Agenda

Advancing economics in business

Cutting edge or blunt instrument? Using economics to analyse crime

Can economics be used to analyse crime and, if so, how? Drawing on the literature of the economics of crime, we explore the problems inherent in calculating the effectiveness of policies designed to reduce crime, and set out some potential solutions. We also show how modern policy evaluation techniques were used to assess the impact of an anti-knife crime initiative in London

Economics has traditionally been applied to problems involving markets, business, trade and economic policy, but it is now increasingly being applied to less traditional areas of economics, including crime.

Market failures can occur in any number of markets or industries—for example, the mis-selling of financial products, or underinvestment in infrastructure—leading to consumer detriment. Crime, too, can be viewed as a 'market failure', as a result of which individuals suffer harm. The UK government and police employ a variety of policies and strategies to prevent and tackle crime. These include enforcement by the police in deterring and catching criminals; a criminal justice system to punish offenders who are caught; and an offender management service to reduce re-offending. Recent economic research has focused on the causal relationship between policy initiatives and crime rates (in contrast to earlier research, which only estimated correlations between the two). Identifying this relationship and estimating its extent are at the heart of assessing the efficacy of government policies or police strategies in relation to crime, and form part of any cost–benefit analysis that is carried out (which might include, for example, the financial and societal costs of imprisoning an individual or hiring more police officers).

In this article, we discuss the various economic methods that have been used to assess the impact of crime prevention policies and strategies, summarise the latest academic literature, and analyse an anti-knife crime initiative in London.

What does economics have to say about crime?

The literature on the economics of crime can at times be controversial, partly because it deals with emotive areas, which economics traditionally does not cover. One such debate is discussed in *Freakonomics*,[1] a chapter of which examines academic research on a proposed link between the legalisation of abortion in the USA in 1973 and the falling crime rate from the early 1990s.[2] (Many alternative arguments and determining factors for why the crime rate reduced in the 1990s have also been suggested, along with criticism of the original research findings presented in *Freakonomics*.[3]) Another controversial and fiercely debated area of research relates to crimes committed with guns—in particular, whether laws on carrying concealed handguns in the USA have a positive effect (as a deterrent to criminals) or negative effect (used for criminality) on the crime rate.[4]

The literature on the economics of crime began with a seminal paper by economist and Nobel Prize winner, Gary Becker.[5] He proposed an economic model, in which criminals are individuals who view crime as a rational decision (ie, ignoring moral and societal considerations), based on comparing the expected benefit with the expected cost (the probability of being caught multiplied by the severity of the punishment when caught). Becker is said to have begun his thinking on the economics of crime when weighing up the expected cost and benefit of parking illegally when he was late for a meeting.[6] For crimes with a financial motive such as robbery, Becker's model stipulates that

factors such as police resources will enter on the expected cost side for criminals, since the presence of more police officers will normally increase the probability of being caught, resulting in a higher expected cost of committing the crime; and factors such as relative poverty will enter on the benefit side because a higher level of poverty increases the expected benefit of a crime for which there is financial gain to the individual.[7] The literature has also distinguished between the effects of a particular policy on different types of crime (for example, property versus violent crimes), and this may lead to insights about how the mechanisms through which a policy works differ by type of outcome.

Within the literature on the economics of crime, a number of relationships have been explored, in particular those related to public policy. For example, if it is established that an increase in unemployment increases the crime rate, the government could lower crime by reducing unemployment. Due to cultural and legal differences between countries, some research findings are relevant only to those countries where the research was carried out. For example, there have been a number of studies in the USA concerning guns and crime, the impact of the death penalty as a deterrent to crime and, as noted above, the impact of the legalisation of abortion on the crime rate. There has also been research into other tools used to control crime, including the arrest rate, imprisonment rate, severity of sentences, and level of police resources. The research methodologies into the relative effects of these policies or strategies are useful since they form part of the process used to identify which policy is most (cost-) effective. For example, will reducing the unemployment rate have a greater effect on crime than increasing the number of police officers? If both policies have a crime-reducing impact, the next stage will be to assess which policy is more cost-effective.

Figure 1 illustrates the approaches that have been used, first to estimate the correlation between a range of policies and crime, and more recently to identify causal relationships.

The 'first generation' research focused on the correlation (ie, the statistical relationship) between crime and different policy variables, while the 'second generation' research has begun to use better-quality panel data (data that varies both over time and by individuals) that has become available more recently, and also employs more sophisticated empirical methodologies to estimate a true causal impact (controlling for other factors that might also affect the outcome). The criticism of the first-generation studies was that they failed to address the issue of 'endogeneity', whereby an increase in police resources, for example, might reduce the crime rate, but the

Figure 1 Research strategies employed in the literature on the economics of crime
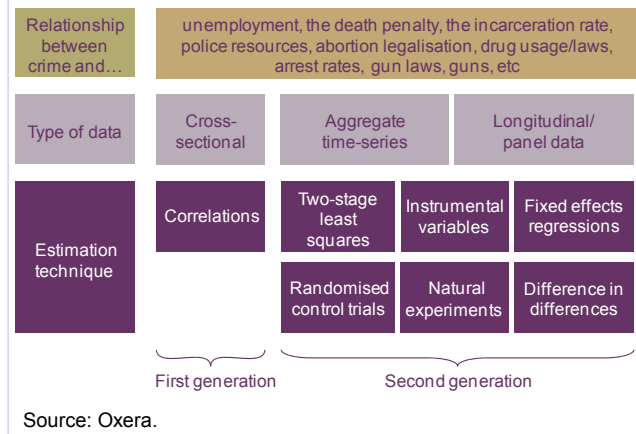
increase in police resources might have been in response to an increase in the crime rate. With the direction of the relationship going both ways, it has been left to economists to untangle these different relationships.

Cutting-edge economics

A variety of techniques can be used to overcome endogeneity. The difference-in-differences framework, for example, allows two different groups to be compared: a treatment group (subject to the policy) and a control group (not subject to the policy). This theory assumes that the trends of the outcome variable (eg, the crime rate) prior to the introduction of the policy are the same for the two different groups, and that, in the absence of the policy, the treatment group would have continued in the same trend as the control group. Figure 2 presents a visualisation of the impact that is being estimated using this methodology. The solid lines are the observed outcomes for the treatment and control groups, and the red dotted line is the

Figure 2 Illustration of the difference-in-differences approach
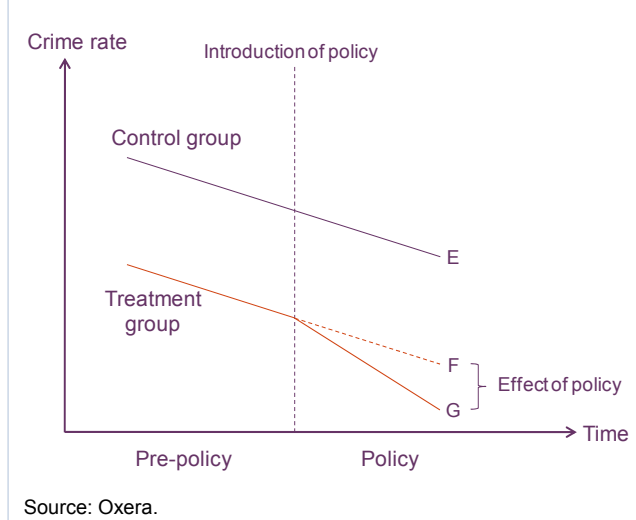
counterfactual outcome for the treatment group—ie, what would have happened to the treatment group if the policy had not been introduced. It is sometimes wrongly assumed that the treatment effect is the distance between E and G. However, the difference-in-differences estimator calculates the treatment effect to be the distance between F and G, since this is the difference between the effect of the policy on the same (treatment) group and the outcome had the policy not been applied to it.

Changes in policy that are unrelated to the outcome being measured can be exploited in several ways to overcome the problem of two-way causality. If a change in a policy variable, such as an increase in police resources, happens for a reason that is unrelated to the crime rate, there will not be endogeneity, enabling the true impact of the policy to be estimated accurately. The various sources of these 'exogenous' changes are discussed below in the context of how an increase in police resources affects the crime rate.

- **Instrumental variables**: where there is potentially bi-directional causality (eg, spending on policing affecting the crime rate and the crime rate affecting spending on policing), economists can look instead at the relationship between the outcome (the crime rate) and a different variable that is closely related to changes in the policy but completely unrelated to changes in the outcome. These alternative variables are known as 'instrumental variables'. Levitt uses electoral cycles as an instrumental variable—the idea being that those in power increase spending on policing because it is a vote winner, and is unrelated to the crime rate, which allows the effect of increased policing on the crime rate to be measured.[8]

- One source of instrumental variables is **natural experiments**, which can be used to identify and estimate relationships. For example, Draca et al. found that following the July 2007 terrorist attacks in London, police activity increased in central London by 30%.[9] The authors also found that the effect of the increase in police officers caused by an exogenous factor (ie, one unrelated to the crime rate being measured) can be used to estimate the impact on the crime rate compared with that in outer London where there was no increased deployment.

- **Randomised control trials** involve increased police patrols being sent to randomly selected crime 'hotspots', and the crime rates in these treated hotspots being compared with those in untreated hotspots.[10]

Crime fighting in London

Knife crime in London has been a recurring headline in the UK press, partly as a consequence of the involvement of teenagers in many of the crimes.[11] Operation Blunt 2 (OB2) was launched by the Metropolitan Police Service across all 32 London boroughs in May 2008, and continues today. The analysis of the effectiveness of OB2 focuses on knife carrying as measured by the crime category 'possession of an offensive weapon', as well as the robbery (personal property) crime rate.[12]

By using an economic framework, the mechanisms through which OB2 works can be analysed. The relevant mechanisms are detailed individually below (although these are not mutually exclusive).

- **Mechanical effect**: all else being equal, a greater number of stop and searches should lead to a greater number of weapons detected, and consequently an increase in the offensive weapon crime rate. That is, assuming that the increased number of searches does not change knife-carrying behaviour or the probability that police find a knife during a search, one would expect to find more weapons in total by carrying out more searches.
- **Deterrence effect**: with more stop and searches being carried out, the higher probability of being caught by police increases the expected cost to those individuals carrying weapons, and may dissuade them from carrying them.
- **Incapacitation effect**: with more stop and searches being carried out, the higher probability that individuals are caught with a weapon means that more weapons will be removed from 'circulation' when they are seized by the police.
- **Incarceration effect**: with more stop and searches being carried out, the higher probability that individuals are found with weapons means that more individuals who carry weapons are sent to prison—ie, there will be fewer individuals carrying weapons in public.

The analysis of OB2 uses monthly data from January 2006 to January 2010 for all 32 London boroughs, as well as data from police forces on the borders of these boroughs (ie, command units in Hertfordshire, Kent and Surrey), which are used as a control group because they did not participate in OB2.

For a police officer to search an individual with no grounds for suspicion, authorisation for the use of stop-and-search powers (known as an S60 authorisation) must be granted by a senior police officer (for a limited time period) when they believe either that offensive weapons are being carried in a

Table 1   Average number of stop and searches per S60 authorisation (standard errors in parentheses)

	Tier 1 boroughs	Tier 2 boroughs	Tier 3 boroughs
Average number of stop and searches per S60 authorisation	50.6*** (9.4)	47.6*** (6.6)	27.0*** (5.0)
Number of boroughs	10	6	16

Note: *** denotes significance at the 1% level.
Source: Oxera 2010.

location (eg, a town centre) or that serious violence might occur in that location. Although OB2 is active across the whole London area, the boroughs were graded into three tiers, with Tiers 1 and 2 receiving the highest intensity of police resources because they are known to have a higher average rate of weapon possession.

The analysis indicates that *for each authorisation* there are a greater number of stop and searches in the higher-priority Tier 1 and 2 boroughs than in Tier 3 boroughs, and these results are statistically significant (see Table 1). For example, each authorisation in a Tier 1 borough results on average in 50.6 stops.

Within the difference-in-differences framework, two distinct comparisons can be made with the control groups:

− Tier 1 and 2 boroughs can be compared (separately or together) in this way against Tier 3 boroughs (ie, within London); and
− the 32 London boroughs can be compared in this way against the police forces in the bordering areas.

As discussed above, for the results to be valid, the pre-policy trends need to be similar.[13] Analysis of the trends shows that the change in offensive weapon crime rate (yearly differences by month) is similar for all three tiers of borough, and that this is also the case when comparing London with the police forces in the bordering areas. The pre-treatment trends for the robbery crime rate are found to be similar when comparing yearly differences of the robbery rate within London. Furthermore, the pre-policy trends are estimated over a 28-month period to minimise any possibility of the pre-policy trend being caused by a transitory shock.

Does the use of stop-and-search powers reduce knife crime?

The results indicate that OB2 has had the intended impact on knife crime. Compared with the Tier 3 boroughs, OB2 has reduced the offensive weapon count in Tier 1 boroughs by an average of 1.7 offences per month, and there are on average 1.3 fewer offences per month in Tier 2 boroughs. This means that there are estimated to have been around 200 fewer offensive weapon offences in the ten Tier 1 boroughs over a 12-month period than there would have been without the policy—a reduction of approximately 7%. Similarly, the personal property robbery crime rate for each Tier 1 borough decreased by 21.0 offences on average per month relative to the estimated outcome without the policy, and by 15.7 offences on average per month for Tier 2 boroughs.

When comparing the overall impact of OB2 on weapon possession in London using the bordering police areas as the control, there was a reduction of two offences on average per borough per month, which equates to a reduction in weapon possession of approximately 12.5% compared with the estimated outcome without the policy.

Conclusions

The analysis presented has identified a causal relationship in which stop and search in London has been estimated to reduce both robberies and the possession of weapons. As strategies to combat crime have developed, so have the economic evaluation techniques to assess their success. In addition, more sophisticated models that take into account the displacement of crime, by either location or time, are being used to estimate the precise impact of police operations. The economic literature has shown that Becker's framework for analysing whether criminals participate in crime is a useful one, and that, within this context, economics is a powerful tool for policy-makers and police officers alike, in allowing them to examine a number of different policy instruments and strategies that can be used to reduce the crime rate.

The research in this area has highlighted economic methodologies that can be used to evaluate the impact of a wide range of policies or interventions. In addition to its application to crime, the difference-in-differences methodology employed is part of a wider policy evaluation literature that has also been used to assess, for example, the impact of education initiatives around the world.[14]

[1] Levitt, S. and Dubner, S. (2005), *Freakonomics: A Rogue Economist Explores the Hidden Side of Everything*, Penguin Books.

[2] Levitt, S. and Donohue, J. (2001), 'The Impact of Legalized Abortion on Crime', *Quarterly Journal of Economics*, **116**:2, pp. 379–420.

[3] For a more thorough discussion, and the most recent response to criticisms of their earlier research, see Levitt, S. and Donohue, J. (2008), 'Measurement Error, Legalized Abortion, and the Decline in Crime: A Response to Foote and Goetz', *Politics and the Life Sciences*, **123**:1, pp. 425–40. For the original critique, see Foote, C. and Goetz, C. (2005), 'The Impact of Legalized Abortion on Crime: Comment', Federal Reserve Bank of Boston Working Paper 05-15.

[4] For a more thorough exposition of both sides of the debate, see Lott Jr, J. and Mustard, D. (1997), 'Crime, Deterrence, and Right-to-Carry Concealed Handguns', *Journal of Legal Studies*, **26**:1, January, pp. 1–68, and Ayres, I. and Donohue, J. (2003), 'Shooting Down the "More Guns, Less Crime" Hypothesis', *Stanford Law Review*, **55**:4, pp. 1193–312.

[5] Becker, G. (1968), 'Crime and Punishment: An Economic Approach', *Journal of Political Economy*, **76**:2, pp. 169–217.

[6] Becker, G. (1992), 'The Economic Way of Looking at Life', Nobel Lecture, December 9th.

[7] For a discussion of how the relative strength of the economy can affect the crime rate, see Gould, E., Weinberg, B. and Mustard, D. (1997), 'Crime Rates and Local Labor Market Opportunities in the United States: 1979–1991', working paper.

[8] Levitt, S. (1997), 'Using Electoral Cycles in Police Hiring to Estimate the Effect of Police on Crime', *American Economic Review*, **87**:3, June, pp. 270–90; Levitt, S. (2002), 'Using Electoral Cycles in Police Hiring to Estimate the Effect of Police on Crime: Reply', *American Economic Review*, **92**:4, September, pp. 1244–50.

[9] Draca, M., Machin, S. and Witt, R. (forthcoming), 'Panic on the Streets of London: Crime, Police and the July 2005 Terror Attacks', *American Economic Review*.

[10] Sherman, L. and Weisburd, D. (1995), 'General Deterrent Effects of Police Patrol in Crime "Hot Spots": A Randomized, Controlled Trial', *Justice Quarterly*, **12**, pp. 625–48.

[11] See, for example, Leppard, D. (2007), 'Knife Crime Doubles in 2 Years', *The Sunday Times*, August 19th.

[12] This includes all robberies, since data on robberies carried out specifically with a knife is not available from the police.

[13] Alternatively, the trends of the outcome variable between the two groups can be controlled for statistically, for example by taking differences over time rather than using levels.

[14] Dearden, L., Emmerson, C., Frayne, C. and Meghir, C. (2009), 'Conditional Cash Transfers and School Dropout Rates', *Journal of Human Resources*, **44**, pp. 827–57.

If you have any questions regarding the issues raised in this article, please contact the editor, Dr Gunnar Niels: tel +44 (0) 1865 253 000 or email g_niels@oxera.com

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