Forthcoming Criminology

Integrating Celerity, Impulsivity, and Extralegal Sanction Threats into a Model of General Deterrence: Theory and Evidence

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January 15, 2000

ABSTRACT

This paper proposes a model integrating the deterrent effects of the certainty, severity, and imminence ("*celerity*") of punishment. Further, the model distinguishes between the legal and extra-legal consequences of punishment and incorporates the economic concept of discounting to account for individual differences in "impulsivity" or "present-orientation." The model was tested using the responses of 252 college students to questions based on a drunk-driving scenario. Key findings include: (1) While variation in sanction certainty and severity predicted offending behavior, variation in celerity did not; (2) The extra-legal consequences of conviction appear to be at least as great a deterrent as the legal consequences; (3) The influence of sanction severity diminished with an individual's "present-orientation"; (4) The certainty of punishment was a far more robust deterrent to offending than the severity of punishment.

INTRODUCTION

Deterrence studies focusing on the certainty and severity of sanctions have been a staple of criminological research for more than thirty years. Two prominent findings from this literature are that punishment certainty is far more consistently found to deter crime than punishment severity, and the extra-legal consequences of crime seem at least as great a deterrent as the legal consequences (Nagin, 1998; Williams and Hawkins, 1986). Going back to Beccaria, punishment imminence ("*celerity*") has been accorded co-equal status with certainty and severity in theory, yet empirical tests of the celerity effect are scant.

This paper aims to advance this well trodden intellectual and empirical ground by proposing and testing an integrated model of certainty, severity and celerity. The framework of the model enables us: (1) to investigate punishment celerity, not in isolation as the few previous studies of celerity have done, but as it relates to certainty and severity, (2) to distinguish the independent roles of legal and extra-legal sanctions, (3) to incorporate aspects of individual difference theories into a rational choice approach, and (4) to explain the finding that punishment certainty is a more effective deterrent than punishment severity.

Our model relies upon two sources outside conventional explanations of deterrence. One is familiar to criminologists. In A General Theory of Crime, Gottfredson and Hirshi argue that persons who engage in crime can be distinguished by their "here and now" orientation. Wilson and Herrnstein similarly emphasize the impulsivity of criminals in their treatise, Crime and Human Nature. We formalize these complimentary ideas with a foundational economic concept, "discounting." Economics

uses “discounting” to compare consequences realized at different times. Nagin and Paternoster (1994) use this intuition to explain differences in investment in social bonds. Here we make formal use of a discount factor to link the *timing* of punishment, the defining concept of celerity, and the *amount* of punishment, the defining concept for certainty and severity.

We also develop several novel techniques for measuring the aforementioned discount rate and placing a monetary value on the legal and extra-legal consequences of criminal behavior. As elaborated below, we believe these advances in measurement have broader application in criminology.

INTEGRATIVE DETERRENCE

We begin by outlining several aspects of deterrence theory that we intend to address with our integrative model. The current version of the theory, which descends virtually intact from the enlightenment philosophers Beccaria and Bentham, continues to face mixed support for its three main predictions. While punishment certainty has been consistently found to deter criminal behavior (Parker and Grasmick, 1979; Paternoster, et al., 1985; Horney and Marshall, 1992), the evidence for severity (Piquero and Rengert, 1999; Klepper and Nagin, 1989; Nagin and Paternoster, 1993; Decker, Wright, and Logie, 1993) and celerity (Howe and Loftus, 1996; Legge and Park, 1994; Yu, 1994) effects is inconclusive. Further, as a purely situational account of criminal behavior, deterrence theory neglects the growing list of personal traits that appear to predict offending (cf. Moffitt, 1993; 1994; forthcoming; Nagin and Tremblay, 1999; Nagin, Farrington, Moffitt, 1995; Fergusson, Horwood, and Nagin, 2000; Evans et al., 1997; Longshore et al., 1996; Block & Gerety, 1995; Wallace & Newman, 1997; Seguin, et al., 1999). This paper proposes an integrative deterrence model that aims to more effectively reconcile extant findings and provide a more descriptively accurate account of criminal conduct.

In contrast to the considerable attention devoted to certainty and severity effects, few studies investigate punishment celerity. This oft-neglected deterrence prediction appears grounded in psychological investigations of "Pavlovian conditioning." In such studies, experimenters effectively suppressed animal behaviors with negative reinforcements occurring within six seconds following the targeted behavior. Criminology has adopted this finding as the basis for a celerity effect -- that is, in similar

fashion, delay should diminish the deterrent efficacy of a legal sanction. This analogy, however, neglects the fact that humans possess a far greater cognitive capacity than animals for connecting acts with temporally remote consequences. Even more, the criminal justice system is designed specifically to remind defendants of the allegations against them at least several times during litigation. With respect to general deterrence, application of Pavlovian conditioning is even further strained. While such conditioning results from prior punishment of the decision-maker, general deterrence occurs when the decision-maker contemplates the punishment experiences of others. General deterrence then does not concern a "connection" between behavior and consequences, but rather whether potential consequences already recognized by the decision-maker seem sufficiently "costly" to deter behavior.

For these reasons, commentators have criticized the current theoretical basis for a celerity effect (cf. Howe & Brandau, 1988; Tittle, 1980; Gibbs, 1975). On this point, Gibbs (1975:130-131) has observed:

> The only rationale for an emphasis on celerity is found in experimental psychology, notably research on "operant" behavior, classical (Pavlovian) conditioning, or aversive conditioning....it is difficult to see how (such) experimental findings support the assumption that differences among jurisdictions or types of crime can be attributed even in part to contrasts in the celerity of punishment. In any case, one would surely be pressed to argue that the importance of the celerity effect extends beyond specific deterrence.

We share Gibbs' contention that classical conditioning provides an insufficient basis for a celerity effect. As to Gibbs' latter contention that the timing of punishment is therefore irrelevant to general deterrence, we wholeheartedly disagree.

An alternative basis for a celerity effect derives from straightforward economic reasoning about the "time value of money." Consider the future obligation to pay $1,000.

There is a sensible basis to want to defer the obligation in order to use the funds and produce offsetting benefits in the interim. Imagine making an immediate payment that would relieve the obligation. The maximum acceptable payment, a plausible measure of the present aversiveness of the obligation, is likely to diminish as the payment date is further delayed. If evaluation of a future criminal sanction resembles that for a future financial obligation, the result is a celerity effect -- the sooner the sanction is expected to commence, the greater its current costliness and resulting deterrent potential.

Ultimately, however, it is an empirical question whether this commonsense economic logic applies to criminal sanctioning. First, unlike a monetary obligation, there is no compelling reason to predict an individual would be more likely to prefer to delay a sanction than they would be to want to "get it over with." Second, no natural reference exists to calibrate the strength of any preference for delay. In economics, the market interest rate provides an appropriate benchmark to “discount” a future financial obligation. To see this, imagine that funds are expected to earn 10% per year and we are again offered a choice to relieve a future $1,000 obligation with an immediate payment. Were the funds due in one year, the immediate acceptable payment should not exceed 1/1.1($1,000) = $910. Were the obligation due in three years, the immediate acceptable payment should not exceed $(1/1.1)^3($1,000) = $750. No such objective standard exists by which to “discount” future criminal sanctions.

The concept of celerity, as we have currently redefined it, thus captures only one side of the role of timing in criminal decision-making. A "celerity effect" is only possible for someone who would prefer to delay a sanction. Further, as the above financial example shows, the magnitude of any celerity effect depends on the strength of the

preference for delay. For example, if the interest rate were 20%, the preference for delay is even greater. The immediate acceptable payment to relieve the $1000 obligation one year hence would be 1/1.2($1000)=$833. More generally, for any individual the impact of celerity depends inextricably on whether and to what extent delay produces the devaluation of future consequences. This latter aspect of timing invokes the well-known criminological concept of "impulsivity" or "present-orientation."

Wilson and Herrnstein (1985) associate impulsivity with an inability to plan for the future. Gottfredson and Hirschi (1990) define impulsivity as the disproportionate adoption of a “here and now” orientation, in contrast to those who more often "defer gratification." In their subsequent "self-control scale," Grasmick et al. (1993) measure impulsivity by asking subjects to report their level of agreement with statements like: "I often do what brings me pleasure here and now, even at the cost of some distant goal," and "I'm more concerned with what happens to me in the short run than on the long run" (Grasmick et al. 1993:14-15).

As with celerity, at its core impulsivity relates to the effect of *timing* on the perceived magnitude of consequences. In particular, impulsivity describes the degree to which an individual eschews the future for the present which, in economic terms, is reflected in the discount rate. Recall the individual contemplating an immediate payment to relieve a $1,000 obligation due in one year. A market interest rate of 10% provides a credible basis to predict that the maximum acceptable amount should not exceed 1/1.1($1,000) = $910. If, however, the individual enjoyed gambling on professional sports, the gambling impulse could cause the maximum acceptable payment to be far less than $910. In this context, the gambler’s impulsivity is evidenced by a high discount rate

for the future $1,000 obligation. If, for example, the maximum acceptable payment were only $100, the implied discount rate, denoted by r, is markedly higher than the market interest rate. It can be inferred to equal 900% by solving for the value of r such that (1/1+r)($1,000)=$100.

We have thus far reframed the concepts of impulsivity and celerity and advocated their inclusion in the traditional deterrence framework. In doing so, however, we have focused on the deterrent properties of legal sanctions which, as a number of scholars have now convincingly shown, represent only one of myriad potential behavioral influences. Meier and Johnson (1977:295) recognize the complications alternative sources of conformance pose for deterrence theory:

> There is no basis for presuming that other (extralegal) influences are somehow "controlled" when the bivariate relationship between legal sanctions and crime is measured. The important question which is not addressed by such studies is: when is compliance the result of legal threats, and when is it the result of other factors?....The rate of nonviolation may actually reflect two sources of compliance: (1) compliance produced by influences other than a legal threat and (2) compliance produced by legal threats.

Grasmick and Bursik (1990) add specificity to the observations of Meier and Johnson (1977) by delineating two such “extra-legal” sources of conformity. Embarrassment is the social analogue to the legal sanction. It refers to the disapproval over the transgression from individuals to whom the offender has significant personal attachments, such as spouses, friends, family, and colleagues. In contrast, shame follows a criminal act when the offender suffers personal dissonance from having violated an internalized behavioral norm.

Ensuing studies investigating extralegal sanctions have shown that a belief that illicit conduct is wrong (cf., Foglia, 1997; Burkett and Ward, 1993; Paternoster and

Simpson, 1996) and the fear of peer disapproval, embarrassment, or social stigma (cf., Williams and Hawkins, 1992; Tittle, 1980; Grasmick and Bursik, 1990; Zimring and Hawkins, 1973; Andeneas, 1974; Nagin and Paternoster, 1994) discourage offending behavior. Further, several studies investigating the relative strength of both sanction forms find the conforming influence of extralegal sanctions to be far greater than that from legal sanctions (Grasmick & Bursik, 1990; Bachman, Paternoster, and Ward, 1992).

The foregoing research suggests that, in addition to accounting for the role played by the timing of sanctions, deterrence theory should permanently delineate alternative sanction forms to promote a more complete understanding of criminal decision-making. Elaborating on the technical structure employed by most rational choice theories of crime, we outline a more expansive model of deterrence.

MODEL AND PREDICTIONS

Like most theories, ours builds on the work of others. We expand the existing rational choice framework to include celerity and impulsivity, redefined in terms of the effect of delay on the evaluation of consequences. The model also adopts the longstanding distinction between legal and extralegal consequences of crime that was advanced by Andaneas (1974) and Zimring and Hawkins (1973) and explored empirically in more recent work (cf. Tittle, 1980; Grasmick and Bursik, 1990; Klepper and Nagin, 1989; Nagin and Paternoster, 1994).

In the simple cost benefit calculus at the heart of general deterrence theory, an individual will offend if

$$U(\text{Benefits}) > p*U(\text{Costs}) \quad (1),$$

where U(*) is a utility function that evaluates the benefits and costs of crime in a common metric, and p is the perceived risk of being sanctioned.[1]

We next generalize the model to distinguish between legal and extralegal sanctions as follows:

[1] Eq (1) assumes the benefits are not contingent upon avoiding detection. This assumption most likely obtains for crimes that yield benefits intrinsic to the act, like physical victimization, vandalism, or drunk driving. Yet for certain transgressions, like property crime or embezzlement, the act is a means to obtain tangible spoils. In this latter case, apprehension normally entails the confiscation of benefits. Eq. (1) can therefore be modified to reflect the necessary contingency: offend if (1-p)*U(Benefits) > p*U(Costs).

$$U(\text{Benefits}) > p*U(\text{Legal Costs} + \text{Extralegal Costs}) \quad (2).$$

Eq. (2) reflects a simplifying assumption that extralegal sanction costs are triggered only by the imposition of a legal sanction. However, as Grasmick and Bursik (1990:841) recognize "An actor can feel ashamed or be embarrassed even if the state does not detect the behavior." Williams and Hawkins (1986) also distinguish such "stigma from the act" from stigma that can originate from apprehension by authorities.

Absent some mechanism to account for non-legal sources of conformance independent of the criminal justice system, eq. (2) can be taken to suggest that if there is no possibility of punishment, the crime must occur. On this point, Nagin and Paternoster (1994) add a term, U(Moral Regret), to the cost side of the ledger. This permits their model to account for individuals who, irrespective of instrumental concerns, will simply not offend. In their model, for such individuals, even if apprehension is impossible, U(Moral Regret) can exceed U(Benefits) and produce restraint.

Our model addresses this issue differently. Williams and Hawkins (1986) also observe that stigma from the act is likely to be least relative to stigma from arrest, for crimes that are simply *mala prohibita*, like marijuana use or drunk driving among college students. That said, even for relatively *mala prohibita* crimes, *some* influence by independently triggered extralegal constraints is likely. Our model accounts for such moral opposition through the utility function. As such opposition increases, U(Benefits) is reduced. For individuals whose independent restraint is of such magnitude that under

no circumstances would they offend, we assume the crime is not therefore beneficial. In this case, U(Benefits) = 0 and, by the logic of eq. (2), the crime will not occur.[2]

Eq. (2) embodies the traditional certainty and severity predictions. An increase in either the certainty of punishment, p, or the severity of legal sanction, Legal Costs, increases the right side of the inequality, thus reducing the likelihood of offending. This rudimentary expression highlights the tenuousness of a celerity effect under current theory – unlike the certainty and severity prediction, a celerity effect is not formally represented.

We next remedy this deficiency by formally accounting for the independent effects of the *timing* of costs and rewards on the criminal decision. Complex problems often demand two types of commensuration. One relates to unlike quantities -- for example, the pleasure from stealing a desired object must be balanced against the cost of being attacked by the owner during its theft.[3] Another entails the commensuration of like quantities that occur at different times. For example, a certain $500 fine in the future may not entirely offset an immediate $500 in stolen cash. Though nominally equivalent quantities, a direct comparison requires assignment of the $500 *future* loss some "present-day" magnitude. This latter type of commensuration is particularly relevant for criminal decision-making -- while the benefits from crime often accrue immediately, the costs must typically await the outcome of a criminal investigation or legal proceeding.

[2] We introduce later a new method to identify such individuals and thus determine the robustness of our results to their exclusion from the analysis.

[3] The utility function, U(*), accomplishes this first type of commensuration.

Our model uses the notion of discounting as an "inter-temporal exchange rate" to balance future costs with immediate gains. We thus incorporate a discount factor, δ_t, that assigns weight to future costs for contemporaneous decision-making. In the expanded model, offending depends upon whether

$$U(\text{Benefits}) > p*U[\delta_t\ (\text{Legal Costs} + \text{Extralegal Costs})] \quad (3),$$

where the value of the discount factor is:

$$\delta_t = 1/(1+r)^t \quad (4).$$

In this expanded model, the sum of legal and extralegal costs is scaled by δ_t. The degree of scaling depends on t, the number of time periods over which onset of the sanction is expected to be delayed ("celerity"), and r, an individual's "discount rate" which governs the degree to which delay produces the devaluation of future consequences ("impulsivity").

We illustrate the impact of t and r on δ_t with an example. Table 1 computes δ_t for t = 1, 2, and 3 periods of delay and for r =.10 and r =.20. Also reported are the counterpart present values of a $1000 fine for various combinations of t and r. As illustrated previously, higher discount rates connote greater impulsivity. To reflect this, the discount factor produces a greater proportionate reduction in the future costs of crime, the higher the value of r. For example, assuming a sanction is delayed one period, for r =.10, the discount factor is .91, while for r = .20, δ_t = .83. Thus while the present day

equivalent of a $1,000 fine for t=1 and r=.10 is $910, this value falls to $750 for the more impulsive individual with r=.20.

The discount factor also operationalizes the concept of celerity. For a given impulsivity level, the decay in deterrence depends on t -- the longer the expected delay, the greater the decline. For example, for r=.10 and t=2, δ_t = .83, whereas when t is increased to 3, δ_t = .75. When our hypothetical $1,000 fine is delayed 2 time periods, its present impact equates to an immediate $830 fine, and an additional period of delay reduces its present impact to $750.

The full model in eq. (3) integrates important features of theoretical and empirical deterrence research. The model recognizes that severity effects are possible from both legal and extralegal sanctions. It expands the traditional approach by linking punishment celerity to punishment certainty and severity. It also integrates situational characteristics of the offending decision, namely certainty, severity, and celerity, with present orientation, an individual trait. Incorporating these several themes into one model improves the framework for studying the criminal decision and also provides a guide to model specification. Key predictions that were tested in the empirical analysis include:

1. Standard Deterrence Predictions relating to Certainty, Severity, and Celerity.

As noted earlier, the right-hand side of the inequality in eq. (3) measures the "down-side" of crime, or the expected negative consequences of apprehension and conviction. The likelihood the individual will experience the costs, U[δ_t (legal sanctions + extralegal sanctions)], increases in proportion with p, the probability of sanction. Thus,

the model accords with the commonsense prediction that the dis-utility of crime increases with p, the certainty of punishment.

Similarly, the dis-utility of crime increases as the costs of its legal consequences increase. This accords with the prediction that greater punishment severity should produce greater deterrence. The amount by which legal sanctions (and extralegal sanctions) reduce utility depends upon the discount factor, δ_t. As δ_t becomes smaller, the individual places less weight on the future punishment. As demonstrated above, δ_t declines as t, the delay to punishment, increases. The result is the standard celerity prediction — the longer the delay to punishment, the smaller its deterrent effect.

2. The Deterrent Impact of Extralegal Sanctions Is at Least as Large as for Legal Sanctions

Numerous studies have shown that a belief illicit conduct is wrong (cf., Foglia, 1997; Burkett and Ward, 1993; Paternoster and Simpson, 1996) and the fear of peer disapproval, embarrassment, or social stigma (cf., Williams and Hawkins, 1992; Tittle, 1980; Grasmick and Bursik, 1990; Zimring and Hawkins, 1973; Andeneas, 1974; Nagin and Paternoster, 1994) discourage offending behavior. In our model, the relative deterrent impact of legal and extra-legal sanctions is an empirical not a theoretical issue. We introduce below a novel method for estimating these two costs in a common metric, dollars, in order to compare their relative sizes.[4]

[4] However, note that if the extra-legal cost are experienced immediately following detection but the legal costs are delayed following conviction and exhaustion of appeals,

3. The Deterrent effects of legal sanctions are smaller for more present-oriented individuals.

This prediction follows directly from our discussion of the celerity prediction above. We again refer to the cost side of the inequality in eq. (3), U[δ_t (legal sanctions + extralegal sanctions)], representing the "discounted," expected negative consequences, legal and extra-legal, from apprehension and conviction. As legal sanctions increase, so too does the dis-utility from crime, producing a severity effect. However, in the model, the costs of conviction are reduced by a discount factor, δ_t, before they are balanced against the benefits. As Table 1 demonstrates, the discount factor declines with r, our theoretical measure of present-orientation. Higher discount rates produce larger reductions in the magnitude of legal sanctions, thus lessening the dis-utility threatened by a possible legal sanction.

4. The Certainty of Punishment is a Greater Deterrent than the Severity of Punishment.

Consider again the punishment component of eq. (3), p*U[δ_t (legal sanctions + extralegal sanctions)]. An increase in p increases the likelihood of experiencing both the legal and extra-legal cost of conviction, whereas an increase in legal sanctions directly affects only one of the two sanction forms. Thus, as emphasized by Williams and Hawkins (1986) an increase in p triggers both legal and extra-legal consequences. The

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a celerity-type argument can also be made for the greater impact of extra-legal consequences.

implication is that even if the magnitude of legal sanctions is small, increases in certainty will have a deterrent effect even as increases in legal sanctions have none.

METHODS

To investigate the predictions outlined above, we administered a survey to several large undergraduate classes at the University of Arizona. The survey posed the following drunk driving scenario involving the possibility of driving while over the legal limit for blood-alcohol level:

> Suppose you drove by yourself one evening to meet some friends in a bar on fourth avenue. Since it is a holiday, the police have increased the number of drinking and driving patrols, and may even conduct random sobriety checks. By the end of the evening, you've had enough drinks so that you're pretty sure your blood alcohol level is above the legal limit. Suppose that you live about 10 miles away and you have to be at work early the next morning. You can either drive home or find some other way home, but if you leave your car at the bar, you will have to return early the next morning to pick it up.

Fourth avenue, which is the site of several popular night-spots, is well known to most University of Arizona students. We chose the issue of drinking and driving and set the scenario in a familiar locale in order to lend realism to subjects' judgments.

Before estimating the chance they would drive under the circumstances above, respondents estimated on a scale from 0 to 100 the likelihood they would be apprehended and convicted of drunk driving if they drove home. We label this variable CERTAINTY.[5] We next informed subjects of the timing (CELERITY) and SEVERITY of the penalty, which involved a suspension of driving privileges. We randomly assigned subjects one of three different suspension lengths: 3, 9, or 15 months. For each subject, we employed one of three different celerity levels. Subjects were informed the

[5] Rather than experimentally manipulate punishment certainty, we allow subjects to estimate their own certainty level. We do this to avoid the artificiality of furnishing detection probabilities that subjects may find unrealistic. Klepper & Nagin (1989) outline the rationale for this approach in detail.

suspension period could be expected to begin either 6, 12, or 18 months from the date of the offense. Our experimental manipulations thus produced a 3 x 3 factorial design. After providing a certainty estimate and learning of the severity and celerity level, each subject estimated on a scale from 0 to 100 the likelihood they would drive home under the circumstances provided in the scenario. This response, which we denote by LIKELIHOOD OF OFFENDING, is the response variable for the analysis.

The model also requires that we measure two additional aspects of the decision environment—the degree to which the subject is influenced by extra-legal compared to legal sanctions and the subject's degree of present orientation. To measure the former, subjects were asked to imagine that they indeed drove home and received a summons for drunk driving, and that they were assigned a court appointed lawyer with whom their chance of escaping conviction was 50%. However, they could hire lawyer B, who over many years and drunk driving cases, had never lost a case. With lawyer B, the subject was virtually assured of escaping conviction. The subjects were asked to provide the maximum total legal fee they would pay to retain lawyer B. The total cost of conviction (TOTAL COST) including both legal and extra-legal consequences was estimated at 2 times (=1/.5) their answer to this question.[6] Next, subjects were asked to assume lawyer B was too busy to handle the case, but that lawyer C was available. Lawyer C is better than the court appointed lawyer, but not as good as lawyer B. Lawyer C could arrange

[6] Since subjects had a 50% chance of an outright acquittal with the public defender, the sum reported equated to the "purchase" of the remaining 50% chance of escaping a conviction and its attendant consequences. We therefore multiplied the answer by 2 in order to obtain the total value placed on avoiding conviction.

the following plea bargain: the subject would plead guilty to drunk driving but avoid any legal penalties. Thus, with Lawyer C the legal consequences of conviction are avoided but the extra-legal consequences are not. Subjects now provided the maximum total legal fee they would pay to hire lawyer C. We estimate the dollar value the respondent places on extra-legal consequences (EXTRA-LEGAL COST) by two times the difference in the respondent's willingness-to-pay for lawyers B and C.[7]

We elicit subjects' discount rates with a question patterned directly on the logic of the discount factor. The procedure is one of several that have been used in the decision-making literature to elicit discount rates for non-pecuniary consequences (Cropper, Aydede, and Portney, 1994; Frederick, 1999). Subjects were asked to imagine they were convicted for drunk driving, and while some judges imposed a license suspension immediately, others permitted the suspension period to begin on some later date. The subject filled in the blank in order to complete the following statement: "I can't decide which penalty is worse – a 6 month suspension beginning immediately or a ___ month suspension beginning in t (t = 1, 2, or 5) year(s)." Each subject answered three such questions, one for each possible value of t.

Each such response to this question was used to solve for the value of the discount rate, r, that equates the relationship, 6 Month Suspension = $(1/1+r)^t$(future equivalent). Rearranging the previous equation, that value of r equals (future equivalent/6 month suspension)$^{1/t} - 1$. For each subject, we average the three resulting estimates of r to form the variable, DISCOUNT RATE. As described below we also use a binary indicator

[7] During later multivariate analyses, we control for each subject's weekly income to account for possible heterogeneity in the "dis-utility" from the expenditure of legal fees.

variable called NEGATIVE DISCOUNTER, which equals 1 for individuals whose average discount rate was negative.

We also elicited several personal control measures. Each subject provided their AGE, GENDER, and WEEKLY INCOME. In addition, they indicated the number of times they had previously driven drunk (DRUNK DRIVING FREQUENCY) and whether they or any relatives or close friends had ever been involved in an alcohol related traffic accident (ACCIDENT). They were also asked whether they had ever been arrested for drunk driving or whether they had ever been convicted of drunk driving. Less than 3% of the sample responded affirmatively to these questions so these data were not used in the analysis.

RESULTS

A total of 252 University of Arizona undergraduates responded to the survey. The average age was 23 years old and 54% of subjects were male. The average weekly income in the sample was $271, with 12% of subjects indicating they earned less than $100 per week and 15% stating they earned more than $500 weekly. Respondents admitted to considerable drinking and driving — the mean number of times subjects reported having previously driven drunk was 8 with 17% admitting they had done so on more than 20 occasions.[8]

On average, the imputed cost of license suspension, the legal consequence of conviction, was $2,307. Variation across respondents was substantial. The 10th percentile imputed value was $0 whereas the 90th was $20,000. Subjects' imputed value of extra-legal consequences was $4,343, nearly double the value for legal consequences.[9] Again variation across respondents was substantial. The 10th and 90th percentile imputed values were respectively $0 and $40,000. While this result suggests the greater prominence of extra-legal sanctions, we examine the impact of both sanction forms on offending behavior with a series of regressions.

The first column in Table 2 reports a baseline regression that provides a starting point for further analyses. We omit the variables AGE, ARREST, and CONVICT from this and further regressions because of insufficient variation in subjects' responses. The dependent variable is the subjects' estimate on a scale from 0 to 100 of the likelihood that, under the circumstances described in the scenario and given the penalty if caught,

[8] Appendix 1 contains a complete list of variables and corresponding summary measures.

[9] p=.000 for two tailed hypothesis test for difference in means.

they would drive home while intoxicated. Since a substantial proportion of respondents (32%) answered 0, we estimate all results using Tobit regression.

We find both a certainty and a severity effect. In the baseline regression in Table 2, the coefficients for both sanction probability and severity are negative and statistically significant for α=.05 or smaller. As for the magnitude of the certainty effect, the estimated coefficient suggests on average each 10% increment in sanction probability (e.g., from 40% to 50%) reduces subjects' probability of driving drunk by 3.3%.[10] Since the average reported offending likelihood in the sample was 31% with a median of 20%, the 10% increment in sanction probability produces about a 10% reduction in offending likelihood from its mean value. As for the severity effect, its coefficient estimate implies that a ten month increase in the suspension period will reduce the drunk driving probability by 6.8%. While the coefficient for celerity is positive and hence in the predicted direction, it is statistically indistinguishable from zero. The only other variable

[10] The tobit model assumes the observed response variable y is related to a latent variable, $y^*=x\beta+\varepsilon$ as follows: y=0 if $y^* \leq 0$ and y=y* if y*>0. The model assumes that ε is normally distributed with mean zero and standard deviation σ. Following Greene (1990), we compute the marginal effect of a covariate x_j on the censored quantity y by $P(y^*>0)\beta_j$ where P(y*>0) is the probability of y*>0 and β_j is estimated impact of x_j on y*. According to this relationship a one unit change in x does not change y by the full amount of β. Instead the impact must be factored down by P(y*>0). Thus, in calculating the impact of a specific regressor on the probability of drunk driving we multiply the estimated regression coefficient by the proportion of the sample who report a non-zero probability of driving drunk, .68.

that significantly predicts offending in this baseline model is previous drinking and driving. The number of times a respondent admits to previous drinking and driving is positively related to their reported offending likelihood. While this result is not surprising, it bolsters our confidence in the validity of subjects' responses.

Table 2 also enables us to compare the deterrent impact of extra-legal and legal sanctions. Model 2 adds these two imputed costs to the baseline regression. Controlling for a subject's weekly income, the value placed on avoiding the extra-legal consequences of conviction significantly predicts offending behavior whereas the value placed on avoiding the legal consequences does not. The coefficient for EXTRA-LEGAL COST suggests each $1,000 increase in the value placed on avoiding the extra-legal consequences produces an additional .7% worth of deterrence.

The results thus far provide some support for our second hypothesis that the deterrent impact of extralegal sanctions is at least as great as that for legal sanctions. First, subjects place far greater monetary value on avoiding the extra-legal consequences of conviction. Second, in model 2, adding the EXTRA-LEGAL COST causes an approximate 15% reduction in the severity coefficient and reduces its significance level to marginal status ($p<.07$). Yet these findings yield an apparent contradiction—while the length of the license suspension (SEVERITY) appears to predict offending, the monetary value placed on avoiding the license suspension does not. This latter finding remains intact even when we estimate model 2 without SEVERITY to purge any colinearity with legal costs.

This finding suggests much of the deterrence produced by legal sanctions occurs from their tendency to produce greater extra-legal consequences.[11] We find some support for this view from a regression of the value placed on avoiding the extra-legal consequences on the severity level, controlling for weekly income. The coefficient for severity is positive and marginally significant ($p<.1$). This suggests that the severity of extra-legal consequences may depend upon the severity of the legal sanction imposed.

We next examine the "discounting" hypothesis, under which greater present-orientation is expected to diminish the deterrent impact of legal sanctions. Figure 1 presents a histogram of the distribution of discount rates across the sample. We note first the immense variation in subjects' responses, which range from –175% to +364%. Recall that the discount rate represents the economic embodiment of present-orientation, with higher discount rates reflecting a greater propensity to reduce the weight afforded delayed consequences. To illustrate how these results apply to criminal sanctions, consider two individuals, one with a discount rate of 0% and the other whose discount rate is 100%. The zero discount rate implies consequences receive equal weight for decision-making regardless of when they are expected to occur. For this individual, the six month suspension beginning immediately provides the same deterrent impact as a six month license suspension beginning 1, 2, or 3 years from now. Contrast this weighting with an individual whose discount rate is 100%. For this individual, an immediate 6 month sanction is as aversive as a 12 month sanction one year from now and a 24 month sanction beginning two years from now.

[11] Williams and Hawkins (1986) term this type of deterrence "stigma from arrest."

The distribution of discount rates in Figure 1 provides another notable finding. A celerity effect assumes people prefer to delay adverse outcomes, a preference that should be reflected by a positive discount rate. Yet a substantial proportion of subjects, 21%, reported a negative discount rate. For these individuals, a six month suspension beginning immediately corresponded to a suspension of *less than six months* in the future, suggesting these subjects would prefer to endure the punishment as soon as possible. The presence of such "negative discounters" challenges a key assumption on which the existence of a celerity effect rests. This unexpected variation in subjects' preferences for the timing of penalties provides a further opportunity to probe the role of present-orientation. For whatever reason, negative discounters prefer to endure adverse outcomes immediately. In this sense, they are just the opposite of the high-risk, "present oriented" group that figures so prominently in theories of persistent individual differences – negative discounters are immensely "future oriented."[12]

Table 3 reports five regressions exploring the role of present-orientation, as operationalized by the discount rate. The first column of Table 3 contains what we term an enhanced baseline model, which is identical to the baseline model in Table 2, except for inclusion of the extra-legal conviction cost variable. Models 2 and 3 test for main effects of discounting. In the former, we add the discount rate to the enhanced baseline model. In the latter, we replace the discount rate with an indicator variable equal to 1 for negative discounters. While the discounting variable in model 2 falls short of statistical

[12] Lowenstein (1987) contains an insightful discussion of the broader implications of negative discounting.

significance at conventional levels ($p<.12$), its positive sign comports precisely with the Gottfredson/Hirschi and Wilson/Herrnstein views of present orientation.

The indicator variable for negative discounting in model 3, however, is significantly related to drunk driving probability. As predicted, negative discounters report lower probabilities of driving while drunk. This negative discounting effect is also quite large -- ceteris paribus, negative discounters are 9.8% points less likely to drive while drunk, a 22% reduction from the sample average of 34%.

Models 4 and 5 duplicate models 2 and 3, except for the inclusion of an interaction between the discounting variable and sanction severity. If greater present orientation reduces the severity effect, the interaction of severity with the discount rate should be positive – that is, the higher the discount rate the less negative is the relationship between sanction severity and offending. We find some support for this prediction in model 4, in which we obtain a positive interaction coefficient. The effect is not, however, statistically significant.

Model 5 is also suggestive. This model includes an interaction of the negative discounter variable and sanction severity. According to our theory, greater present orientation reduces the influence of sanction severity, thus, we expect a negative coefficient for the interaction. For negative discounters, severity should be a greater deterrent than for positive discounters. We obtain precisely this result with a negative coefficient for the interaction variable ($\beta = -1.64$) but again this interaction falls short of statistical significance ($p<.13$). Still the point estimate suggests a large impact. When considered in tandem with the main effect severity coefficient in model 5, -.56, the

severity effect for negative discounters is nearly four times as large (-1.64-.56/.56) as for positive discounters.

We next test the robustness of our findings to the assumption in our model that extralegal sanction costs are triggered primarily by the imposition of a legal sanction. Our survey instrument included a method for identifying individuals whose opposition to the contemplated act appeared independent of potential contact with the criminal justice system. Following the question eliciting respondents' offending likelihood under the penalty conditions in the scenario, respondents were asked to report their offending likelihood if there were no possibility of punishment. For the approximate 15% of subjects answering '0' to both questions, we inferred that the act posed by the scenario afforded no inherent benefits.[13]

Each of the five models in Table 3 was re-estimated after excluding the above-described subjects from the sample. All results were essentially unchanged, except for a shift in the relative magnitude of certainty and severity effects. For instance, for the enhanced baseline model estimated on the full sample, an absolute increase in the probability of apprehension of 10% is predicted to reduce the offending probability by 3.5%, whereas the counterpart impact based on the sample without the committed nonoffenders is 2.7%. This occurred because the excluded subjects estimated a substantially greater probability of punishment (66%) than the balance of the sample (43%). By definition, such subject also reported an offending likelihood of '0.' Reducing the sample in this fashion therefore purged subjects with both high certainty estimates and low offending likelihoods, precisely the group contributing most to the

[13] For such individuals, U(benefits)=0.

magnitude of an estimated certainty effect. Since the magnitude of the severity effect was unchanged, by implication, the certainty effect was smaller relative to the severity effect when committed nonoffenders were removed. Beyond this one difference, our results were robust to the exclusion of such independently constrained subjects.

Our final prediction concerns the comparative deterrent effect of certainty and severity effects. While we found significant main effects for each of these variables, their interaction does not significantly predict offending. Further, with the inclusion of a certainty-severity interaction in the enhanced baseline model, the severity effect is eliminated ($p<.6$) whereas the certainty coefficient remains statistically significant and nearly unchanged. This is one of several findings indicating that the certainty main effect is far more robust than the severity main effect. The sensitivity of the severity main effect to model specification should not, however, be interpreted to mean that the severity effect is spurious. To the contrary, it is in fact the product of randomized assignment. Instead we interpret its sensitivity to model specification as reflecting the possibility that the severity impact is largely mediated by extra-legal sanction costs and its attendant trigger mechanism sanction probability. It is in this sense that the results support the prediction that certainty effects will be more pronounced that severity effects.

DISCUSSION

We view this as the initial rather than final step in testing our integrative model of the deterrent effects of the certainty, severity, and celerity of punishment. It would be fruitful to test all aspects of the model with non-college student populations using a similar instrument, but for offenses even more serious than drunk driving. Special emphasis should be given to populations with large numbers of active offenders and individuals at high risk of offending. In this regard, high priority should be given to assembling data from individuals under the control of the juvenile and adult justice systems.

We also believe that broader application of the procedure demonstrated here for monetizing perceptions of legal and extra-legal costs has promise for illuminating a number of issues of considerable importance to criminology and public policy. One is the impact of contact with the criminal or juvenile justice system on such perceptions. Much of the extra-legal costs arise from the social stigma attendant to being formally sanctioned. However, following an individual's first experience with the criminal justice system, this stigma cost may be eroded substantially. Testing this hypothesis convincingly requires longitudinal data on legal and extra-legal cost perceptions for a population at high risk of contact with the justice system. Assembling such data would be a difficult but not impossible task.

Nagin (1998) observed that the stigma cost of sanctions likely depends upon the rarity of actual punishment: Just as the stigma of Hester Prynne's scarlet "A" depended upon adultery being uncommon in Puritan America, a criminal record cannot be socially and economically isolating if it is commonplace. Thus, policies that are effective in the

short term may erode the very basis for their effectiveness over the long run if they increase the proportion of the population who are stigmatized. It would also be valuable to conduct a study of perceived legal and extra-legal costs across an ethnically and racially diverse sample to test whether the extra-legal cost perceptions of individuals vary systematically with their group's level of contact with the justice system.

As for the celerity effect, further testing is necessary before it can be confidently concluded that the impact of celerity is immaterial. Ours is among only a handful of studies that have tested for celerity effects in a deterrence framework (cf. Howe and Brandau 1988; Legge and Park 1994; Yu 1994), and is the first to explicitly model the interdependence between celerity and present orientation.

Since this was an initial foray, we applied the traditional and most widely held conceptualization of discount rates. In particular, our discount factor produces a function relating the discounted consequence to delay that is exponential and approaches linearity with higher discount rates. Yet application of discounting in other, non-pecuniary domains has uncovered evidence of a "hyperbolic" discount function (Loewenstein and Prelec, 1992). A simple manifestation of hyperbolic discounting is when individuals "choose the larger and later of two alternative cash prizes when both are distant, but change to the smaller, earlier one as they draw nearer" (Ainslie and Haendel, 1983). This anomaly implies consequences may receive a sharp reduction in weight over initial delays, but that such discounting "levels off" as the consequence becomes increasingly temporally remote.

In terms of criminal decision making, hyperbolic discounting implies a pronounced diminution in the impact of sanctions over initial, small delays, with such

diminution becoming rapidly less discernible over time. The possibility of hyperbolic discounting may well explain our failure to find a celerity effect. We manipulated punishment delay across three levels: 6, 12, and 18 months. By 6 months, the discounting function for punishment may already flatten out so that delays beyond this point seem relatively insubstantial. More work is needed to test for celerity effects in our integrated framework with hypothetical delays over more immediate time periods. Such investigation would be especially pertinent to drunk driving policy since several states are at least considering policies under which driving privileges are suspended immediately when a driver's blood alcohol level is discovered to be over the legal limit. More generally, better specification of a discounting function for punishment will help predict the likely magnitude of celerity effects for various periods of delay.

Finally, individual attitudes toward *when* the consequences of crime are likely to occur should be distinguished from individual attitudes toward risk. As with impulsivity, attraction to adventure and thrill seeking is also hypothesized by individual difference theorists to comprise part of an underlying criminal propensity (Gottfredson and Hirschi, 1990). While impulsivity focuses on the timing of consequences, risk attitudes implicate their likelihood.

In decision-making parlance, the criminal opportunity presents a choice between a sure thing, restraint from the criminal act, and a gamble that arises since the contemplated conduct can produce a gain with some probability and a loss with complementary probability. Individuals who tend more toward the safety of a sure thing rather than risk a loss are considered risk averse. In contrast, individuals with the opposite propensity, namely to risk a loss for even the slightest chance of reward, are considered risk seeking.

At least several studies have found an association between this risk seeking propensity and criminal behavior (Block and Gerety, 1995; Buck, 1989).

As risk preference and time preference embody disparate decision making concepts, a useful next step would explore how much of our discounting effects may be attributable to the preference for risk. In this spirit, the next phase of model testing should incorporate appropriate risk preference controls. Such efforts would only propel us further down what we believe is the valuable path of integrating core decision making concepts into one deterrence model to generate a better informed theory and more sensible policies.

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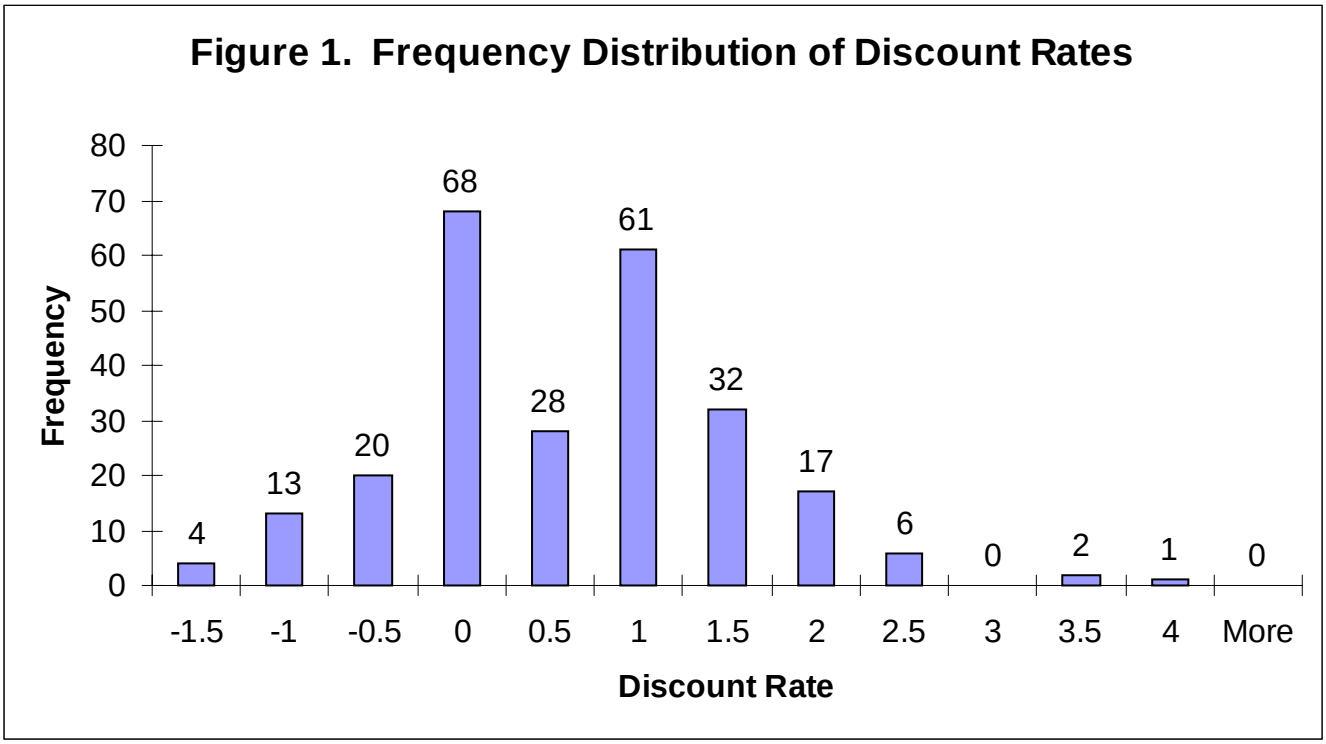

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Table 1. Discount Factor and Present Dollar Equivalents for Various Discount Rates and Periods of Delay

	Discount Factor (δ_t)		Present Value of $1,000	
Expected Payment Period (t)	r = .10	r = .20	r = .10	r = .20
t = 1	.91	.83	$910	$830
t = 2	.83	.70	$830	$700
t = 3	.75	.57	$750	$570

Table 2. Tobit Regressions: Dependent Variable is LIKELIHOOD OF OFFENDING
(standard errors in parentheses)

	Baseline Model	Model 2	Model 3
SEVERITY	-1.01*	-.86	-.88
	(.47)	(.47)	(.47)
CERTAINTY	-.49**	-.51**	-.51**
	(.09)	(.09)	(.09)
CELERITY	.37	.53	.52
	(.48)	(.48)	(.48)
ACCIDENT	.33	1.06	1.25
(Yes =1; 0 otherwise)	(4.62)	(4.64)	(4.57)
GENDER	.55	2.79	2.84
(Male=1; 0 otherwise)	(4.99)	(4.99)	(4.98)
DRUNK DRIVING FREQUENCY: # Times Previously Driven Over Legal Limit	1.51**	1.44**	1.43**
	(.28)	(.27)	(.27)
WEEKLY INCOME	.002	.007	.007
	(.015)	(.015)	(.015)
EXTRA-LEGAL COST: dollar value placed on avoiding extra-legal sanction		-.001*	-.001**
		(.0005)	(.0004)
LEGAL COST: dollar value placed on avoiding legal sanction		-.0002	
		(.0007)	

Notes: 1 – For all regressions, n = 251; sample excludes 1 outlying observation.
2 – Constant included in all models
3 - * denotes $p < .05$ for H_0: $\beta = 0$.
4 - ** denotes $p < .01$ for H_0: $\beta = 0$.

Table 3. Tobit Regressions Testing Discounting Effects: Dependent Variable is Offending Likelihood
(standard errors in parentheses)

	Enhanced Baseline	Model 2	Model 3	Model 4	Model 5
SEVERITY	-.88 (.47)	-.95* (.47)	-.95* (.47)	-1.09* (.52)	-.56 (.53)
CERTAINTY	-.51** (.09)	-.50** (.09)	-.51** (.09)	-.50** (.09)	-.51** (.09)
CELERITY	.52 (.48)	.51 (.48)	.53 (.48)	.51 (.48)	.51 (.47)
Accident (Yes =1; 0 otherwise)	1.25 (4.57)	1.32 (4.60)	.44 (4.57)	1.31 (4.59)	-.25 (4.56)
Gender (Male=1; 0 otherwise)	2.84 (4.98)	5.26 (4.85)	5.40 (4.81)	4.80 (4.90)	4.42 (4.82)
DRUNK DRIVING FREQUENCY: # Times Previously Driven Over Legal Limit	1.43** (.27)	1.30** (.27)	1.32** (.26)	1.30** (.27)	1.33** (.26)
WEEKLY INCOME	.007 (.015)	.0003 (.0144)	.001 (.014)	.000 (.014)	-.001 (.014)
EXTRA-LEGAL COST: dollar value placed on avoiding extra-legal sanction	-.001** (.0004)	-.001** (.0004)	-.001** (.0004)	-.001** (.0004)	-.001** (.0004)
DISCOUNT RATE: average of subject's three annual discounting measures		4.02 (2.58)		1.35 (5.09)	
NEGATIVE DISCOUNTER: (1 if negative discount rate, 0 otherwise)			-14.4** (5.62)		-.47 (10.69)
Interaction: SEVERITY*DISCOUNT RATE				.30 (.50)	
Interaction: SEVERITY*NEGATIVE DISCOUNTER					-1.64 (1.08)

Notes: 1 – For all regressions, n = 251; sample excludes 1 outlying observation.
2 – Constant included in all models
3 - * denotes $p < .05$ for H_0: $\beta = 0$.
4 - ** denotes $p < .1$ for H_0: $\beta = 0$.

Appendix I. Means and Standard Deviations for Study Variables.

	Mean	Standard Deviation
SEVERITY	8.83	4.96
CERTAINTY	46.54	27.27
CELERITY	12.05	4.80
ACCIDENT (Yes =1; 0 otherwise)	.55	.50
GENDER (Male=1; 0 otherwise)	.54	.50
DRUNK DRIVING FREQUENCY: # Times Previously Driven Over Legal Limit	7.54	9.03
WEEKLY INCOME	270.31	161.76
EXTRA-LEGAL COST: dollar value placed on avoiding extra-legal sanction	4343.36	10121.20
LEGAL COST: dollar value placed on avoiding legal sanction	2307.12	5471.68
DISCOUNT RATE: average of subject's three annual discounting measures	.42	.89
NEGATIVE DISCOUNTER: (1 if negative discount rate, 0 otherwise)	.25	.44

Appendix II. Partial Correlations among Study Variables

	SEVERITY	CERTAINTY	CELERITY	ACCIDENT	GENDER
SEVERITY	1.0				
CERTAINTY	-.08	1.0			
CELERITY	-.10	.08	1.0		
ACCIDENT	-.06	-.02	.02	1.0	
GENDER	-.07	-.19	.01	.08	1.0
DRUNK DRIVING FREQUENCY:	-.03	-.30	.06	.11	.28
WEEKLY INCOME	.09	-.15	-.03	-.05	.02
EXTRA-LEGAL COST	.01	-.13	.09	.06	.05
LEGAL COST	.17	-.03	.07	-.13	.03
DISCOUNT RATE:	.04	-.01	.02	-.03	.01
NEGATIVE DISCOUNTER	-.04	.01	.01	-.01	-.01

	DRUNK DRIVING FREQ.	WEEKLY INCOME	EXTRA-LEGAL COST	LEGAL COST	DISC. RATE
DRUNK DRIVING FREQUENCY:	1.0				
WEEKLY INCOME	.07	1.0			
EXTRA-LEGAL COST	.09	.18	1.0		
LEGAL COST	-.02	.09	.53	1.0	
DISCOUNT RATE:	.02	-.12	.13	.08	1.0
NEGATIVE DISCOUNTER	-.02	.06	-.06	-.06	-.63