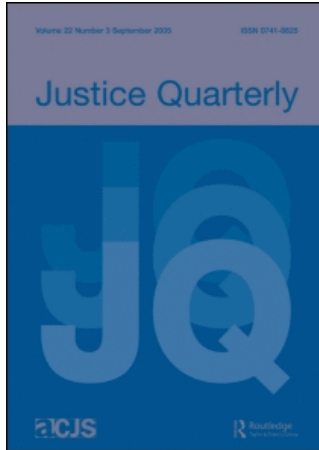


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On: 17 April 2008
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Publisher: Routledge
Informa Ltd Registered in England and Wales Registered Number: 1072954
Registered office: Mortimer House, 37-41 Mortimer Street, London W1T 3JH, UK



Justice Quarterly

Publication details, including instructions for authors and subscription information:
<http://www.informaworld.com/smpp/title~content=t713722354>

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Online Publication Date: 01 December 2007

To cite this Article: Hochstetler, Andy, DeLisi, Matt and Puhmann, Aaron M. (2007) 'Toward an Integrated Model of Offending Frequency: A Replication Study', Justice Quarterly, 24:4, 582 - 599

To link to this article: DOI: 10.1080/07418820701717128

URL: <http://dx.doi.org/10.1080/07418820701717128>

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Toward an Integrated Model of Offending Frequency: A Replication Study

Andy Hochstetler, Matt DeLisi and Aaron M. Puhmann

Criminology is limited by a paucity of replication studies. As such, the measurement of key concepts and the empirical support for theory is open to skepticism. Drawing on the RAND Survey of Inmates and a replication of it, the current study developed an integrated model of offending frequency that contained measures from the rational choice, criminal identity, and criminal careers literatures. A confirmatory structural equation model revealed that criminal self-concept partially mediated the effects of background risk factors. Perceived costs of crime had no significant effect. Perceived benefits of crime were directly and indirectly (through criminal identity) related to offending frequency. However, differences in measures and variance across data sets contributed to discrepant model fit. This attests to the importance and increasing need for precise replication in criminological research.

Introduction

Replication is rare in criminology. Although repeated examinations of concepts and theories are common, these tests are seldom conducted with the same variables, measures, or data. As a result, the reliability of both findings and measures is open to skepticism in central areas of research. For instance, few measures designed to assess offender perspectives have been applied in studies of criminal offending. Fewer still can be accepted on defensible empirical grounds as validated measures. Almost none are conventional.

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The tendency to devise new measures before adequately exploring older ones is particularly common in research employing structural equation models. Often these are explored and confirmed on a single data set. Many confirmatory and measurement models in journals have received creative and statistical refinement, possibly because of the programming ease for revising the structure of sophisticated models (Cuttance & Ecob, 1988). It is conventional in criminology for investigators to correlate error terms, perform cross-group interactions, adjust paths to achieve reasonable fit, identify promising modification indices, and produce findings. Unfortunately, the empirically based improvements that result are likely to capitalize on chance. Although criminologists sometimes caution readers that models are fit as best as possible to the data in use (e.g., DeLisi, Hochstetler, & Murphy, 2003, pp. 259-260), calls for replication are usually unanswered. As such, the line between confirmatory and exploratory analysis is dangerously thin in the absence of replication.

Research Purpose

The RAND Survey of California Prison Inmates is one of the few survey instruments that contains an array of important criminological variables and has been administered to multiple samples of offenders (Chaiken & Chaiken, 1984; Peterson, Braiker, & Polich, 1981; Peterson, Polich, & Chaiken, 1977). Drawing on the original study and a replication, the current research purpose was to examine a theoretical model with an eye toward confirming findings and exploring differences across samples. Specifically, we assess the relationship between background risk factors on offending frequency and the extent that both criminal self-concept and perceptions of the costs and benefits of crime mediate it. The model is not creative. It arranges variables in a way that reflects a simple interpretation of theory on criminal choice and offender self-concept. Variables appear chronologically and in roughly the same order that they appear in the survey. Those on the far left side occur in early life. Those in the middle are attitudinal and were presumed by investigators to have some stability. The dependent variable, a measure of offending frequency or lambda, reflects criminal activity in the last period of criminal offending. The layout of the survey and codebook calls out for such a model, and earlier work based on the survey supports the logic we used to order variables. Importantly, the current study is limited to conventional or street crimes and is not generalizable to other forms of deviance, such as white-collar or political crime.

Literature Review

Criminal Decision-Making

Conventional or street crimes are generally not the result of careful, deliberate, and well-crafted decisions. Offenders give limited attention to formal costs in

decision-making processes; their deliberation usually is brief and imprecise, and reflects a desire to avoid immediate detection (Gottfredson & Hirschi, 1990; Tunnell, 1992; Wilson & Abrahamse, 1992; cf. Tremblay & Morselli, 2000). Benefits of crime need only be immediate to entice those already looking for criminal opportunity. It might be tempting to conclude that the characteristic sloppiness of crime and the hedonistic activities that precede it imply that continuing in criminal activity is as irrational and even unpredictable. Some have taken the apparent impulsiveness and poor planning that are characteristic of offenses to be the intrinsic link between offender traits and the allure of crime. Continuance in crime is portrayed as one result of a consistent inability to rationally calculate outcomes on the part of the offender that makes immediately gratifying, exciting, and risky behavior of all sorts appealing (Gottfredson & Hirschi, 1990). Other limitations of a rational choice approach to criminal decision-making include the inaccuracy of the offenders' calculations, the exclusion of other relevant explanations, the failure to account for crime among persons who cannot legally form criminal intent, and the neglect of emotion and experience as bases for decision-making (Bouffard, 2002; Brezina, 2002; Nagin & Paternoster, 1993; Piquero & Tibbetts, 1996).

There is reason to believe, however, that this oversimplifies criminal decision-making and the offenders' perspective when contemplating conventional or street crimes. Offenders act with reference to their experience that is rooted in previous crimes and scripts of how to react to opportunities. Perceptions of the attractiveness of crime vary by person and with practice. It is not only thrills and sensations that attract the impulsive to crime, but also different estimates of costs and benefits formed in antecedent criminal pursuits (Exum, 2002; Pogarsky, Piquero, & Paternoster, 2004). Several scholars have found that familiarity with the consequences of criminal offending allow a person to identify and appreciate criminal opportunities in a way that differs from the uninitiated or criminally inexperienced (Horney & Marshall, 1992; Topalli, 2005; Wright, Logie, & Decker, 1995). Thus, it would be difficult to convincingly argue that crime, and the decisions producing it, are wholly erratic, impulsive, or accidental reactions for those who engage in it continually. It is foolhardy to assert that an inability to see and predict consequences of crime and criminal lifestyles is characteristic of practiced offenders who know vicariously and through personal experience the consequences of their acts. For many, parts of the criminal decision already are resolved, and responses to various forms of events and criminal opportunities are "standing decisions" (Cook, 1980).

Criminal Self-Concept

Experienced offenders have accepted their potential for criminal behavior and incorporated it into their self-concept. For many, criminal opportunities offer a chance to accomplish particular goals, such as the pursuit of a generalized criminal lifestyle (Steffensmeier & Ulmer, 2005; Tibbetts & Gibson, 2002; Tunnell,

2002; Wright & Decker, 1992). Indeed, offenders often see material and social rewards of crime that are less apparent to others. For instance, Pezzin (1995) showed that actual earnings and estimates of earnings prospects were significant and strong predictors of desistance, suggesting that the economics of offending occurs well before each crime (also see Tremblay & Morselli, 2000). Similarly, Shover (1996) identified several forms of criminal self-concepts that consistently shape persistent offenders' choices. Katz (1988) devoted a chapter to describing the special objectives of hardened offenders that potentially make the most "irrational" of crimes seem logical for these seasoned street toughs and participants in street culture. Finally, Anderson (1999) demonstrated that even street violence has special rewards for those who are taught to see interpersonal challenges through a tacit code of the streets (Brezina, Agnew, Cullen, & Wright, 2004; Heimer, 1997).

There is considerable and increasing overlap between contemporary rational choice approaches and other theories of offending (McCarthy, 1992, 2005; Piquero & Tibbetts, 2002). Indeed, much of criminology is devoted to showing that crime is not as irrational as it might seem, once the perceptions of offenders are considered. For example, Piquero and Tibbetts (1996) estimated structural equation models with self-control and moral beliefs conceptualized as time-stable variables and situational shame and perceived pleasure as situational variables. Their findings lend support to the contention that moral predisposition, a general outlook, influences situational variables measuring perception of crime. Others have found evidence that the effects of some basic correlates of crime are mediated and moderated by a great variety of cognitive traits and rational choice factors (Blackwell, Grasmick & Cochran, 1994; Nagin & Paternoster, 1993; Tibbetts, 1997; Tibbetts & Herz, 1996; Tittle, 1980).

Offending and Criminal Careers

Street offenders operate according to a logic drawn from their backgrounds in crime and related activities. They exhibit not only particular utilities but also estimates of costs and benefits bred by experience. For instance, Feeney (1986, pp. 66-67) observed that after only a few robberies, offenders were much more hardened to the consequences for victims and also less tentative and fearful. Of the 100 incarcerated robbers he interviewed, 30 percent admitted that they might commit further robberies when released. This finding contributed to the conclusion that when examining crime, the "decision should not be defined too narrowly ... there may be no single decision to begin robbing, to continue robbing, or even to desist from robbing. Rather, the offender has a whole thought process and belief system that ultimately lead to some kind of conclusion." The discussion of whether offenders are rational agents whose crimes should be seen as an outcome of deliberate choice vacillates between recognition that costs and benefits of crime contribute to it, and recognition that

offenders' weighting and estimation of these may be foreign to non-offenders. Crime, after all, is seldom part of any larger conventional pursuit, and it seldom makes a significant contribution toward success. Rather, continued crime is a logical avenue in further pursuit of a particular form of free, hedonistic, and spontaneous living that is attractive for some, despite negative outcomes. Even the most "irrational" of persistent offenders recognize their fate in occasional moments of clarity (Maruna, 2001; Shover, 1996).

Many persistent offenders initiate their criminal career early and take advantage of an increasing number of criminal opportunities across the life course. By and large, they are fully cognizant of the assorted pains and pleasures associated with a prolonged and sustained criminal lifestyle and criminal career (DeLisi, 2005; Steffensmeier & Ulmer, 2005). Rational-choice perspectives, those that aim at identifying the costs and benefits considered by offenders and their effects, can easily accommodate the fact that particular types of offenders view crime differently than the average person. For example, offenders may be in pursuit of what crime and the lifestyle that accompanies it have to offer. For the poor and already disreputable, there are a limited number of routes to experiencing the autonomy and escape that accompany the street offenders' approach to "life as party" (Shover, 1996; Wright & Decker, 1992). Offenders may see money as no more or less attractive than anyone else, for example, but they recognize that crime pays and suits the way that they would prefer to live. It might be said that they have a preference for money gained by illicit avenues, confusing the issue of motivation and opportunity. Continuance in a criminal career makes crime even more attractive. Offenders may come to view their criminal and life experience as a substitute for deliberation over each opportunity and "believe that they can handle any situation that arises [during crime] without specific planning" (Feeney, 1986, p. 66).

In sum, offenders vary on criminal versatility, and the number of criminal self-concepts that they possess indicates this variation. Those who consider themselves to be versatile generalists in crime have a wider array of options than offenders who look for a very specific set of circumstances or whose interest is sparked by only one offense. As the investigators whose data inspired this discussion recognized

respondents who described themselves in terms of more than one type of crime (e.g., they were both a "robber" and a "burglar") reported substantially more crime than those who provided only a single criminal identity ... these respondents committed more different types of crime and they reported substantially greater activity for each of the crimes in which they were active. (Peterson et al., 1981, p. xxv)

A person with a flexible criminal self-concept is likely to encounter, recognize, and seize diverse forms of illicit opportunity. Consequently, crime becomes frequent when a number of criminal opportunities are viewed as befitting personal options.

Methods

Study Groups

The Survey of California Prison Inmates, 1976—henceforth called the RAND study—utilized one of the most sophisticated sampling designs and inclusive surveys ever administered to prisoners. It remains a cornerstone of knowledge about serious and persistent offenders and was the first step in extended research program on offender risk (Blumstein et al., 1986; Chaiken & Chaiken, 1984; Greenwood & Abrahamse, 1982; Petersilia, Greenwood & Lavin, 1977; Peterson et al., 1977). This program resulted in many significant research products (Greenwood & Turner, 1987; Visher, 1986), and the survey has been replicated often. The goals of the study were to explore how habitual offenders could be identified, to establish prevalence and incidence rates of different types of serious offenders, and to develop a hypothesis about connections of drug use, juvenile socialization, motivations, economic and social payoffs, self-concepts, and situational variables to crime. In addition, the RAND study played a part in inspiring the many risk assessment instruments and typologies used by practitioners today, as well as in pessimistic assessments of the movement toward selective incapacitation as a crime fighting strategy.

The anonymous self-administered survey was distributed to 10-20 inmates at a time. All were male felons in one of five California prisons in 1976. The sample was closely representative of inmates in the five institutions on age, race, and conviction offense. These inmates were at various stages of their sentences. The survey contained information on inmates' criminal records, criminal identities (or self-concepts) in youth and adulthood, economic, and social backgrounds, and other social psychological characteristics that might be related to offending. The study contained 378 variables for 624 cases.

As part of a larger study containing a survey designed to assess offender risk, the Colorado Department of Public Safety, Division of Criminal Justice replicated much of the RAND study (Mande, 1986, hereafter referred to as the Mande study). This replication used a questionnaire that was nearly identical to the California RAND survey and subsequent studies that were based on it. An incoming cohort of males ($n = 313$) sentenced to the Colorado Department of Corrections in 1986 constituted the sampling frame. Incoming inmates housed at the Reception and Diagnostic Unit and those backlogged at county jails were randomly selected. Because these were incoming inmates, some adjustments to the RAND data were required to make comparisons to the Mande replication. Fortunately, the design of the RAND study and weight variables included by the original researchers allowed for this.

Weighting Procedures

We weighted the 623 cases in the RAND study so that they approximated an incoming cohort of prisoners upon entry to prison. Each case weight is the inverse

of the probability that an offender will be found in prison based on the rate of incarceration for a particular offense. The formula also takes age into account, so that young offenders will be adequately represented in a sample drawn from housed prisoners. The weighting scheme is based on Erlang's formula with loss and is described extensively elsewhere (Peterson et al., 1981). After applying the weights, the covariance matrix was imported into AMOS 5.0. While weighting has some drawbacks, it is necessary for the present purposes. The disadvantages of transformation of original data are outweighed by the advantages of comparable data across data sets and samples that are representative of an incoming cohort of prisoners. Sentences vary and prison populations obviously are not representative of the inmates that enter them. One reason is that entrants have committed fewer serious crimes than inhabitants. For example, murderers are overrepresented in a sample of housed prisoners. Since the current study compared two data sets where one was an incoming cohort and the other represented already detained inmates, weighting was critically important.

Variables and Measures

Modified Greenwood scale

One contribution of the RAND research was that it led to the development of a well-known scale (known as the Greenwood scale) designed to predict the risk posed by an offender. A derivative of this scale is the only exogenous variable in the model. This variable is created by adding yes responses to five questions and then dummy coding the total into two categories (0 = 1-2 / 1 = 3-5) (Greenwood & Abrahamse, 1982). The items are (1) criminal conviction before the age of 16; (2) commitment to a state or federal juvenile facility; (3) use of heavy drugs; (4) unemployment for greater than half of the 2-year period preceding the current arrest; and (5) incarceration for more than half of the 2-year period preceding the current arrest. Items in this indicator provide simple and consistently strong predictors of offending frequency, although their effects are known to vary by state and may be mediated by more proximate variables like adult drug use (Visher, 1986).

There is one difference between the current measure and the original. Greenwood's version included an item that indicated repeated commission of the same crime as a component. We omitted this specialization indicator because of potential overlap with self-concept items. These items are designed to measure self-concept but are likely to be highly correlated with repeated record of involvement in the same crime. For example, a person with multiple robberies on record would be likely to check robbery in the self-concept measure. Therefore, we decided not to use an indicator of offense specialization as part of the exogenous variable. In the weighted RAND data set, the mean of the current scale was nearly identical ($M = .50$; $SD = .50$) to the mean in the replication sample ($M = .51$; $SD = .50$).

Criminal identity

Self-concept was derived from the variable "criminal identities" created by the original investigators for the RAND survey. Respondents were asked if they thought of themselves as a member of categories that reflected criminal and non-criminal self-concepts. Only six items measuring criminal self-concepts that correspond to items used in the Mande study could be used here because the wording and measurement for these were identical across data sets. The criminal identity categories were booster, robber, player, forger, violent person, and gang member. These self-concepts were dichotomized (coded 0/1) and summed to form the variable criminal identity (RAND $M = .57$; $SD = .84$; Mande $M = .54$, $SD = .92$). It is worth noting that the variable reflects adherence to a diversity of criminal self-concepts or versatility in criminal identity. Therefore, it may reflect openness to a more or less restricted array of criminal opportunities. Obviously, it does not measure the strength of adherence or salience of the self-concepts, and it cannot reveal how often they are drawn upon in daily life or offenses.

Rewards of crime

Three items comprise the variable used to reflect respondents' opinions concerning the rewards of crime. These items contain Likert scales to assess agreement with statements about what committing crime means. They measure the respondents' belief that crime will increase chances of acquiring money, high living (e.g., having an active social life, going "out" frequently), and owning things. The RAND sample descriptive statistics for these respective measures were ($M = 3.16$, $SD = 1.26$; $M = 3.10$, $SD = 1.24$; $M = 3.04$, $SD = 1.22$). The Mande descriptive statistics for these respective measures were ($M = 3.01$, $SD = 1.12$; $M = 2.94$, $SD = 1.11$; $M = 3.05$, $SD = 1.16$). The items factored acceptably in both samples (RAND Cronbach $\alpha = .89$; Mande Cronbach $\alpha = .89$).

Costs of crime

Three items make up the latent factor that measures respondents' assessments of the cost associated with crime. These also are Likert items that result from agreement with statements about arrests, hassles, and worries associated with crime. The RAND sample descriptive statistics for arrests, hassles, and worries were ($M = 3.63$, $SD = 1.21$; $M = 3.99$, $SD = 1.13$; $M = 3.42$, $SD = 1.32$). The Mande descriptive statistics for arrests, hassles, and worries were ($M = 3.98$, $SD = .96$; $M = 3.81$, $SD = 1.12$; $M = 4.03$, $SD = 1.08$). The large difference in the standard deviation for crime means arrest across data sets is noteworthy. Cronbach's alpha suggests that these items factored at acceptable levels in the Mande data

($\alpha = .74$) and in the RAND data ($\alpha = .73$), and subsequent findings show that there are problems with the reliability of this measure.

Lambda

The dependent variable is a measure of the frequency of criminal offending. It is an approximation of the frequency of number of offenses divided by the months in freedom in the 2 years preceding arrest for the current offense. One data set asked offenders to recall the previous 3 years, while the other used a 2-year recall. To standardize, the percentage of time free in the 36-month calendar was multiplied by 24 months. The product served as the denominator and represented months free. The offenses include armed robberies, beatings, cons, shooting or cutting someone, burglary, fist fights, rape, attempted murder, threaten with injury, forgery, and stealing cars. There were four categories in answer sets (0 = none, 1 = 1-2, 4 = 3-5, 8 = 6 or more). Variation and skewness in the variable is reduced because the maximum number of offenses allowed for each crime was 8. In the weighted RAND data, the measure of offending was lower ($M = .50$, $SD = .73$) than in the Mande sample (mean = .79, $SD = .81$).

Analytical procedure

A structural equation model (SEM) was fitted to both sets of cross-sectional data based on a reasonable theoretical and logical temporal ordering. In drawing the model, we did not theorize or explore which paths would be significant. Instead, all logically arranged paths were examined. For example, the risk variable contains the earliest and arguably most intractable characteristics of offenders. The way that the self-concept characteristics are identified in the surveys requires that offenders view themselves and self-identify as a type of person. Like the original researches, we assume that these self-identifications approximate consistent, if alterable, views of self. This is why the investigators labeled the variables "criminal identities" in the RAND data. Theory also gives guidance on the positioning of this variable. Self-concept is located on the right side of the model near crime in keeping with theoretical perspectives that see it as a late development in criminal careers (Steffensmeier & Ulmer, 2005; Tibbetts & Gibson, 2002; Tunnell, 2002) and because of theoretical proximity to the dependent variable.

Cost and benefits of crime also are located as endogenous variables that potentially mediate the effects of background risks on the formation of self-concepts and ultimately on crime. With longitudinal data, it would make sense to examine reciprocal effects between these variables as they surely develop and are related over time. In the present arrangement the direct and indirect effects of risk and rational choice variables as predictors of criminal identity and lambda are examined. Risk is the exogenous variable.

Results

The confirmatory SEM achieves a significant fit in the RAND data, although it comes very near to failing standards for a good fitting model on some measures appropriate for a sample of 624. For instance, the model χ^2 , a badness of fit measure, is significant but expected given the large sample. This indicator of fit is generally seen as useful when sample sizes are between 100 and 200. The χ^2/df ratio is 3.94. Fit measures that are advantaged by large samples are very high (GFI = .97; AGFI = .94). The PGFI = .43 that adjusts for the number of parameters in the model indicates a model that loosely fits the data. However, RMSEA (.069), NFI (.956), and CFI (.97) add to confidence that the model achieves moderately acceptable levels of fit (Hu & Bentler, 1999).

The Hoelter Index is used when χ^2 is significant. This statistic is particularly useful where samples are large. It is interpreted to represent the sample size that would result in an insignificant χ^2 for the model and, therefore, adjusts this easily interpreted statistic for sample size. For the RAND data, the Hoelter index was 247 ($p = .05$). This is higher than the suggested 200-threshold for a model that fits and far higher than the generally accepted standard of 75 for indication of a poorly fitted model. Overall, we can say that the model fits the RAND data well enough to continue discussion of individual parameters.

As shown in Figure 1, risk is a significant direct predictor of lambda ($r = .22$, $p = .02$), payoff ($r = .15$, $p = .01$), and cost ($r = .18$; $p = .01$). Risk seems to be related to criminal identity but does not achieve significance ($r = .07$, $p = .10$). Payoff is a significant direct predictor of criminal identity ($r = .25$, $p = .01$). Cost and payoff did not have significant effects on lambda, although they were correlated with each other in a positive direction ($r = .13$, $p = .04$). Criminal identity was a predictor of lambda ($r = .28$, $p = .01$). Three indirect effects (not

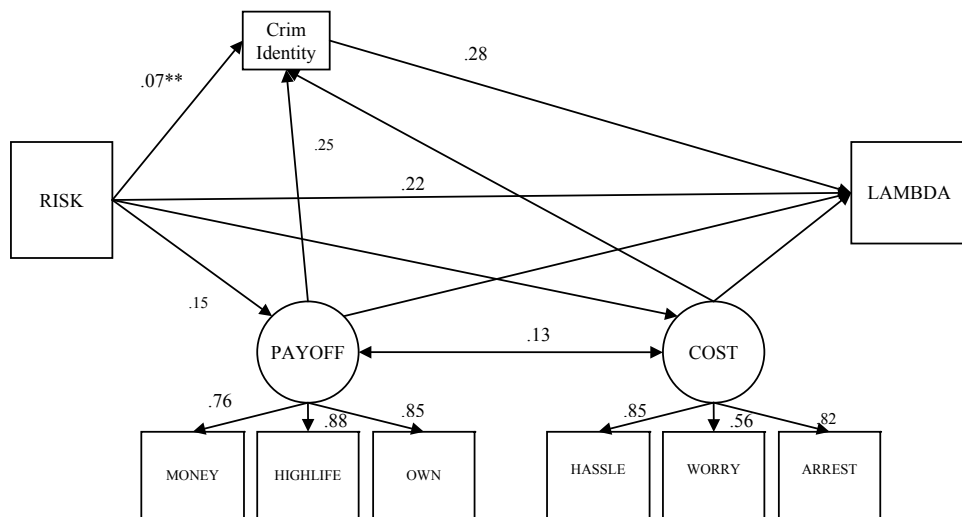


Figure 1 SEM with RAND data. All coefficients significant at $p < .05$ (except ** $p < .10$).

shown in the figure) were significant. Payoff ($r = .07, p = .00$) and risk ($r = .05, p = .01$) have indirect effects on lambda. Risk also affects criminal identity indirectly ($r = .04, p = .02$).

The latent factors in this model correlate significantly with each of their items. The paths from the latent factor payoff to money ($r = .76, p = .02$), high life ($r = .88, p = .02$), and own things ($r = .85, p = .01$) are significant and strong. The paths from the latent variable cost to arrest ($r = .82, p = .01$), worry ($r = .56, p = .01$), and from cost to hassle ($r = .85, p = .02$) are significant and in the case of the hassles and arrest variables the relationships are strong. The correlation of the worry variable is low with the latent factor.

All fit statistics in the Mandé data ($n = 313$) indicate a good fit of the model to the data. The χ^2/df is 1.06 and χ^2 badness of fit is insignificant at .38 indicating a much closer fit than in the weighted RAND data. Other fit statistics are as impressive (GFI = .99, AGFI = .97, RMSEA = .01, NFI = .97, CFI = .99). The Hoelter index is not reported because χ^2 is not significant. PGFI, which adjusts for the number of paths in the model, is considerably lower (PGFI = .44). Because the model has many parameters and was not refined based on exploratory findings, this is expected. Indications are strong that the model fits these data.

As shown in Figure 2, risk is a significant direct predictor of criminal identity ($r = .16, p = .01$) and payoff ($r = .14, p = .04$). Payoff is a significant predictor of criminal identity ($r = .32, p = .01$), and criminal identity affects lambda ($r = .18, p = .01$). Payoff also affects lambda ($r = .14, p = .06$), although the effect is not significant at the $p < .05$ significance level. Two variables have significant indirect effects at the appropriate significance level. Risk indirectly effects criminal identity ($r = .05, p = .02$) and lambda ($r = .06, p = .00$). Payoff indirectly affects lambda ($r = .06, p = .00$). The rational choice measurements for cost and payoff factor significantly in the Mandé data. Payoff is related to

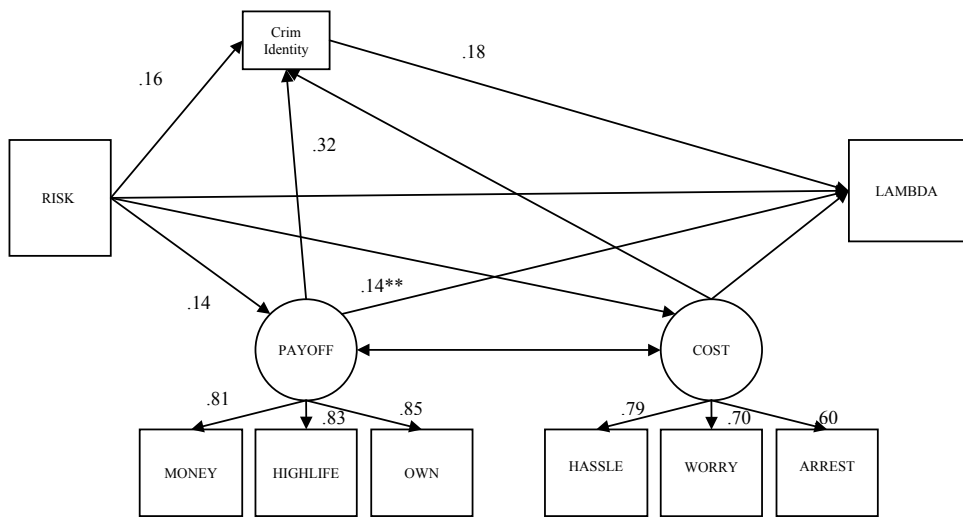


Figure 2 SEM with Mandé data. All coefficients significant at $p \leq .05$ (except $**p < .10$).

money ($r = .81, p = .01$). Highlife also has significant effects ($r = .83, p = .01$) as does owning things ($r = .85, p = .01$). Cost affects hassle ($r = .79, p = .02$), worry ($r = .70, p = .00$), and arrest ($r = .60, p = .02$).

There are both similarities and differences in the effects of the parameters across these models. In both, total effects show that risk predicted criminal identity and payoff. Cost has no effect in either data set. In addition, the measurement paths from the cost and payoff indicators to their latent constructs were significant across data sets. Payoff and risk predict criminal identity consistently. Of the fifteen paths and one covariate in the model, nine direct paths were significant in both at the $p < .05$ level (the covariate for payoff and cost was significant only in the RAND data). Six of these were in the latent measures. Three paths were insignificant in both data sets at the $p < .05$ level. Two of these run from the cost measure to other variables, and the other is from payoff to lambda. Despite these similarities, there are important differences. One of the most glaring is the differing total effect for risk on cost. Of course, the above description of differences does not show that the effects differ significantly across data sets, only that they vary at face value.

Finally, we explored the differences across the data to see if they were significant. There are a number of strategies for accomplishing this, and we decided to incrementally constrain all paths to be equal to the corresponding path in the other data set. This required creation of RAND samples near the same size as the Mandé sample as the effects of differing sample sizes on such comparison make interpretation difficult. Three samples were drawn using an automatic random case selector from the RAND data to draw approximately 50 percent of the cases. The sample reported contains 306 prisoners. A sample was drawn to ensure that the results could not be attributed to differing sample sizes in the Mandé and RAND data. To test the similarity of measures across models, we cumulatively stepped in constraints in a logical order across data sets following convention on utilizing this procedure (Kenny, 2006). We used a conservative ($-.01\Delta$ in CFI) as indicator of invariance across models (Cheung & Rensvold, 2002; Yu, 2002) and the Tucker-Lewis Index as a guide in comparing free and constrained models.

Table 1 illustrates the six models. First, we constrained paths in the factor loadings to be equal. If the factor loadings are not invariant, then units of measurement differ by group, and testing equality of paths is senseless. Second, we further constrained the model so that paths were set equal across data sets. To this point, the model passed our standard of invariance, indicating that cross-group comparison of paths is meaningful and that they operate in a similar way. Third, we constrained error variances to be equal across groups. If error variances had been invariant, we could have proceeded with confidence in examining error covariances. Here, the model failed our threshold for rejecting the null hypothesis that the models are not equal. By examining variances and further exploring individual paths, we identified some sources of the difference between the data sets. Again, these concentrated in the cost measure. Specifically, the variances were generally larger in the replication data, but they were most different for the crime means worry item, where variances were 22 percent

Table 1 Comparison analysis of RAND and Mande data

Model	χ^2	df	χ^2/df	Tucker-Lewis	CFI
1	67.37	40	1.68	.97	.98
2	83.59	44	1.90	.96	.98
3	97.86	53	1.85	.96	.97
4	125.80	59	2.13	.95	.96
5	141.64	63	2.25	.94	.95
6	141.73	67	2.21	.95	.95
Model 2 loadings	16.22	4			
Model 3 paths	14.27	9			
Model 4 error V	27.94	6			
Model 5 factor V	15.84	4			
Model 6 factor CV	0.09	4			

higher, and crime means arrest item which is 14 percent more variable than in the original data. Fourth, although there was little reason to continue, since it was clear that the data were not invariant in variance, factor variances were set to equal. Fifth, we also constrained factor covariances to be invariant across data sets for the purposes of illustration.

Finally, we explored the paths and the single covariate path. To do this, we examined modification indices from step 2 (mentioned above). Furthermore, we constrained individual paths to be equal across data sets with other paths allowed to vary freely. Taken together, the result of this exploration confirmed that the cost measure was significantly different across models and that this difference could be largely attributed to the arrest item. For example, when imposing the constraint that any other path in the model is set to equal across data sets, the model improved fit by comparison to the model where all parameters were free across models.

Our exploration lends confidence to cross-model comparison, but illustrated the difficulty of doing so when a critical measure and variances differ across models. These exercises confirmed that despite similarities in the structure, there are differences across data sets. In measurement models, these concentrated in the cost measure and particularly in a single path for arrest. One logical interpretation is that arrest is fresh in the minds of an incoming cohort of prisoners and that weighting did not properly account for the distribution. Whatever the cause, the use of risk of arrest as part of the cost-benefit calculation is troublesome among a sample of known and high-rate offenders, and our data do not increase confidence that it has consistent and reliable distribution or meaning.

Discussion and Conclusion

This study began with a call for replication in criminology, and the results reveal how important it is. Considerable effort was taken to locate similar data sets.

The incoming cohort weights from the RAND data were applied to make the data more like the Mandé replication. Only items that matched closely were used in creating measures. Variables and latent factors were simple and created from items that were designed to go together in latent measures. They represented straightforward notions about rational choice, self-concept, and offending careers, and were placed in a simple structure. Even the size of the data sets was matched to be identical in the final part of the analysis. These efforts did not result in a model that was statistically the same across both bodies of data. The central lesson is that caution should be taken in interpreting any single study until it is truly replicated.

Criminology direly needs reliable measures for fundamental concepts. The most important finding was that the choice and self-concept measures partially mediated the effects of background factors on offending frequency. Clearly there are other processes at work, but risk has significant indirect effects in both models. Self-concept and offender perceptions are significant and important links. Furthermore, there is evidence that the payoff measure has effects in both data sets. The cost measure on the other hand fails dismally (Exum, 2002). In fact, this measure is so unreliable across data sets that constraining paths to equal across the data set significantly reduces the fit of the entire model. Without careful inspection, one might think that little in the model was similar when in fact most other variables and paths in the model did not differ significantly. If a measure seems to be reliable because the items factor, especially where the item factor scores are not reported, this says little of its reliability and potential for use in other data sets and structural models.

The data used herein provide guidance on the creation of standard and conventional measures, but they were not designed in an era of evaluation of measurement models or SEM. It is likely that prior researchers would change some things if they repeated the study today. For example, an investigator that had similar analysis in mind could design surveys toward performance in a structural equation model. If this were the case, our measures would not have varying numbers of indicators. More questions would be asked about each construct so that they would likely factor together. In addition, Likert-scale answer sets could be used to measure constructs, such as criminal self-concept, costs, and benefits of crime. In short, investigators today are familiar with SEM and design their surveys with its strengths in assessing measurement and structural relationships in mind.

It is unclear whether the failure of the cost measure in this analysis is a result of measurement or theory. Surely, there are a variety of limitations to consider. The RAND and Mandé data sets are 30 and 20 years old, respectively. More contemporary data sets would likely include additional information that bears on the costs of crime. For instance, the cost measures did not include informal sanctions from peers, parents, employers, and others. As such, there are potentially fruitful variables that we were unable to control for because they were not included in the original data sets. Recent developments in rational choice research have pointed to a variety of background characteristics, such as shame

(Tibbetts, 1997), low self-control (Piquero & Tibbetts, 1996), and sexual arousal (Loewenstein, Nagin, & Paternoster, 1997), that mediate and, at times, transcend the cost-benefit calculations of potential offenders. Perhaps due to these limitations, costs of crime added little to understanding the frequency of offending of the offenders in these samples. Quite possibly, the negative consequences of associated with crime (hassles, arrest, and worries) have little bearing on the decision to offend for those who know something of crime and are socially positioned by their backgrounds and previous deeds to find it attractive (DeLisi, 2005; Steffensmeier & Ulmer, 2005; Tunnell, 1992).

The rewards of crime are different. We find significant and consistent support for the perception that crime is rewarding (leading to high living, money, and owning things) on frequency of offending. Offenders do seem to gauge the attractiveness of crime based on these things in a way that increases their frequency of offending. Their perception that crime is rewarding in this way is predicted by the measure of risk based on early offending experiences. Indeed, a growing area of research has shown that rational choice operates differently among more extreme offenders or among those with specific characteristics, such as low self-control (DeLisi, 2005; Morselli & Tremblay, 2004; Morselli et al., 2006; Piquero et al., 2004; Tibbetts & Gibson, 2002; Tremblay & Morselli, 2000; Tunnell, 2002; Wilson & Abrahamse, 1992).

Results also indicated that criminal self concepts play an important part in predicting the frequency of offending. Indeed, they also link the effects of background risk and payoff to offending frequency. Those who see crime as rewarding are most likely to have high scores for criminal self-concept. Likewise, the number of self-concepts is affected by the perception that crime is rewarding. The notion of a criminal self-concept may be an important psychological link between rational choice variables and offending. Put differently, a person who views crime as rewarding may adapt a criminal self-concept and then use it as a decision-making device (Piquero & Tibbetts, 2002). Once criminal identity is established, it frames opportunities and may shortcut the decision-making process when criminal opportunities arise and increase the frequency of offending.

There are at least two methodological shortcomings of the current analyses. First, it is based on retrospective data collected from a cross-section of inmates. The frequency of crime refers to crime committed before incarceration. The ordering of variables is logical, but questionable. Only the exogenous risk variables clearly occurred before other variables. The arrangement of variables makes theoretical sense, but it is easy to imagine other arrangements that are as logical. There is reason to have some confidence, however. Frequency of offending is known to be stable, but the stability of rational choice and self-concept variables is open to skepticism. The effort to make an argument about causal ordering is hampered severely by the fact that the data are not longitudinal.

Second, this study made no effort toward exploratory model refinement. Had we done so, we could have arrived at a better fitting and more

convincing model. For example, elimination of the paths from cost to crime, or of the cost measure, would improve the fit and parsimony. A logical next step to this research is to refine a model and export it to another data set. There are other data available for development and test of these and other models using the RAND design. Replications have occurred in several states, and the most widely used multistate data collected under the RAND program are not used in this paper. Exploratory investigation across these data sets might modify or validate the theoretical structure of the path to crime and lead to greater certainty about the criminal decision-making process. We encourage this and other efforts aimed at improving confidence in measurement in criminology.

This study was presented at the Annual Meeting of the Academy of Criminal Justice Sciences, Baltimore, Maryland, February 28 to March 4, 2006.

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