NEW DIRECTIONS IN THE ECONOMIC ANALYSIS OF CRIME AND LAW ENFORCEMENT"

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I. Introduction

The persistence of "crime" in all human societies and the challenges it imposes for determining how to enforce laws enjoining it, have attracted the attention of scholars throughout human history including, in particular, utilitarian philosophers and early economists like Beccaria, Paley, Smith, and Bentham. Indeed, in view of its empirical regularity, sociologists like Durkheim adopted the view that "crime, in itself, is a normal social phenomenon", rather than an aberration of human nature. It was not until the late 1960s, especially following the seminal work by Becker (1968), however, that economists reconnected with the subject in a systematic fashion, using the modern tools of economic theory and applied econometrics.

The essence of the economic approach, as restated by Becker, lies in the assumption that potential offenders respond to incentives, and that the volume of offenses in the population can therefore be deterred or prevented through an optimal allocation of resources to control crime. The objective of social policy is specified as minimization of the aggregate social loss from crime and law enforcement. Based on this criterion, Becker derived a comprehensive set of behavioral propositions and optimal enforcement strategies involving the certainty of apprehending and convicting offenders, the severity of punishment to be imposed on those convicted, and the selection of optimal instruments of punishment. The "deterrence hypothesis", as stated by Ehrlich (1973, 1975a, 1982, 1996), expands the scope of the relevant incentives by which offenders can be motivated or controlled. It highlights the relative roles and limitations of "negative" incentives such as the prospect of apprehension relative to conviction and punishment, whether by public law enforcement or private self-protection efforts, as well as "positive" incentives such as opportunities for gainful employment for workers at the lower end of the earnings distribution, or education and rehabilitation efforts, as deterrents to criminal activity. In this approach, the analysis of crime shares some formal similarities with that of occupational choice in labor-theoretic settings.

For this approach to provide a useful approximation to the complicated reality of crime, it is not necessary that all offenders respond to incentives, nor is the degree of individual responsiveness prejudged; it is sufficient that a significant number of potential offenders so behave on the margin. By the same token, the theory does not preclude a priori any category of crime, as offensive or heinous as it may be, or any class of incentives. Indeed, economists have applied the deterrence hypothesis to a myriad of illegal activities, from tax evasion, corruption, and fraud to robbery, murder, and terrorism.

II. Theory

The economic approach to criminal behavior can be summarized by the following syllogism: "People respond to incentives. Offenders are people too. Therefore, offenders respond to incentives". Crime, in turn, inflicts material and emotional harm on both individual victims and on society as a whole and disrupts the foundations of civil society and efficient resource allocation. This is true even in the case of petty theft, which entails

just a small redistribution of wealth from victim to offender. Theft involves a net social loss by virtue of the fact that thieves spend their time and energy on effecting a redistribution of wealth instead of creating new wealth. In addition, individuals and society spend resources on protection of property and avoidance of emotional loss, as well as the potential loss of life and limb from being victims of serious crime, which is another significant drag on the economy and the pursuit of happiness. Therefore theft, let alone more serious crime, entails a significant social cost and society has a strong incentive to resist it in various forms.

In Becker's analysis, equilibrium volume of crime reflects the interaction between offenders and the law enforcement authority, and the focus is on optimal probability, severity, and type of criminal sanction – the implicit "prices" society imposes on criminal behavior to minimize the aggregate income loss from crime. This thesis has powerful implications concerning the choice of an optimal level of resources to be devoted by society to combat crime, as well as the optimal combination of law enforcement instruments to be imposed – the probability of apprehending and convicting offenders, the magnitude of the punishment to be meted out for crimes of different severity, as well as the form of the sanction to be imposed: imprisonment, or monetary compensation (see Becker, 1968 and Stigler, 1970).

Subsequent work has focused on more complete formulations of components of the criminal justice system, especially the supply of offenses, the production of specific law enforcement activities, as well as alternative social welfare criteria for producing optimal law enforcement strategies. Another methodological evolution has expanded the basic analytical setting of the Becker model by addressing the interaction between potential offenders (supply), consumers and potential victims (private "demand" for illegal goods or "derived demand" for protection), and deterrence and prevention (government intervention). This "market model" applies not just in the case of transactions involving direct demand for illegal goods and services, such as illicit drugs and prostitution, but on theft, robbery, and murder for which the "demand" side derives from the private demand for individual safety. In this setting, government intervention works as a form of both demand and supply management, which can in principle combine elements of pure deterrence, like monetary fines, with methods of individual control, such as incapacitation (retention, imprisonment, or confiscation of illegal goods) and rehabilitation of convicted offenders. This virtual market for offenses (Ehrlich, 1981, 1996) has later been extended to include interactions of crime with the general economy as well, including the prospect that crime could harm creative economic activity and thus economic growth and development. These extensions are discussed in greater detail in the following sections. For specific articles on which the following discussion is based, see Ehrlich and Liu (2006, vol. 1 and 2).

Supply

The extent of participation in crime is generally modeled as an outcome of the allocation of time among competing legitimate and illegitimate activities by potential offenders acting as expected-utility maximizers. While the mix of pecuniary and non-pecuniary benefits varies across different crime categories, which attract offenders of different attitudes toward risk and proclivities ("preferences") for crime, the basic

opportunities affecting choice are identified in all cases as the perceived probabilities of apprehension, conviction, and punishment, the marginal penalties imposed, and the differential expected returns on competing legal and illegal activities. Entry into criminal activity and the extent of involvement in crime is shown to be related inversely to deterrence variables and other opportunity costs associated with crime, and directly to the differential return it can provide over legitimate activity as well as to risk aversion. Contrary to the perception that criminals constitute a "non-competing group" in classical labor jargon, by which all of them are completely specialized in the pursuit of criminal activities as members of gangs or organized crime, the labor-theoretic approach to participation in illegitimate activities expects many offenders to be "part-time" offenders, pursuing legitimate endeavors as well, and criminal enterprises to be typically small organizations, partly to diversify excessive risk bearing, given the prospect of detection, apprehension, and punishment (see Ehrlich, 1973) and the extensive empirical evidence documented by Reuter et al. (1990).

The theory yields not just general qualitative propositions about the way offenders respond to incentives, but also discriminating implications about the relative magnitudes of responses to different incentives. For example, a one per cent increase in the probability of apprehension is shown to exert a larger deterrent effect than corresponding increases in the conditional probabilities of conviction and punishment. Essentially due to conflicting income and substitution effects, however, sanction severity can have more ambiguous effects on active offenders: a strong preference for risk may weaken, or even reverse the deterrent effect of sanctions and the results are even less conclusive if one assumes that the length of time spent in crime, not just the moral obstacle to entering it, generates disutility. The results become less ambiguous at the **aggregate** level, however, as one allows for heterogeneity of offenders due to differences in employment opportunities or preferences for risk and crime: a more severe sanction can reduce the crime rate by deterring the entry of potential offenders even if it has little effect on actual ones. In addition to heterogeneity across individuals in personal opportunities and preferences, the literature has also addressed the role of heterogeneity in individuals' perceptions about probabilities of apprehension, as affected by learning from past experience. As a result, current crime rates may react, in part, to past deterrence measures. A different type of heterogeneity that can affect variations in crime across different crime categories and geographical units may stem from the degree of social interaction, which can partly explain why urban crime rates generally exceed rural rates.

This theory also yields testable propositions about the way participation in criminal activity varies across states, over the life cycle and across different crime categories. Ehrlich's work identifies inequality in the distribution of income, especially at the lower tail of the income distribution, as having a powerful impact on participation in all felonies, essentially because those with lower skills have poorer prospects for entry into legitimate occupations and lower opportunity costs of imprisonment. In contrast, area wealth provides higher gains from property crimes. Also, educated workers who earn relatively high salaries in legitimate occupations can be expected to avoid especially street crimes which require low skills, but this is not necessarily the case with white collar crimes, which do require education and skills. Evidence from prison data and self-reported crimes confirms these propositions (Ehrlich, 1973, 1975, Lochner 2004).

4

Private "Demand"

The incentives operating on offenders often originate from, and are partially controlled by, consumers and potential victims. Transactions in illicit drugs or stolen goods, for example, are patronized by consumers who generate a direct demand for the underlying offense. But even crimes that inflict pure harm on victims are affected by an indirect (negative) demand, or "derived demand", which is derived from a positive demand for safety, or "self-protection". This term has been used in the economic literature to indicate individual efforts aimed at reducing the probability of being afflicted by hazards to their economic or physical well-being (Ehrlich and Becker, 1972). The hazard of becoming a victim to crime is a natural application of the concept. By their choice of optimal self-protective efforts through use of locks, safes, Lojacks, private guards and alarm systems, or selective avoidance of crime-prone areas, potential victims lower the marginal returns to offenders from targeting them, and thus the implicit return on crime to the offender. And since optimal self-protection generally increases with the perceived risk of victimization (the crime rate), private protection and public enforcement will be interdependent. Thus, even in the absence of public enforcement of laws, the incidence of crime in the population can be contained, or "equilibrated" through private self-protection. At the same time, however, private protection can also generate both positive and negative externalities, i.e., spillover effects, of considerable magnitudes, which make it both necessary and expedient to resort to the power of the state to play the major role in protecting life and property and assuring law and order.

Public Intervention

Since crime, by definition, causes a net social loss, and crime control measures are largely a public good, collective action is needed to augment individual self-protection. Public intervention typically aims to 'tax' illegal returns through the threat of punishment, or to 'regulate' offenders via incapacitation and rehabilitation program. All control measures are costly. Therefore, the 'optimum' volume of offenses cannot be nil, but must be set at a level where the marginal cost of each measure of enforcement or prevention equals its marginal benefit.

To assess the relevant net social loss, however, one must adopt a criterion for public choice. Becker (1968) and Stigler (1970) have chosen maximization of variants of 'social income' measures as the relevant criterion, requiring the minimization of the sum of social damages from offenses and the social cost of law enforcement activities. This approach leads to powerful propositions regarding the optimal magnitudes of probability and severity of punishments for different crimes and different offenders, or, alternatively, the optimal level and mix of expenditures on police, courts, and corrections. The analysis also reaffirms the classical utilitarian proposition that the optimal severity of punishment should "fit the crime", and thus be set according to its overall deterrent value, essentially because applying the more severe sanctions on, say, petty theft would induce offenders to go for grand larceny. Moreover, it makes a strong case for the desirability of monetary fines as a deterring sanction: since fines are essentially a transfer payment which does not require use of real resources to punish offenders, as do imprisonment, confinement, deportation, and banishments, they are "socially costless". However, fines cannot be relied upon as the dominating form of sanctions since optimal crime control requires the

reliance on incapacitating offenders with a high risk of recidivism, or providing them opportunities for rehabilitation through training programs oriented to bolster legitimate skills (Ehrlich, 1981).

Another aspect of optimal law enforcement where the income-maximizing, or cost minimizing criterion has a natural appeal is the choice of the optimal way to **produce** enforcement or security services. This is inherently a "supply-side" issue, since optimal enforcement services need not be produced by government agencies - they could be delivered by private enforcers or private suppliers of security and protection services whose task can be to detect legal infractions, help prosecute offenders, or administer legal sanctions. Optimal public law enforcement involves setting up rules of compensation to maximize the efficiency of the supply of enforcement and protection services, including private provision of detention, imprisonment, and rehabilitation services. (see, e.g., Becker and Stigler, 1974, Landes and Posner, 1975 and Benson, 1998).

Different criteria for public choice, however, yield different implications regarding the optimal mix of law enforcement strategies. An important example is the optimal mix of probability and severity of apprehending and punishing offenders, as is the case when the social welfare function is expanded to include concerns for "distributional consequences" of law enforcement on offenders and victims in addition to aggregate income. These considerations can be ascribed to aversion to risk, as in Polinsky and Shavell (1979), or to alternative concept of justice, as proposed in Ehrlich (1982). Furthermore, a positive analysis of enforcement must address the behavior of the separate agencies constituting the enforcement system: police, courts, and prison authorities. For example, Landes's 1971 analysis of the courts, which focuses on the interplay between prosecutors and defense teams, explains why settling cases out of court may be an efficient outcome of many court proceedings.

The optimal enforcement policy arising from the income maximizing criterion can be questioned from yet another angle: a public-choice perspective. The optimization rule invoked in the preceding papers assumes that enforcement is carried out by a social planner. In practice, public law enforcement can facilitate the interests of rent-seeking enforcers who are amenable to malfeasance and bribes. Optimal social policy needs to control malfeasance by properly remunerating public enforcers (Becker and Stigler, 1974) or setting, where appropriate, milder penalties (Friedman, 1999).

Market Equilibrium

In Ehrlich's (1981) "market model", the equilibrium flow of offenses results from the interaction between aggregate supply of offenses, direct or derived demand for offenses (through self-protection), and optimal public enforcement, which operates like a tax on criminal activity. Some behavior classified as crime, such as prostitution and consumption of illicit drugs, involves the interaction between suppliers and consumers in an explicit market setting. But even crimes against persons and property can be analyzed by reference for a virtual market that involves the interaction between offenders and potential victims through the latter's demand for self-protection, and thus a negative demand for crime. This analysis identifies more fully the interaction between crime, private self-protection and public law enforcement and the limitations of alternative means of crime prevention. One important application concerns a comparison of

6

deterrence, incapacitation, and rehabilitation as instruments of crime control. This is because the efficacy of deterring sanctions cannot be assessed merely by the elasticity of the aggregate supply of offenses schedule, as it depends on the elasticity of the private demand schedule as well. Likewise, the efficacy of rehabilitation and incapacitation programs cannot be inferred solely from knowledge of their impact on individual offenders. It depends crucially on the elasticities of the market supply and demand schedules, as these determine the extent to which successfully rehabilitated offenders will be replaced by others responding to the prospect of higher net returns. This market setting has also been applied in works by Schelling, Buchanan, and Garoupa, for example, to analyze various aspects of organized crime.

The "market model" has been developed largely in a static, partial-equilibrium setting in which the general economy affects the illegal sector of the economy, but not vice versa. More recently, the model has been extended to deal with the interaction between the two under dynamic settings as well. Specific applications focus on the interaction between crime and income distribution and the relation between bureaucratic corruption and economic growth over the process of economic development (Imrohoroglu, Merlo, and Rupert, 2000, Ehrlich and Lui, 1999).

III. Applications and Empirical Evidence

Scope

Largely due to the paucity of theoretically relevant data, little has been done thus far to implement a comprehensive market model of illegitimate activity. Many researchers have attempted, however, to implement a simultaneous equation model of crime and law enforcement activity consisting, typically, of three sets of structural equations originally proposed in Ehrlich (1973): supply-of-offenses functions linking the rate of offenses with deterrence variables and other measurable incentives; production functions of law enforcement activity linking conditional probabilities of arrest, conviction, and punishment with resource inputs and other productivity measures; and demand-for-enforcement functions linking resource spending with determinants of public intervention. Attempts to address other aspects of the market model of crime include measuring the effect of law enforcement on the net return from crime, as in Viscusi (1986), and simulating a general equilibrium model that focuses on the interaction between the legal and illegal sectors of the economy (Imrohoroglu et al. 2000, and Engelhardt, Rocheteau, and Rupert, 2008). Other applications concern modeling organized crime or "victimless crimes", for which there is direct demand by consumers and patrons and analyses of the general criminal justice system (see, eg. Buchanan 1973, Garoupa, 2000, Reinganum, 1993).

A number of studies have focused, instead, on specific components of the market model. Some have examined various forms of private self-protection, including use of guards, flight from high crime neighborhoods into suburbs, and carrying concealed guns as a possible means of self-protection against crime. Other studies have focused on the effects of specific measures of law enforcement, such as the Federal sentencing guidelines, enhanced police presence, and the two-and three-Strike legislation in California. Another set of papers focuses on crime and aspects of the labor market. Studies related to these applications by Bartel, Ayres and Levitt, Cullen and Levitt, Lott

and Mustard, Duggan, LaCass and Paine, Gould, Weinberg and Mustard, Raphael and Winter-Ember, Shepherd, and Lochner are surveyed in Ehrlich and Liu (2006, vol. 2 and 3). See also Kling (2006) and Evans and Owens (2007).

The bulk of the empirical implementation, especially over the last two decades, tested the deterrence hypothesis against data from different population aggregates and different types of crime. The first set explores data on individual offenders, juveniles, females, urban areas and different countries, such as Canada, the UK, Italy, Finland, and Germany. The second set includes data on specific crime categories, ranging from aircraft hijacking, drugs, drunk driving, Anti-Trust violations, corporate fraud, and Federal fraud. Early and recent papers on these topics by, e.g., Witte, Levitt, Bartel, Glaeser and Sarcedote, Wolpin, Landes, Corman and Mocan, Block, Nold and Sidak, Karpoff and Lott, and Waldfogel are also surveyed in Ehrlich and Liu (2006 vol. 2 and 3). Also see the recent study by Drago, Galbiati, and Vertova (2009).

Methodological issues and Major Findings

The econometric applications via regression analyses have been hampered by a number of methodological problems. FBI crime reports are known to understate true crime rates, and related errors of measurement in estimated punishment risks may expose parameter estimates to biases and spurious correlations. The inherent simultaneity in the data, whereby the relation between crime and deterrence variables may reflect different directions of causality corresponding to supply, demand, or production relationships, requires systematic use of identification restrictions to assure consistent estimation of structural parameters. In testing offenders' responsiveness to incentives, the deterrent effect of imprisonment must be distinguished from its incapacitating effect. Efficient functional forms of structural equations must be selected systematically. And there is the ubiquitous possibility that regression estimates would be biased by 'missing variables' and sample-selection biases. Most of these problems have been recognized and addressed in the literature from the outset, but more attention has been paid to these problems in recent studies.

In particular, and as the "market model" of crime suggests, higher crime rates, and thus risks of victimization, should increase the willingness of potential victims and law enforcement agencies to spend resources on crime prevention and deterrence, which could bias the estimated association between crime and enforcement variables in a direction contrary to the one predicted by the deterrence hypothesis. In contrast, the "crowding effect" on existing law enforcement resources that can be produced by unexpected surges of crime, as well as errors of measurement in crime counts are likely to produce the opposite bias (Ehrlich 1973). To overcome such statistical biases, researchers must try to identify instrumental variables that are not affected by the concurrent incidence of crime but otherwise raise the public willingness to enforce the law or the efficiency of law enforcement efforts. Examples of instrumental variables identified by researchers include "political cycles" which bring to power politicians running on strengthening law and order (see e.g., Levitt, 1997), although successful campaigns may reflect previously high and persisting crime rates, or the stock of legal decisions stemming from constitutional principles, especially by the Supreme Court, which make it either easier or more difficult to convict those apprehended and charged by police (see e.g., Ehrlich and Brower, 1987). Another important research challenge

concerns the separation of deterrence from incapacitation effects, since law enforcement by way of detention, or incarceration and imprisonment can reduce the incidence of crime by incapacitating actual offenders, rather than deterring would be ones. The deterrence hypothesis applies only to the latter effect. The incapacitation effect can be assessed theoretically, since it depends largely in the **level** of the risks of apprehension and imprisonment rather than changes in these variables (Ehrlich 1982), but the two effects can also be isolated empirically by estimating a set of interrelated crimes simultaneously: for example, higher prison terms for burglary cannot have an incapacitating effects on those committing robbery, but they may deter would-be robbers (Kessler and Levitt, 1999). Helland and Tabarrok (2007) provide further evidence on the existence of pure deterrence effects based on California's "Three-Strike" law.

Use of different types of data can also impact the researcher's ability to measure the effects of "positive incentives". For example, cross-sectional data on variations in unemployment rates may be affected by an area's industrial composition, unemployment compensation level, and the age and skill composition of the area's labor force, rather than involuntary layoffs. Time series data that span business cycles are more likely to reflect involuntary layoffs and thus the opportunities for gains from legitimate labor market activities. Studies based on time series and panel data are therefore more likely to reflect the force of legal employment incentives – the effect of the unemployment rate specifically – and the deterrence hypothesis.

The overwhelming volume of studies following systematic econometric applications, which were applied to alternative regions, population groups and different crime categories, has produced similar findings: probability and length of punishment are generally found to lower crime rates, with elasticities of response of crime rates to probability of punishment often exceeding those with respect to severity of punishment (see, e.g., the early studies by Ehrlich and the recent study by Drago, Galbiati, and Vertova, 2009). Also, the estimated elasticities of crime with respect to the risk of apprehension are generally found to exceed those with respect to the conditional risks of conviction and punishment. Crime rates are also found to be directly related to measures of income inequality and community wealth (proxy measures of relative gains from crime). Estimates of unemployment effects are somewhat ambiguous, however, depending, in part, on whether they are derived from time-series or cross-section data (see the surveys by Freeman, 1983, and Ehrlich 1996), but more recent studies (e.g., Raphael and Winter-Ember, 2001) have confirmed the existence of deterrent effects of employment opportunities using instrumental variable techniques.

Not all past research appears to be consistent with the deterrence hypothesis. For example, some studies report a positive association between police expenditure and crime, although this relationship may represent positive demand for public protection from crime. Critics have argued that the estimated deterrent effects may mask a crowding effect of crime on punishment rather than vice versa (Blumstein et al., 1978). However, recent studies provide evidence corroborating the deterrence hypothesis by using effective instrumental variables and panel data techniques to isolate and identify the effect of deterrence variables. Some studies have also estimated a system of interrelated crimes to separate deterrence from incapacitation effects of imprisonment (e.g., Ehrlich and Brower, 1987, Ehrlich and Liu, 1999, Levitt, 1997, and Kessler and Levitt, 1999).

The applicability of the economic approach to the crime of murder, and whether the death penalty constitutes a specific deterrent have raised greater controversy. The center of debate has been Ehrlich's 1975 and 1977 studies based on time series and cross-state data, in which deterrence variables, including the risk of execution as well as the probability and length of punishment by imprisonment, were found to lower murder rates (see Blumstein et al., 1978; and the response in Ehrlich and Mark, 1977). The controversy has generated additional empirical research which is still on-going, some inconsistent with the deterrence hypothesis (e.g. Avio, 1979; Hoenack and Weiler, 1980, McManus, 1985) but others strongly corroborative not only of the direction of the deterrent effect of the probability of execution, but even the quantitative impact of this extreme penalty as originally estimated (e.g., Wolpin, 1978, Layson, 1983 and 1985, Ehrlich and Liu, 1999, Mocan and Gittings, 2003, and Dezhbakhsh, Rubin, and Shephard, 2003). The studies by most economists have been motivated by scientific curiosity concerning the issue of deterrence, for if severity of punishment matters, as is overwhelmingly documented by studies following a rigorous econometric methodology, why wouldn't the most severe legal sanction impart a deterrent effect as well. Many critiques have been motivated, however, by a normative concern about the desirability of executions as a legal sanction, an issue that should be divorced from the issue of its effectiveness. Indeed, if murderers respond to incentives, alternative sanctions can be effective as well.

IV Policy Implications

The principle of minimizing the aggregate income loss from crime, while involving a narrow efficiency criterion involving material losses, nevertheless has powerful implications concerning optimal crime control policies. It suggests the need to employ differential punishments for different types of offenses, to "fit the crime", as well as for different types of offenders in proportion to their deterrent and incapacitating or rehabilitating values. It also implies that although government intervention in the economy is necessitated in order to avoid a suboptimal reliance on private self-protection, which creates both external economies (thus too little private protection) and diseconomies (too much emphasis on the protection of individual interests as opposed to society as a whole), the production of means of crime control need not be done just by government agencies and may involve outsourcing of the production of desirable security services to private firms (e.g., bail-bonding, legal firms, private prisons, and training centers).

The relative desirability of specific means of crime control cannot be determined just by their relative efficacy or cost efficiency; it also depends on their relative social costs and on the welfare criteria invoked as a justification for public law enforcement. For example, if the welfare objective is to maximize social income, then the social cost of purely deterring sanctions, such as fines, would be close to zero, because as transfer payments, fines are free of the deadweight costs associated with imprisonment, house arrests, probation and other intermediate punishments. An optimal enforcement strategy may then involve raising such fines to their maximal feasible level (consistent with a convict's wealth constraint) while lowering the probability of apprehension and conviction to its minimal level. Even under this (narrow) efficiency criterion, however, it

would be optimal to use imprisonment and intermediate punishments along with fines for those crime categories where the added incapacitation value of imprisonment justifies its added costs.

The enforcement strategy would be different if the social welfare function were broadened to include distributional objectives as well. These include, for example, a preference for promoting equality of individuals under the law, reducing the legal error of convicting the innocent, or lowering the corollary prospect of letting the guilty go free. For example, since the probability of apprehension and punishment is substantially less than one, penalties are in fact applied through a lottery system. Offenders who are caught and punished are subjected to ex-post discrimination under the law because they "pay" not just for their own crime, but also for offenders who get away with crime. The degree of such ex-post discrimination rises as the penalty becomes more severe, or if the probability of punishment is very low. Such concerns help explain why severity of punishment is often traded on the margin for a higher probability of apprehension and conviction. It also helps explain why the justice system introduces numerous safeguards to protect the rights of the accused, and why the opposition to capital punishment tends to increase when the penalty is applied infrequently and capriciously (Ehrlich, 1982).

Incorporating concerns for equality and legal error in the social welfare function raises not just the marginal social cost of severity of punishment, but that of any strategy of enforcement (as long as the probability of being arrested and punished for a crime is low) relative to its cost under the narrower efficiency criterion. The implication is that more crime would be tolerated as a result of a tradeoff between equity and efficiency in enforcement – a tradeoff typical of social choice in general.

Another common mistake is the argument that higher severity of punishment makes juries less inclined to convict or punish severely, or that more public law enforcement will necessarily lower private protection. There is, however, no mechanical substitution relationship between severity of penalty and probability of conviction and punishment, and the association, or simple correlation, between these two variables could be both positive and negative, since it depends on the underlying factors which generate their observed co-variation. If the more severe punishment is considered in cases where optimal severity should be lower, as is the case when the crime is less severe or the penalty is less likely to deter because of the offender's age or mental capacity, then indeed, juries would be less inclined to convict. However, if severity of punishment is justified by the greater severity of the offense, or a higher risk of victimization in the community, the more severe penalty could be associated with a greater tendency to convict (see Ehrlich and Gibbons, 1977).

This analysis is applicable to crime control strategies concerning the use of positive incentives as well. The market model implies that a lower disparity in the distribution of earning opportunities in legitimate markets will deter offenders on the margin, by reducing their differential gains from criminal activity. This provides a justification for public policies aimed at equalizing educational and employment opportunities partly as means of reducing crime. However, since these policies, unlike conventional law enforcement, cannot be targeted specifically at actual or potential offenders, they may entail relatively high social costs as means of crime control. The positive implications of the market model and some corroborating empirical evidence concerning the relative efficacy of deterrence vs. incapacitation and rehabilitation for many crimes suggest a

11

direction of reform of the criminal justice system through greater reliance on general incentives and purely deterring sanctions. Forcing offenders to pay fines through work-release programs (including direct restitution to their victims) may in many cases be as effective a means of crime prevention as the more costly incapacitating penalties - especially in the case of many theft crimes or transactions in illicit goods and services. The dramatic growth in the proportion of those imprisoned for drug offenses, in the last few decades, appears to be inconsistent with this implication of optimal enforcement. "Intermediate punishments", including work-release programs and probation can also provide effective substitutes to imprisonment and incapacitation through the force of incentives, as implied by the general "deterrence hypothesis".

V. Future Directions

The application of the economic approach to crime in the analysis of some of the main components of the criminal justice system has been done primarily under a partial equilibrium setting in which the criminal sector of the economy has been analyzed separately from the general economy. The analysis has revolutionized previous literature on the causes and consequences of criminal activity by identifying new factors that account for the diversity of the incidence of criminal behavior across geographical areas, population groups, and over time, and by predicting and measuring their empirical importance. Much remains to be done, however, to improve both the analytical rigor and econometric accuracy of the relevant behavioral relations and clarify their implications for public policy. On the analytical part, the complete application of the market model which exposes more fully the interaction of crime with both private and public protection efforts is still a challenge to be addressed, partly through a better collection and utilization of the relevant data. Moreover, the development of a general equilibrium setting that identifies more fully the interaction between the legal and illegal sectors of the economy and their feedback effects at a point in time, over the business cycle, and over the long run, are still challenges to be met. Indeed, macroeconomic and growth accounting still misses a satisfactory assessment of the role played by the illegal sector of the economy, the underground economy in particular, on the behavior of the full economy and its dynamic movements. I expect the next wave of works on crime to delve into these challenging areas of inquiry through the application of general equilibrium models and numerical analyses under both static and dynamic settings.

Also, a disproportionate work on illegal activity has focused so far on felonies and street crime, and less on white collar crimes, because of the paucity of relevant statistical data on the latter: at this point, there is little information available on the actual volume of these legal infractions independently of clearance and arrest statistics. The relatively little attention paid so far to fraud, digital counterfeiting, and violations of fiduciary obligations in business endeavors may have been partly the result of unjustified belief in the power of competitive market forces to eliminate these economically and socially harmful behaviors, but the recent world-wide financial crisis implies that the study of these illegal infractions deserves closer attention. The greater reliance in recent decades on victimization studies and comprehensive population surveys could offer opportunities for systematic applications of the economic approach in studying white collar crimes and their economic impact.

Furthermore, most of the studies on crime have relied on within-country data. The application of the economic approach in studying variation in criminal activity across countries and different legal system is still a major challenge to be met, largely because of differences in the definition, interpretations and methods of reporting of crime. The role of the legal system itself - the Common Law versus Islamic Law or the Napoleonic Code - is yet to be revealed through rigorous analyses.

VI. Summary

The economic approach to crime has provided one of the important revolutions in the social sciences by applying the rigorous tools of economic analysis and econometric methodology to offer a unified approach for understanding illegal behavior as part of human behavior in general. It has also offered significant insights about the relative efficiency desirability of different means of crime control and different components of the law enforcement system.

The economic approach and the "market model" specifically, however, are still a work in progress. It is still early to assess the degree to which the various econometric studies have produced accurate estimates of critical behavioral relationships underlying variations and trends of crime. While a strong consensus is emerging in the economic literature regarding the power of the economic approach to explain criminal behavior, and the validity of the "deterrence hypothesis", future progress will depend on better data and more complete implementations of the comprehensive model of crime.

The economic approach, however, has not been equally embraced outside of economics. This is partly due to healthy interdisciplinary competition. Criminologists have also tended to produce theories of crime in which the economic and social environments and institutions, rather than individual incentives and enforcement efforts, play the major role in explaining the phenomenon. This, however, does not contradict the economic approach which assigns an important role to institutions as well, often as an endogenously evolving part of the comprehensive market system. A common misconception about the broad meaning of the "deterrence hypothesis" is that it applies only to negative incentives, while positive incentives may hold a greater promise for solving the crime problem. Another often-heard claim is that we don't need to know more about punishment because punishment does not eliminate crime. Both claims are inappropriate. The deterrence hypothesis and its logical extension - the market model - rely on the marginal efficacy of both positive and negative incentives and on the interaction between market demand and supply forces, to explain the observed variability in the frequency of offenses across space and time. The empirical evidence developed in most econometric applications is consistent with the hypothesis that punishment and other general incentives exert a deterrent effect on offenders. This suggests, for example, that there is no need to rely exclusively on harsh or incapacitating sanctions to achieve efficient crime control. A better understanding of what does work, however, calls for more rather than less research into the general deterrence hypothesis and the market model based on it.

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VII. References and Further Readings

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