



The relative effectiveness of punishment severity and risk of apprehension in deterring dishonest behavior: Experimental results from a developing country

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Abstract

For many types of wrongdoings, a deterrent may be a more desirable goal than punishment due to the damage these wrongdoings have already caused and the strain on the resources of enforcement authorities. This paper uses economic experiments to offer insights into the relative effectiveness of monitoring (increasing the risk of apprehension) and punishment severity in deterring dishonest behavior. Experimental results show that varying the degree of punishment severity does not alter self-reported scores on a 5-minute quiz, an indicator of dishonest behavior, given a low risk of apprehension. On the other hand, at a seemingly light punishment level (no gain received), higher risks of apprehension are associated with lower levels of dishonest behavior as seen from lower self-reported quiz scores. These results suggest that the current approach to deterring wrongdoings that usually involve threats of more severe punishment may not be achieving the desired outcome.

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Introduction

An important issue facing many societies is how to deter negative behavior like crime and corruption. Successful deterrence of wrongdoing means we can avoid the consequences of the crime itself, as well as having to identify, capture, prosecute, and deliver the punishment to the offender. All of these activities are costly. Thus, deterrence is more efficient than incapacitation (Chalfin & McCrary, 2017).

Discussions of deterrence tend to focus on the responses of individuals to changes in certainty, severity, and celerity of punishment. The standard economic model of criminal behavior was developed by Becker (1968) based on a rational agent facing the choice of whether to commit a crime. He can commit the crime and receive a benefit at a risk, or he can forego the crime and its benefits and risks, continuing with the status quo. Deterrence, then, depends on the probability of apprehension and punishment, and it is unclear which of these is more effective in practice.

Becker's model predicts that if individuals are risk-loving, risk of apprehension would be the more effective crime deterrent than punishment severity. If they were risk-averse, then punishment severity would be more effective. Both punishment

severity and risk of apprehension would have the same impact on crime decision if individuals were risk neutral. However, behavioral decision research finds that events in the future would hold less sway on decisions in the present than they rationally should (Darley & Alter, 2013). This suggests that people would be more sensitive to changes in risk of apprehension, which affect utility immediately, than by changes in punishment, which mostly affect utility in the future. Other studies find that people tend to overestimate the likelihood of rare events and underestimate the likelihood of common events. This implies that people may overly respond to changes in probability of apprehension especially when the perceived probability of detection is very low (Durlauf & Nagin, 2011).

The empirical evidence of crime responsiveness to probability of apprehension and punishment is mixed. Some studies find that deterrence is effective when increases in punishment and sanction are imposed (e.g. Helland & Tabarrok, 2007; Bell, Jaitman, & Machin et al., 2014). Others find no impact of punishment on crime deterrence (e.g. Zimring, Fagan, & Johnson, 2010; Hjalmarsson, 2009). Evidence on the effectiveness of apprehension is similarly inconclusive (DeAngelo & Hansen, 2014; e.g. Levitt, 2002; Lin, 2009). Data and technical limitations make it difficult for these studies to address a potential endogeneity issue as changes in deterrence levels are generally not random (Chalfin & McCrary, 2017; Donohue & Wolfers, 2009).

Many studies use experimental techniques eliminate confounding issues and uncover the causal effect of the risk of being caught and punishment severity on cheating behavior, albeit with mixed results (e.g. Anderson, Deangelo, Emos,

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Freeborn, & Lang, 2017; Friesen, 2012; Qin & Wang, 2013). Previous studies using experiments usually frame the punishment severity in terms of foregone gain in which subjects did not lose their own money if caught, but lose money offered by researchers. Findings from behavioral economics studies however suggest that (dis)incentive in form of foregone gain may have less impact on decision than that of a loss (Knetsch & Mahasuweerachai, 2015).

This study adds two main contributions to the literature of the effects of punishment severity and probability of apprehension. First, the study uses the experimental technique to clarify causation, and to elicit the effects of changes in risk of apprehension and punishment severity on the negative behavior of cheating. Since the payoff in this experiment is immediate, it is devoid of the present-bias issue. Therefore, the effectiveness between the risk of apprehension and punishment in deterring cheating behavior could be compared, given that the benefit and punishment of cheating can happen at the same time. Second, the experimental design was set up to elicit the impact of punishments in forms of a loss and of a foregone gain. Thus, not only the impact of punishment severity but also different forms of punishment severity could be tested.

Scores on a 5-minute quiz were self-reported as our honesty indicator, with higher scores suggesting less honesty. The experimental results showed that risk of apprehension was more effective in deterring cheating. Though not monotonic, higher apprehension risk brings cheating behavior down to the level observed when researchers rechecked each reported score (full monitoring). Varying punishment severity does not seem to alter cheating behavior in our experiments, even when subjects can lose *their own* money. When trying to deter dishonest behavior, increasing monitoring effort seems to be an appropriate method.

The next section describes experimental design and its implementation, followed by the empirical analysis and interpretation. Our findings are discussed and concluded in the remaining sections.

Methodology

Participants

The experiments were conducted with 130 Khon Kaen University undergraduate students. The subjects were recruited through KKU group, which is a popular social media group among the students. The subjects were then randomly assigned to each experimental group. We therefore believe there were no systematic differences across the experiment groups because the sample consisted of students of similar ages, and different majors were randomly assigned to different experiment groups.

Experiment Design

To determine the relative importance of the possibility of getting caught and the severity of punishment, an experiment was carried out involving a quiz of general knowledge with monetary reward according to the number of questions answered correctly. Different groups of subjects got the same quiz questions with different cheating deterrent mechanisms. Scores across groups were then compared with two extreme control groups. These were (1) complete deterrence, where the administrators checked the answers, and (2) zero deterrence, where participants simply reported their own scores. Higher mean scores were taken as indicative of more cheating.

Subjects were divided into 3 groups of experiments. Group 1 was the control group consisting of 2 subgroups—complete deterrence and zero deterrence. The outcomes of the subgroups served as references for no cheating and complete freedom to cheat, respectively. Group 2 consisted of 5 subgroups with varying degrees of risk and a constant monetary punishment if caught cheating.

These would help to identify the effect of the risk of getting caught. Group 3 consisted of 6 subgroups with varying levels of punishment and a constant risk of getting caught cheating. The experiments in this group were meant to identify the effect of punishment severity. The same set of questions was given to all the groups.

Each subject was given a 10-question multiple choice quiz with 5 minutes to complete. The participant received 30 THB (slightly less than 1 USD as of 2016) for each question correctly answered. The questions were pretested with 50 undergraduate students varied by majors to make sure there was no bias toward any field. The test scores were grouped by students' majors and pairwise comparison confirmed there was no statistically significant difference among pairs (majors) with all $p > .05$. Two example questions are given below.

Example Question 1: "The 6th ASEM Meeting was held on 10–11 September 2006 in Helsinki. What does ASEM stand for?"

Example Question 2: "Given this sequence 4, 3, 3, 36, 6, 3, 5, 90, 8, 3, 7, ..., what is the number in the blank?"

Experiment Groups

We divided subjects into 3 main experiment groups, with varying details in the severity of cheating punishment and the chances of getting caught. The details of each experiment group are given as follows, and summarized in Figure 1. The experiments in the control group consisted of 2 subgroups—complete surveillance and complete freedom to cheat. In subgroup 1, complete surveillance, each subject turned in their quiz to be graded by the administrator and monetary reward was given accordingly. In subgroup 2, complete freedom, each subject graded their own quiz with answers provided by the administrators, and reported the score. Monetary reward was given without verification. For this subgroup, the administrators either walked away or did other activities during the 5 minutes of the quiz.

There were 5 sub experiments in group 2 of the experiments, each with varying levels of risk of getting caught (punishment risk henceforth) and a constant punishment severity, seen in the second column of Figure 1. For every subgroup, participants completed the 10-question quiz in 5 minutes, graded their own quiz, and then reported the score to the administrators to receive monetary reward. If they were found to over-report, they received no reward of money. The punishment was that the cheater would have wasted 5 minutes plus grading time and received nothing in return, possibly with some degree of shame.

To represent punishment risk, the administrators randomly verified the participants' answers at 5 different levels of probability. The subjects in this group were informed of the level of verification probability they faced beforehand. To implement the verification probability, say at 5 percent, a participant was asked to think of 5 numbers between 0 and 99, then a number was drawn from a hat containing numbers from 0–99. If their number was drawn, the administrators checked their answers. The participant received an award of money if their reported score was the true score, and received no money if the reported score was incorrect. For larger verification probabilities, say 70 or 90, subjects chose 30 and 10 numbers, respectively, and their answers were checked if these numbers were *not* drawn.

In group 3 of the experiments (third column in Figure 1), we aimed to test the importance of punishment severity. Subjects were assigned to one of the 6 sub experiments with constant subjective punishment risk and varying punishment severity. Instead of being verified randomly at varying probabilities, scores were verified at 1 percent probability for everyone in this group. If caught over-reporting, they faced varying levels of sanctions announced beforehand.

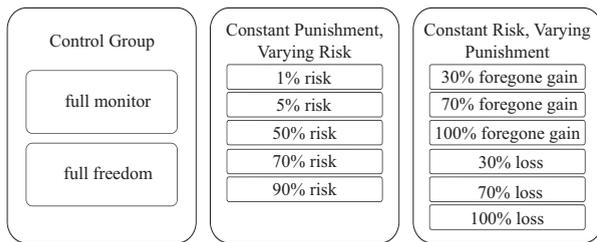


Figure 1 Experiment groups

Previous experimental studies usually framed the punishment as a foregone gain where subjects did not lose their own money (Anderson et al., 2017; Friesen, 2012; Qin & Wang, 2013). Recent studies in behavioral economics suggest that the impact of foregone gain would be weaker than that of loss (Knetsch, 2010; Knetsch, Riyanto, & Zong, 2012; Knetsch & Mahasuweerachai, 2015). Imposing punishment severity as foregoing a gain may therefore provide a smaller impact than imposing a loss. This insight was incorporated into our experiment design. In one group, the punishment for over-reporting was taken from the amount they would have earned. In another, they were fined from their own pockets. This gave us a total of 6 levels of punishment, with 3 framed as foregone gain and 3 framed as losses.

Results

Since our subjects were quite similar across groups, differences in average scores across groups were viewed as being due to different deterrent regimes. It was found that the lowest average score was in the experiment group with full monitoring. However, the score was not the highest in the full-freedom experiment group, suggesting that the threat of a punishment for cheaters is not the only deterrent. There may be a sense of honor involved. At the same time, a fall in average score was observed as the possibility of getting checked was increased, whereas increasing the punishment severity did not bring out a visible pattern.

Linear regressions were next estimated to statistically test for the effect of different deterrent regimes. The first regression tests for differences in the mean scores across groups whose deterrent regimes vary by punishment risk but face the same punishment severity. The dependent variable is the score of a participant, while the dependent variables are group dummy variables indicating punishment risk levels. The reference group was 100 percent surveillance, where researchers checked the scores of all participants. Table 1 presents the results.

Consistent with the comparison of means across groups, it was found that the scores of all treatment groups were higher than in the control group. In particular, statistically significantly higher scores were observed for groups with 0 percent, 1 percent, and 5 percent verification probabilities (punishment risks). The no-risk group scored 1.3 points above the reference while the 1 percent risk group scored 2.2 points higher than the reference group. The 5 percent risk group scored 1.7 points higher than the reference. The scores across these 3 low-punishment-risk groups were not significantly different from one another. The Wald test comparing the coefficients of the 1 percent and 5 percent risk groups with the no-risk group gave a *p*-value of 0.16 and 0.53, respectively. Meanwhile, groups with higher levels of risk had scores no different from the reference group. It seems that a punishment risk of 50 percent is sufficient to deter cheating in this sample.

The second regression tests for the effect of varying levels of punishment severity holding punishment risk constant. Again, the dependent variable is the test score. The independent variables are group dummy variables indicating punishment

severity levels. The reference group for the second regression was where the participants checked their own scores. Lower mean scores in the control groups occur when coefficient on the dummy group variable is negative and significant. Table 2 reports the results. The mean scores in all punishment severity levels were not different from the full-freedom scenario. This was true even when subjects faced an out-of-pocket fine equal to 100 percent of the reward of the severest punishment. At least for this sample, punishment severity played little role in deterring cheating.

Discussion

The experimental design allowed for studying the effect of varying punishment severity and probability of getting caught, or enforcement intensity, independent of confounding factors. This enabled us to make *ceteris paribus* conclusions about the deterrent effect of punishment severity and punishment risk. However, the experiment subjects consisted of college students, who are certainly not representative of the adult population in Thailand. While the results were conclusive in this sample, we cannot completely apply our findings to the general population.

Table 1 Regression result for constant punishment severity and varying punishment risks

Variable	Total Score
Constant (full monitor)	3.000*** (6.344)
Full Freedom	1.300** (1.994)
1% risk	2.200*** (3.375)
5% risk	1.700** (2.608)
50% risk	0.900 (1.381)
70% risk	1.000 (1.534)
90% risk	0.300 (0.460)
R ²	0.213
Number of Observations	70

Note: Numbers in parentheses are t-statistics.
****p* < 0.01. ***p* < 0.05. **p* < 0.1.

Table 2 Regression result for constant punishment risk and varying punishment severity

Variable	Net Total Cheating
Constant (full freedom)	4.300*** (10.014)
Full Monitor	-1.300** (-2.084)
Forgone gain 30%	-200 (-0.329)
Forgone gain 70%	-700 (-1.153)
Forgone gain 100%	-400 (-0.659)
Loss 30%	-200 (-0.329)
Loss 70%	-100 (-0.165)
Loss 100%	0.000 (0.003)
R ²	0.090
Number of Observations	80

Note: Numbers in parentheses are t-statistics.
****p* < 0.01. ***p* < 0.05. **p* < 0.1.

There are both similarities and differences between our results and those obtained by Friesen (2012). Similar to that work, we found that “inspection rate” reduced cheating behavior. However, we found a larger effect from increasing inspection rate than from increasing punishment severity, while Friesen (2012) found the opposite. In that work, both inspection rate and punishment severity significantly deterred cheating, but a stronger effect came from increasing punishment severity. The anonymity in the Friesen (2012) study may allow subjects to approach the problem in a more traditional way, which is to attempt to maximize total payoff. In our case, monitoring involved face-to-face interaction and thus added to the “pain” of getting caught.

While the range of values for punishment risk, i.e. inspection rate, can only take a value between 1 and 100, reasonable punishment severity varies across offenses. Our chosen punishment severity values reflected this consideration, and they might be too small to affect decisions. Nonetheless, we observed a higher degree of effectiveness coming from punishment risk, even with light punishment levels. We take this as further evidence of a higher relative effectiveness of punishment risk than punishment severity.

Finally, the cost and benefit analysis considered in this experiment was only taken from the perspective of individuals. It was taken for granted that any reduction in undesirable behavior was justifiable in terms of its costs. For example, we made a case of increasing monitoring or surveillance in order to deter the undesirable behavior, without making any statement about how undesirable these behaviors actually are for society. A complete picture of an optimal deterrent mechanism design should further consider social costs and benefits of increasing monitoring efforts, and an optimal design would be where the social deterrent costs do not outweigh the social benefits.

Conclusion and Recommendation

As societies become ever more complex, occurrences of transgressions are sure to increase. Without the internal motivation to avoid doing harm to others, relegating all peacekeeping responsibilities to law enforcement will only stretch their resources thinner and thinner over time. Crime deterrence therefore becomes increasingly important as resources are struggling to keep up with enforcement responsibilities. This study used economic experiments to explore two broad alternatives to deterring potential wrongdoing—risk of apprehension and severity of punishment. The results were somewhat comforting, that increasing the risk of apprehension, i.e. monitoring effort, seems more effective than increasing the severity of punishment.

Increasing punishment severity is undesirable from both the economic and moral standpoints. From the economic standpoint, severe punishments are typically associated with higher costs of implementing, such as longer sentences or lengthy processes due to the convicted expending more effort to avoid a stronger punishment than a more lenient one. From the moral standpoint, most societies do not want to punish someone more harshly than the crime warrants. To increase the severity of punishment will likely push the punishment above the appropriate threshold, and most societies would prefer to avoid that.

The experimental results, though convincing in many respects, are still subject to a few shortcomings worth mentioning. First, the subjects in this study are university students. The behavior in this sample may not be representative of much of the population. Second, and possibly most importantly, the results do not generalize to all wrongdoings. In this experiment, the offense does not involve much emotion

in the decision-making process typical in many violent crimes, for example. Finally, different rewards sizes may produce different results from those we have here.

Future studies may explore other types of wrongdoings, alter the amounts or types of punishment and reward, increase the sample size, and/or experiment with different subsets of the population. They may also address different types of offenses that are motivated by different factors other than monetary gains. The experiments in this study address only the “stick” side of the motivation to avoid wrongdoing, and future work may explore “carrot” type of options. Finally, the types of offenses may require different types of different mechanisms. It is up to each society to decide how much resource they are willing to commit to learn about the appropriate deterrent schemes for myriad types of wrongdoings they most want to prevent.

Conflict of Interest

There is no conflict of interest.

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