nonnegligent manslaughter rate	*3-Strikes Index*	*-0.69*	*0.47*	*-1.46*	*0.14*
Aggravated assault rate	*3-Strikes Index*	*22.87*	*12.28*	*1.86*	*0.062 .*
Legacy rape rate	*3-Strikes Index*	*-0.53*	*1.20*	*-0.44*	*0.66*

*Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1*

As we can see from our regression results tables, our regression concludes what our graphs suggested. We can see that for violent crime as a whole, that the three strikes law had no statistically significant effect on violent crime or any of its sub categories. However, for property crime rates as a whole, we see that there is a 99.9% statistically significant negative effect. One potential reason for this difference is that property crime felons are more likely to return to prison within 5 years than violent crime offenders (82.1% vs 71.3%), therefore they are more likely to be subject to a Three Strike Conviction due to repeat offenses[7]. While this difference in recidivism is noteworthy, 11% is not proportional to the much larger discrepancy in decrease between violent and non-violent crimes we see in states who implemented the Three Strikes law.[8] In the sub-categories of property crime we largely see the same result. For robbery, and burglary rate, we find 99.99% statistically significant negative effects, and for larceny 95% statistically significant negative effect. Perhaps one of the more surprising results is that there is no statistically significant effect of the three strikes law on motor vehicle theft rate. One reason for this is that in three strike states, motor vehicle theft can either be charged as a felony or a misdemeanor, and predominantly

[7] Durose, Matthew R., Alexia D. Cooper, and Howard N. Snyder. 2014 "Recidivism of Prisoners Released in 30 States in 2005: Patterns from 2005 to 2010", Bureau of Justice Statistics Special Report, NCJ 244205

[8] In difference in the decrease of violent crime versus property crime was 26% in California and 41% in Nevada.

motor vehicle theft is not charged as a strikable offense, meaning that perpetrators are usually not subject to the incentives of the Three Strikes Law.

One concern with our results is that the marginal difference in sentencing under the three strikes law varies greatly from one crime to the next. For example, for a crime like murder in which the sentence is already 15- life, an increase to 25-life is not that different. However, when considering a crime like larceny, which normally carries a 6 month to 3 year sentence, an increase to 25-life is substantial. This would mean that the three strikes law would not work very well for a crime that already has a very high sentence length. Below is a table of the crimes we observe and their respective sentencing lengths in California. We use California as an example, because of its high rate of three strike convictions, however it should be noted that while sentencing lengths can vary across states they are for the most part fairly uniform.

Type of crime and sentencing years

Table 4

Violent Crimes	***Sentencing (years)***	***Property Crime***	***Sentencing (years)***
Murder or non-negligent manslaughter	*15 - Life, or death penalty*	*Robbery*	*2 - 20*
Aggravated assault	*0 - 3*	*Motor-vehicle theft*	*1 - 3*
Rape	*3 - 8*	*Burglary*	*1 - 6*
		Larceny	*0.5 - 3*

The sentencing length for aggravated assault is relatively short. On the basis of the marginal difference in sentencing under the tree strikes law, we would expect to see that the three strikes law is significant in reducing aggravated assault. However, our regression results show no such decrease. Because of this, we can say that the marginal difference in before and after three strike sentencing is not the reason for the lack of reaction in violent crime, except potentially with the exception of murder, but even then we cannot definitively say.

VII. Conclusion and future work

Aside from the anomaly of vehicle theft, it is clear to see that property crime is significantly affected by the three strikes law, while violent crime is not. To understand what this means for rationality, we refer again to our equation for the net payoff of crime.

$$N = A + G - J$$

Given that the three strikes law creates a sort of leveling effect on the marginal cost (J) for all additional felonies, and because additional felonies are the vast majority of felony convictions[9]. We can reasonably propose that this difference we observe between violent crime and property crime is either from one, or a combination of both of the following reasons. First, a difference in rationality from one crime to the next, meaning that both crimes have the same value for N, but the criminals don't act rationally according to this value. The other potential explanation is that the marginal benefit (G) of violent crime, is much higher than it is for property crime (or at least perceived to be at the time of the crime). While these are two separate reasons for the crime, it is impossible to observe the difference in our data.

Ultimately, our results show that criminals who would commit property crime respond strongly to negative incentives. Namely, incentives that dramatically increase sentencing, as in the case of the three strikes law. We observe that there is no observable response to these same incentives for violent crime. This leads us to conclude that the payoff of violent crime is either much higher than non-violent crime, or that perpetrators of violent crime act less rationally to these incentives. This result is interesting in that it shows that it is possible to curve property crime rates with incentives against crime. However, if someone is going to commit a violent crime, there is probably little that can be done to dissuade them in regards to incentives; either because they do not react rationally to these incentives, or because the marginal benefit of violent crime is so high that harsh sentencing is not enough to dissuade the perpetrator.

We assert that it is more logical to assume that this lack of reaction to incentives for violent crime is due to a lack of rationality, as opposed to a high marginal benefit. One reason for this is that violent crimes are more often committed in a sudden act of aggression or in a circumstance that lacks premeditated thought. This phenomenon is evidenced in the existence of the crime of passion defense, which can only be initiated for violent acts committed suddenly and irrationally. One would think that property crime would almost always require some amount of premeditated thought, which would allow the perpetrator more time to conduct a cost-benefit analysis. Whereas

[9] Durose, Matthew R., Alexia D. Cooper, and Howard N. Snyder. 2014 "Recidivism of Prisoners Released in 30 States in 2005: Patterns from 2005 to 2010", Bureau of Justice Statistics Special Report, NCJ 244205

many violent crimes involve no such premeditated thought. Therefore we conclude that criminals react rationally to incentives when it comes to property crime, but irrationally for violent crime.

While this project brought interesting results, it was most limited by the amount of available data. Therefore, for future work we would like to obtain better data that gives more detailed information for a more in-depth analysis. Ideally we would like to have a large panel dataset with individual identifiers across all states. This would allow us to see to what degree the three strikes law lessened first, second, and third strike offenses. We would also like to have data that includes more minor offenses to allow us to see if criminals simply switch away from felony offenses, or if they stop crime entirely. Finally, we would like to look into other law implementations or adjustments other than the three strike law to see if our results are robust for other types of incentives.

VIII. Bibliography.

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