Malice Aforethought

Philip A. Curry*
University of Waterloo

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Abstract

This paper examines why criminal intent matters in sentencing. In particular, it considers two types of crimes, opportunistic and premeditated. Opportunistic crimes are ones that present themselves to a criminal and can be deterred if the victim makes it too costly for the criminal through private property protection. Premeditated crimes are ones sought out by the criminal, and the effect of private property protection is simply to displace crime. This difference between deterrence and displacement leads to the result that it is optimal to punish premeditated crimes more. The extent to which this is true, however, lies in the response by potential victims. If victims protect themselves from premeditated crimes in ways that also protect them from opportunistic ones, then the difference in penalties is relatively less.

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"The state of mind of the accused criminal is a pervasive consideration in the criminal law. This is puzzling to the economist; one can read dozens of books on economics without encountering a reference to intent."
– Richard Posner (1992)

1 Introduction

A central result in the law and economics literature on optimal sanctions for criminal behavior states that penalties should be proportional to the harm caused. This result is quite robust and can be derived in a number of ways: from cost minimization, welfare maximization (by including the benefits to crime as in Polinsky and Shavell (2000)), and marginal deterrence (see Stigler (1970) and Friedman and Sjostrom (1993)). At first blush, this analysis seems to generate some puzzling implications. For example, it is not obvious why accidental deaths should be treated differently than murder, nor why there exist multiple degrees of murder. The harm to the victim is the same in all these cases, so why do the penalties differ? Further, the extent to which a crime was premeditated can often influence sentencing. Why should an individual's intentions matter? In legal terms, why are the courts concerned with *mens rea* and not simply *actus reus*?

While *mens rea* and criminal intent can have many meanings, the particular focus of this paper is to examine why "planned and deliberate" crimes are punished differently from opportunistic crimes. The answer perhaps lies in the response of potential victims to crime. In the context of theft, for example, it is generally understood that social harm includes the resources an individual spends trying to protect their property.[1] These expended resources, which shall be referred to as precaution or avoidance, constitute social loss since they could have been used for more productive purposes. The extent to which this aspect of social harm is important in determining the structure of criminal law, however, has not been well recognized.

[1]Becker (1968) made this point in his seminal paper. There is a fairly extensive literature that measures the social cost of crime and such expenditures are always included. See, for example, Brantingham and Easton (1996) and Atkinson, Healey and Mourato (2005).

This paper considers the response of individuals when they may be victimized by either opportunistic or premeditated crimes. It is assumed that opportunistic crimes are ones that are not sought out but are presented to a potential criminal with some probability. For example, an individual may come across an unlocked bicycle and decide to take it. These probability of such a crime occurring is a function of the precautions taken by the victim. For opportunistic crimes, avoidance has a *deterrent effect*.

In contrast, premeditated crimes are sought out by the criminal. For example, an individual who wishes to steal a car may search a parking lot until he finds one with unlocked doors, or perhaps without an alarm system. As such, avoidance has a *displacement effect*, as it merely pushes the crime onto a different individual. The result is that premeditated or intentional crimes ought to be punished more in order to reduce the social waste associated with victim precaution.

The extent to which premeditated crimes actually receive greater punishment is also of interest. There are many different penalties possible for culpable homicide, and intent is a key factor in determining which one is used. In the United States there are two degrees of murder (although some states have three degrees) and two types of manslaughter even though all the harm to the victim is the same for all four of these crimes: death. Thus, in some cases, intent actually impacts that *classification* of the crime and not just the sentencing. Other crimes, such as assault and burglary, also have recommended increases in sentencing as a result of premeditation, although are not given different names. This paper examines the extent to which premeditation actually affects sentences in light of the model developed.

The distinction between the deterrent effect and displacement effect of property protection has been noted by others, such as Shavell (1991a), Mikos (2006) and Hotte and van Ypersele (2008). However, the focus thus far has been on the nature of the property protection itself (namely conspicuous versus inconspicuous), and not on the criminal act. Intent has been examined in other areas of the law such as breach of

contract[2], antitrust[3] and torts.[4].

The paper proceeds as follows. Section 2 lays out the basic model. Section 3 examines the predictions of the model and compares them to what is observed, both in the statement of the law and in the literature. Section 4 compares the predictions of this model to other possible theories and discusses. Finally, section 5 concludes.

2 The Basic Model

Consider an economy with a continuum of agents who are potential criminals and another continuum of potential victims,[5] each with mass one. Potential criminals differ in the benefits they derive from committing a criminal act, b. Let the distribution of benefits among potential criminals be characterized by pdf $g(b)$ and cdf $G(b)$. For simplicity, all potential victims are assumed to be identical and all agents (criminals and victims) are assumed to be risk neutral.

As mentioned above, there are two types of crimes: opportunistic and premeditated. Opportunistic crimes are not sought out - the opportunity merely presents itself with some probability, $\pi^O(a)$, which is a decreasing function of the avoidance expenditure by the victim, a. An example of such an opportunistic crime would be bike theft where the thief did not set out to steal a bike that day. Whenever an individual leaves their bike in a public place, there is a chance that a potential criminal will come across it and attempt to steal it. The probability that the criminal takes up this opportunity would depend on factors that the victim can influence, such as whether the a lock was used, and the location (which would influence the number of passersby).

Formally, criminals and victims are paired up at random, after which the criminal

[2]See Bar-Gill and Ben-Shahar (2009), who find that penalties should be higher because if the information revealed about one's type.

[3]See Cass and Hylton (2000), who find that requiring proof of intent reduces legal errors.

[4]See Hylton (2009), who considers harms that may be caused by either malicious acts as well as activities that are generally socially beneficial. When penalties are a function of intent, malicious acts are deterred while minimizing the discouragement of socially beneficial ones.

[5]Nothing in the model changes if the potential victims and criminals are the same people.

opportunity presents itself with some probability that decreases in the precaution taken by the victim. For opportunistic crimes, avoidance expenditures by victims have only a *deterrent* effect on the criminal. This is the case since it is assumed that the potential criminal did not set out to commit a crime, but rather was presented with an opportunity that he may or may not take up.

Premeditated crimes, however, are assumed to not be deterred by avoidance expenditures. Instead, avoidance expenditure is assumed to decrease the probability that a person is victimized by the criminal. In other words, avoidance has a pure *displacement* effect that creates a game between potential victims.[6] Here, our bike thief from above has set out to steal a bike, and surveys many possible victims before choosing one.

Let the probability that an individual, i, is the victim of a planned crime be $q\left(a; \mathbf{a}_{-i}, M^I\right)$, where $\mathbf{a}_{-i}$ denotes the avoidance of all other potential victims and M^I denotes the mass of criminals that choose to commit premeditated crimes. It is assumed that $q_a < 0$, $q_{M^I} > 0$ and $q_{aa} > 0$, $q_{aM^I} < 0$.

Criminal intent may entail, but is not restricted to, planning and effort exerted by the criminal. Since costs of premeditation have no qualitative effect on the analysis, they will be assumed to be zero. Victim's avoidance expenditures include the purchase of locks for doors and staying away from certain parts of town.[7] Such expenditures have a per unit cost of 1.

If the criminal commits a crime, the victim suffers harm h and the probability of being caught and convicted is given by p while the sanction is s. Given that the main objective of this paper is to examine penalties associated with premeditation, it is assumed that p is fixed, as would arise if there were a large number of crimes and enforcement were general.[8] This assumption is discussed further in section 4. Finally,

[6]The analysis would change quantitatively, but not qualitatively, if avoidance had a deterrent effect as well as a displacement effect.

[7]One could also imagine that premeditation and investment in property protection might affect the benefit to the criminal (and therefore the harm suffered by the victim). Given the assumption of risk neutrality, however, there is no real difference between the two scenarios.

[8]See Shavell (1991). Note that Shavell considers 'specific' enforcement to describe the case in which police focus enforcement effort on certain types of crimes. 'General' enforcement, therefore,

it is assumed that there are costs associated with levying the sanction. If a mass of criminals M are convicted to sentence of s each, then the costs incurred are $c(Ms)$, where $c' > 0$, $c'' \geq 0$.

Optimal sanctions will be examined using the criterion of cost minimization. That is, sanctions are chosen to minimize the sum of harm caused, avoidance costs and enforcement costs. Criminal benefits are not included in the calculations, some implications of which are discussed in the conclusion. At this point, it is worth mentioning that, if we assume that the benefits to opportunistic crimes are the same as premeditated ones (and that the distributions are the same), then the use of a utilitarian welfare function (that includes criminal benefits) simply entails the addition of another term (the aforementioned benefits). Given the assumption above, this term would be the same for both opportunistic and premeditated crimes, and so would not change the results below. The use of cost minimization below, therefore, simply keeps the focus on the component of a welfare function that varies as intent varies, namely costs.

2.1 Strongest Case

The strongest case to have increased penalties for premeditated crimes occurs when the avoidance of opportunistic crimes, a^O, is distinct from the avoidance of premeditated crimes, a^I. In other words, when the expenditures incurred to avoid opportunistic crimes have no effect on the avoidance of premeditated crimes and vice-versa. While this may strike some as quite unrealistic, it is illuminating.

Given a sanction for opportunistic crimes, s^O, criminals will act upon an opportunity when it arises if $b > ps^O$, which occurs with probability $1 - G\left(ps^O\right)$. The mass of opportunistic crimes occurring is thus $M^O = \pi^O\left(a^O\right) 1 - G\left(ps^O\right)$.

Potential criminals will choose to plan a crime if $b > ps^I$, where s^I is the sanction for a premeditated crime. The mass of criminals that commit premeditated crimes is

describes the case in which there is a single probability of detection for all crimes. Here, general enforcement only requires that police do not try to solve opportunistic crimes more than premeditated ones. Given that police may not be able to even determine whether a crime was opportunistic or premeditated until after the crime is solved, this is not a very strong assumption.

therefore $M^I = 1 - G\left(ps^I\right)$. As stated above, the probability that an individual is victimized by a planned crime is $q\left(a^I; \mathbf{a}^I_{-i}, M^I\right)$. Victims choose their avoidance to solve

$$\min_{a^O, a^I} \pi^O\left(a^O\right)\left[1 - G\left(ps^O\right)\right] h + q\left(a^I; \mathbf{a}^I_{-i}, M^I\right) h + a^O + a^I$$

The first order conditions are

$$\frac{\partial \pi^O}{\partial a^O}\left[1 - G\left(ps^O\right)\right] h + 1 = 0 \tag{2.1}$$

$$\frac{\partial q}{\partial a^I} h + 1 = 0 \tag{2.2}$$

Let $\hat{a}^O$ and $\hat{a}^I$ denote the solutions. Note that these equations are independent so that 2.1 characterizes $\hat{a}^O$. The decision of how much to expend on avoidance for premeditated crimes, a^I, is a game theoretic one, created by the fact that displacement is possible. Each individual's best response function is characterized by equation 2.2. Since all individuals are assumed to be (*ex ante*) identical, there exists a symmetric equilibrium in which all potential victims expend the same amount of resources, $\hat{a}^I$, and have an equal chance of being victimized. It is assumed that this will be the outcome.[9]

The following lemma examines the relationship between the sanctions, s^O and s^I, and avoidance.

Lemma 2.1 *Avoidance of opportunistic crimes, $\hat{a}^O$, is decreasing in the sanction s^O and independent of s^I. Avoidance of premeditated crimes, $\hat{a}^I$, is decreasing in the sanction s^I and independent of s^O.*

Given the behavior of criminals and victims, the cost minimization problem is therefore

$$\min_{s^O, s^I} \left[M^O + M^I\right] h + \hat{a}^O + \hat{a}^I + c\left(M^O ps^O + M^I ps^I\right)$$

[9]That is, it is assumed that either the symmetric equilibrium is unique or that other equilibria are never played.

where $M^O = \pi^O\left(\hat{a}^O\right)\left[1 - G\left(ps^O\right)\right]$ and $M^I = \left[1 - G\left(ps^I\right)\right]$. The first order conditions are

$$-ph\pi^O g\left(ps^O\right) + c'(\cdot)\left[\pi_a^O\left[1 - G\left(ps^O\right)\right]ps^O\frac{\partial \hat{a}^O}{\partial s^O} - pg\left(ps^O\right)\pi^O ps^O + p\pi^O\left[1 - G\left(ps^O\right)\right]\right] = 0$$

$$-phg\left(ps^I\right) + \frac{\partial \hat{a}^I}{\partial s^I} + c'(\cdot)\left[\left[1 - G\left(ps^I\right)\right]p - pg\left(ps^I\right)ps^I\right] = 0$$

Proposition 2.2 *Let $\hat{s}^O$ and $\hat{s}^I$ be the cost minimizing sanctions. Then $\hat{s}^I > \hat{s}^O$.*

The intuition is as follows. An increase in the penalty has a greater effect on the number of premeditated crimes committed than on the number of opportunistic crimes. This stems from the fact that opportunistic crimes can be deterred by avoidance while intentional crimes are merely displaced. An increase in the penalty for opportunistic crimes reduces the number of criminals willing to commit the crime, but only a proportion of them ($\pi^O\left(\hat{a}^O\right)$) have the chance. Since all criminals that set out to commit a crime (premeditate one) find an opportunity, an increase in the penalty has a larger effect. Furthermore, an increase in the penalty for a given type of crime reduces the avoidance associated with it, thereby mitigating the reduction in crimes. For intentional crimes, avoidance only displaces crime, so it is socially wasteful. The reduction in avoidance associated with an increase in the penalty is therefore beneficial, and the marginal benefit to an increase in the penalty for premeditated crimes is thus greater.

2.2 Weaker Case

Let us now consider the case in which there is a single avoidance activity, a that affects both opportunistic and premeditated crimes. Potential victims thus solve

$$\min_a \pi^O(a)\left[1 - G\left(ps^O\right)\right]h + q\left(a; \mathbf{a}_{-i}, M^I\right)h + a$$

The first order condition is

$$\left[\frac{\partial \pi^O}{\partial a}\left[1 - G\left(ps^O\right)\right] + \frac{\partial q}{\partial a}\right]h + 1 = 0$$

As before with intentional crimes, the avoidance decision is game theoretic. Again, there exists a symmetric equilibrium in which all potential victims expend a^*. In

this equilibrium, the probability of being the victim of an opportunistic crime is $\pi^O(a^*)\left[1-G\left(ps^O\right)\right]$ and the probability of being the victim of a premeditated crime is $1-G\left(ps^I\right)$.

Lemma 2.3 *Avoidance a^* is decreasing in both s^O and s^I.*

A corollary to this lemma is that, for a given $s=s^O=s^I$, $\frac{\partial a^*}{\partial s^I}<\frac{\partial a^*}{\partial s^O}$ if and only if $q_a\left(a^*;\mathbf{a}^*_{-i},M^I\right)q_{M^I}<\pi^O_a(a^*)$.

The cost minimizing sanctions solve

$$\min_{s^O,s^I}\left[M^O+M^I\right]h+a^*+c\left(M^Ops^O+M^Ips^I\right)$$

where $M^O=\pi^O\left(\hat{a}^O\right)\left[1-G\left(ps^O\right)\right]$ and $M^I=\left[1-G\left(ps^I\right)\right]$, as before. The first order conditions are

$$-ph\pi^Og\left(ps^O\right)+c'(\cdot)\left[\pi_a\left[1-G\left(ps^O\right)\right]ps^O\frac{\partial a^*}{\partial s^O}-pg\left(ps^O\right)\pi^Ops^O+p\pi^O\left[1-G\left(ps^O\right)\right]\right]=0$$

$$-phg\left(ps^I\right)+\frac{\partial a^*}{\partial s^I}+c'(\cdot)\left[\left[1-G\left(ps^I\right)\right]p-pg\left(ps^I\right)ps^I\right]=0$$

Proposition 2.4 *Let $\tilde{s}^O$ and $\tilde{s}^I$ be the cost minimizing sanctions. Then $\tilde{s}^O<\tilde{s}^I$.*

It is also worth comparing $\hat{s}^O,\hat{s}^I,\tilde{s}^O$ and $\tilde{s}^I$. To this end, it is worth examining $\frac{\partial\hat{a}^O}{\partial s^O}$, $\frac{\partial a^*}{\partial s^O}$, $\frac{\partial\hat{a}^I}{\partial s^I}$ and $\frac{\partial a^*}{\partial s^I}$.

Lemma 2.5 *Avoidance activity is more responsive to changes in penalties when it is distinct (i.e. there is a^O and a^I) than when it is not (i.e. when there is just a). That is $\frac{\partial\hat{a}^O}{\partial s^O}<\frac{\partial a^*}{\partial s^O}$ and $\frac{\partial\hat{a}^I}{\partial s^I}<\frac{\partial a^*}{\partial s^I}$.*

Theorem 2.6 *When avoidance activities are distinct, the difference between the penalty for premeditated crimes and the penalty for opportunistic crimes is greater than when avoidance activities affect both crimes. Specifically, $\hat{s}^O<\tilde{s}^O<\tilde{s}^I<\hat{s}^I$.*

The intuition is as follows. Victim precaution is socially valuable insofar as it deters opportunistic crimes and socially wasteful when it displaces premeditated crimes.

The fact that avoidance is increasing in the number of criminals willing to commit crime forms the basis for increased penalties for intent. From a social standpoint, an increase in the penalty for premeditated crimes reduces costs to a greater degree for two reasons. First, since victim precaution that leads to displacement is socially wasteful, reducing the number of premeditated crimes reduces the costs associated with avoidance. Second, since victim precaution reduces the number of opportunistic crimes committed, an increase in the penalty for opportunistic crimes has less of an effect than an equivalent increase in the penalty for premeditated crimes, because of the decrease in avoidance. The greater the distinction between avoidance of premeditated versus opportunistic crimes, the more an increase in the penalty for premeditated crimes can reduce socially wasteful precautions without deterring socially valuable ones.

3 Empirical Implications

The model above predicts that premeditated crimes should receive greater penalties than opportunistic ones and the extent to which this is the case depends on the nature of the precautions taken. This section considers a variety of crimes, the difference that premeditation makes to sentencing, and a discussion of the precautions that victims take.

3.1 Manslaughter and First and Second Degree Murder

3.1.1 Definitions and Penalties

Many countries make distinctions between manslaughter and various degrees of murder. These distinctions of depend on some form of intentionality on behalf of the one committing the act. In the United States, there are two forms of manslaughter and either two or three degrees of murder, depending on the state (two degrees federally).

Manslaughter may be either voluntary or involuntary. The distinction lies predominantly in intent. To be charged with involuntary manslaughter, one must commit an act that leads to the death of another, even though that was not the goal of

the tortfeasor. Examples include the throwing of a brick off of a bridge (constructive manslaughter or reckless conduct), and professionals (such as doctors) who are grossly negligent in the performance of their job (criminal negligence). Voluntary manslaughter generally occurs when there is intent to kill, but mitigating circumstances reduce the charge from murder. Examples include provocation, imperfect self-defense and diminished capacity.

The U.S. Sentencing Guidelines suggests that voluntary manslaughter receive 87-109 months as a base offense level and that involuntary manslaughter receive 10-16 months for criminal negligence and 27-33 months for reckless conduct. If the reckless conduct involves a means of transportation, then the recommended sentence is 41-51 months.

For a fatal act to be considered murder, there must be intent, or *malice aforethought*. The states that have two degrees of murder (often referred to as the New York scheme) use second degree murder for any killing that does not involve special circumstances. Circumstances that could lead to first degree murder being the charge include the killing of a police officer, judge or witness (among others), or especially heinous murders (e.g. ones that involve torture). The base offense level for second degree murder is 235-293 months, while first degree murder gets a life sentence.

In Canada, "[c]ulpable homicide that otherwise would be murder may be reduced to manslaughter if the person who committed it did so in the heat of passion caused by sudden provocation."[10]. There are two degrees of murder in Canada, first and second. The Canadian definitions differ from the New York scheme in that murder is first degree if *either* it planned and deliberate, if the victim is a peace officer or otherwise employed in law enforcement (such as a prison warden), if the killing occurs in the course of another criminal act, or was part of an act of intimidation. Otherwise, it is second degree murder[11].

[10]Criminal Code of Canada, R.S., 1985, c. C-46, s. 232.

[11]Criminal Code of Canada, R.S., 1985, c. C-46, s. 231; R.S., 1985, c. 27 (1st Supp.), ss. 7, 35, 40, 185(F), c. 1 (4th Supp.), s. 18(F); 1997, c. 16, s. 3, c. 23, s. 8; 2001, c. 32, s. 9, c. 41, s. 9.

3.1.2 The Model's Predictions

Consider the case of involuntary manslaughter. Here, the precautions an individual would take to avoid being a victim are presumably very similar to the ones that an individual would take to avoid being the victim of an accident. Some precaution of this type is certainly socially optimal. These precautions are presumably quite different from those taken to avoid being a victim of voluntary manslaughter, even though they may also be welfare enhancing (such as not provoking another person).

The difference in penalty between the two forms of manslaughter is quite large - approximately eight fold for criminal negligence and three fold for reckless conduct. The fact that the penalty is less for criminal negligence suggests that there are more socially valuable precautions to be taken than there are for reckless conduct. For example, one might imagine that criminal negligence on behalf of a professional can be avoided by researching the potential injurer's reputation, which has benefits for the operation of that particular market. It is interesting to note that reckless conduct involving a means of transportation receives a considerably greater penalty than other forms of reckless conduct. This would be consistent with the notion that such conduct could generate a lack of trust in such forms of transportation as highways or air travel and that this would have deleterious effects on the economy as a whole.

Murders that are not planned or deliberate and are not the result of provocation may often be the result of being in the wrong place at the wrong time. Such events are hard to foresee, and as such, potential victims may not change their behavior much in order to avoid such encounters. The types of precautions an individual may take include avoiding certain parts of town and not associating with certain individuals. Compared to the precautions an individual may take if they feel they are being targeted as a victim, these are relatively small and considerably different. More importantly, these precautions represent social loss but probably have a deterrent effect. That is, if the victim had not been "at the wrong place at the wrong time," then no death would have occurred.

Finally, when a murder is planned and deliberate, it seems unlikely that the mur-

derer would give up[12] if he were foiled by victim precaution in a first attempt. In this case, the displacement of the crime may not be across people but across time. While the model does not formally capture this form of displacement, the logic still holds. There are many reasons that an individual may be targeted for murder. Taking precaution not to be targeted may, in some circumstances, be welfare enhancing (such as not sleeping with another person's spouse), may reduce incentive to do productive things (become a politician, accumulate wealth), or may be impossible (if one is targeted for personal characteristics such as sex or race). If a person thought they were being targeted for murder, say because somebody was targeting women, then the precautions would certainly involve more than avoiding the "bad parts of town".

Second degree murder receives a penalty 3 to 4 times as long as voluntary manslaughter. Since both crimes are "planned and deliberate," the difference in penalty reflects the difference that victim precaution has on deterrence. The comparison between the penalty for first degree murder (life imprisonment) and second degree murder is obviously hard to make.

3.2 Other Crimes

3.2.1 Definitions and Penalties

Aggravated assault entails a physical attack on an individual that results in serious bodily harm and/or is committed with a dangerous weapon. The base offense level is 15-21 months, however if the attack involves "more than minimal planning", then the suggested penalty becomes 21-27 months.

Burglary, sometimes known as breaking and entering, constitutes the unlawful entry into a building for the intention of committing a crime. It receives a penalty of 24-30 months if the crime involves a residence and a penalty of 10-16 months otherwise. If there is more than minimal planning involved, then the penalties are increased to 30-37 months and 15-21 months, respectively.

Obstruction of justice can refer to any "interference of the administration and due

[12] Although, he may be caught.

process of law". The base offense level is 15-21 months, however if it was "extensive in scope, planning, or preparation" then the penalty is 21-27 months.

3.2.2 The Model's Predictions

For all these crimes, the presence of premeditation (be it "more than minimal planning" for assault and burglary or "extensive in scope, planning or preparation" for obstruction of justice) increases the penalty by about 50%, considerably less than the difference between voluntary and involuntary manslaughter and first and second degree murder. The model predicts that this would occur if the precautions people take to avoid premeditated crimes also help them avoid opportunistic ones. For burglary, this certainly seems to be the case. While a person may be able to avoid opportunistic crimes simply by closing and locking one's door, things that discourage premeditated crimes, such as alarm systems, would also deter opportunistic crimes.

4 Other Theories

Posner (1992) offers a couple of possible explanation for why intent might affect sentencing. First, he proposes that planned and premeditated crimes are harder to catch. If expected penalties should be proportional to harm, then crimes that are solved with lower probability should receive greater penalties. Specifically, if a criminal act causes harm h and is caught with probability p, then the penalty should be $s = \frac{h}{p}$. If planning reduces the probability of being caught to p', then the penalty should be $s' = \frac{h}{p'} > s$. While there is some intuitive appeal to this argument, it is fair to ask whether this can account for the difference. While this is an empirical question, it is one that is very difficult to answer. Specifically, one cannot typically know the planning that was involved in unsolved cases. However, differences in conviction probabilities cannot account for why a homicide may be downgraded to murder because of mitigating circumstances such as provocation. In addition, premeditation is not perfectly correlated with being difficult to solve. In particular, actions designed to cover up a crime can be taken even if the crime was not planned. If the goal of increased sentencing was to keep expected penalties roughly equal, then

a better instrument would be to condition sentences on actions taken to reduce the probability of capture. To some extent this occurs already in that criminals who turn themselves in may receive leniency in sentencing.

Another explanation proposed by Posner is that impetuous crimes may be less deterrable. This certainly would seem to be important in understanding why provocation would reduce a sentence, but does not explain why dropping a brick off of a bridge would receive *less* of a sentence than one that occurred in the heat of passion, nor would it account for differences in sentencing for burglary. The extent to which difference in deterrability can account differences in sentences is ultimately an empirical question, however not one that has thus far been looked at.

5 Conclusion

This paper examines optimal penalties in the context of deterrence of crimes by private expenditures. Private property expenditures that displace rather than deter are socially wasteful, and so crimes that are displaced rather than deterred by such expenditures should be punished to a greater degree. In particular, this paper argues that a main determinant of whether a crime is deterred or displaced by private property protection has to do with the intentions of the criminal - something that is generally overlooked in the literature.

As mentioned above, the criterion used for determining optimality is that of cost minimization. Another criterion that could have been used is welfare maximization, where penalties would be chosen to maximize the sum of benefits to criminals and costs to victims. As was discussed, the introduction of criminal benefits into the calculation of optimal sanctions would not change the result that premeditated crimes should be punished more than opportunistic ones as long as the benefits and the underlying distribution is the same for both types of crime.

It is worth considering this in greater detail, however. It would seem plausible that those individuals who choose to seek out crime (and therefore commit premeditated acts) would be those for whom the benefits are higher. As such, the distribution of benefits among potential criminals is likely not the same when considering oppor-

tunistic crimes as premeditated ones.

6 Appendix

Proof to Lemma 1:

Since equations a^O and s^O only appear in 2.1, and a^I and s^I only appear in 2.2, it is clear that $\hat{a}^O$ is independent of s^I and $\hat{a}^I$ is independent of s^O. Further, $\frac{\partial \hat{a}^O}{\partial s^O}$ and $\frac{\partial \hat{a}^I}{\partial s^I}$ can be found using the Implicit Function Theorem.

$$\frac{\partial \hat{a}^O}{\partial s^O} = \frac{p\pi_a^O g\left(ps^O\right)}{\pi_{aa}^O\left[1-G\left(ps^O\right)\right]} < 0$$
$$\frac{\partial \hat{a}^I}{\partial s^I} = \frac{q_{aM^I} pg\left(ps^I\right)}{q_{aa}} < 0$$

■

Proof to Proposition 1:

Consider the derivative of total costs with respect to s^O, which can be rewritten as

$$\pi^O\left[-phg\left(ps^O\right) + c'(\cdot)\left[p\left[1-G\left(ps^O\right)\right] - pg\left(ps^O\right)ps^O\right]\right] + c'(\cdot)\left[\pi_a^O\left[1-G\left(ps^O\right)\right]ps^O\frac{\partial \hat{a}^O}{\partial s^O}\right]$$

When this expression is evaluated at $\hat{s}^I$, the first term is equal to $-\pi^O\frac{\partial \hat{a}^I}{\partial s^I}$. We thus have

$$-\pi^O\frac{\partial \hat{a}^I}{\partial s^I} + c'(\cdot)\,\pi_a^O\left[1-G\left(ps^O\right)\right]ps^O\frac{\partial \hat{a}^O}{\partial s^O} > 0$$

Thus the cost minimizing level of a^I is greater than the cost minimizing level of a^O.

■

Proof to Lemma 2:

Since the equilibrium is symmetric, each agent's avoidance expenditure is characterized by the equation

$$\left[\frac{\partial \pi^O(a^*)}{\partial a}\left[1-G\left(ps^O\right)\right] + \frac{\partial q\left(a^*; \mathbf{a}^*_{-i}, M^I\right)}{\partial a}\right]h + 1 = 0$$

Applying the Implicit Function Theorem yields

$$\frac{\partial a^*}{\partial s^O} = \frac{p\pi_a^O g\left(ps^O\right)}{\pi_{aa}^O\left[1-G\left(ps^O\right)\right] + q_{aa}\left[1-G\left(ps^I\right)\right]} < 0$$
$$\frac{\partial a^*}{\partial s^I} = \frac{pq_{aM^I} g\left(ps^I\right)}{\pi_{aa}^O\left[1-G\left(ps^O\right)\right] + q_{aa}\left[1-G\left(ps^I\right)\right]} < 0$$

■

Proof to Proposition 2:

As in the proof to Proposition 1, the derivative of total costs with respect to s^O can be rewritten as

$$\pi^O\left[-phg\left(ps^O\right)+c'\left(\cdot\right)\left[p\left[1-G\left(ps^O\right)\right]-pg\left(ps^O\right)ps^O\right]\right]+c'\left(\cdot\right)\left[\pi_a^O\left[1-G\left(ps^O\right)\right]ps^O\frac{\partial a^*}{\partial s^O}\right]$$

When this expression is evaluated at $\tilde{s}^I$, the first term is equal to $-\pi^O\frac{\partial a^*}{\partial s^I}$. We thus have

$$-\pi^O\frac{\partial a^*}{\partial s^I}+c'\left(\cdot\right)\pi_a^O\left[1-G\left(ps^O\right)\right]ps^O\frac{\partial a^*}{\partial s^O}>0$$

Thus the cost minimizing level of a^I is greater than the cost minimizing level of a^O.

■

Proof to Lemma 3:

From Lemma 1 and 2 above, we have that

$$\begin{aligned}
\frac{\partial\hat{a}^O}{\partial s^O} &= \frac{p\pi_a^O g\left(ps^O\right)}{\pi_{aa}^O\left[1-G\left(ps^O\right)\right]} \\
\frac{\partial\hat{a}^I}{\partial s^I} &= \frac{q_{aM^I}pg\left(ps^I\right)}{q_{aa}} \\
\frac{\partial a^*}{\partial s^O} &= \frac{p\pi_a^O g\left(ps^O\right)}{\pi_{aa}^O\left[1-G\left(ps^O\right)\right]+q_{aa}\left[1-G\left(ps^I\right)\right]} \\
\frac{\partial a^*}{\partial s^I} &= \frac{pq_{aM^I}g\left(ps^I\right)}{\pi_{aa}^O\left[1-G\left(ps^O\right)\right]+q_{aa}\left[1-G\left(ps^I\right)\right]}
\end{aligned}$$

First consider the effect of s^I on $\hat{a}^I$ and a^*. Holding s^I the same, we can see that $\frac{\partial\hat{a}^I}{\partial s^I}<\frac{\partial a^*}{\partial s^I}$ if and only if

$$\frac{q_{aM^I}pg\left(ps^I\right)}{q_{aa}}<\frac{pq_{aM^I}g\left(ps^I\right)}{\pi_{aa}^O\left[1-G\left(ps^O\right)\right]+q_{aa}}$$

At a given s^I, the numerator is the same, however the denominator is greater in the term on the right (and positive). Since both terms are negative, it must be that $\frac{\partial\hat{a}^I}{\partial s^I}<\frac{\partial a^*}{\partial s^I}$.

Now consider the effect of s^O on $\hat{a}^O$ and a^*. Holding s^O the same, we can see that $\frac{\partial \hat{a}^O}{\partial s^O} < \frac{\partial a^*}{\partial s^O}$ if and only if

$$\frac{p\pi_a^O g\left(ps^O\right)}{\pi_{aa}^O\left[1-G\left(ps^O\right)\right]} < \frac{p\pi_a^O g\left(ps^O\right)}{\pi_{aa}^O\left[1-G\left(ps^O\right)\right]+q_{aa}\left[1-G\left(ps^I\right)\right]}$$

At a given s^O, the numerator is the same, however the denominator is greater in the term on the right (and positive). Since both terms are negative, it must be that $\frac{\partial \hat{a}^O}{\partial s^O} < \frac{\partial a^*}{\partial s^O}$. ■

Proof to Theorem 1:

Consider the first order conditions for the cost minimization problem:

$$-ph\pi^O g\left(ps^O\right)+c'(\cdot)\left[\pi_a\left[1-G\left(ps^O\right)\right]ps^O\frac{\partial a}{\partial s^O}-pg\left(ps^O\right)\pi^O ps^O+p\pi^O\left[1-G\left(ps^O\right)\right]\right]=0$$

$$-phg\left(ps^I\right)+\frac{\partial a}{\partial s^I}+c'(\cdot)\left[\left[1-G\left(ps^I\right)\right]p-pg\left(ps^I\right)ps^I\right]=0$$

where $\frac{\partial a}{\partial s^O}$ and $\frac{\partial a}{\partial s^I}$ refer to either $\frac{\partial \hat{a}^j}{\partial s^j}$ or $\frac{\partial a^*}{\partial s^j}$, $j=O,I$. Let us first consider the first order condition pertaining to s^O. Suppose that avoidance activities are distinct and consider evaluating it $\tilde{s}^O$. This yields

$$-ph\pi^O g\left(p\tilde{s}^O\right)+c'(\cdot)\left[\pi_a\left[1-G\left(p\tilde{s}^O\right)\right]p\tilde{s}^O\frac{\partial \hat{a}^O}{\partial s^O}-pg\left(ps^O\right)\pi^O p\tilde{s}^O+p\pi^O\left[1-G\left(p\tilde{s}^O\right)\right]\right]$$

Since $\frac{\partial \hat{a}^O}{\partial s^O} < \frac{\partial a^*}{\partial s^O}$, it therefore must be the case that this expression is positive, meaning that $\tilde{s}^O > \hat{s}^O$.

Now consider the first order condition with respect to s^I. Evaluating it at $\tilde{s}^I$ when avoidance activities are distinct yields

$$-phg\left(p\tilde{s}^I\right)+\frac{\partial \hat{a}^I}{\partial s^I}+c'(\cdot)\left[\left[1-G\left(p\tilde{s}^I\right)\right]p-pg\left(p\tilde{s}^I\right)p\tilde{s}^I\right]$$

In this case, however, since $\frac{\partial \hat{a}^I}{\partial s^I} < \frac{\partial a^*}{\partial s^I}$, it therefore must be the case that this expression is negative, meaning that $\tilde{s}^I < \hat{s}^I$. Since $\tilde{s}^O < \tilde{s}^I$, we therefore have that $\hat{s}^O < \tilde{s}^O < \tilde{s}^I < \hat{s}^I$. ■

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