NEW ECONOMICS OF SOCIOLOGICAL CRIMINOLOGY

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■ **Abstract**   This paper begins with a summary of the rational choice approach and its implications for the study of criminal behavior. I then review research on offending that uses the rational choice approach in conjunction with more sociological orientations. I also summarize research on game theory and demonstrate how it can be effectively used to understand and predict criminal decision-making. I argue that, contrary to the assessment of many criminologists, rational choice approach and game theory insights can be combined profitably with sociological perspectives to advance the understanding and prediction of criminal behavior.

INTRODUCTION

More than thirty years ago, Gary Becker (1968) introduced sociologists to a neo-classical economic approach to crime. Although most sociological criminologists are familiar with Becker's work and early tests of this approach, many ignore or give only passing attention to more recent studies. The reluctance to embrace economic contributions reflects doubts about economists' use of the rational choice approach to decision-making, as well as the belief that it is inconsistent with the empirical reality of crime. Confusion about key concepts, premises, and predictions of the rational choice approach further contributes to this skepticism. The use of terms in the rational choice approach that have different popular and disciplinary meanings adds to this suspicion, as does the variety of definitions and assumptions attributed to the rational choice approach by economists, sociologists, and other social scientists.

Sociological interest in the rational choice approach to crime has also been discouraged by the pomposity of some economists' writings. Becker (1968, p. 176) likely alienated many sociologists in his championing of the neoclassical approach at the expense of sociological explanations: "I cannot pause to discuss the many general implications of this approach, except to remark that criminal behavior becomes part of a much more general theory and does not require ad hoc concepts of differential association, anomie and the like." More recently, John DiIulio (1996, p. 3) claims that sociologists are incapable of making worthwhile contributions

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to the understanding of crime: "They [sociologists, among others] generally lack the quantitative and formal modeling skills necessary to shed new light on old controversies or provide analytically compelling answers to methodologically complicated questions." DiIulio (1996, p. 3) concludes that the study of crime and its related topics (e.g., criminal justice) "is a field that needs to be conquered by economists."

Other economists advocate a different approach. For example, O'Donoghue & Rabin (2001, p. 29) argue that, "to take full advantage of the economic insights and methodology, economists must embrace insights from . . . other social sciences so as to make our models more relevant and realistic" (also see Swedberg 1990). In this paper I review research that adopts this perspective and combines the rational choice approach with insights from other disciplines. Given the confusion about the rational choice approach (Akers 1990), I begin my discussion with a summary of its key features. I then describe the rational choice approach as it applies to the decision to offend. In the third section of the paper, I review studies that combine insights from economics and sociology in the study of the individual costs and benefits of crime. A fourth section examines game theory and its contributions for understanding the dynamic, interactional nature of offending decisions. I conclude with suggestions for future research.

There are several summaries of early rational choice approach research on crime (see Schmidt & Witte 1984, Eide 1994), and so I focus on more recent work. Although the rational choice approach has implications at both the micro and macro levels (Hechter & Kanazawa 1997), I emphasize the former. I also set aside research that challenges the rational choice approach with debates about whether offenders consider all relevant information, plan ahead, and make "reasoned" decisions. The rational choice approach does not make these claims and is distinct from the "reasoned offender" approach to crime (Cornish & Clarke 1985, 1986). I also ignore approaches that argue that offenders' personalities or backgrounds preclude them from making decisions in a manner consistent with the rational choice approach (e.g., Gottfredson & Hirschi 1990). The rational choice approach offers a theoretical orientation for explaining how individuals make "rational" choices; it assumes that all sane people are capable of making such choices, but recognizes that they often do not.

THE RATIONAL CHOICE APPROACH

My summary of the assumptions of the rational choice approach draws on works by economists, political scientists, and sociologists (Frank 2000, Morrow 1994, Tsebelis 1990a); these assumptions are central to most economic models of crime (Bueno de Mesquita & Cohen 1995, Schmidt & Witte 1984).

1: People have preferences for outcomes (goods, services, states of being, etc.). Although many economists typically focus on material goods, Becker (1968, 1996) and others have extended the study of preferences to include a vast array of outcomes. Preferences typically do not refer to actions.

2: People's preferences are complete, transitive, and stable. Completeness means that people can order all possible combinations of a set of feasible outcomes from most to least valued. Some outcomes are unknown and others are noncomparable; thus, completeness typically refers to a specific set of outcomes, rather than all possible ones. The transitivity and stability assumptions specify a coherence and consistency to preferences. Transitivity requires that if a person prefers X to Y, and Y to Z, she also prefers X to Z.

There are different interpretations about the stability assumption. Some economists require that preferences are exogenous and unchanging, thereby excluding the possibility that they are influenced by events and conditions (Usher 1992); this perspective does not assume that preferences are always immutable, but rather that they be treated as such in an economic analysis (Fine & Green 2000). Other economists simply require that preferences are consistent in the course of a decision, allowing them to change across time as new information is acquired (Becker 1996, Frank 2000). The latter approach eliminates post-hoc, circular interpretations that attribute behavioral changes to sudden shifts in preferences, as opposed to situations or available information.

3: People's preferences are influenced by their orientation to present versus future outcomes. Individuals may have a positive time preference for outcomes and will need greater future compensation in order to forgo a present benefit. People willing to forgo a current benefit for a lower-level return in the future have a negative time preference. People who have a neutral time preference are willing to trade off present and future benefits against one another at a rate of one to one. Individual time preferences are not fixed across all contexts; they are influenced by several factors, including a person's current level of a valued outcome.

4: Most outcomes are uncertain; there is typically no guarantee that they will be realized. As a result, people's attitudes toward risk and uncertainty (i.e., their expectations about the way the world will exist when an action is undertaken) affect their preferences. The importance of these attitudes is reflected in the von Neumann-Morgenstern (1944) expected utility function.

The expected utility function reflects three important features of preferences for outcomes. First, people's preferences are influenced by the potential—as opposed to the assured—benefits of an outcome, relative to its costs. Costs and benefits are typically described in terms of individual assessments of how much satisfaction an outcome will provide; however, satisfaction is not observable and is simply an illustration of what might be occurring in people's minds as they formulate preferences.

Second, economists recognize several types of potential costs and benefits (e.g., opportunity costs, external costs, sunk costs), many of which are nonmonetary; however, decision-making models typically assign monetary values to these. This approach allows for comparisons across seemingly diverse benefits and costs. The most common way to represent the sum of cost and benefits associated with outcomes is to use an ordinal scale to assign numbers to each outcome. An expected utility function maps outcomes to numbers that mirror preferences.

Third, calculating an expected utility for an action involves multiplying a person's utility of each possible outcome by the probability that it will occur if an action is chosen, and then summing across all possible outcomes. According to von Neumann and Morgenstern, the expected utility of an action will often differ from the expected value because of nonlinearities in the utility function that summarize a person's attitude toward risk taking. Economists do not assume that people have a preference for risk taking in itself (i.e., risk taking is not an outcome); rather, people's attitudes toward risk taking influence the expected utility they associate with an outcome.

A risk-averse person generally refuses to accept what is calculated to be a fair gamble (i.e., one with an expected value of zero, such as the possibilities of winning or losing an equal amount in a coin toss). Those who generally have a preference for taking fair gambles, rather than a sure thing, are risk-seekers. Finally, between these extremes are people who are risk-neutral: those who are generally indifferent to accepting or refusing a fair gamble. These different attitudes toward risk correspond to differently shaped utility functions. For example, risk aversion produces a concave utility function that exhibits diminishing marginal utility, whereas risk seeking results in a convex function that reflects increasing marginal utility. In other words, an increase in the expected value of an outcome provides a smaller increment in utility for a risk-averse person and a larger one for a risk-seeker. Thus, people may agree about an outcome's value, but vary widely in their comfort with the gamble involved in attempting to acquire it; thus they will assign it different utilities.

5: People base their assessments of costs and decisions on information they collect. Gathering information is, however, itself a cost. Thus, although people prefer to have all available information when making decisions, choices are made frequently with incomplete information. People may believe they have adequate information when they do not, they have imperfect memories, and they often miscalculate (e.g., ignoring implicit and opportunity costs while including unimportant sunk ones). As well, information does not guarantee that people will make rational choices: Information is simply data, and rational choice involves much more (Lupia & McCubbins 1998). These shortcomings can compromise people's ability to choose outcomes consistent with preferences. As Frank (2000, p. 29) notes: "the art of cost-benefit analysis lies in being able to specify and measure the relevant costs and benefits, a skill that many decision makers conspicuously lack."

6: Rational actions are those that are consistent with the above assumptions. Common shorthand is to describe such actions as being consistent with the maximization of utility. Maximizing utility requires choosing behaviors consistent with one's expected utility function. Thus, behaviors alone cannot be described a priori as rational. Determining a behavior's "rationality" depends on knowing or making assumptions about a person's information, preference ordering, and approach to risk taking and time discounting. People's rational choices may, therefore, result in different behaviors even when they are faced with the same situation.

In addition, behaviors can only be described as rational for members of a group, collective, or population, if we can assume that most of these individuals have the same expected utility functions. The difficulty is in knowing people's preference orderings, knowledge, and approach to risk taking and time discounting prior to a decision. This difficulty encourages social scientists to deduce these from past actions, experimentation, or assumptions (e.g., Bentham's claim that pleasure and pain motivate people) and apply these to current and future decisions.

Economists commonly distinguish between two approaches to rationality: the self-interest and present-aim standards. The self-interest standard is associated with the neoclassical "Chicago school" (see e.g., Becker 1968) and defines rational behavior as actions that reflect individuals' consideration of costs and benefits that accrue directly to themselves. This standard assumes that people are basically motivated to pursue their own economic interests. In contrast, the present-aim standard makes fewer assumptions about the nature of people's preferences; it defines rational behavior as those activities that reflect the consideration of costs and benefits for whatever objectives the individual has at the moment a choice is made. It assumes a richer set of interests and argues that behaviors are rational if they attempt to meet an individual's ordered preferences. Thus, it allows for diverse interests (cultural, social, psychological, or emotional) that help explain such individually, and often materially, costly preferences (and resulting actions) as philanthropy, altruism, and fidelity to a principle.

Historically, economists have drawn on Adam Smith's work in supporting their preference for self-interest rationality. Models that assume self-interest are more parsimonious and thus more efficient than others; they also avoid having to address the difficulty of explaining variation in preferences. Yet, Smith (1976 [1761]) recognized the importance of motives other than self-interest. Moreover, some economists (e.g., Frank 2000) argue that the internal logic of the rational choice approach does not predict the narrow self-interested behavior typically attributed to it by critics, and they argue for the necessity of accounting for preferences or tastes.

7: Although economists are typically not concerned with distinguishing between rational and irrational actions, the rational choice approach does not preclude the possibility of people acting irrationally (i.e., choosing actions inconsistent with expected utilities). People may pursue a course of action because of an emotional state or a sudden change in context. Alternatively, they may not be cognizant of the interests that motivate them (these may be equally obscure to observers). Explanations that emphasize false consciousness, habitus, national culture, inertia or similar forces suggest that these may prompt people to make choices that are inconsistent with their preferences (Tsebelis 1990a). Indeed, most economists do not assume that the rational choice approach explains all instances of a behavior (e.g., all crimes), nor all of the actions of any individual; instead, the more common assumption is that the rational choice approach is useful for understanding most occurrences of a particular behavior.

8: People's choices can be examined with either a decision or game theory approach. Decision theory applies when an outcome is affected only by the person's

choice and by chance. A game theory approach is more appropriate when an outcome depends on the intersection of more than one person's choices. In other words, some outcomes are independent of other people's decisions, whereas others are strongly affected by them.

9: The rational choice approach is not a theory of cognition. It does not argue that people think in ways typically associated with rationality as used in common discourse (e.g., reasoned, thoughtful, reflective), nor does it assume people undertake literal calculations. The rational choice approach simply refers to the consistency between people's preferences and choices. As well, the rational choice approach assumes stochastic processes, not deterministic ones. It provides an explanation of how most people make many of their decisions, without assuming that all choices can be explained. Thus, it recognizes that individuals' choices will vary, even when confronted with the same preferences, information, and approaches to risk. It does not assume that people are always conscious of their attempts to maximize their interests but simply argues that many of their actions can be understood as rational. In other words, it contends that we can make useful predictions of human behavior by assuming that most people act "as if" they had made cost-benefit calculations.

Although some theorists argue that the rational choice approach can explain most choices (Friedman 1953), a more compelling approach accepts that the rational choice approach is best suited to situations in which preferences, behavioral options, and actions can be clearly identified (Tsebelis 1990a). As is the case with other accounts, the rational choice approach simplifies the complex etiology of actions. In general, the value of the rational choice approach lies in its parsimonious, elegant explanation, which has considerable predictive power.

THE RATIONAL CHOICE APPROACH AND CRIME

The rational choice approach to crime assumes that crime can be understood as if people choose to offend by using the same principles of cost-benefit analysis they use when selecting legal behaviors (Becker 1968, Ehrlich 1974, Eide 1994, Schmidt & Witte 1984). Thus, the decision to offend is influenced by people's preferences, their attitudes toward risk and time discounting, and their estimates of an illegal opportunity's availability, costs, and benefits versus a legitimate opportunity's availability, costs, and potential for realizing the same or comparable returns.

Early economic models of crime adopt the self-interested standard of rationality and assume that people choose crime when it maximizes their self-interest. For example, Becker (1968) argues that the frequency of crime is determined by three factors: (*a*) the costs associated with arrest, probability of conviction, state punishment, and loss of income that could be gained from legal employment; (*b*) the benefit of the monetary or psychic gain from offending; and (*c*) a portmanteau of variables representing a willingness to offend. Although he clearly recognizes psychic returns, and by extension other types of costs and benefits, Becker concentrates on crime's pecuniary returns and the financial costs associated with

state sanctions (i.e., the monetary equivalent of punishment). The tendency to focus on a small set of costs and benefits is so widespread that Schmidt & Witte (1984, p. 154; also see Levitt & Lochner 2001, p. 335) argue that the key prediction of the economic approach is that "[c]rime is reduced by reducing the monetary gains to crime or by increasing the probability or severity of [state] punishment."

A broader rational choice approach adopts the present-aim standard of rationality and assumes a wider range of preferences (Eide 1994). This approach requires that researchers first specify people's preferences and their attitudes toward risk and time discounting, and then examine if a decision to offend is consistent with these. The rational choice approach differs from many theories of crime in that it provides an account of how people's preferences affect their choices, rather than explaining the source of their preferences. Thus, it is a sharp contrast to the most commonly researched theories that argue that crime is a result of low self-control, differential association, strain, labeling, or other social experiences or forces. Theoretically, the rational choice approach shares some but not all of the features of other explanations of criminal decision-making, such as routine activity theory (Cohen & Felson 1979), the reasoned-offender approach (Cornish & Clarke 1985, 1986), and the criminal event perspective (Meier et al. 2001). Although the rational choice approach contrasts with theories that explain the origins of choice, there is a considerable conceptual overlap between the rational choice approach and more sociological theories of offending (Gibbs 1994a,b, Hirschi 1986), and suggestions for theoretical integration are common (Clarke & Felson 1993, Fagan & Freeman 1999, Grasmick & Bursik 1990, Nagin & Paternoster 1993). However, it is incompatible with explanations that argue that structural conditions or socialization produce character defects that make an offender's decision-making distinct from that of non-offenders (e.g., Gottfredson & Hirschi 1990, Wilson & Herrnstein 1985). In sum, rational choice provides a fruitful approach to understanding criminal decision-making, and it can be combined with explanations of the origins of preferences and the availability of the mechanisms by which preferences are realized. As Tsebelis (1990b, p. 256) notes, there are many benefits from examining behavior, including crime, as a "consequence of choice by rational individuals who are socially influenced."

The above summary suggests that many common criticisms of the rational choice approach to crime are unfounded. According to some critics, the rational choice approach adds little to existing explanations of crime (see, e.g., Akers 1990); yet, the rational choice approach grants people more agency than explanations of offending that adopt a deterministic view when explaining the effects of socialization, peer associations, and other social conditions and experiences.

Other detractors claim that the predictions of the rational choice approach are inconsistent with the reality of crime (Gottfredson & Hirschi 1990). Critics charge that the rational choice approach describes offenders who collect all relevant information, and weigh it carefully, systematically, and effectively before acting. According to these scholars, the rational choice approach envisions offenders who regard crime as the illegitimate equivalent of labor-force participation, whereby

they can consistently obtain financial returns that surpass those of legal work; they then use this income prudently rather than "irrationally" (e.g., gambling, partying, purchasing expensive clothes). As is clear from the above summary, the rational choice approach does not make these claims. Granted, some economists and criminologists have extrapolated from the rational choice approach to make assertions similar to some of the items, but these extrapolations are not necessarily part of the rational choice approach or its application to offending.

A different perspective argues that the rational choice approach is only applicable to specific types of crimes. A common argument is that it is better at explaining "instrumental" rather than "expressive" offenses; the former are assumed to be premeditated and are a means to an end (e.g., material gain), whereas the latter occur in the "heat of the moment" and are ends unto themselves. This distinction assumes a questionable degree of mutual exclusivity: It is not clear that types of crime can be clearly differentiated as expressive or instrumental. Moreover, it applies labels to outcomes (i.e., crimes) that more accurately refer to motives: anger, jealousy, rage, hatred, and a host of other emotional states commonly used to describe "expressive" crimes refer to forces that influence outcomes. In addition, emotional states have intentional objects and are not independent of preferences (Damasio 1994, Elster 1998). As noted above, the rational choice approach recognizes that individual offenses may not be rational. However, there are no reasons for assuming that particular types of crime are beyond choice or that the rational choice approach does not apply to the decision to commit these offenses.

By far, the most important concerns with the rational choice approach are its assumptions about preferences and decision-making. For example, critics charge that the assumptions that preferences are exogenous and that time discounting is consistent are inaccurate reflections of the real world, as is the claim that individual decision-making can be understood as a result of a cost-benefit analysis that uses subjective expected utilities. There are important challenges within economics to the conventional rational choice approach, time discounting (Gruber 2001) and expected utility (see, e.g., Rabin & Thaler 2001, Sen 1990). As well, findings from the experimental psychology research of Kahneman & Tversky (2000) and others (see O'Donoghue & Rabin 2001) appear inconsistent with predictions derived from the rational choice approach and its assumptions. According to some critics, these challenges suggest that the rational choice approach may be inappropriate for understanding criminal decision-making (Lattimore & Witte 1986).

Defenders of the conventional rational choice approach note that although a substantial proportion of experimental subjects selects options that contradict the rational choice approach, many people's choices are consistent with it (Morrow 1994, Wittman 1995). As well, an increasing body of psychological research supports the rational choice approach (Friedman & Massaro 1998, Massaro & Friedman 1990). Combining conventional rational choice approach with a theory of errors can correct many of the observed inconsistencies in predictions derived from the rational choice approach, making it superior to prospect theory, bounded rationality, and other challengers (Bueno de Mesquita & Cohen 1995, Jackman 1993).

DISINCENTIVES, INCENTIVES, AND CRIME

In this section, I review recent research that examines the rational choice approach prediction that the potential costs and benefits affect the decision to offend. This survey is not extensive; its objective is to provide some examples of investigations that are consistent with the rational choice approach. These studies have been conducted by economists who extend their analyses to include concerns more commonly pursued by sociologists, and by sociologists who broaden their approach by integrating the work of economists. More comprehensive discussions of this literature are available in Nagin's (1998) review of deterrence studies, Fagan & Freeman's (1999) summary of investigations of research on crime and work, and Hechter & Kanazawa's (1997) overview of research findings consistent with rational choice predictions.

Punishment Costs

As noted earlier, Becker (1968) and other economists (Schmidt & Witte 1984) argue that state sanctions represent crime's most important cost. Thus, they predict that, all else equal, increases in the severity and certainty of state punishments should decrease offending. Indeed, many economists presume that this hypothesis is *the* economic theory of crime (Cameron 1988). Most of the early economic research in crime investigates this hypothesis, and although many studies found a negative association between state sanctions and crime rates, much of this research is seriously flawed (Cameron 1988, Nagin 1998). More recent investigations have addressed the shortcomings of earlier studies, and economists have documented a deterrent effect for several but not all types of offending in ecological studies of crime rates and sanctions (e.g., Levitt 1996, 1997; Levitt & Lochner 2001; Spelman 2000), as have other social scientists (e.g., D'Alessio & Stolzenberg 1998; also see Nagin 1998). Many of the economic studies incorporate factors emphasized by sociologists. For example, Levitt's (1997) analysis includes controls for race, age, welfare, educational spending, unemployment, and poverty. Thus, although there are still major gaps in our understanding of the deterrence process, Nagin's (1998, p. 16) review of deterrence research supports the argument that legal sanctions exert "a substantial deterrent effect."

Sociologists have also influenced economists who examine deterrent effects with individual-level data. For example, Grogger (1991) extends the usual economic analysis of sanction effects and considers the role of structural variables in conditioning deterrence. Grogger's analysis uses justice and unemployment insurance income data (from employers) for a random sample of 14,000 men arrested in California. The results point to large deterrent effects emanating from the certainty of punishment (number of convictions over the number of arrests), and smaller, generally insignificant effects from the severity of sanctions (average sentence length). However, punishment effects are conditional. The certainty effect is greatest for serious felony crimes and for whites, and declines in strength for

nonserious offenses and for blacks and Hispanics. In contrast, the severity effect is positive for whites and negative for blacks.

Economic Costs

The rational choice approach suggests that economic costs, such as loss of legitimate income, also influence offending. Economists and sociologists have approached this hypothesis by examining the effects of employment and employment earnings on offending, assuming that the cost of crime increases with legal income. Consistent with this hypothesis, Grogger (1991) finds a strong, negative effect of legal income on arrest and a positive relationship between arrest and the length of a current jobless spell. Grogger also reports that relatively minor criminal activity complements employment, whereas employment and serious crime are substitute activities. When these two crime types are pooled, one erroneously concludes that employment has no effect on criminal activity.

Grogger (1998) provides additional evidence of the importance of legal wage incentives in an analysis of legal and illegal income data reported in the National Longitudinal Survey of Youth (NLSY). Grogger estimates models in which the decision to work is independent of the decision to commit crime. He finds that a decrease in wages encouraged offending and that declining wages throughout the 1970s and 1980s may have contributed considerably to youth crime increases in these years, with a 20% fall in wages leading to a comparable increase in offending. He further demonstrates that the black-white age gap explains about one quarter of racial differences in crime participation rates and that rising wages explain a considerable amount of the decline in offending that occurs with age.

Pezzin's (1995) analysis of the NLSY also indicates that economic incentives and opportunity costs exert a powerful influence on illegal involvement. She finds that the odds that an offender will stop offending increased with legal earnings and decreased with illegal ones. Moreover, although the number of past convictions also increased desistance, the magnitude of this effect is considerably smaller than that of legal wages. Similarly, Uggen & Thompson (1999) find that legal employment decreased the returns to offending in a sample of offenders, addicts, and youth dropouts who were followed for a three-year period (however, see Uggen 2000). They report that work and legal income negatively influence illegal earnings: Employment reduced illegal earnings by between $100 and $200 per month, and every legal dollar earned decreased illegal earnings by about seven cents.

Other Costs

Sociologists have contributed further to the economic approach to crime's costs by proposing a more inclusive approach to crime's liabilities. These costs include the stigma and rejection by significant others that can accompany state sanctions, as well as the guilt and shame that sanctions and norm violations may induce, given the strength of an individual's commitment to normative values and belief that the legal system is just and moral (see e.g., Grasmick & Bursik 1990, Paternoster

1989). Although there are methodological problems with many early studies (see Williams & Hawkins 1986), a growing consensus is that these social costs are typically more important than those associated with imprisonment and loss of wages (Nagin 1998).

Perceptions about social and state sanctions probably have the greatest influence on particular people: that is, individuals who have a considerable stake in society, have internalized norms that prohibit offenses, are embedded in networks of people who appear to follow the law most of the time, and whose criminal experiences are limited to a small number of common petty offenses (Stafford & Warr 1993). In other words, perceptions about these sanctions may have their greatest effects on those who have few of the motivations or opportunities that encourage crime. Piliavin et al. (1986) find that estimates of the likelihood of formal (e.g., arrest and incarceration) and informal (e.g., loss of friend or spouse) sanctions have minor effects on the offending decisions of a sample of adolescent high school dropouts, adult offenders, and drug users. In research on inner-city adolescents, Foglia (1997) reports that perceptions of the likelihood of legal sanctions and negative responses from friends do not influence involvement in several illegal acts. In addition, research indicates that people most likely to offend—those who have already done so in the past and those embedded in criminal networks—realize what crime commission and arrest data indicate: The likelihood of being arrested for most offenses is small (Horney & Marshall 1992, Montmarquette et al. 1985). Horney & Marshall (1992) find that offending is negatively associated with inmates' perception of future arrest—a pattern pronounced for those who committed the offense in question at least once in the three years prior to their incarceration, but who were never arrested for it. Horney & Marshall report that less successful offenders (i.e., a high ratio of arrests to offenses) had higher risk perceptions, but this effect of sanctions is limited, given the low probability of arrest.

In an alternative approach, McCarthy & Hagan (2002) explore the deterrent effect of a different type of criminal cost: physical harm. Many victims use violence in responding to illegal activities, and crime's potential for injury is an important consideration in offending decisions (Black 1993, Jacobs et al. 2000, Wright & Rossi 1986). This violence occurs more quickly than state sanctions and is often more severe. Using data from a sample of homeless adolescents, McCarthy & Hagan (2002) find that perceptions of crime's dangerousness have more powerful effects on several types of offending than do perceptions about arrest; moreover, the effects remain significant once controls are introduced for other costs, benefits, and background variables.

The Benefits of Crime

Critiques of the rational choice approach to crime typically argue that the economic benefits of crime are so meager that they cannot be realistically viewed as incentives. According to these critics, crime does not pay (Gottfredson & Hirschi 1990, Katz 1988, Wilson & Abrahamse 1992). Yet, recent research on a variety of offenders finds considerable variability in crime's financial returns and demonstrates

that for many offenders, illegal incomes exceed those provided by legal employment (Fagan & Freeman 1999). For example, research on homeless youth reports that, on average, youth who sold drugs earned $101 a day, compared to the average legal daily wage of $37 for legitimate employment (McCarthy & Hagan 2001). Similarly, Washington, DC drug-sellers earned monthly incomes that were more than double the median amount earned in legal jobs (Reuter et al. 1990). Levitt & Venkatesh (2000) report an average wage of $11 an hour among a gang of crack dealers; however, they also find that low-end "foot soldiers" often made below minimum wage, whereas gang leaders earned between $4,000 and $11,000 a month (also see Williams 1989).

Research on incentives also suggests that offenders may have reasonable expectations about crime's financial returns. McCarthy & Hagan (2002) examine the roles of several anticipated benefits (e.g., income, excitement) and costs (e.g., arrest, harm) on the frequency of theft, drug selling and sex trade work. They find that offending is positively associated with the anticipation that crime will bring greater returns than legitimate employment, but it is unrelated to the belief that crime will provide "lots of money" (Piliavin et al. 1986). Similarly, Levitt & Venkatesh (2000) suggest that offenders approach drug dealing as a tournament, knowing that large rewards are available, but for only a few participants.

Other studies find that illegal income discourages legal employment. In an analysis of the NLYS data, Grogger (1998) reports that offenders' market wages were 11% lower than non-offenders', but that they worked about 15% fewer hours. Using data on California inmates, Tremblay & Morselli (2000) find that involvement in the legal economy decreases with illegal earnings: 38% of all inmates always or mostly worked in the three years prior to their incarceration, whereas only 21% of those with high illegal incomes had been consistently employed.

Evaluation of crime's returns also demonstrates the importance of the various types of capital that offenders bring to their crime ventures. Both human and social capital contribute to success in normative activities such as employment, and criminal parallels to conventional capital may influence illegal success (Grogger 1998, Hagan 1994, Hagan & McCarthy 1997, Matsueda & Heimer 1997, McCarthy & Hagan 1995). Research on human criminal capital (i.e., offending knowledge and skills) finds that previous experiences contribute to illegal earnings (Matsueda et al. 1992, Viscusi 1986a; however, see Uggen & Thompson 1999), as does specialization (Fagan 1994, McCarthy & Hagan 2001, Tremblay & Morselli 2000; however, see Reuter et al. 1990). Criminal social capital also plays a role: Illegal income increases with the number of connections with other offenders (Pezzin 1995, Tremblay & Morselli 2000, Uggen & Thompson 1999, Viscusi 1986a,b) and the support these associations provide (McCarthy & Hagan 2001).

Cultural and personal capital (i.e., individual personality characteristics; see Caspi et al. 1998) may also influence illegal income. Matsueda et al. (1992) find that illegal earnings are positively related to offenders' prestige rankings of illegal occupations. This finding may indicate that individuals who adopt subcultural views about criminal activities receive greater support for their cultural identification and are able to translate this support into greater earnings. McCarthy & Hagan

(2001) report that a personal capital attribute, general competency (a combination of self-efficacy and intelligence), interacts with measures of criminal human and social capital to increase drug-selling income.

There is considerable diversity among the studies reviewed above. They reflect the interests of economists, sociologists, and criminologists; they focus on an array of criminal costs and benefits from arrest, stigma, and victim retaliation to illegal earnings; and they demonstrate the effects of both macro- and micro-level variables on offending. Nonetheless, these studies share the perspective that the rational choice approach can be effectively used to understand the decision to offend.

GAME THEORY

Most rational choice approach research on crime recognizes that the decision to offend does not occur in a vacuum, and yet it typically uses decision theory to understand offending. Tsebelis (1989) demonstrates the flaws in this approach with a simple comparison between two decisions: to stay home or go out when the probability of rain is greater than zero, and to follow the law or break it and hope to avoid arrest. People know that the probability of rain is independent of their decision to stay in or go out, but they may realize the likelihood of arrest is not. They may recognize that the police's interest in law enforcement is not fixed, but depends on the actions of others; that is, the police may want to increase their presence following a rise in crime and decrease it as crime falls. In other words, the outcome that results from a person's decision to offend is not independent of the decisions made by the police, victims, bystanders, or other people involved in crime.

Game theory recognizes the interactional dynamics of decision-making and thus offers an important avenue for generating and evaluating explanations of crime. The following summary of game theory draws on writings by Morrow (1994), Mero (1998), Gates & Humes (1997), Tsebelis (1990a), and Samuelson (1997). Game theory is most often used to construct models that provide a way of organizing and making explicit assumptions about people's preferences, behavioral options, and consequences, and the connections between their choices and their expectations of others' decisions. In short, these models are a way of representing interactive decisions. In this sense, game theory may be more aptly referred to as a language or analytical approach, rather than a theory. Although game theory has most often been used to build formal mathematical models of offending, rather than to guide empirical research, the propositions of game theory models are falsifiable and therefore subject to empirical test.

Game theory models differ from conventional decision-making models in that they make explicit the assumptions that people know their actions affect one another and use this knowledge in making choices; that is, game theory models assume people act strategically in their interactions. Game theory models also assume that decision-makers are rational, have knowable preferences, and know the defining characteristics of the interaction in which they are mutually involved (i.e., they know the rules of the game). Game theory models explain the structure and rules for

how individuals' decisions and actions interrelate and why the different outcomes occur. They specify which decisions are made and the situations in which they are decided; the choices that are possible and their probabilities; the order in which decisions occur; the information available; and the possible outcomes. In game theory language, models formalize a game's structure, players, payoffs, decision nodes, strategic actions, information sets, and probability distributions for each node.

Games may take a variety of forms, varying conditions to reflect the empirical situation they are attempting to model. They may be one-shot games or involve iterative play. Players may be required to move simultaneously or sequentially. Opponents may have complete information about the other players, or they may be missing key details. Players may begin and end the game with the same amount of information, or they may be allowed to update their knowledge.

After conceptualizing a given theory into a game theoretic form, game theory uses deductive analysis to delineate the players' strategies or "equilibria" that solve the game. For example, in the widely used Prisoner's Dilemma Game, two offenders have to choose simultaneously between "defecting" and implicating the other to a district attorney, or remaining silent. If one defects and the other remains silent, the former gets the highest outcome and the latter gets the worst. If they both refuse to talk, they get the second best outcome; if they both defect and incriminate the other they get the second worst result. Defecting is the dominant strategy for both players; that is, they should each choose to defect regardless of the other player's choice. Most games do not have this "dominant strategy equilibrium"; instead, people's best strategies are usually based on the decisions of others and reflect the interdependence of decisions.

Game Theory and Crime

Most game theorists introduce crime in their models in one of two ways: Some treat crime as a heuristic device, laying the foundation of a game to explore assumptions about social organization, social change, people's behavior, or game theoretic concepts (Bram 1994, Hoffman 2001), whereas others explicitly focus on offending decisions as a way of understanding crime. The following studies adopt the second approach. Political scientists and economists have contributed the most to this literature; yet, many of their analyses are implicitly sociological, integrating concerns and perspectives common to sociological research. I divide these game theory models into three games or decision categories based on the primary people involved: victims, offenders, and the police; offenders and the police; and citizens and the government. In each case, the game theory model emphasizes how variation in preferences and information leads to different outcomes.

Victims, Offenders, and the Police

Laver's (1982) *The Crime Game* is one of the earliest uses of game theory to model criminal decision-making. Laver's approach is unconventional. He writes in the

vernacular and adopts the voice of a seasoned offender who uses profanity, threats, and insults to make his points. And although he uses game theory models, he does not refer to game theory, nor integrate research on games or crime. Nonetheless, this small book provides several examples of how game theory can be used to understand crime. For example, most criminologists begin with the assumptions that victims' and offenders' preferences are in opposition and independent of each other. Laver uses extortion, blackmail, kidnapping, and hijacking to demonstrate problems with both of these assumptions. Laver's game theory models also make explicit the importance of two factors emphasized in studies of social interaction: credibility and reputation. Laver demonstrates that variation in the desire to establish and maintain a reputation influences the preferred strategies of both victims and offenders.

Consider extortion. A victim can choose to pay or not to pay, and the extortionist can decide to use violence or walk away. If the extortionist is a fraud, then both he and the victim have dominant strategies (a dominant strategy is one preferred regardless of the choice of other decision-makers). A person who poses as an extortionist is never going to use force regardless of the victim's actions (if he did he would not be a fake); thus his dominant strategy is not to use force and the victim's is, therefore, not to pay. However, a real extortionist does not have a dominant strategy; her actions depend on the victim's decision. If a victim does not pay, a real extortionist's interest in building or maintaining a reputation makes using violence the preferred choice; however, she prefers not to use force if the victim pays. Thus, a victim who wishes to escape violence should cooperate and pay.

A victim who is concerned about reputation introduces additional complications. A victim who believes that he is at risk of future extortion and who wants to establish a reputation as one immune to threats, has a strongly dominant strategy of not paying and accepting being harmed. The police create further difficulties, as their preferences are the same as those of the victim who wishes to build a reputation as a nonpayer; they prefer that victims do not pay. Thus, a professional extortionist and a victim who does not believe that he will be victimized in the future both have incentives not to involve the police: the extortionist and the victim both want a payment to occur in order to avoid violence, but the police prefer to sacrifice the victim. Laver's games nicely demonstrate the need to recognize the complex interconnections between the preferences of offenders, victims, and the police in order to understand victims' and offenders' decisions.

Gambetta (1993, 1994) adds further insights into extortion and related crime by explicating the role of "signaling strategies." Gambetta notes that offenders and consumers of illegal goods and services have vested interests in establishing signals that indicate the quality or authenticity of illegal goods (e.g., large shipments of drugs) or services (e.g., protection). Echoing Laver's work, Gambetta notes that an extortion victim must decide if the offer of protection is authentic or fraudulent. The victim needs complete information to make the best choice (i.e., pay the authentic protector and ignore the poser), and thus, both the victim and the authentic protector

have vested interests in finding unambiguous signals that convey who is real and who is not. Conversely, a fraudulent extortionist has an incentive to imitate signals or to encourage their distortion, thereby weakening them.

Gambetta (1994, 1993) argues that offenders' and victims' interest in unambiguous signals contributes to an array of practices that characterize organized crime and illegal markets; these include the emphasis on reputation, inflated self-images, secrecy, and the creation of myths. Using data on the Italian Mafia, he demonstrates how these practices help create and maintain signals that are difficult to pirate, thereby deterring pretenders. Gambetta's model clarifies the strategic rationale behind some organized crime behavior and helps explain why both offenders and victims may support the maintenance of unambiguous signals.

Cressman et al. (1998) use game theory to explore the dynamics between property crime victims, thieves, and the police. They begin with a game in which owners are solely responsible for protecting their property. Owners have two choices: they may be passive, doing nothing to guard property, or they may engage in various protective activities such as surveillance. Criminal opportunists choose between theft and nontheft. The game illustrates that owners' increased vigilance deters theft; however, as crime decreases, the owners' incentive for choosing passivity increases, encouraging their inactivity and increasing the returns to theft. Cressman and colleagues then add police to the game. The police increase the likelihood that thieves will be caught, but over time, policing makes passivity a dominant strategy for owners and theft then again becomes dominant for opportunists. The game reveals some of the processes involved in crime at the aggregate level and may help explain why stiffer penalties and greater police enforcement may deter crime in the short run, but not the long run, a finding often noted in deterrence research (Sherman 1990).

Offenders and the Police

Tsebelis (1989, 1990b, 1993) introduces a game that adds further insight into the relationships between police activity, sanctions, and crime. Tsebelis' (1989, 1990b) game begins with the following assumptions: Offenders prefer to offend when the police are elsewhere and prefer to follow the law when they are present; the police prefer to enforce the law when it is violated and to not enforce it when it is not. In other words, both players' optimal choice depends on the decision of the other, and both have an incentive to change their behavior in response to the other's actions. These assumptions lead to a game in which an increase in the severity of sanctions initially decreases crime by diminishing its expected utility. The police have less of an incentive to enforce the law as crime drops, and people respond to the decrease in policing by increasing their offending. This series of moves and countermoves eventually encourages a new equilibrium in which the increase in penalties has no long-term effect on criminal activity. Over time, increasing the severity of penalties has the greatest effect on police behavior, lowering their monitoring and thus decreasing the certainty of arrest.

Tsebelis (1989, 1990) modifies the game to allow for the following: incomplete information (players do not know the other's payoffs); myopic players (no long-term view or centralized strategy); variation in the level of crime and police enforcement; and the inclusion of nonstrategic players. In the last game, two types of police and two kinds of people play. One type of police monitor all the time, regardless of the amount of crime, whereas strategic police work only when crime increases. The two kinds of people are those who prefer violating the law only when the police are inactive, and honest people for whom offending is never a dominant strategy. In response to critics (Bianco et al. 1990, Cox 1994, Hirshleifer & Rasmusen 1992, Rapoport 1990, Weissing & Ostrom 1991), Tsebelis (1993; Bianco et al. 1990) explores additional models that introduce third players, such as the courts or legislatures who move before the police or the public, and that increase the severity of penalties. All of these more realistic models lead to the same theoretical equilibrium in which changes in policing and sanctions do not reduce crime over the long term.

Willmer (1970) adopts a different approach to the interactions between police and offenders. He suggests that these can be usefully conceptualized as information contests in which offenders strive to limit potentially dangerous information, such as clues to their identity, while the police endeavor to maximize their access to this information. These competing preferences indicate that both the police and offenders have a stake in knowing the practices of the other; moreover, the benefits achieved by either group come at the expense of the other. For example, the success of police practices is influenced by the learning curve of offenders who acquire information about policing and the frequency with which the police change their activities. This conclusion is consistent with empirical research that suggests that offenders adapt to changes in policing practices (Sherman 1990), as well as studies that demonstrate that the police and offenders use arrests and crime to communicate strategies to each other (Kohfeld & Sprague 1990).

Other game theory models explore how the information available to the police may actively encourage crime. Marjit et al. (2000) assume that offenders differ in their abilities to avoid detection; thus different levels of policing are required to deter them. They also assume that law enforcers have preferences for the amount of effort they want to spend policing; although arrests are an incentive for police—they reduce work—so are bribes. In Marjit et al.'s game, an individual police officer moves first, committing an amount of effort to detection. The offender responds by deciding whether to offend or not. If the offender commits a crime and is apprehended, she must decide if she should try to bribe the police and the police must decide whether or not to accept the offer. If bribes are large enough relative to the returns provided for arrest, police have an incentive to accept the former. Officials who know the type of offender they will encounter have a further incentive not to deter offenders whom they know will bribe, thereby allowing crime. In contrast, law enforcement officials who do not know the type of offenders they will encounter (i.e., have incomplete information) have a greater incentive to monitor so that they can obtain the reward associated with arrest. The game suggests that information

about offenders, the attractiveness of bribes, and the police's susceptibility to rewards may interact to influence the level of crime.

Citizens and the Government

Bueno de Mesquita & Cohen (1995) expand the list of decision-makers in their game, adding people, government, and nature (i.e., the random effect of forces outside the game). The game assumes that people's abilities to meet their preferences are influenced by the following: their level of social status, the value obtained through legitimate opportunities a government provides, the value provided by social assistance programs, the fairness of the government, the probability of apprehension and punishment for offending, and the cost of crime. People can choose to offend or to engage in socially acceptable behavior. Government can treat citizens in two ways: a fair government allows people legitimate opportunities to earn benefits that exceed the value provided by the government's social safety net; an unfair one imposes policies that shift resources from the individual to the government and limit returns. In the game, the level of law enforcement is fixed, being arrested is determined by nature, and the government moves first. Bueno de Mesquita & Cohen vary characteristics of people and governments to produce various equilibria for the game.

Solving the game reveals several conclusions. First, an individual's decision to offend is strongly influenced by his level of trust in the government's expected fairness: If people are convinced that their government will treat them unfairly, punishment may have no effect on offending. Second, with level of trust held constant, the fundamental structural features of a society increase the motivation to offend for the poor, relative to those who are wealthy. Indeed, no level of trust is sufficient to reduce crime if poverty is extreme. Reducing crime among the poor requires increases in opportunities to gain social status and the rewards provided by legitimate opportunities. Third, increasing the severity of punishment will have a small impact on the decision to offend, whereas increases in the probability of apprehension have a far greater effect in deterring crime. Fourth, improving social welfare does not discourage offending and may actually increase it if offenders receive benefits independent of their choice between legal and illegal actions.

Evolutionary Game Theory

Although game theory models provide many insights into the decision to offend, critics question the viability of the central assumptions that people's choices are always rational and that people know that others are rational. These assumptions are often necessary for any equilibrium to occur. However, critics argue that these assumptions do not adequately reflect how people choose their actions, nor do they mirror how strategies develop and spread in a population. Evolutionary game theory addresses these issues (Samuelson 1997); it assumes that people may not know the benefits of behaviors when they choose them, but that unintended rewards can encourage people to repeat their behaviors and can encourage others to copy them. According to evolutionary game theory, these behaviors are strategies, not

because they were necessarily intended as such, but because they yield rewards; the more benefits a strategy provides, the more likely that it will be repeated and thus proliferate within and across populations.

The relaxing of the rationality assumptions allows evolutionary game theory to explain how strategies can develop, change, and proliferate in response to new situations such as environmental change, evolution, or new ways of thinking. Evolutionary game theory emphasizes that strategies are not the sole properties of individuals but are behavioral options that exist in populations. Although evolutionary game theory does not assume perfect rationality in explaining people's decisions, it argues that a rational equilibrium can develop from these decisions. Following the Darwinian principle, this theory assumes that successful strategies are more likely to be repeated in the future than unsuccessful ones. However, evolutionary game theory recognizes that strategic choices can be influenced by a "transmission bias constant" for or against a strategy. The notion of a transmission bias is imported from cultural evolutionary theory and recognizes that forces outside the game also influence strategic choices. These forces can include cultural biases for or against particular types of strategies, as well as structural conditions that delay or accelerate the transmission of strategies between people and groups.

Evolutionary game theory has had the greatest impact in economics, and only a few researchers have made more explicit use of this theory in modeling crime. For example, the article described above by Cressman et al. (1998) uses evolutionary game theory and an emphasis on imitation to model how thieves and property owners acquire new strategies in response to evolution in the strategies of the other. However, some sociologists have recognized the value of combining evolutionary game theory and sociological insights (Macy & Flache 1995).

Currently, the most ambitious use of evolutionary game theory to study crime is Vila & Cohen's (1993) test of hypotheses derived from Cohen & Machalek's (1988, 1994) ecological theory of illegal expropriation. Cohen & Machalek (1988) define illegal expropriation as a process whereby individuals or groups use coercion, deception, or stealth to usurp material or symbolic resources from others. Criminal strategies develop because the social organization of production (e.g., the routine patterns of activity, the availability and distribution of resources, and mode of production) creates an opportunity structure that invites invasion by nonproductive strategies. People are most likely to adopt or copy an illegal expropriation strategy when they observe or acquire knowledge about its success (also see Usher 1992). Thus, the success of a strategy depends on the kinds of strategies used by others. In some contexts, common strategies are the most successful, whereas in others, unique ones provide greater returns. Cohen & Machalek argue that successful expropriation is more likely when it is a less common strategy. They assume that strategies compete against each other; over time, individuals' ability to access, retain and implement possible strategies results in different strategy proportions in a society.

In Vila & Cohen's game, all individuals in a large population play repeated rounds of a two-person game; for simplicity's sake, people have only two behavioral strategies: produce or exploit. They also know the costs associated with

exploitation. The game assumes that choosing the productive strategy does not diminish the resources of the group, whereas each instance of exploitation reduces each group member's resources (i.e., they pay a cost). In each round, the average payoff for exploiters depends upon the value of resources exploited, the costs of exploitation, and most important, the average number of exploiters per producer. Vila & Cohen (1993) use computer simulations to estimate models of repeated game playing over 500 generations. The simulations demonstrate that the likelihood of expropriation increases when its costs are low and returns are high, and when there is little competition among exploiters. It is also more likely when changes in production encourage continual innovation in illegal strategies and when these can be easily transmitted. Consistent with Cohen & Machalek's claim, Vila & Cohen's analysis suggests that expropriative crime is a normal outgrowth of routine economic, social, and productive interactions.

Capitalizing on Game Theory Research

Game theory research clearly offers several insights into offending; however, only a few researchers have tested any of these in empirical studies of offending. McCarthy et al. (1998) use research on the Prisoner's Dilemma Game (PDG) to examine assumptions about offenders and their involvement in co-offending. Experimental research from more than 1000 studies indicates that a sizable proportion of PDG players, often around 40% (Mero 1998), simultaneously choose to cooperate. As a result, they both forego the maximum payoff, but also avoid the worst one. Although this outcome appears to be inconsistent with the rational choice approach, this is not necessarily the case; indeed, there are several possible explanations for this pattern of unplanned cooperation (see Mero 1998). McCarthy et al. (1998) argue that it can be explained by collective or cooperative rationality: the joint recognition that the probability of avoiding an undesirable outcome and/or attaining a desired one may rise with, and indeed may require, a cooperative effort. McCarthy et al. suggest that like other cooperators, co-offenders may be instrumentally rational actors who recognize that structural conditions may necessitate that they work together to satisfy their preferences. Consistent with this hypothesis, McCarthy et al. find that homeless youth who are willing to collaborate offend more frequently than others. Moreover, McCarthy & Hagan (2001) find that criminal collaboration increases the illegal successes of these youth: drug sellers who indicate a willingness to work with others earn more than do those who shun cooperation.

CONCLUSION

In one of the most frequently cited books on crime of the last century, Gottfredson & Hirschi (1990, p. 72) conclude that "the theoretical contribution of the new economic positivism is not as impressive as it is to its authors." Moreover, they argue that economic analyses have "extremely limited value" [around the same time Gary Becker (Swedberg 1990, p. 43) reported that he thought rational choice

had already made contributions to criminology and would "pay off even more in the future"]. In an early assessment, Martin (1978, p. 99) argued that game theory is also of little use for understanding crime: "[Game theory] does not lead to a real elucidation . . . [but rather is] a mathematical, esoteric way of perpetuating and justifying existing concepts about crime." The review of the work presented above suggests that these authors are mistaken. Although sociological criminology should not abandon its interest in culture, values, social structure, and other phenomena typically ignored by economists, it should draw upon and profit from the advances of the rational choice approach.

There are several ways for sociological criminology to capitalize on the contributions of a rational choice approach, and I suggest five possibilities. First, sociological criminologists must move beyond the assumption that all offenders share the same preferences (e.g., Gottfredson & Hirschi 1990) and end the fruitless debate about which one—e.g., the thrill of crime versus its material returns (Katz 1988)—dominates in offending decisions. Individual preferences vary over time (Becker 1996), crime provides an array of returns, and people differ in their assessments of crime's costs and benefits. Future theory and research must begin by specifying the preference orderings that contribute to offending and then explicate how particular contexts or structural configurations encourage people to choose crime as a means of satisfying their preferences. It is clear that criminal involvement varies over the life course (Sampson & Laub 1992, 1993, Uggen 2000), and it is likely that this variation reflects change in individuals' preferences. Criminologists must develop more compelling explanations of the origins and sources of variation in the preferences that encourage crime.

Second, sociological criminology must recognize the limitations of assuming that offenders have one dominant strategy that applies to most if not all situations (i.e., to offend because of their socialization or lack of self-control). Choosing a strategy depends on the strategic choices of others, and people choose differently when they have strongly dominant strategies as opposed to when they do not have such singularity. Game theory models provide considerable insights into the complexities of illegal decisions, but these are abstractions that are mostly untested. And, although several studies of policing and deterrence reach the same conclusions as game theory research, there is little overlap between game theory models of crime and empirical studies of offending. Sociologists who study crime need to make better use of game theory contributions, proposing and testing theories that detail the various strategies available to different kinds of individuals and the conditions under which they are more likely to choose criminal strategies over others.

Third, the specification of preferences, perceptions, and strategies must be contextualized more precisely. Criminologists have long recognized that neighborhoods, families, schools, friends, and other affiliations influence criminal involvement. However, there is a tendency to view these as static rather than as dynamic forces, ignoring the ways in which their influence varies across contexts. For example, familial relationships and parenting strategies differ over time and

situations, and this variation may encourage their children to vary their responses in different contexts.

Fourth, sociologists often evaluate social programs, criminal justice, and punishment systems using the assumption that offenders and the police (as well as victims and other agents of social control) have unique preferences that are oppositional, independent, and stable. Yet, game theory and deterrence research suggest that each group's preferences can overlap and may change in response to the actions of the other, as does their choice of strategies. Using insights about the complex relationship between preferences, strategies, and incentives, sociologists need to make more realistic assessments of the consequences of the reciprocal relationships between offending and policing, punishment and other sanctions. These assessments should also inform their recommendations for improving future social control practices.

Finally, criminologists should abandon the view of people as overly determined by forces highlighted in their theories and recognize more explicitly an individual's agency in making decisions. For example, explanations that view people as actively involved in transforming their relationships into social capital and their experiences into human capital (conventional or criminal) are more compelling than those that suggest that people simply respond to associations and events; they are also more likely to realize the variability of preferences and strategies involved in the active decision to offend.

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