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## **Crime Causation: Economic Theories**

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### **Abstract**

Economic analysis of crime is concerned with (a) the effect of incentives on criminal behavior (b) evaluation of alternative strategies to reduce crime. This entry surveys some extensions to the basic theory as well as providing a brief overview of the empirical evidence. Some emphasis is given to recent work on juvenile crime and education.

JEL classification: J22; K42.

## **Crime Causation: Economic Theories**

The roots of crime are diverse and a discipline like economics, predicated on rational behavior, may be at something of a disadvantage in explaining a phenomenon largely viewed as irrational. The foray by economists in to this area is relatively recent, dating back to Gary Becker's pathbreaking contribution in 1968. As part of a larger model designed to explore optimal criminal justice policy, he developed the "supply of offense" function, which indicates the factors affecting the number of crimes a rational individual commits. Since then there has been much progress in both expanding on this important relationship and utilizing it for more theoretically-grounded analyses of criminal behavior.

A recent survey suggests that three general issues are of central concern in the economics of crime literature: the effects of incentives on criminal behavior, how decisions interact in a market-setting, and the use of cost-benefit analysis to assess alternative policies to reduce crime (see review by Freeman 1999a). In this article we will focus on the role of incentives on criminal behavior.

Crime is a major activity for young males. Crime is like basketball; it's a young man's game. As one researcher has observed: "Actual rates of illegal behavior soar so high during adolescence that participation in delinquency appears to be a normal part of teen life" (Moffit 1993, 675). By the age of 18 possibly 90 percent of young males have participated in delinquent acts and approximately half have been arrested for nontraffic offenses by the time they are 30. Only 50 to 60 percent of young females have been involved in delinquent acts by the time they are 18 and less than 10 percent have been arrested by the age of 30 (Witte 1997).

Explaining the secular trend in criminal participation rates in most industrialized economies is a difficult task. Many social scientists argue that crime is

closely related to work, education and poverty and that truancy, youth unemployment and crime are by products or even measures of social exclusion. “Blue-collar” criminals often have limited education and possess limited labor market skills. These characteristics partly explain the poor employment records and low legitimate earnings of most criminals. These sort of issues originally led economists to examine the relationship between wages and unemployment rates on crime. More recently economists have also considered the benefits and costs of educational programs to reduce crime.

A related question concerns the impact of sanctions. For example, does increased imprisonment lower the crime rate? How does the deterrent effect of formal sanctions arise? Although criminologists have been tackling such issues for many years, it is only recently that economists have entered the arena of controversy. This is not surprising given the high levels of crime and the associated allocation of public and private resources towards crime prevention. The expenditure on the criminal justice system (police, prisons, prosecution/defense and courts) is a significant proportion of government budgets. In addition, firms and households are spending increasingly more on private security.

The incentive-based economic model of crime is a model of decision making in risky situations. Economists analyse the way in which individual attitudes toward risk affect the extent of illegal behavior. In most of the early literature, the economic models of crime are single-period individual choice models. These models generally see the individual as deciding to allocate time with criminal activity as one possible use of time. A key feature is the notion of utility; judgements are made of the likely gain to be realised (the ‘expected utility’) from a particular choice of action.

Individuals are assumed to be rational decision-makers who engage in either legal or

illegal activities according to the expected utility from each activity. An individual's participation in illegal activity is, therefore, explained by the opportunity cost of illegal activity (for example, earnings from legitimate work), factors that influence the returns to illegal activity (for example, detection and the severity of punishment), and by tastes and preferences for illegal activity.

Economists see criminal activity as being similar to paid employment in that it requires time and produces an income. Clearly, the dichotomy between *either* criminal activity *or* legal activity is an oversimplification. For example, individuals could engage in criminal activities while employed since they have greater opportunities to commit crime; similarly, some criminals may *jointly* supplement work income with crime income in order to satisfy their needs. A secondary problem with the economist's choice model, which was highlighted in our opening comments, is that young people are more likely to participate in crime long before they participate in the labor market. This observation raises questions about the appropriateness of the economic model of crime in explaining juvenile crime.

Economic models of criminal behavior have focused on sanction effects (e.g. deterrence issue) and the relationship between work and crime. In the main, these models have not directly addressed the role of education in offending. It could be argued that unemployment is the conduit through which other factors influence the crime rate. For example, poor educational attainment may be highly correlated with the incidence of crime. However, this may also be a key determinant of unemployment. Although educational variables have been included as covariates with crime rates, they have not received a great deal of attention in correlational studies.

The remainder of the article is organized as follows. In the next section, we outline the economic model of crime; the following section considers two extensions

to the basic theory ; the section that follows provides a brief overview of the empirical evidence; the final section examines recent work on juvenile crime and education.

### **Economic Model of Criminal Behavior: Basic theory**

As mentioned in the overview, the economic model of crime is a standard model of decision making where individuals choose between criminal activity and legal activity on the basis of the expected utility from those acts. It is assumed that participation in criminal activity is the result of an optimizing individual responding to incentives. Among the factors that influence an individual's decision to engage in criminal activities are (i) the expected gains from crime relative to earnings from legal work (ii) the chance (risk) of being caught and convicted, (iii) the extent of punishment and (iv) the opportunities in legal activities. Specifying an equation to capture the incentives in the criminal decision is a natural first step in most analyses of the crime as work models. The most important of these gives the relative rewards of legal and illegal activity. For example, the economic model sees the criminal as committing a crime if the expected gain from criminal activity exceeds the gain from legal activity, generally work.

Just as in benefit-cost analysis, when comparing alternative strategies, interest centers on the returns from one decision *vis-à-vis* returns from another decision. For example, a preference for crime over work implies the earnings gap between legal and illegal activities must rise when the probability of being caught and the severity of punishment increases. Attitudes towards risk are central to economic models of criminal choice. For example, if the individual is said to dislike risk (i.e., to be risk averse) then he will respond more to changes in the chances of being apprehended than to changes in the extent of punishment, other things being equal. Becker developed a comparative-static model that considered primarily the deterrent effect of

the criminal justice system. As we will see, how individuals respond to deterrent and incapacitation effects of sanctions has generated considerable theoretical and empirical interest from economists.

Any reasonable economic model has crime dependent on (i) legal and illegal opportunities, (ii) the chance of being caught, and (iii) the extent of sentencing; in the terminology of Freeman (1999a), they are *intrinsically related*. Thus, severe sentencing and improvements in legal work opportunities of criminals must be expected *jointly* to reduce crime. Of course, this assumes that crime and work are determined by the same factors and that higher legitimate earnings increase the probability of working. In the early literature, economists applied static one period time allocation models to analyse criminal behavior. In other words, crime and work are assumed to be substitute activities; if an individual allocates more time to work, he will commit less crime because he will have less time to do so. The basic economic model of crime is static or comparative static in economic jargon because it does not see the potential criminal as considering more than a single time period when making his decision.

### **Extensions of the basic model**

The incentive-based model of crime has experienced significant theoretical and empirical developments. The model by Becker has been developed subsequently by Ehrlich (1973). Since at least Ehrlich there has been an awareness of a correspondence between any crime-work decision and time allocation. In the 1970s and 1980s, the influential contributions of Ehrlich (1975) and Witte (1980), among others, made this connection much more precise and the awareness more widespread. For example, Ehrlich allowed for three different criminal justice outcomes, whereas Witte utilized a model in which the time allocations between legal and illegal

activities entered the utility function directly. See Schmidt and Witte (1984) for a survey of these first-generation economic models of crime.

Early studies of criminal behavior by economists can be criticized for being set in a static framework. Economic models of crime are typically estimated as static models, though there are many reasons to suspect dynamic effects matter, both theoretically through habit formation, interdependence of preferences, capital accumulation, addiction, peer group effects, etc., and empirically through improvements in fit when lagged dependent variables or autocorrelated residuals are included in the model. Labor economists have long been interested in state dependence, the fact that activities chosen in the current period may be strongly affected by the individual's activities in the previous period (e.g., Heckman 1981). Examples of state dependence in economic models of criminal behavior include; the effect of education today on future criminal activities; the effect of crime in one period on future legitimate and criminal earnings. Becker and Murphy (1988), Flinn (1986), Grogger (1995), Nagin and Waldfogel (1995), Tauchen and Witte (1995), and Williams and Sickles (1999), exemplify attempts at describing a causal dynamic economic model of crime.

Flinn incorporates human capital formation in a time-allocation model. In his model, human capital is accumulated at work, not at school. Consequently, crime takes time away from work and hence diminishes the amount of human capital accumulated. The diminished human capital leads to lower future wages and hence less time spent working. Since crime and work are substitutes in his model, the decline in time allocated to work leads to increased participation in criminal activities.

Becker and Murphy build on consumer demand theory and develop a model of rational addiction. Their model relies on "adjacent complementarities" in

consumption to produce habit formation. Under their model, the marginal utility of consuming a good that is an adjacent complement is higher if the good has been consumed in the previous period. They also incorporate myopia to explain why people become addicted to harmful goods.

Grogger estimates a distributed lag model to allow arrests and prosecution to affect both current and future labor market outcomes. Using data from the California Adult Criminal Justice Statistical System, he found that arrest effects on employment and earnings are moderate in magnitude and fairly short-lived. Nagin and Waldfogel consider the effects of criminality and conviction on the income and job stability of young male British offenders. Their analysis uses a panel data set assembled by David Farrington and Donald West as part of the Cambridge Study in Delinquent Development (CSDD). The authors present results, which at first sight appear somewhat paradoxical. They find that conviction increases *both* the job instability and legal income of young offenders. To rationalize these results Nagin and Waldfogel outline a characterization of the labor market in which young men participate. The basic idea underlying the model is that young men have two types of jobs available to them –skilled and unskilled – where wage profiles are rising in the former (due to accumulation of human capital, training and experience) and flat in the latter (no training). If discounted wages are equalized across jobs, the unskilled wage would start above and end below skilled wage. Also, human capital theory suggests that job stability will be greater in skilled sector than in the unskilled sector. Given these predictions, and assuming that a criminal conviction adversely affects prospects of getting a skilled job, it is likely that conviction is associated with higher pay and higher job instability. Note that Nagin and Waldfogel found criminal activity without conviction had no significant effect on labor market performance. They conclude that



this result implies stigma, rather than withdrawal from legal work, explains the effects of conviction.

Dynamics arising from the impact of private and social programs (e.g. police treatments in cases of domestic violence) have been dealt with by including the lag of the dependent variable (actual violence) and the latent variable (Tauchen and Witte, 1995). Tauchen and Witte use data from the Minneapolis Domestic Violence Experiment to determine how police treatments in cases of domestic violence (advising the couple, separating the individuals temporarily, or arresting the suspect) affect the couple's subsequent violence. Estimating a dynamic probit model for the probability of observing violence in the follow-up periods, the authors find that arrest is more effective than advising or short-term separation but that the differential effect is transitory.

In an interesting paper, Williams and Sickles provide an extension of Ehrlich (1973) by including an individual's social capital stock into his utility and earnings functions. Social capital, including things like reputation and social networks, is used as a proxy to account for the effect of social norms on an individual's decision to participate in crime. This assumes that the stigmatism associated with arrest depreciates an individual's social capital stock. Williams and Sickles clarify this point further by arguing that employment and marriage create a form of state dependence, which reduces the likelihood of criminal involvement. In other words, an individual with a family, job or good reputation has more to lose if caught committing crimes than those without such attachments. Dynamics arise from current decisions affecting future outcomes through the social capital stock accumulation process. The main result is that criminals behave rationally in the sense that they account for future consequences of current period decisions.

## **A Brief Sketch of the Empirical Evidence on the Supply of Crime**

The motivation behind most early applications of Becker's model was to examine the impact of legitimate labor market experiences (e.g., unemployment) and sanctions on criminal behavior. Broadly speaking, the empirical findings are that (i) poor legitimate labor market opportunities of potential criminals, such as low wages and high rates of unemployment, increases the supply of criminal activities and (ii) sanctions deter crime.

The empirical evidence on the relationship between unemployment and criminal activity has been the subject of much investigation (see literature review Freeman 1999a). Unemployment could be taken to influence the opportunity cost of illegal activity. High rates of unemployment growth could be taken to imply a restriction on the availability of legal activities, and thus serve to ultimately reduce the opportunity cost of engaging in illegal activities. Although theoretically well-defined, most empirical studies of the unemployment-crime relationship have provided mixed evidence.

Not all early studies used aggregate time-series data to test the relationship between unemployment and crime. Thornberry and Christenson (1984) use individual level data from the 1945 Philadelphia cohort find that unemployment had significant effects on crime. Farrington et al. (1986) using data from the CSDD showed that property crime rates were higher when offenders were unemployed.

Witte and Tauchen (1994) exploit the panel data dimensions of the Philadelphia cohort used by Thornberry and Christenson. Instead of primarily focusing on crime as a function of unemployment, they use a richer set of controls, like deterrence, employment status, age, education, race and neighbourhood characteristics. The results reported by Tauchen and Witte on the relationship

between employment and crime were consistent with the previous findings of Thornberry and Christenson and Farrington. Recent work, of which Levitt (1996) and Witt et al. (1999) are representative, proceeded to use pooled time-series cross-section data and find, *inter alia*, positive associations between unemployment and property crime.

One problem with most work and crime models is that they assume both activities are mutually exclusive. This may be a problematic assumption when considering disadvantaged youths. See Freeman (1999b). The fact that a youth can shift from crime to an unskilled job and back again or can commit crime while holding a legal job means that the supply of youths to crime will be quite elastic with respect to relative rewards from crime *vis-à-vis* legal work or to the number of criminal opportunities.

From the 1970s through the 1990s the labor market prospects for unskilled workers in most OECD countries has deteriorated considerably. In particular, the real earnings of young unskilled men fell, while income inequality rose. This suggests that as the earnings gap widens, relative deprivation increases, which in turn leads to increases in crime. Empirical research into the relationship between earnings inequality and crime generally find that more inequality is associated with more crime. For example, in a study based on a sample of the 42 police force areas in England and Wales, Witt et al. (1999) report a positive association between earnings inequality and crime rates for vehicle crime, theft and burglary. For the US, see the evidence reviewed in Freeman (1999a).

Much of the empirical work on testing the Becker model has focused on the role of deterrence in determining criminal activity. Deterrence refers to the effect of possible punishment on individuals contemplating criminal acts. Deterrence may flow

from both criminal justice system actions and from social actions (i.e., the negative response of friends and associates to criminal behavior). To date, attempts to measure deterrent effects have concentrated on the effects of the criminal justice system. See, Nagin (1998) for a survey of this literature.

This section discusses a variety of practical problems that arise in testing for deterrent effects. In particular, we consider three estimation issues: measurement error, endogeneity and nonstationarity.

Models of criminal behavior are usually estimated using official reported crime statistics. Such recorded offences are influenced both by victims' willingness to report crime and by police recording practices and procedures. At the level of the individual police department, both administrative and political changes can lead to abnormalities in reported data or to failures to report any data. For example, the measurement error in crime rates may arise because hiring more police leads to more crimes reported. Consequently, estimates derived from regressing crime rates on the number of police (or on arrest rates) may be severely distorted by the impact of measurement error.

The potentially serious problem of simultaneity between sanctions and crime has been the subject of much debate. Here, the main point is that increases in sanctions may cause decreases in crime, but increases in sanctions may be in response to higher crime rates. Since the 1970s there has been a considerable effort to find instruments (i.e. exogenous factors) to identify the effects of sanctions on the supply of crime. For example, Levitt (1996) uses instrumental variables to estimate the effect of prison population on crime rates. Prison-overcrowding litigation in a state is used as an instrument for changes in the prison population.

In order to identify the effect of police on crime, Marvell and Moody (1996) and Levitt (1997) proposed different procedures. Marvell and Moody are concerned with the timing sequence between hiring police and crime. Using lags between police levels and crime rates to avoid simultaneity, they test for causality in the spirit of Granger (1969). Although they find Granger causation in both directions, the impact of police on crime is much stronger than the impact of crime on police. In a recent paper Levitt (1997) uses the timing of elections (when cities hire more police) as an instrumental variable to identify a causal effect of police on crime. He finds that increases in police instrumented by elections reduces violent crime, but have a smaller impact on property crime.

A substantial problem that has been ignored in the vast majority of empirical studies is nonstationarity of crime rates. A time-series is said to be nonstationary if (1) the mean and/or variance does not remain constant over time and (2) covariance between observations depends on the time at which they occur. In the US, the index crime rate appears strongly nonstationary, for the most part being integrated of order one with both deterministic and stochastic trends (a random variable whose mean value and variance are time-dependent is said to follow a stochastic trend) See, for example, Witt and Witte (2000). Here, the authors have attempted to estimate and test a model using linear nonstationary regressor techniques like cointegration and error correction models. The empirical results suggest a long-run equilibrium relationship between crime, prison population, female labor supply and durable consumption.

### **Recent developments: Juvenile crime and education**

Recently some researchers have focused their attention on juvenile crime and education. Levitt (1998) and Mocan and Rees (1999) provide evidence to show that the economic model of crime applies to juveniles as well as adults. Levitt uses state-

level data over the period 1978-1993 for making comparisons between the adult criminal justice system and delinquents. The dependent variable is juvenile crime (either violent or property crime) per number of juveniles. The explanatory variables include the number of juveniles or adults in custody per crime; the number of juveniles or adults in custody per juvenile or adult; economic variables, including the state unemployment rate and demographic variables, including race and legal drinking age, and dummy variables for year and state. Levitt finds that juvenile crime is negatively related to the severity of penalties, and that juvenile offenders are at least as responsive to sanctions as adults. Interestingly, he finds that the difference between the punishments given to youths and adults helps explain sharp changes in crimes committed by youths as they reach the age of majority.

Mocan and Rees estimate the economic model of crime for juveniles using individual-level data from a nationally representative sample of 16,478 students in grades 7 through 12. The data set contains rich information on offences and deterrence measures, as well as on personal, family and neighbourhood characteristics. They find probit estimates that for young males selling drugs and assault are strongly affected by violent crime arrests (i.e. increases in arrests per violent crime reduce the probability of selling drugs and committing an assault). Violent crime arrests reduces the probability of selling drugs and stealing for females. Mocan and Rees also find that higher levels of local unemployment and higher levels of local poverty to be associated with higher levels of crime. Family welfare status, a proxy for family poverty, has a positive impact on juvenile offending. Finally, family structure and the education of the juveniles' parents also have an impact on delinquent behavior.

Up to now, we have primarily concerned ourselves with research on crime reduction that focuses on labor market experiences and deterrent effects. The issue of education and training has generally been neglected. It is only recently that economists have begun to explicitly model work, education and crime. Witte (1997) reviews the literature on education and crime and discusses models that suggest possible crime-reducing effects of education. She carefully traces the various attempts made over the past two decades at a full integration of education and crime but finds that the empirical evidence regarding the effects of education on crime is limited. In recent work, using data from the National Longitudinal Survey of Youth and Uniform Crime Reports, Lochner (1999) developed and estimated a dynamic model in which all three activities, work, investment in human capital, and crime are endogenised. He finds that education, training and work subsidies can reduce criminal activity.

### **Summary and Conclusions**

Most economic work on crime has focused on the deterrent effect of the criminal justice system and on the interrelationship between work and crime. Empirical work provides some, but not unambiguous support for the deterrence hypothesis. Recent work by economists suggest that the relationship between work and crime may be far more complicated than implied by economic models.

The rise in juvenile crime rates has focused increasing attention on youth crime. This has forced economists to expand their thinking to incorporate such things as education, peer group effects and the influence of family and community.

Increasingly both theoretical and empirical work on the economics of crime has come to use dynamic models. Theoretical work is developing multi-period models of crime. Empirically economists are using both panel data techniques and modern time series techniques to examine the dynamics of criminal behavior.

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