

chapter 31

Crime

As crime has risen to the top of the nation's domestic policy agenda, so has the need for a body of policy-relevant knowledge about crime. . . . To be frank, the professional criminologists, sociologists, political scientists, law professors, public management specialists and self-styled practitioner-scholars who have dominated the field are incapable of meeting this challenge. They 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. In my view, therefore, criminal justice is a field that needs to be conquered by economists.

—DiIulio (1996)¹

According to the National Crime Victimization Survey (NCVS), U.S. residents fell prey to a combined total of just over 25 million crimes in 2006. The crimes included 19 million property crimes (burglary, motor vehicle theft, and theft), 6 million violent crimes (rape, sexual assault, robbery, aggravated assault, and simple assault), and 174,000 personal thefts (pocket picking and purse snatching).² The total estimated costs of crime to the U.S. economy are truly staggering. In one of the most comprehensive studies to date, Anderson (1999) reports that, in 1997, the annual cost of crime exceeded \$1.7 trillion.³

Yet, before we all pack our bags and run off in a blind panic for the relative safety of the hills, it is important to appreciate that these numbers represent but a snapshot of the overall pattern of crime in the United States. In fact, the tidal wave of criminal activity that crashed into the United States in the mid-1970s and continued its violent inundation during the 1980s actually crested in the early 1990s. Since that time there has actually been a dramatic and inexorable decline in criminal activity:

Between 1993 . . . and 2005, the violent crime rate decreased 58%, from 50 to 21 victimizations per 1,000 persons age 12 or older. Property crime declined 52%, from 319 to 154 per 1,000 households.⁴

LEARNING OBJECTIVES

By reading this chapter, you should be able to:

- Recognize the broad stylized facts pertaining to criminal activity and the criminal justice system in the United States.
- Understand the basic microeconomic principles that underlie Becker's rational-choice model of crime.
- Appreciate why properly accounting for general-equilibrium interconnections is essential for the prudent design of anticrime policies.
- Recognize evidence that relates to the effects of labor-market conditions on the crime rate.
- Understand how deterrence efforts—in the form of policing and punishment—are liable to affect the crime rate.

Furthermore, according to the U.S. Bureau of Justice, in 2006, “[a]t the national level, crime rates remain stabilized at the lowest overall levels experienced since 1973.”

Crime is a phenomenon of considerable social concern and great academic interest for it affects all of us in one way or another. It is obviously relevant for those who fall victim to crimes and those who perpetrate them. More subtly, it also affects us as potential victims and as taxpayers who must foot the bill for ever-burgeoning expenditures on law enforcement, prisons, and the legal system broadly defined.

In this chapter, we show how economic theory sheds light on the determinants of criminal activity.⁵ At first glance, it might appear obvious that this approach simply involves formulating and testing hypotheses that relate economic conditions (such as, the average wage, and both the unemployment and poverty rates) to the level of criminal activity. While there is some truth to this—economists do examine the effects of labor-market conditions on crime—it is only part of the story.

Most significant, economists view crime itself as an economic act. In particular, building on the seminal work of Becker (1968) and the pioneering works of Ehrlich (1973, 1981), and Block and Heineke (1975), economists model criminal activity through the conceptual lens of rational (yes, rational) choice theory. For example, Becker (1968) advances the view that

[A] useful theory of criminal behavior can dispense with theories of anomie, psychological inadequacies, or inheritance of special traits and simply extend the economist’s usual analysis of choice.⁶

Thus the highly educated white collar embezzler is deemed to be as rational (i.e., calculating) as the mugger, the drunk driver, or even the proverbial mad ax-man—who was last seen chasing Dougal down the street. The power of the approach is easy to see. All criminal activity is unified under one umbrella that differs in degree rather than in kind, and is united by a strict adherence to the principles of rationality (i.e., the maximization of utility subject to constraints).

The economic approach to crime is grounded on the following triumvirate of microeconomic principles: rationality, equilibrium, and efficiency. The first principle asserts that crime is a rational act that responds to incentives, whether they be provided by the market (through, for example, legitimate earnings opportunities) or via the criminal justice system (through sanctions, such as fines, incarceration, and even torture or capital punishment).

According to the second principle, crime is not viewed in isolation from other parts of the economic system but is an integral part of it. Thus poverty does not cause crime; instead, poverty and crime are jointly determined as equilibrium outcomes that depend on deeper economic variables. The importance of understanding crime in a general-equilibrium context that accounts for all relevant interactions should not be underestimated. Policy nostrums that purport to solve

the crime problem are usually ineffectual precisely because they ignore this critical aspect of economic reality. The third principle of economic efficiency permits the (relatively) straightforward assessment of the effectiveness of myriad alternative anticrime policies.

In Section 31.1, we begin by outlining the key elements of the stylized evidence as it pertains to the extent of criminal activity in the United States. The sections that follow describe the microeconomic approach to crime just outlined.

31.1 The Evidence

Data on criminal activity are available from two primary sources: the FBI's Uniform Crime Reporting Program (UCR) and the National Crime Victimization Survey (NCVS). The UCR is compiled by the FBI. It comprises monthly and annual reports gathered nationwide by police, sheriffs, and state police on crimes that are committed in their respective jurisdictions. The NCVS is collected annually by the Bureau of Justice Statistics (BJS).⁷ In short,

[D]ata are obtained from a nationally representative sample of roughly 45,000 households comprising more than 94,000 persons on the frequency, characteristics and consequences of criminal victimization in the United States.⁸

The two data sets often differ markedly in the extent of criminal activity they report. The reason is that not all crimes are reported to the police, and the ones that are reported vary according to the type of crime:

[P]olice reporting rates (percent of victimizations) varied by type of crime. In 1994, for instance, 32 percent of the rapes/sexual assaults were reported; 55 percent of the robberies; 40 percent of assaults; 33 percent of personal thefts; 51 percent of the household burglaries; and 78 percent of motor vehicle thefts.⁹

Different categories of crimes are often grouped together. Thus **Property Crimes and Robbery** refer to robbery, burglary, larceny-theft, motor vehicle theft. **Violent Crimes** refer to criminal homicide, rape, robbery, and aggravated assault. An important, and apparently growing, category of criminal activity, falls under the rubric of **white collar crime**, which, according to the U.S. Department of Justice, is:¹⁰

[N]onviolent crime for financial gain committed by means of deception by persons whose occupational status is entrepreneurial, professional or semi-professional and utilizing their special occupational skills and opportunities; also, nonviolent crime for financial gain utilizing deception and committed by anyone having special technical and professional knowledge of business and government, irrespective of the person's occupation.¹¹

Criminal Activity: Recent Trends

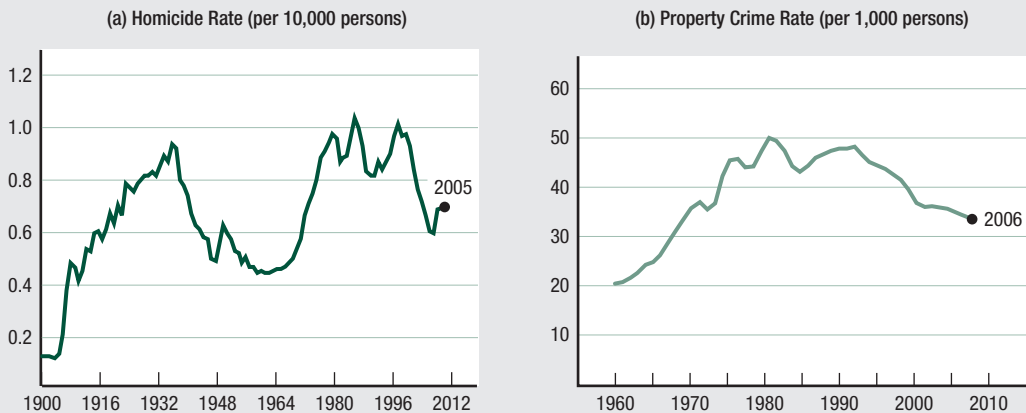
Criminal activity is characterized by several striking empirical features. It is subject to considerable temporal variation, it is geographically concentrated, and it exhibits wide dispersion across communities that possess ostensibly identical economic characteristics. Less affluent cities are disproportionately afflicted—in particular, those characterized by chronic poverty, a poorly educated workforce, and limited access to employment opportunities.

The United States witnessed a precipitous increase in the extent of criminal activity that began in the mid-1970s and that peaked in the early 1990s. This was immediately followed by an equally impressive meteoric decline in criminal activity that has continued unabated for almost 15 years. Regarding geographic concentration, Freeman, Grogger and Sontselie (1996) note that in 1990 the median number of reported street robberies in Los Angeles equaled 4 per 1,000 residents. Yet, 10% of neighborhoods had crime rates four times greater than the median. In a similar vein, Glaeser, Sacerdote, and Scheinkman (1996) observe, “Ridgewood village reported 0.008 serious crimes per capita, whereas nearby Atlantic City reported 0.34.”

A similar pattern can be seen by comparing crime rates in large metropolitan and rural areas. According to the 2007 U.S. Bureau of the Census (Table 300), the rate of violent crime was 510 in large metropolitan areas but only 207 in rural ones.¹² The corresponding figures for property crimes were 3,599 and 1,700 respectively.

A more complete picture of criminal activity can be garnered by looking at patterns over a longer time span. Figure 31.1a depicts the homicide rate in the

FIGURE 31.1 The Homicide and Property Crime Rates



Source: Panel (a) U.S. Bureau of Justice Statistics (BJS). Available at <http://bjs.ojp.usdoj.gov/content/glance/hmrt.cfm>. Panel (b) Federal Bureau of Investigation (FBI). Available at www.fbi.gov/page2/jan08/ucr_statistics010708.html. (Both URLs accessed May 5, 2010.)

United States over the past 100 years.¹³ Notice the peaks and troughs in the data. The rapid decline in the homicide rate that began in the early 1990s is readily apparent—as is the slight uptick that began in 2003. Panel (b) depicts the U.S. property crime rate over the period 1960 to 2006. Once again, notice the inexorable increase in the level of criminal activity until the late 1980s, and its steady decline since then.

The Bureau of Justice Statistics (2006) NCVS provides a useful snapshot of criminal activity in the United States during 2005:

In 2005, U.S. residents age 12 or older experienced an estimated 23 million violent and property victimizations, according to the National Crime Victimization Survey (NCVS). These criminal victimizations included an estimated 18 million property crimes (burglary, motor vehicle theft, and theft), 5.2 million violent crimes (rape or sexual assault, robbery, aggravated assault, and simple assault), and 227,000 personal thefts (pocket picking and purse snatching). . . . Between 1993 . . . and 2005, the violent crime rate decreased 58%, from 50 to 21 victimizations per 1,000 persons age 12 or older. Property crime declined 52%, from 319 to 154 per 1,000 households.¹⁴

African Americans and Hispanics are disproportionately represented as both the perpetrators and the victims of crime. According to the U.S. Bureau of the Census, African Americans represent 47% of all murder victims, despite the fact they make up only 12% of the population.¹⁵ At the dawn of the new millennium, the Black homicide rate was an appalling 20.5 per 100,000 persons, compared to a rate of 3.3 per 100,000 for Whites. The only solace that can be drawn from these figures is that, for Blacks, they represent a significant improvement in their relative circumstances. Only a decade or so earlier, in 1991, the homicide rate had been twice this number, at 40 per 100,000 persons. This rendered murder the leading cause of death among young African American men.

So much for the number of crimes committed, Anderson (1999) reports that (in 1997) the total dollar value of *transfers* from victims to criminals amounted to \$603 billion.¹⁶ Table 31.1 breaks down the transfers resulting from criminal activities into several different categories. Despite the attention that is placed in the press on crimes such as robbery, burglary, and personal theft, it is easy to see that the lion's share of dollars misappropriated through criminal activity result from white collar crimes. Thus the various categories of fraud accounted for some \$563 billion annually or 93% of all transfers. Some data are also available on the average value of the losses suffered by the victims of crime. Thus in

Transfers (1997)	\$Billions
Occupational fraud	204
Unpaid taxes	123
Health insurance fraud	109
Financial insurance fraud	53
Mail fraud	36
Property/casualty insurance fraud	21
Telemarketing fraud	17
Business burglary	13
Motor vehicle theft	9
Shoplifting	7
Household burglary	4.5
Personal theft	3.9
Household larceny	2
Coupon fraud	0.9
Robbery	0.8
Total (approximately)	604

Source: Anderson (1999), table 6.

TABLE 31.2
Criminal Participation by Age

Age	Any Income from Crime (%)	More than 50%
15	21.7	4.2
16	24.4	4.1
17	29.5	4.5
18	23.3	2.7
19	19.6	1.8
20	19.2	2.2
21	17.6	2.1
22	17.1	1.1

Source: Lochner (2004), table 2.

2004 the average loss from robbery was \$1283 (it was \$4153 for bank robberies); \$1726 for burglary; \$733 for larceny, and \$6019 for motor vehicle theft.¹⁷

Criminals tend to be preponderantly young, male, and undereducated. Table 31.2 describes self-reported criminal participation by age. It is drawn from the 1980 National Longitudinal Survey of Youth (NLSY). Notice the sudden burst of criminal activity around the age of 17. From the third column, it is clear only a small percentage of criminals obtain most of their incomes from crime. According to Freeman (1996), “This . . . indicates that for many young men, illegal work may be temporary or transitional work that supplements difficult low-wage or otherwise unsatisfactory work.”¹⁸

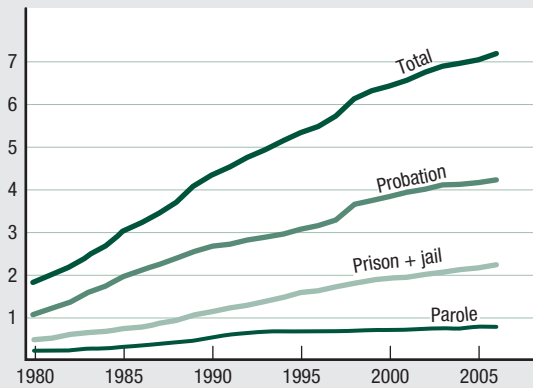
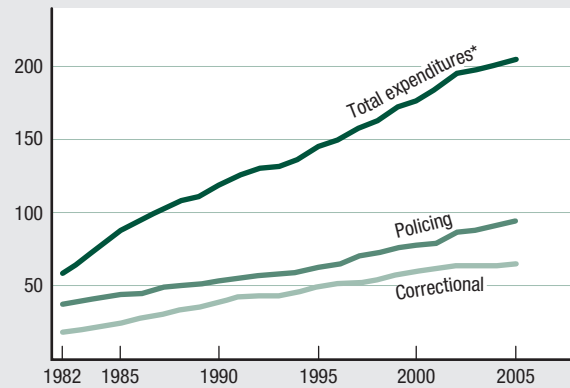
The vast majority of both violent and property crimes are carried out by men. One symptom of this is the striking difference in the relative numbers of men and women who are currently incarcerated. According to the U.S. Census Bureau, 1,337,668 men were incarcerated in state and federal prisons in 2004. The corresponding figure for females was less than one tenth of this figure, at only 96,125.

Turning to educational levels, Lawrence (1995) reports that (in 1982), “In the general population, 85% of males 20–29 years of age have finished high school; only 40% of prisoners have done so. . . . Six percent of prisoners have had no schooling at all.” In fact, several studies—including Tauchen, Witte, and Griesinger (1994); Lochner (2004); and Lochner and Moretti (2004)—also indicate that completing high school significantly reduces criminal proclivities.¹⁹ These are the broad patterns of crime. Next, let’s turn to the issue of law enforcement.

Law Enforcement

In 2006, a total of 836,787 police officers were employed in the business of law enforcement.²⁰ Their combined efforts resulted in a total of 10,369,000 arrests (excluding arrests for traffic offenses). Almost 80% of those arrested were men.²¹ In the same year, a total of 7,211,400 persons were either in prison, in jail, on probation, or on parole.²²

The increase in the number of incarcerated persons (in jail or federal/state prison) over the past 20 years or so is truly staggering. In 1980 the number was (approximately) half a million. Today it is in excess of 2.1 million, which represents a fourfold increase over the period. Figure 31.2a depicts the numbers of persons under correctional supervision in the United States. Needless to say, law enforcement is not cheap. Panel (b) depicts the explosive growth in total expenditures (constant 2005 dollars) on enforcement efforts (broadly circumscribed) over the past 25 years.

FIGURE 31.2 Expenditures on the U.S. Legal System: 1982–2006**(a) Number of Persons under Correctional Supervision (in Millions)****(b) Expenditures on Law Enforcement (Billions of Constant 2005 Dollars)**

* Total expenditures = policing + corrections + judiciary.

Source: U.S. Department of Justice, <http://bjs.ojp.usdoj.gov/> (accessed May 3, 2010).

Currently, the United States spends over \$200 billion on policing, corrections, and the judiciary. The costs of enforcement and running the prison system are taking a severe toll on many states' finances. Consider the following account given in the *New York Times* (April 1995):

In 1995 California spent more on prisons than on higher education. Spending on prisons rose from 2 percent of the state budget in 1980 to 9.9% in 1995 whereas spending on higher education shrunk from 12.6% in 1980 to 9.5 percent. The number of inmates increased from 23,500 to 126,100 over the period and 17 new prisons were built. This was before the state's 'three strikes and you're out' law.²³

Expenditures on private enforcement efforts are also extremely large. For instance, Anderson (1999) reports that, "Private expenditure on guards amounts to more than \$18 billion annually. Security guard agencies employ 55 percent of the 867,000 guards in the U.S.; the remainder are employed in house."²⁴

Households also incur a variety of costs in their private attempts to deter crime. Examples include installing burglar alarms, living in a safer neighborhood (and paying a premium on housing), taking a cab instead of walking, and, yes, time spent looking for keys. Perhaps the reader can empathize:

Based on over 150 observations of individuals locking and unlocking cars, offices, buildings, mail boxes . . . , I estimate that each adult spends two minutes

locking and unlocking doors each day, and just over two minutes per day looking for keys. This represents \$89.6 billion worth of time lost due to such crime-prevention activities.²⁵

31.2 The Economic Approach to Crime: Theory

Pain and pleasure are the great springs of human action. When a man perceives or supposes pain to be the consequence of an act, he is acted upon in such a manner as tends, with a certain force, to withdraw him, as it were, from the commission of that act. If the apparent magnitude, or rather value of that pain be greater than the apparent magnitude or value of the pleasure or good he expects to be the consequence of the act, he will be absolutely prevented from performing it. The mischief which would have ensued from the act, if performed, will also by that means be prevented.²⁶

Over the intervening years that have elapsed since the appearance of Becker's (1968) seminal paper *Crime and Punishment*, economists have taken enormous strides toward understanding the principal determinants of criminal behavior.

A Partial Equilibrium Model

In this section, we present a simple model that captures the main elements of the economic approach by focusing on the individual incentives to engage in crime. In the next section, we examine the general equilibrium implications of the model. As we shall see, it will be possible, for the first time, to capture the intuitive notion that a robust labor market discourages criminal activity and poverty foments it.

A Model of Criminal Behavior. In Model 31.1, we present the main assumptions we will use to model criminal activity.²⁷

MODEL 31.1

Criminal Behavior

- (a) The economy extends over a single period of time and is populated by N homogeneous, amoral, utility-maximizing individuals.
- (b) Each person's utility is given by $U = U(x)$, where x is the dollar (equivalent) value of consumption. Each person is also endowed with an indivisible unit of time that is supplied inelastically without disutility from effort. Individuals allocate their time either to formal work or to (property) crime.
- (c) The wage rate from legitimate activity is $\$w$.
- (d) If not apprehended, the (expected) income from crime is $\alpha \cdot n$, where n is the number of crimes committed during the period and α is the dollar value of each crime.

- (e) The authorities devote resources to policing and capturing criminals. The probability that a criminal is captured in the commission of a crime is π . In the event of capture, the criminal's utility is $U(\alpha \cdot n - s)$, where $s > 0$ is the dollar (equivalent) value of any legal sanctions imposed on him or her.
- (f) $U(w) > U(\alpha \cdot n - s)$.

In part (a) of Model 31.1, the assumption of only a single time period simplifies the analysis considerably. Obviously, the choices that people make—especially concerning whether to commit crimes—can have far-reaching consequences. Thus a sentence of 40 years' hard labor would be enough to put a severe dint in anyone's career prospects. Nevertheless, even with this important restriction, Model 31.1 provides valuable insights into the determinants of criminal behavior.²⁸ The amorality assumption says that individuals have no leanings toward—or against—criminal acts per se but make their choices solely on the basis of monetary outcomes or their monetary equivalents. As we shall see, we do not need to invoke issues of morality to explain why some people commit crimes and others do not. Therefore these complications can be ignored through an application of Occam's razor.

According to part (b), each person supplies his or her labor inelastically and without disutility from effort. This neutralizes any labor-supply complications.²⁹ It is no doubt edifying to understand why some people spend 14 hours per week planning and executing crimes and others spend 15 hours (which is possible only if there is some latitude in allocating time between work, crime, and leisure); nevertheless, as economists, our first order of business is surely understanding why people commit any crimes at all. The assumption that each person possesses a single indivisible unit of time also implies that agents must specialize either in legitimate formal employment or illegitimate criminal activities (given you can't split the indivisible). In reality, however, few people actually make a living from crime alone. As Freeman (1999) remarks,

The border between illegal and legal work is porous, not sharp. Some persons commit crimes while employed—doubling up their legal and illegal work. Some persons use their legal jobs to succeed in crime. . . . Some criminals shift between crime and work over time, depending on opportunities.³⁰

Despite this shortcoming, the indivisibility assumption is a very helpful simplification. Together, parts (c) and (d) of Model 31.1 describe the consequences of the individual's actions. This is a partial equilibrium setting, so no explanation is given (or required) as to why the wage is w , or why criminals accrue $\alpha \cdot n$ from their activities. They simply do, and that's that.

Although n and α are treated as exogenously given, there is some evidence concerning the magnitudes of these important variables. Indeed, prisoner surveys shed light on the average number of crimes, n , committed per annum. Piehl and

DiIulio (1995) estimate that each incarcerated prisoner conducts 12 nondrug-related crimes in the year before his or her capture. Likewise, Marvell and Moody (1994) estimate each prisoner committed about 17 crimes per year before capture. Hence it is reasonable to take $n \approx 15$.

As for criminal earnings, α , Freeman (1999) remarks, “Average hourly wages from crime were \$19. All these estimates exceed the average legal wage of \$7.50.”³¹ Grogger (1998) estimates that, on an annual basis, the average criminal earns \$1187. Piliavin, Gartner, Thornton, and Matsueda (1986) focus their attention on severe offenders. Using data collected between 1975 and 1979 for the Evaluation of National Supported Work Demonstration (a job-creation program for persons with severe employment problems), offenders (1,497 of them) reported that their street earnings exceeded their legitimate earnings by 63%. Moreover, some 48% of those surveyed asserted they had frequent opportunities for committing crimes.

The Legal Environment. Part (e) of Model 31.1 describes the legal environment. The probability that a criminal is apprehended during the commission of a crime is denoted π . Obviously, the likelihood of detection and the probability of conviction depend on the resources devoted to enforcement efforts. For the moment these factors are simply treated as given. The utility $U(\alpha \cdot n - s)$ is a catch-all that describes the criminal’s utility on capture. Here s is the dollar-equivalent value of legal sanctions arising from the imposition of fines and possible incarceration.³² Finally, condition (f) is included because of its plausibility. Without this assumption, criminal behavior would be very strange since a formal worker would be better off robbing a bank and running through the streets exclaiming, “It was me! It was me!” hoping for his or her arrest.

Optimal Behavior

Each individual in the economy must decide between one of two courses of action: legitimate work or crime. In determining the action that is best for him, each person looks to his own preferences, the constraints he faces, and selects the action that gives him the greatest expected utility.

Analysis. In what follows, let $I = 1$ index formal employment and let $I = 0$ index crime. The expected utility from formal employment (work), denoted EU_1 , is $EU_1 = U(w)$, which is the utility that the individual accrues from earning the wage, w . To determine the utility from choosing crime, denoted EU_0 , the individual is assumed to be fully cognizant of the fact that he may get away with his ill-gotten gains but also runs the risk of being captured and punished. Using the methods set out in Appendix D, his *expected utility* is therefore,

$$EU_0 = (1 - \pi)U(\alpha \cdot n) + \pi U(\alpha \cdot n - s) \quad (31.1)$$

With probability $1 - \pi$ he gets away scot-free (and enjoys $\alpha \cdot n$ to boot); however, with probability π , the game's up, he's caught, punished, and his utility is only $U(\alpha \cdot n - s)$, where s captures the severity of the legal sanctions inflicted on him.

If $EU_0 > EU_1$, then crime is individually *rational*. It follows from the definitions of EU_1 and EU_0 that crime is optimal if,

$$(1 - \pi)U(\alpha \cdot n) + \pi U(\alpha \cdot n - s) - U(w) > 0 \quad (31.2)$$

Notice that $U(w)$ captures the *opportunity cost* of crime. It reflects the legitimate earnings that the individual forgoes by pursuing a life of crime rather than working in the formal sector. Equation 31.2 can be used to derive the principal insights of the economic model of crime. For convenience, they are summarized in Major Result 31.1.

MAJOR RESULT 31.1

Criminal Activity

A given individual is **more likely** to opt for crime, vis-à-vis formal work, the:

- Greater the earnings from crime, $\alpha \cdot n$.
- Lower the earnings from legitimate employment, w .
- Smaller the probability of detection, π .
- Lower the punishment, s .
- Lower the degree of the individual's aversion to risk.

Only point (e) requires clarification. By engaging in crime that individual is taking a calculated risk. With probability π he is apprehended and finds himself in a pickle, and with probability $(1 - \pi)$ his criminal efforts succeed. The greater an individual's aversion to risk, the greater the weight he places on the bad outcome, $U(\alpha \cdot n - s)$. In the limiting case of *complete* risk aversion, he is so averse to risk that he places zero weight on the favorable one, $U(\alpha \cdot n)$. Hence the greater the degree of risk aversion, the lower the expected utility of crime vis-à-vis formal work, U_0 , which establishes the claim.

The Marginal Benefits and Costs of Crime. It is instructive to rearrange Equation 31.2. The outcome is that it is possible to show that crime is individually optimal only if the following condition is satisfied:

$$(1 - \pi) \{U(\alpha \cdot n) - U(w)\} > \pi \{U(w) - U(\alpha \cdot n - s)\} > 0 \quad (31.3)$$

According to Part (e) of Model 31.1, we have $U(w) > U(\alpha \cdot n - s)$. It follows that Condition 31.3 is satisfied only if $U(\alpha \cdot n) > U(w)$, which, in turn, requires

that $\alpha \cdot n > w$. This says that crime must pay! To carry out criminal activities, criminals require a premium to compensate them for the punishment risks they bear. The left-hand side of Condition 31.3 is the marginal benefit of crime; with probability $(1 - \pi)$ criminals expect *not* to be apprehended and to enjoy a utility premium, relative to formal work, of $U(\alpha \cdot n) - U(w) > 0$. The right-hand side of Condition 31.3 is the marginal cost of crime; with probability π crime results in interdiction and a loss of utility (relative to formal work) of $U(w) - U(\alpha \cdot n - s) > 0$. Therefore, Condition 31.3 says that crime is the optimal choice only if the benefits exceed the costs at the margin.

One of the most appealing features of the framework is that it is easy to use it to think about the design of policies intended to deter crime. Policy makers can make crime less attractive by either increasing the likelihood of detection (i.e., increasing π) or by increasing the severity of the punishments they mete out (i.e., lowering $U(\alpha \cdot n - s)$). Alternatively, they can deter crime by making formal employment more attractive (through, for example, a wage subsidy that raises w). This, of course, is nothing more than the familiar carrots and sticks parable as applied to the encouragement of legitimate activities as opposed to criminal ones.

31.3 General Equilibrium

Section 31.2 offers important insights into the core determinants of criminal behavior; nevertheless, the analysis is incomplete as it stands. In particular, nothing has been said about the determination of the wage, the average return to crime, and the number of people who choose to become criminals. This latter limitation is obviously significant because it is then impossible to determine the crime rate and discuss, in a sensible manner, policies that might reduce it. In this section, we attempt to remedy these deficiencies by examining crime within a general-equilibrium context. Loosely speaking, this means that not only are people's actions rational (in the sense just used) but that they also are coherent en masse.

This extension is consonant with the view that crime is just one part of a much broader mosaic of human behavior. Most important, policies tailored to meet partial-equilibrium objectives may have little effectiveness when applied within a general-equilibrium setting. For instance, later we will see that incarceration may have little effect on the equilibrium crime rate—a possibility first emphasized by Freeman (1996).

The Economic Environment

To simplify the analysis, we maintain the notation and many of the key assumptions laid out earlier in Model 31.1. Let's also assume that people are risk neutral, which implies their preferences take the simple form $U(x) = x$, where x is the

dollar value of the goods they consume. The risk-neutrality assumption means that they care about only their expected consumption levels.

The Disposition of the Population. Let L denote the number of people who work and C denote the number who commit crimes. Because the people in this economy are assumed either to work or commit crimes it follows that $N = L + C$, where it will be recalled that N is the total population.

General-Equilibrium Features. Let's impose Assumption 31.1, which describes the economic processes that determine both the wage and the returns to crime.

ASSUMPTION 31.1

General Equilibrium

(a) The labor market is competitive, and the demand for labor is:

$$w = D(L)_0 \quad (31.4)$$

where w is the (real) wage, and $D(L)_0$ is a standard negatively sloped demand curve (see Figure 31.3a).

(b) Each crime yields a fixed payoff α .

(c) The probability a criminal is apprehended is a constant π . If apprehended the criminal's utility is $U(\alpha \cdot n - s) = \alpha \cdot n - s$.

According to Assumption 31.1a, the demand for labor is governed by a standard negatively sloped schedule. Let's assume, for a moment, that each crime yields a *fixed* return of α . In practice, the returns to crime might be expected to depend on the average income level in the community. The reason is that, *ceteris paribus*, an increase in the average income level implies there is more to steal. This possibility is dealt with later. The legal environment (characterized by s and π) is also exogenously given.

The Expected Cost of Crime. Obviously the proceeds from each crime, α , do not materialize out of thin air. Rather they represent transfers from victims to criminals. With this in mind, let us do some accounting. If there are C criminals, each of whom commits n crimes, this implies that a total of $C \cdot n$ crimes occur during the period. In addition, each crime yields an average booty of α . This implies that the total loss inflicted on victims (gain to criminals) is $\alpha \cdot C \cdot n$. From the perspective of potential victims, crime is a random event. Suppose that everyone in the population of N people—criminals and formal workers alike—each faces the same probability of falling victim to a crime.³³ Hence each person expects to suffer a crime related loss, z , that is given by:

$$z \equiv (\alpha n C)/N = \alpha n c, \quad \text{where } c \equiv C/N \quad (31.5)$$

Expected Utilities. The expected utilities from legitimate work, EU_1 , and from crime, EU_0 , are given by:

$$EU_1 = w - z \quad \text{and} \quad EU_0 = \alpha n - \pi \cdot s - z \quad (31.6)$$

The (possibly negative) *net gain*, G , from committing crimes (as opposed to formal employment) is defined by $G \equiv EU_0 - EU_1$. In turn, this latter condition can be written as:

$$G \equiv \alpha n - \pi \cdot s - w \quad (31.7)$$

If $G > 0$, then the individual gains from crime, which implies that criminal activity is strictly optimal; if $G < 0$, then he loses, so formal employment is strictly preferred; and if $G = 0$ he is just indifferent between formal employment and crime. Notice that, since crime affects everybody equally, the expected dollar loss from criminal victimization, $\$z$, has no effect on the decision of whether to engage in criminal activities at the margin.

General Equilibrium

So where's the general equilibrium in all of this? The answer to this question is in two parts. First, and most important, notice that the wage, w , accruing from formal employment appears in Condition 31.7. Notice too that it depends (negatively) on the number of workers who choose formal employment, L . Consequently, as shown in Figure 31.3a, if the level of employment is *low* the wage is *high*. Likewise, if the level of employment is *high*, then the wage is *low*.

Second, Condition 31.7 determines whether people opt for crime or for formal employment (or are indifferent between the two activities). Combining both these elements together gives us the general equilibrium that we are seeking to find.

Analysis. To see how the parts of the model fit together, suppose that everyone is formally employed, implying $L = N$. Reading off the demand schedule, $D(L)_0$, in Figure 31.3a, shows that at this high level of employment the wage is very low (see point H). But then the net gain from criminal activity is positive, $G > 0$, so everyone elects to become a criminal! Obviously, this cannot be an equilibrium. We began with a situation in everyone works but ended up with one in which everyone makes precisely the opposite choice and becomes a criminal! Similar but opposite remarks apply to the case in which everyone chooses to be a criminal. In this case, the wage is high, so everyone wants to work because $G < 0$!

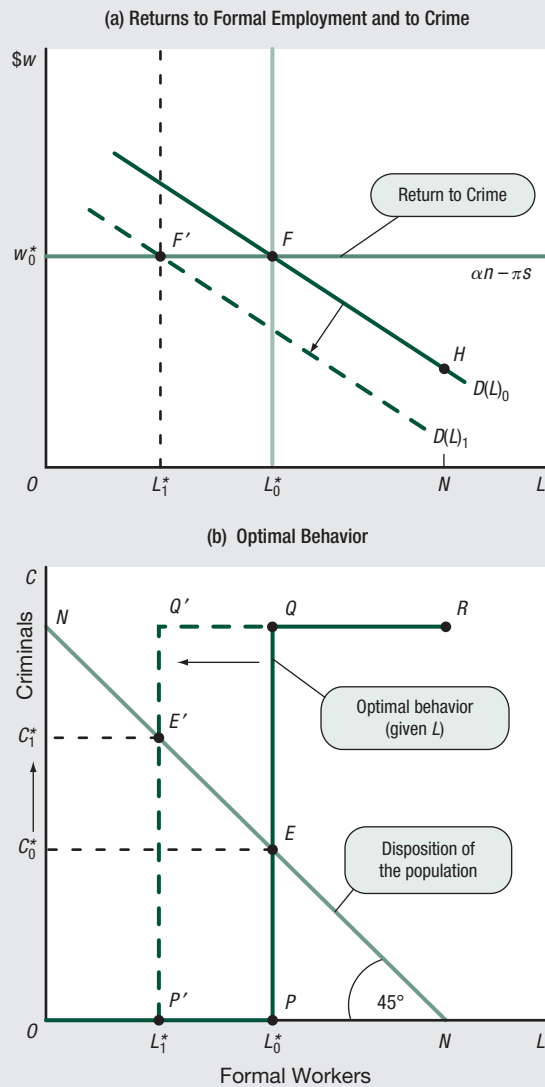
It follows from these remarks that, in equilibrium, the net to gain from crime *must* be precisely zero, $G = 0$. Only then is it the case that there is no incentive for anyone to change his or her behavior. This outcome is located at the intersection of the two solid lines in panel (a), implying the equilibrium level of employment equals L_0^* .

Figure 31.3*b* describes how the population is allocated between work and crime. The negatively sloped 45° line, NN , corresponds to the identity $N = C + L$, which describes the disposition of the population between crime and formal work. The line $OPQR$ depicts the number of people who *plan* to become criminals conditional on the given level of employment L . Everyone wants to work for levels of employment less than L_0^* , and everyone wants to be a criminal for levels of employment that exceed L_0^* , for the reasons just given. Individuals are indifferent between the two occupations only if $L = L_0^*$. Hence the equilibrium outcome is located at point E , where the line NN intersects the line $OPQR$, since nobody then has any incentive to change his or her behavior.

Comparative Statics. The general equilibrium framework can be used to examine the effects of an assortment of policies and changes in the economic environment. Consider, for example, the effect of an adverse macroeconomic shock that reduces the demand for labor in the formal sector (e.g., the recent near catastrophe that occurred during the 2008 financial meltdown). As shown in Figure 31.3*a*, the shock induces a leftward shift in the labor-demand schedule, which moves from $D(L)_0$ to $D(L)_1$ along the *unchanged* return-to-crime schedule, $\alpha \cdot n - \pi \cdot s$. Notice that workers are now indifferent between crime and formal work at point F' , where there are a total of L_1^* formal workers.

Reading down to panel (b) reveals that the optimal-behavior schedule shifts from $OPQR$ to $OP'Q'R$. In turn, this change causes the equilibrium to shift from point E to E' . It is readily seen that the equilibrium number of criminals increases from C_0^* to C_1^* . Notice that, despite the reduction in the demand for labor, the equilibrium wage remains unchanged at w_0^* ; it must, for each worker has the option of becoming a criminal, which provides an invariant expected income of $\$(\alpha \cdot n - \pi \cdot s)$.

FIGURE 31.3 The Equilibrium Levels of Crime and Employment



Endogenous Returns to Crime

Up to this point, the returns to each crime, α , have, in the interests of simplicity, been treated as exogenously given. In practice, however, α , might be expected to depend on several different factors. Consider Assumption 31.2.

ASSUMPTION 31.2

Endogenous Returns to Crime

Assume that $\alpha = \alpha(C, w)$, where α is *decreasing* in C and *increasing* in w .

Assumption 31.2 says that the returns to each crime, α , depend negatively on the number of criminals C and positively on the wage. Intuitively, for very low levels of criminal activity, the few active criminals in the population can search out soft high-return targets with ease, but as their numbers increase it becomes increasingly difficult to do so. Moreover, as the crime rate increases, individuals might respond by becoming more vigilant and devoting greater efforts toward ensuring their own security: Doors remain unlocked in much of rural America but this would hardly be prudent in many poor urban neighborhoods.³⁴ An increase in average earnings, w , implies that the typical individual has more possessions that are available for criminals to steal, which explains why α increases with the wage.

Analysis. The expected *net* returns to crime are once again given by,

$$G \equiv EU_0 - EU_1 = \alpha n - \pi \cdot s - w, \quad (31.8)$$

where $\alpha = \alpha(C, w)$ and $w = D(L)$. Previously, α was exogenously given but now it depends on C and w . This simple but plausible extension makes for a world of difference. The reason is that the *direct* effect of an increase in the number of criminals, C , is to lower α . Nevertheless, there is an *indirect* general-equilibrium effect that works through w . More specifically, as C rises then L falls, which raises both the wage, w , and α . Hence, depending on the size of these two effects, the (expected) utility from crime, $\alpha n - \pi \cdot s$, may *increase* or *decrease* as the number of criminals, C , rises.

Figure 31.4a depicts the returns-to-crime schedule $\alpha n - \pi \cdot s$, denoted QQ . It possesses both increasing and decreasing segments, for the reasons just described. Figure 31.4b depicts the schedule OR , which determines the number of individuals who plan to become criminals given the number of formal workers, L . Notice that the OR locus intersects the negatively sloped 45° line at several (three) points: G , B , U —the good, the bad, and the ugly. This outcome is referred to as a situation of *multiple equilibria*, because all three points represent potential equilibrium outcomes.

The ugly equilibrium, depicted at U , is characterized by a high level of criminal activity and a low level of formal employment. The good equilibrium, G , has little

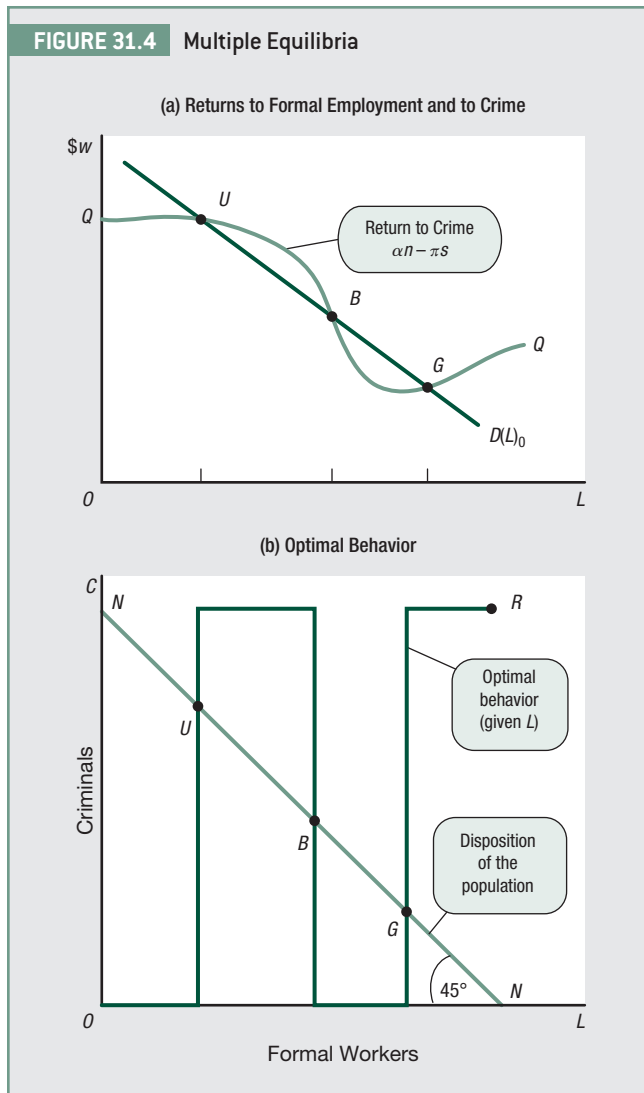
crime and a high level of employment. (Case B is intermediate.) The actual outcome that pertains depends on the beliefs held by the population at large. For instance, point U is a pessimistic equilibrium: everyone expects the crime rate to be very high and employment to be low. Given the high wages earned by the few individuals who do work, everyone expects that crime is also lucrative and their beliefs are fulfilled. Similar, but opposite, remarks apply to the optimistic equilibrium shown at point G .

Recent Developments

The economic approach to crime is a very active area of current research. Below, two broad classes of developments are outlined.

Dynamic Models. The hallmark of dynamic models of criminal behavior is that individuals recognize that their current actions have future ramifications for their well-being. Imrohoroglu, Merlo, and Rupert (2000) construct a model in which individuals specialize in either legitimate or criminal activities. Greater numbers of police increase apprehension rates, but result in a greater tax burden to finance them. The level of police expenditures is determined by the outcome of the political process that depends on majority voting. Using U.S. data the authors find that a technologically induced reduction in income inequality lowers the crime rate. Nevertheless, (depending on the details) policies that reduce inequality through taxes and transfers may increase or decrease the crime rate.

Imrohoroglu, Merlo, and Rupert (2004) study property crime in the United States in a very rich general-equilibrium setting. Individuals differ in their productivities and they are forward-looking, recognizing their current actions have future consequences. The authors calibrate their model to the 1980 U.S. data. (In essence, this means that some of the parameters are selected so that the model reproduces the major features of the U.S. experience in 1980.) They then use 1996 data to evaluate the effects of various changes that occurred in the U.S. economy



over the period. The model is rich enough to account for the decline in the (property) crime rate over the period. The most important factors that explain the decline (in order of importance) are (1) greater policing, (2) the stronger economy, and (3) the aging population.³⁵ Most interesting, the authors find that the increase in income inequality that occurred over the period would, absent effects 1–3, have led to a substantial increase in the number of property crimes.

In Huang, Laing, and Wang (2004) we construct a model featuring search activity and crime. Some individuals elect to become criminals (and search for victims), while others become formal workers and search for jobs. Formal workers can accumulate human capital, which increases their productivity once employed. We show that criminal activity (theft) essentially acts as a tax on the accumulation of human capital. After all, there is little point acquiring a costly education if, at some future point in the not too distant future, there is a high chance that one's possessions (i.e., the fruits of one's labor) will be stolen. Because of these considerations, the model exhibits multiple equilibria of the sort just considered, with high crime, low levels of educational attainment, long spells of unemployment, and poverty (low incomes) correlated across them.

Burdett, Lagos, and Wright (2003) also consider an environment characterized by labor-market search and by the random interaction between criminals and formal workers. In their model, an equilibrium wage distribution arises in which some firms use high wage payments to reduce costly labor turnover. Workers employed at high-wage firms do not commit (property) crimes because they have too much to lose if they are apprehended, incarcerated, and lose their jobs as a result. It is, however, optimal for workers employed at low-wage firms to commit crimes, since they have little to lose.³⁶ Their paper offers interesting insights into the relationship between the distribution of wages and the level of criminal activity.

Interaction Models. Glaeser, Sacerdote, and Sheinkman (1996) develop a framework, in which each agent must choose between criminal and legitimate behavior. The choices of some agents are, however, partly driven by peer group effects, in which they imitate the behavior of their nearest neighbor. They show a distribution of equilibria may emerge, which offers valuable insights into the high temporal and spatial variance of crime rates that are observed in the United States.

31.4 Crime and Punishment: Deterrence

The extent of enforcement of laws depends upon the amount of resources devoted to the task. With enough policemen almost every speeding automobile could be identified. . . . We could make certain that crime does not pay by paying enough to apprehend most criminals. Such a level of enforcement would of course be enormously expensive, and only in crimes of enormous

importance will such expenditures be approached. The society will normally give to the enforcement agencies a budget which dictates a much lower level of enforcement.

—Stigler (1970)³⁷

One of the major benefits of the economic approach is that it forces us to clearly articulate the costs and benefits of criminal activity and the resources used in its prevention. Hence it is relatively easy to assess the relative efficacy of alternative anticrime programs (such as the value of spending an additional tax dollar on policing as opposed to prisons). In this section, we examine the effectiveness of some of these policy options.

Deterrence

In the year 1531, when Henry VIII was King, an act was passed for boiling prisoners to death. The act details the case of one Richard Roose, or Coke, a cook in the diocese of the Bishop of Rochester, who had, by putting poison in the food of several persons, occasioned the death of two, and the serious illness of others. He was found guilty of treason, and sentenced to be boiled to death.

—Andrews (1991)

As we saw in Section 31.2, crime is individually optimal if:

$$(1 - \pi)U(\alpha \cdot n) + \pi U(\alpha \cdot n - s) - U(w) > 0 \quad (31.9)$$

where it will be recalled that π is the probability of arrest (and conviction), and $U(\alpha \cdot n - s)$ is the criminal's utility in this event. There are a variety of interpretations of the sanction s . It could represent a monetary fine or the dollar cost the individual places on his incarceration (or even torture). For simplicity assume the individual is risk neutral, so $U(x) = x$. The individual's decision then boils down to (no pun intended) *choose crime if*:

$$\alpha \cdot n - w - \pi \cdot s > 0 \quad (31.10)$$

It is quite easy to see, from this expression, how the economics of deterrence work. Holding constant the gross rewards from crime, $\alpha \cdot n - w$, the individual is less likely to commit crimes the greater is either the likelihood of his apprehension π (given the penalty s) or the greater the penalty s (given the apprehension likelihood, π).

This simple framework has an immediate but startling implication for the optimal design of policies intended to combat crime. In particular, notice that the deterrence effect is constant provided that the combined product $\pi \cdot s$ is constant. It follows that if π is reduced but s is increased in proportion, then the deterrent effect, $\pi \cdot s$, remains unchanged. Yet, society bears the costs associated with detection (π), and the felon, by and large, bears the costs of his punishment.

Consequently, society should seek to implement any given level of deterrence, $\pi \cdot s$, by minimizing π or, equivalently, by maximizing s . It follows that the most cost-effective way for society to prevent crimes—varying from murder to even the late return of library books—is to execute offenders with a suitably chosen probability. (Boiling them to death would be even more effective.) Although this is a prediction of the model, it is obviously at variance with the facts. Not even Singapore executes people for crimes such as littering or spraying cars with paint.³⁸

Why the Punishment (Usually) Fits the Crime. Almost no society gives murderers a slap on the wrist and executes those who return their library books late. In general, the punishment usually fits the crime. In a now classic paper, Stigler (1970) advanced two main reasons for why this is so and for why there is a balance between enforcement expenditures and the severity of punishments.

First, expenditures on policing and law enforcement reduce the likelihood of convicting and punishing the innocent. For example, it would be most unfortunate were we to execute Norburt for the late return of his library books, only to then discover that he had in fact returned them on time and there had been a clerical error. This concern alone is sufficient to mitigate the harshness of many legal sanctions.

The second reason concerns the proper pricing of criminal punishments. For example, suppose I can be executed for a minor crime, such as illegally parking my car. It follows that if I commit this crime, then I might as well also commit a more serious one, such as armed robbery. However, this logic fails if, instead, I face a \$20 fine for the former crime and 15 years in state prison for the latter.³⁹

An Interesting Externality. Sah (1991) and Freeman, Grogger, and Sonstelie (1996) identify an interesting externality that arises whenever a given level of resources are used to investigate and prosecute crimes. To see what is afoot, let us return to the net gain from crime G , which previously was shown to equal:

$$G \equiv \alpha \cdot n - \pi \cdot s - w \quad (31.11)$$

where it will be recalled that π is the probability of interdiction. Sah (1991) and Freeman, Grogger, and Sonstelie (1996) argue that it is plausible to assume that this detection probability is given by:

$$\pi = \pi(P, C) \quad (31.12)$$

where P denotes total policing expenditures, and, once again, C represents the number of criminals. As society increases the level of policing (say, by increasing the number of police patrols) each criminal faces a greater likelihood of arrest, so π increases with P . However, for any given level of policing, P , an increase

in C reduces the likelihood that any given criminal will be apprehended. (Think of police resources being stretched to the breaking point during a crime wave.) Therefore, it is plausible to suppose that π declines as C rises.

This latter effect is termed an *externality*: my decision to become a criminal lowers the chances that, as a criminal, *you* will be arrested. It is interesting because it means that as the number of criminals, C , increases, then the expected net returns to crime, G , also increase at the margin, since there is a lower probability of detection. This leads to the possibility of multiple equilibria (of the sort described earlier), which, in turn, can help to explain why, during some periods, there is a crime wave and during others the crime rate is relatively low.

Prisons

Prisons are an integral part of the U.S. justice system: We don't just fine murderers, we lock them up! There are four main reasons why we do this. DiIulio (1996) elegantly summarizes these reasons as follows:

Imprisonment offers at least four types of social benefits. The first is retribution: imprisoning Peter punishes him and expresses society's desire to do justice. Second is deterrence: imprisoning Peter may deter either him or Paul or both from committing crimes in the future. Third is rehabilitation: while behind bars, Peter may participate in drug treatment or other programs that reduce the chances that he will return to crime when free. Fourth is incapacitation: from his cell, Peter can't commit crimes against anyone save other prisoners, staff or visitors.⁴⁰

Of these, only incapacitation is unique to the prison system. Society can both deter crimes and extract retribution via the use of either fines or corporal punishment, and it can rehabilitate by educating the convicted. Regarding incapacitation, DiIulio (1996) continues,

As columnist Ben Wattenberg so vividly put it, everyone grasps, "A thug in prison can't shoot your sister." Few criminologists (and no average citizens) doubt that if we emptied the prisons tonight we would have more crime tomorrow.⁴¹

In fact, the arguments for incapacitation appear to be so compelling that it is difficult to imagine that there is any room for debate on the issue. There is. The claim that incarceration reduces crime because it removes criminals from civil society, so denying them the means of doing further harm, is based on a *partial-equilibrium* view of the world. Nevertheless, as Freeman stresses, it is important to account for the potential replacement of those who are incarcerated by the entry of new criminals. Freeman (1996) remarks,

From the mid-1970s to the mid-1990s, the United States roughly tripled the number of men in prison or jail. . . . Incapacitation of so many criminals should

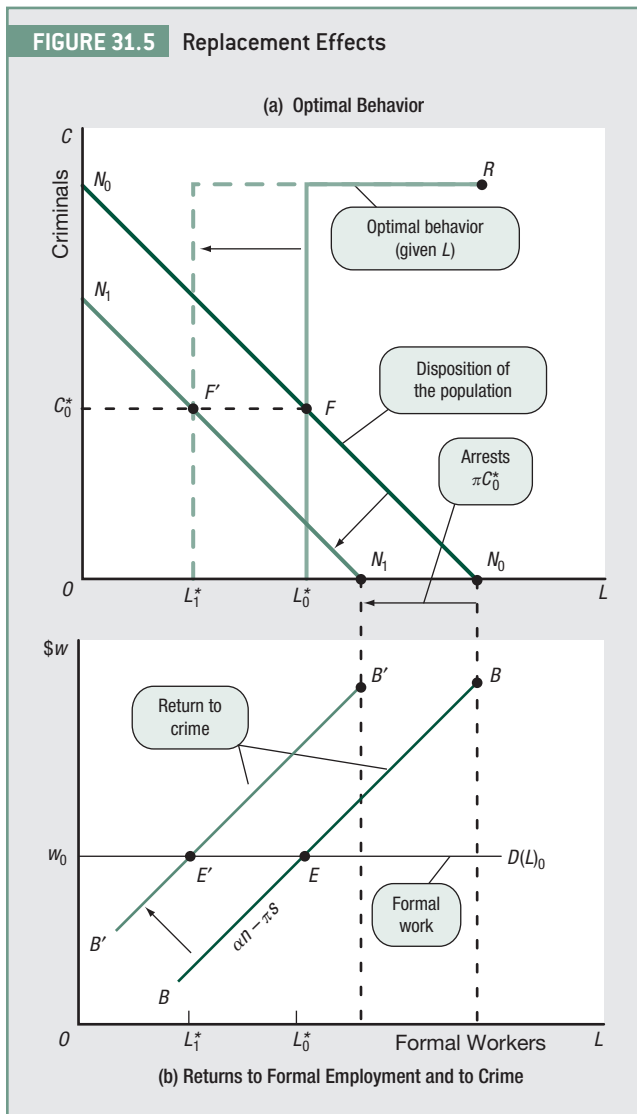
have greatly reduced the crime rate: if the worst offenders are in prison, they can't mug, rob or otherwise commit offenses against the citizenry. But no such drastic reduction in crime occurred. . . . Non-institutionalized men evidently "replaced" incarcerated criminals in committing crimes.⁴²

Replacement Effects. The general-equilibrium model, presented in Section 31.3, offers valuable insights into the workings of the replacement effect. The only modification required of the framework is that it must be extended to cover two time periods: the minimum number required to study the effects of the capture and incarceration of one cohort of criminals and their subsequent replacement by another.

Once again, assume that the disposition of the population, N , between formal workers, L , and criminals, C , is $N = C + L$. To make the arguments as crisp as possible, let's assume (Figure 31.5b) that the labor-demand curve, $D(L)_0$, is perfectly elastic (i.e., horizontal), which implies the wage is constant and equals $\$w_0$.

Suppose that the value of each crime, $\alpha = \alpha(C)$, depends (negatively) on the number of criminals, C , because it becomes more difficult to locate soft targets as C rises.⁴³ Conditional on a given number of criminals, C , the expected earnings from crime are $\$(\alpha(C) \cdot n - \pi \cdot s)$. In turn, given $C \equiv N - L$, this can be written as $\$(\alpha(N - L) \cdot n - \pi \cdot s)$. Notice that the return depends positively on L (as shown by the line BB in Figure 31.5b). Intuitively, a greater number of formal workers automatically means there are fewer criminals, which raises the value from each crime, $\$\alpha(C)$. Finally (and most important), since $\alpha(C) \equiv \alpha(N - L)$, notice that if both N and L happen to change by the same amount, then the returns-to-crime schedule, $\alpha(C) \cdot n - \pi \cdot s$, remain unchanged.

The significance of this latter fact is that if ΔN people are incarcerated in one period, then the returns-to-crime schedule, BB , shifts leftward by ΔN in the next. (Why? If the population, N , declines by ΔN and if the



number of formal workers, L , declines by ΔN , then the returns to crime remain unchanged for the reasons just given.)

We are now ready to analyze the properties of the model. In the first period, the equilibrium is located at points E and F in the figure. There are a total of C_0^* criminals, $L_0^* \equiv (N_0 - C_0^*)$ legitimate workers, and nobody has an incentive to change his behavior.

Based on the arrest and conviction probability, π , a total of $\pi \cdot C_0^*$ criminals are arrested in the first period. Suppose that they all remain behind bars in the second period, which removes them from civil society. The result is that the population declines by πC_0^* (from N_0 to N_1). As shown in Figure 31.5b, this displaces the returns-to-crime schedule, BB , leftward (by the amount πC_0^*) to $B'B'$ (for the reasons just described).

Because the average criminal commits n crimes, the partial-equilibrium commonsense effect of incarcerating the πC_0^* apprehended criminals is that the overall level of criminal activity will decrease by $n \cdot \pi C_0^*$. Nevertheless, the folly of looking at only partial-equilibrium effects is quite apparent. In the second period, many of the incarcerated are replaced by those who were legitimate workers in the first period. The light green lines depict the general-equilibrium effects. In panel (a), the $N_0 N_0$ schedule shifts inward, by the amount πC_0^* , to $N_1 N_1$ (reflecting the incarceration of those arrested in the first period).

As shown in panel (b), this, in turn, causes the returns to crime locus to shift leftward from BB to $B'B'$. In the second period, the new equilibrium pertains at points E' and F' . Notice that, in this simple model, there is complete replacement because the number of criminals remains unchanged! This example is obviously extreme, and in reality, we might expect only partial replacement to occur. Even so, its main message should be enough to give policy makers pause for thought.

In 2007, the United States spent over \$60 billion on the prison system. Nevertheless, the total cost of the prison system is much greater than this number suggests. The reason is that society loses the value of each prisoner's contribution to GNP from his potential employment. (Anderson (1999) estimates these costs were about \$35 billion in 1997.) In addition, the *use it or lose it* principle has particular relevance for members of the prison population. The possibility of sewing mail bags notwithstanding, prisoners have (for reasons that are all too transparent) few opportunities for finding gainful employment. As a result, they might lose much of their human-capital stocks over lengthy periods of incarceration.

This loss in human capital is unfortunate on at least two counts. First, society obviously loses some (productive) human capital. Second, the loss in human capital encourages recidivism at the margin. Recall that one of the primary insights of Becker's model of crime is that one of the major deterrents of criminal activity is the legitimate earnings, $\$w$, that an individual forgoes by choosing a life of crime. A lengthy prison sentence, however, weakens this deterrence effect because it reduces the individual's human capital stock and therefore his legitimate earnings on release.

31.5 The Economic Model of Crime: The Evidence

The hallmark of the economic model of crime, first proposed in Becker (1968), is that criminal activity responds to incentives. More specifically, according to the basic model presented in Section 31.1 the crime rate is predicted to decline with:

- An improvement in formal employment opportunities.
- A deterioration of criminal opportunities.
- An increase in efforts that are directed at legal deterrence, such as an increase in the likelihood of detection, π , or in the severity of punishments, $\$s$.

A huge number of empirical studies have tested the main predictions of Becker's model of criminal activity, and, on balance, the framework has received strong empirical support. In this section, we discuss some of the major empirical findings of this literature, beginning with those that have focused on changes in the opportunities that are available to workers in the formal labor market.

Labor Market Opportunities

Earlier, in Section 31.1, we presented evidence that showed that the United States witnessed, on the one hand, a striking increase in criminal activity that extended over a 20-year period (beginning in the early 1970s) and, on the other hand, an equally impressive meteoric decline in crime during the 1990s. For example, after controlling for county level demographic changes in race, age, and sex ratios, Gould, Weinberg, and Mustard (2002, p. 47) report the number of property crimes increased by about 29% between 1979 and 1993 and decreased by 7.6% between 1991 and 1997.

The changes in criminal activity, however, apparently mirrored two significant developments that occurred in the United States labor market: the sharp decline in the earnings of young unskilled men, which began in the early 1970s, and the substantial decrease in the aggregate rate of unemployment, which began in the 1990s. More specifically, from the mid-1970s to the early 1990s the earnings of (unskilled) young men decreased by 20%–30% and between 1992 and 1998 the aggregate unemployment rate plummeted from 7.5% to 4.5%.⁴⁴ The close parallel developments of these events immediately raises the question of whether they are related in some way. Of course, such a connection might be expected to hold on a priori grounds because the decision of whether to engage in criminal activity is a time allocation problem. In fact, as we have seen, changes in the opportunities available to workers in the formal labor market are predicted to have a direct and ineluctable impact on the crime rate, by affecting the *opportunity cost* of criminal behavior.

In perhaps the most comprehensive study to date, Gould, Weinberg, and Mustard (2002) analyze the effects on the crime rate of the changes that occurred over the last two decades in the (legal and illicit) opportunities available

to young men.⁴⁵ According to one set of estimates, they find a 1% increase in the weekly wage of non-college-educated men reduces property crimes by 0.54%; a 1% decrease in unemployment reduces them by 2.2%; and finally a 1% decrease in statewide per capita income reduces property crimes by 0.48%. (Broadly similar estimates are obtained for an assortment of other criminal activities.)

Despite the fact that the effect of a 1% change in unemployment on crime is almost 5 times greater than the effect of a 1% change in the wage, the authors argue that, between 1979 and 1993, the increase in criminal activity was largely driven by the decline in the real earnings of young men. Quite simply, despite the powerful connection between crime and unemployment, the unemployment rate did not change enough, over the period of interest, to have much of an impact. (In fact, the unemployment rate in 1979 was virtually the same as it was in 1997, despite the fact that property crimes were 21% higher.) Gould, Weinberg, and Mustard (2002) determine that the 23.3% reduction in the real wages of unskilled men, between 1979 and 1993, explains much of the increase in criminal activity:

The non-college-educated wage explains 43% of the 29% increase in adjusted property crime during this time period, and 53% of the 47.2% increase in adjusted violent crime. The unemployment rate of non-college-educated men explains 24% of the total increase in property crime and 8% of the increase in violent crime. Clearly, the long-term trend in wages was the dominant factor on crime during this time period.⁴⁶

They continue by observing that the decline in the unemployment rate did explain much of the reduction in criminal activity that occurred after 1993.

The declining crime trends in the 1993–1997 period are better explained by the unemployment rate. The adjusted property and violent crime rates fell by 7.6% and 12.3%, respectively. . . . The 3.1% increase in the wages of non-college-educated men predict a decrease of 1.7% in property crime and 3.3% in violent crime. The comparable predictions for the 3.1% decline in the unemployment rate are decreases of 7.5% for property crime and 4.0% for violent crime.⁴⁷

The authors include state per capita incomes to control for the relative prosperity of the area, which has a theoretically ambiguous effect on crime. On the one hand, as average incomes increase, there is more for criminals to steal. On the other, individuals might use part of their extra wealth to better protect themselves against crime. Between 1979 and 1994 per capita incomes increased by about 7.7%. According to the authors' estimates this is predicted to raise property crimes by about 4% (i.e., 0.54 times 7.7%). Hence between 1979 and 1994, the increase in per capita incomes explains about 14% of the increase in property crimes that occurred during this period.⁴⁸

Freeman (1996), Freeman and Rodgers (1999), Grogger (1998), and Raphael and Winter-Ebmer (2001) examine the effects of labor-market conditions on

crime. Consistent with the findings of Gould, Weinberg, and Mustard (2002), Raphael and Winter-Ebmer (2001) find that a 1% increase in unemployment leads to a 1.6%–2.4% increase in property crimes. Freeman and Rodgers (1999) estimate that unemployment and crime are positively related, and that each 1% increase in unemployment raises the crime rate by about 1.5%. Grogger (1998) estimates the crime-wage elasticity lies between -0.95 and -1.2 .

Black men earn substantially less than White men (see Chapter 12). Moreover, a substantive body of evidence indicates that Black men are more likely to commit crimes than White men. Grogger (1998) investigates whether this racial wage gap can explain the observed racial differences in criminal behavior and finds that the gap does indeed go some way toward them:

Blacks typically earn less than whites, and this wage gap explains about one-fourth of the racial difference in criminal participation rates.⁴⁹

Grogger's analysis is also useful for helping us understand the age distribution of crime. Recall from Section 31.1 that criminal behavior declines rapidly with age.⁵⁰ Yet, earnings also increase with experience because of the human capital that is accumulated through on-the-job learning. It follows that part or all of the reduction in criminal activity over the life cycle might then just represent the fact that legitimate earnings—which capture the opportunity cost of crime—increase with age.⁵¹

Deterrence

In addition to the overall improvement in labor-market opportunities, the last 25 years also witnessed an aggressive increase in policing efforts. The significance of this observation is that according to the economic model of crime, criminal behavior is driven by both the value of crime relative to legitimate labor-market activity and by deterrence measures (i.e., policing efforts and the penalties inflicted on those who are captured).⁵²

Policing.

One of the most surprising empirical results in this literature is the repeated failure to uncover evidence that an increase in the number of police reduces the crime rate. Of the 22 studies surveyed by Samuel Cameron (1988) that attempt to estimate a direct relationship between police and crime using variation across cities, 18 find either no relationship or a positive (i.e. incorrectly signed) relationship between the two.

—Levitt (1997)⁵³

The greatest obstacle to obtaining valid estimates of the effect of deterrence measures on crime arises because of simultaneity problems. Crime and law enforcement efforts are jointly determined, so crime-ridden cities have larger police departments. As Levitt (1997) succinctly puts it,

Detroit has twice as many police officers per capita as Omaha, and a violent crime rate that is four times as high, but it would be a mistake to attribute the differences in crime rates to the police.⁵⁴

In an ingenious study, Levitt (1997) gathers data that potentially allow him to overcome this simultaneity problem. Specifically, he exploits (exogenous) changes in police expenditures that occur around the time of mayoral elections in the United States. In election years there is a 2% increase in policing and in nonelection years there is no increase in policing at all. He finds that additional policing has a substantial deterrent effect on both violent and property crimes. A 1% increase in police expenditures reduces violent crimes by 1.1% and property crimes by 0.3%.

Juvenile Crime. Levitt (1998) examines the major determinants of juvenile criminal activity. Between 1979 and 1993, the United States saw the juvenile crime rate grow twice as fast as the adult crime rate. The divergence in murder rates is particularly striking. Thus,

Juvenile murder arrests rose 177 percent, whereas the murder arrest rate for adults actually fell 7 percent.⁵⁵

Levitt presents evidence indicating that 60% of the juvenile crime wave is attributable to relative change in sanctions.⁵⁶ Most important, congruent with the economic model of crime, juveniles are as responsive to legal sanctions as adults. The strongest evidence for this is the observation that there is a sharp reduction in crime at the age of majority (at which point adult penalties come into effect). This finding suggests deterrence—as opposed to incarceration—plays an important role. For violent crimes, states with lenient juvenile systems witness a 3.8% reduction in the crime rate, at the age of majority, but those states that are tough on juveniles see their crime rates increase by 23% at the age of majority.⁵⁷

Carrots and Sticks. Because of data limitations, relatively few studies have jointly examined the effects of criminal sanctions and labor-market conditions on the level of criminal activity. Corman and Mocan (2002) is an interesting exception. The authors examine the effect of economic conditions (carrots) and sanctions (sticks) on murder, assault, robbery, burglary, and motor vehicle theft in New York City, using monthly time-series data that span the period 1974–1999. *Carrots* are captured by the unemployment rate and the real value of the minimum wage. They proxy the severity of the *sticks* by the number of felony arrests, the size of the police force, and number of New York City residents in prison or jail. The paper also tests the validity of the broken windows hypothesis, using misdemeanor arrests as a measure of policing. Their evidence provides some support for the hypothesis in the case of robbery and motor vehicle theft. While

both economic and deterrence variables are important in explaining the decline in crime, their evidence indicates that the impact of deterrence measures is more pronounced than economic variables.

Private Enforcement Efforts. There are important external effects associated with private enforcement efforts. If I lock the doors to my house, install an expensive burglar alarm system, buy a gun, and so on then, *ceteris paribus*, it becomes relatively cheaper for criminals to victimize my neighbors. Therefore, private enforcement efforts may displace crime toward softer targets and so have little effect on the overall level of criminal activity. Critics, however, argue that the extent of these substitution effects is limited, and that private crime prevention activities is socially beneficial because it lowers the overall returns to crime and the number of crimes committed.

In an interesting study, Ayres and Levitt (1998) examine the effects on crime (car thefts) of the LoJack automobile recovery system.⁵⁸ A notable feature of LoJack is that the vehicle has no visible indication that the system is installed in the car. It follows that, in areas in which the system operates, car thieves cannot simply target their efforts at automobiles that are not fitted with the device. They always run the risk of stealing a LoJack-equipped car. This feature of the system eliminates the negative externality associated with individual enforcement efforts just described, and it leaves only the positive externality that arises because automobile theft becomes less lucrative at the margin. The authors find that in cities that implement the system, there is a significant reduction in auto thefts. In fact, on average, 1 car theft is prevented for every 3 automobiles fitted with LoJack. (The authors find no evidence that would-be car thieves switch toward the commission of different crimes.) From an efficiency standpoint, it is likely that too few people will purchase the LoJack system because those who do purchase and install it fail to capture the full benefits of their actions, which result from the overall reduction in the number of car thefts.

A debate is currently raging concerning whether greater gun ownership raises or lowers the crime rate. The argument is simple enough. On the one hand, I might buy a gun to protect both myself and my family. On the other, I might then subsequently use the gun I bought (perhaps with these initial legitimate goals in mind) to shoot Norburt (for one of an assortment of possible reasons). The former of these effects might be expected to reduce the average number of crimes because it increases the (expected) costs the typical criminal bears in the commission of a crime. The latter effect, obviously, raises the crime rate. The effects of gun ownership rates on crime therefore depend on the relative magnitudes of these two forces.

Duggan (2001) carefully examines this relationship empirically. Much of the earlier research in the area suffered from a plentiful lack of reliable data on

gun ownership rates. The author exploits a unique data set to accurately estimate annual rates of gun ownership at both the state and the county levels over a 2-decade span of time. His main findings are that changes in gun ownership are significantly positively related to changes in the overall murder rate and that this relationship is driven almost entirely by the impact of gun ownership on gun-related homicides. Almost one third of the differential decline in gun-related homicides relative to non-gun-related homicides, since 1993, is explained by recent reductions in the fraction of households owning a gun. (This finding contrasts with Lott and Mustard (1997), who find a substantial deterrent effect of concealed handgun laws.)

The Deterrent Effects of Arrests and Prisons. More people are arrested and incarcerated when the crime rate is high than when it is low. This simple fact of life leads to classic case of simultaneity bias in estimating the true deterrent effect of prisons. The reason is that the raw evidence spuriously points to the possibility that high incarceration rates lead to more crimes being committed.

Levitt (1996) employs an interesting approach to overcome this simultaneity problem. Specifically, he uses data generated by the passage of legislation dealing with prison overcrowding to capture the effects of exogenous changes in the number of incarcerated prisoners. The idea is based on the facts that the overcrowding legislation is driven by the size of the prison population (and not the crime rate per se), and that it leads to the early release of an *exogenous* number of criminals. His results are striking: the beneficial crime-reducing effects of incapacitation are two to three times greater than those found in previous studies. In fact, a one person reduction in the prison population is associated with the commission of an additional 15 crimes per year. (Most interesting, this number is close to the number of crimes that are committed by the median criminal reported on page 4.)

It is natural to focus on the loss of freedom as the primary cost—and hence source of deterrence—that an individual bears because of his arrest and his subsequent incarceration. Yet, the consequences of incarceration can exert a profound negative effect on an individual's subsequent career development. The attempt to explain to potential employers that the 30-year gap in your résumé resulted from a triple murder you committed in your youth may not go over that well.⁵⁹ In this sense, the deterrent effect of arrest and subsequent conviction must include the total cost of all legal sanctions, including fines, the value of lost freedom, and the value of any reduction in expected future labor-market earnings.⁶⁰ In an interesting study, Grogger (1995) estimates the employment consequences of arrest and incarceration. To do so he merged longitudinal data on arrests from the California correction system with unemployment insurance records. The raw data indicate that workers who went to prison had earnings that were some 20% lower than other comparable workers.

However, Grogger is able to show that, by and large, the difference in earnings is not causal. Thus,

The primary conclusion of this paper is that the effects of arrests on employment and earnings are moderate in magnitude and rather short-lived. My analysis indicates that most of the negative correlation between arrest records and labor market success stems from unobserved characteristics that jointly influence crime and labor market behavior, rather than from the causal effects of arrests.⁶¹

One explanation for this finding is that the level of schooling level is not included in his sample. It follows that if those with low schooling levels commit the most crimes, they are also subject to the greatest number of arrests and earn the lowest wages. Consequently, human capital differences could explain why convicted felons earn low wages.

Demographics: The Effects of *Roe v. Wade*

Donohue and Levitt (2001) proffer evidence that indicates that much of the dramatic decrease in crime witnessed during the 1990s is due to the legalization of abortion in 1973 with the Supreme Court's decision in *Roe v. Wade*.

Their findings indicate that the reduction in crime began roughly 18 years after abortion was legalized. As a control for this sea change in the legal environment, the authors use data from five states that permitted legal abortions 3 years before *Roe v. Wade*, in 1970. Most interesting, these states experienced reductions in criminal activity 3 years earlier than the rest of the nation. Their evidence indicates that the legalization of abortion accounts for as much as 50% of the drop in crime witnessed during the 1990s.

The effect of abortion on crime is inconsistent with the simple economic model of crime presented in this chapter. It is, however, consistent with an environment in which individuals accumulate human capital within the family that raises their subsequent productivity (as either formal workers or as criminals). Seven years after *Roe v. Wade*, 1.6M abortions were carried out annually in the United States (this is one abortion for every two live births). Abortion not only changed the size of each new cohort (in particular the numbers of young men), it also affected its composition. More specifically, the women who seek abortions are disproportionately from less affluent backgrounds. What is more, abortion better allows women to optimally plan the timing of births and hence to more judiciously invest in their children's human capital by providing a more nurturing home environment. Together, these effects are predicted to work to reduce the criminal proclivities of each cohort. Their evidence indicates that an increase of 100 abortions per 1,000 live births reduces that cohort's crime rate by 10%.⁶²

SUMMARY

- Criminal activity is subject to considerable temporal and spatial variation. The 1980s witnessed a striking increase in criminal activity and the 1990s an equally impressive meteoric decrease.
- The estimated costs of criminal activity in the United States are huge. According to some measures they exceed \$1.5 trillion annually.
- According to Becker's model of crime, individuals rationally decide whether to commit crimes on the basis of the net perceived benefits.
- In a *general equilibrium* setting, the returns to both crime and to formal employment depend on the number of participants in each activity.

Multiple equilibria may emerge. Some equilibria have low levels of crime and high levels of employment. Others have precisely the opposite characteristics.

- There are potentially significant replacement effects that must be accounted for in establishing the effectiveness of incarcerating offenders.
- Empirically assessing the effectiveness of alternative policies designed to lower crime is complicated because of simultaneity issues. For example, the level of policing is generally highest in neighborhoods where crime is most prevalent.

PROBLEMS

P1. Describe the major trends in criminal activity in the United States over the last 40 years.

P2. Is it reasonable to model criminal behavior using a rational choice approach?

P3. The crime rate exhibits huge temporal and spatial variations. Why is this observation a problem for theories that stress that crime is largely the product of bad genes?

P4. Explain the role played by risk aversion in determining whether an individual chooses to commit crimes.

P5. Larry, Curly, and Mo have fallen on hard times and are contemplating establishing their own printing business. Indeed, they estimate that if they can get away with printing \$10 bills, then they will each pocket \$10K. Nevertheless, there is a 50–50 chance they will be caught red-handed, sent to jail, and receive only a meager \$1 of consumption during their incarceration. Larry is risk neutral and his utility is

$u(c) = c$. Both Curly and Mo are risk averse, deriving utility $u(c) = \sqrt{c}$ and $u(c) = \log_{10}(c)$ respectively. Despite the fact that the earnings from legitimate work are only $w = \$200$, one of them chooses this option rather than the criminal enterprise. Which one and why?

P6. Why are relatively so many criminals young men?

P7. Suppose the likelihood of falling victim to crime differs between criminals themselves and formal workers. Indeed, suppose that only formal workers are victims. How does this change the general equilibrium analysis?

P8. Using a figure similar to Figure 31.3, show what happens to the crime rate if (a) there is an increased probability of arrest, π , and (b) there is an increase in the dollar value of each crime α . What does this last result suggest about the effects of an increase in inequality on the crime rate?

P9. Examine the case in which the probability of arrest, π , depends negatively on the number of criminals C (for any given level of policing). Show that multiple equilibria may arise.

P10. What are the major trade-offs that society faces in choosing the appropriate amount to spend on

law-enforcement efforts vs. the severity of the sanctions it metes out on those who are convicted of crimes?

P11. What are the main benefits and drawbacks of incarcerating those convicted of committing crimes?

NOTES

1. DiIulio (1996), p. 3.
2. The statistics pertain to U.S. residents aged 12 or older. See www.ojp.usdoj.gov/bjs/pub/pdf/cv06.pdf (accessed May 5, 2010).
3. Freeman (1996) estimates that the total cost of crime is about 4% of GDP.
4. See www.ojp.usdoj.gov/bjs/pub/pdf/cv05.pdf (accessed May 5, 2010).
5. There are some excellent and accessible surveys available to those who are interested in pursuing the economics of crime in greater depth. Freeman (1999) stands out for its clarity.
6. Becker (1968), p. 170.
7. The Bureau of Justice Statistics was founded in 1979. It is part of the U.S. Department of Justice.
8. Source: www.ojp.usdoj.gov/Plan/text/bjs.txt (accessed May 5, 2010).
9. U.S. Census Bureau, *Statistical Abstract of United States* (2003), p. 196. *The Statistical Abstract of the United States* (various states) is available at www.census.gov/compendia/statab (accessed October 20, 2010).
10. The term *white collar crime* was first coined in 1939 by the sociologist Edwin Sutherland.
11. Quoted by Strader (2002, p. 2).
12. Unless stated otherwise, these numbers refer to the rate of crime per 100,000 persons. For reasons that are all too obvious, murder—evidently a violent crime—is not included in the NCVS.
13. In 1980 there were 23,040 murders in the United States. See U.S. Bureau of the Census, (2000), Table 312. By 2005 this number had fallen to 16,692. About 76% of murder victims are male and 90% are adults. Firearms are used in 7 in 10 homicides. Data are available at www.fbi.gov/ucr/05cius/data/table_01.html (accessed May 5, 2010).
14. See BJS bulletin (2006), www.ojp.usdoj.gov/bjs/pub/pdf/cv05.pdf (accessed May 5, 2010).
15. See U.S. Bureau of the Census, (2000), Table 310.
16. There is some debate about whether transfers should be counted as a social cost of crime. Thus if I break into your apartment and abscond with your collection of Dolly Parton CDs, then society gains if I value them more than you; otherwise, it loses. This perspective, although superficially plausible, ignores the value of the time I spend planning and executing the crime; see Becker (1968). It also ignores an important ex ante cost. Perhaps your Dolly Parton collection is only a shadow of what it otherwise would have been in the absence of its prospective theft.
17. Source: *Statistical Abstract of the United States* (2007), Table 306.
18. Freeman (1996), p. 35.
19. Indeed, according to Lochner (2004), two thirds of the 1.35 million men incarcerated in 1993 had not completed high school.
20. Source: <http://ftp2.census.gov/govs/apes/06stlus.txt> (accessed May 5, 2010).
21. See <http://www.census.gov/compendia/statab/tables/08s0318.pdf>.

22. Source, Table 350, *U.S. Census Bureau Statistical Abstract of the United States* (2007). Almost 2.3 million persons were incarcerated either in jail or state/federal prison. Over 4.2 million people were on probation, and almost 800,000 were on parole.
23. Quoted by Freeman (1996), pp. 37–38.
24. Anderson (1999), p. 621.
25. Anderson (1999), p. 623–624.
26. Bentham (1830), Bk. 1, Ch. 3.
27. The model is an amalgam of others that are seen in the literature. In particular, see Becker (1968), Ehrlich (1973), Block and Heineke (1975), and Freeman (1999). It is easy to extend the model presented here to other crimes, such as fraud and violent crimes.
28. Some of the most exciting work currently being undertaken is unquestionably that pertaining to the dynamics of criminal activity. One of the most eloquent call to arms in this area was made in Merlo (2001).
29. These issues are dealt with thoroughly in Block and Heineke (1975).
30. Freeman (1999), p. 3543.
31. Freeman (1999), p. 3551.
32. This formulation is quite general. For example, if $s = \alpha \cdot n - c_0$ then the apprehended criminal's utility is simply $U(c_0)$. This corresponds to the situation in which (say) the state confiscates the criminal's ill-gotten gains and provides some (possibly minimal) level of consumption $\$c_0$.
33. The model can be extended to the case in which, for example, criminals face a lower (or greater) likelihood of falling victim to crime than legitimate workers. See, for example, Murphy, Shleifer, and Vishny (1993).
34. DiIulio (1996) describes these private anticrime actions as *target hardening*.
35. Criminal activity is overwhelmingly concentrated among young innercity men. As a consequence, a reduction in the fraction of young men in the population is predicted, *ceteris paribus*, to lower the crime rate. Indeed, the authors report that in 1980 almost 21% of the population was aged between 15 and 25. By 1996 this fraction had fallen to only 15.1%.
36. This formulation is an adaptation of the employee crime models of Becker and Stigler (1974) and Dickens, Katz, Lang, and Summers (1989), in which firms pay efficiency wages to deter malfeasant behavior.
37. Stigler (1970), p. 527.
38. Singapore does imprison and cane them though. In 1994 the Singaporean High Court dismissed American student Michael Peter Fay's appeal against a sentence of 4 months in jail, and six strokes of the cane for vandalizing two cars.
39. Friedman (1999) offers a third reason: corruption among law enforcement agencies. Under a system of fines, some agency benefits from the fine. If the transfer is large enough, then it is in the agency's interest to seek a conviction regardless of actual guilt. Moreover, law enforcement agencies have an incentive to threaten to prosecute the innocent, unless they receive a suitable payment.
40. DiIulio (1996), p. 18.
41. Ibid.
42. Freeman (1996), p. 25.
43. Since the wage is constant, it is safe to ignore its effects on α .
44. See Bound and Johnson (1992) and Katz and Murphy (1992).
45. Two early studies that document a positive effect of unemployment on crime include Cantor and Land (1985) and Freeman (1983). Öster and Agell (2007) document that as much as 15%–20% of the reduction in burglaries and auto thefts witnessed in Sweden during the 1990s is attributable to the decline in unemployment that occurred over the period. (For people under the age of 25—those most likely to commit crimes—unemployment decreased from 21.2% to 8.7% during that time.) Nilsson (2004) demonstrates that income inequality levels are an important contributory factor determining the Swedish crime rate.

46. Gould, Weinberg, and Mustard (2002), p. 50.
47. Ibid.
48. Ehrlich (1973) was one of the first to recognize the importance of per capita incomes as a possible determinant of criminal activity.
49. Grogger (1998), p. 787.
50. Grogger presents evidence indicating that criminal participation rates decrease from 37.5% among 17- to 18-year-olds to 18.9% among 22- to 23-year-olds.
51. Some authors have argued that the effect of age on crime is essentially inexplicable. Thus “Hirschi and Gottfredson (1983) have argued that the age effect is ‘direct’ and ‘invariant,’ and simply ‘cannot be accounted for by any . . . combination of variables . . . currently available to criminology.’” Quoted in Grogger (1998, p. 786). Regarding this possibility, Grogger concludes, “[W]ages largely explain the tendency for crime to decrease with age, a phenomenon widely observed by criminologists. . . . Wages represent the opportunity cost of crime and are well-known to rise with age” (p. 787).
52. A seminal study in this area is Ehrlich (1975), who attempted to measure the deterrent effect of capital punishment. Witte (1980) and Tauchen, Witte, and Griesinger (1994) uncover evidence pointing to a substantial deterrence effect.
53. Levitt (1997), p. 270.
54. Levitt (1997), p. 270–271.
55. Levitt (1998), p. 1156.
56. For adults, incarcerations per violent crime increased from 0.34 to 0.54 (a 60% increase between 1978 and 1993). The juvenile crime rate fell from 0.36 to 0.29—a decline of 20%—see Levitt (1998, p. 1155).
57. Here the key is to look at the relative gap between juvenile and adult punishments. Thus, consider a state that is lenient on the former and harsh on the later. In this case, an individual faces a stiff increase in penalties at the age of majority, which is predicted to reduce the crime rate (at this point). In contrast, a state that is tough on juveniles and adults experiences no such relative change in penalties.
58. LoJack involves the use of a small radio transmitter that is hidden somewhere in the car. If it is reported stolen, the authorities can then track the car, determining its precise location.
59. The loss in earnings could arise for any one of a variety of reasons, including stigma effects or from the loss of skills that result from an extended period of incarceration.
60. Waldfogel (1994) presents evidence indicating that there is a large negative effect of arrests on future earnings.
61. Grogger (1995), p. 61.
62. In an interesting study, Glaeser and Sacerdote (1999) furnish evidence that also indicates the importance of demographic factors for understanding changes in the incidence of crime. They show that the preponderance of crime observed in large metropolitan urban areas is explained by the large number of single-parent households.

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