UNEMPLOYMENT AND CRIME IN THE REGIONS OF BRITAIN: A THEORETICAL AND EMPIRICAL ANALYSIS[1]

Vani K. Borooah
School of Public Policy, Economics and Law, University of Ulster, Co Antrim, BT37 0QB, Northern Ireland.

Grainne Collins
School of Public Policy, Economics and Law, University of Ulster, Co Antrim, BT37 0QB, Northern Ireland.

ABSTRACT This paper examines the link between unemployment and crime within the context of an expected-utility model to explain optimal choices between legal and illegal activities. It is shown that the outcome of this choice depends upon the type of unemployment that is being considered, with criminal activity more likely to be the result of long-term unemployment than of short-term unemployment. The model used annual data for the 12 standard regions of Britain over the period 1983 to 1992. The results identified unemployment and lack of school-leaving qualifications as factors leading people into crime and the success of the police in clearing up crime as a factor deterring people from entering crime. These sets of factors may therefore be viewed, respectively, as factors pushing people towards, and pulling them away from, criminal activity.

1. INTRODUCTION

The relationship between unemployment and crime has attracted considerable attention from researchers in the social sciences[2]. In analysing this relationship, an important question for economics is whether there exists, or does not exist, a causal link between rising unemployment and increases in the rate of criminal activity? The answer to this question is important because conventional thinking on macro-economic policy regards unemployment as the price that society pays for a low inflation rate. If, however, unemployment spawns crime then the price for keeping the inflation rate down to a prescribed level might be deemed excessive.

Commonsense would suggest that there does exist such a causal link:

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2 See Dickinson (1995) for a useful bibliography.

unemployment provides the *motivation* for criminal activity[3], while the fact that the majority of the labour force is in employment - along with the fact that the increase in dual-earner families means than many more houses are unoccupied during the day - provides the unemployed with the *opportunity* to engage profitably in such activity[4]. However, research on this topic has not, at least on British data, produced results sufficiently clear-cut to either substantiate or refute such commonsensical reasoning. On the one hand, there are studies (Dickinson, 1995; Wells, 1995; Reilly and Witt, 1992; Hale and Sabbagh, 1991[5]) which establish a link between unemployment and crime. On the other hand, there exist studies (Pyle and Deadman, 1994; Field, 1990) which conclude that such a link is at best tenuous.

Such studies are, however, vitiated by several problems. First, the observed correlation between crime and unemployment may not reflect a causal relationship but instead be due to the influence of other factors (for example, deprivation, inequality) omitted from the estimated relationship[6]. Second, the link between unemployment and crime might depend on the nature of unemployment and also upon the nature of the crime. While the literature takes account of the latter factor by emphasising the link between unemployment and crimes against property (burglary, theft, vandalism, fraud and forgery), little attempt has been made to distinguish between different types and measures of unemployment. Thirdly, many crimes are committed by persons who are not unemployed and little attempt has been made to control for this fact; neither has much attempt been made to control for the deterrent effects of detection and punishment upon criminal activity. Thus in the absence of attempts to (i) control either the effects on crime of factors related to unemployment or for the effects of factors acting independently of unemployment, and (ii) experiment with different unemployment measures, attempts to establish a causal link between any observed relation between unemployment and criminal activity must be suspect.

This paper is an attempt to correct for such deficiencies. Its first contribution is to establish a theoretical framework within which the relationship between unemployment and crime might be analysed. The starting point of such a framework is to relate the volume of criminal activity to the stock of 'criminals' and to explain changes to this stock in terms of entry into, and exit out of, this stock. This stock-flow model is derived in Section 2.

Section 3 uses the expected utility model[7] to analyse the role of unemployment in determining criminal behaviour. The argument of this section is that those unemployed persons who are actively, and intensively, searching for jobs and who

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3 See Box (1987) for a discussion of motivational effects.

4 Cantor and Land (1985) argued that as unemployment rose, and becomes more wide-spread, the opportunity for crime would be reduced. For this reason, rising unemployment could lead to a reduction in crime levels.

5 Hale and Sabbagh (1991) found significant relationship between unemployment and crime for five out of eight crime categories.

6 This point is made by Pyle and Deadman (1994).

7 Applied by Ehrlich (1974) to analysing criminal behaviour.

have been unemployed for a sufficiently short period of time as to be optimistic about their chances of finding employment, along with those persons at school who are optimistic about their chances of finding a job on completion of their studies, are likely to eschew criminal activity. At the other end of the spectrum, those jobless persons who are only weakly (or not at all) searching for jobs, along with those still at school who are pessimistic about securing a job on completion of their schooling, will be more likely to enter the criminal fraternity. Thus the model distinguishes the strength of the unemployment-crime relationship according to the type of unemployment and it also encompasses the fact that some criminal activity may be attributed to the behaviour of persons who have even dropped out of the labour market.

Section 4 attempts to put empirical flesh on the theoretical skeleton by estimating the unemployment-crime relationship on annual data for burglaries and thefts for the 10 standard regions of Britain for the period 1983-92. In carrying out this estimation, attempts were made to control for a variety of factors, other than unemployment, that might also affect movements in the crime rate. Section 5 concludes the paper.

2. A STOCK-FLOW MODEL OF CRIMINAL ACTIVITY

Let S_t be the stock of criminals at beginning of period t, defined (say) as the number of persons, who over period t, perpetrated one or more criminal acts, regardless of whether their identities are known to the police or to the victims of their crimes; S_t is therefore a quantity whose value may be guessed at, but is not measurable[8].

If E_t is the number of entrants into the criminal fraternity during period t, then the rate of growth of stock is given by:

$$\Delta S = E_t = E(S_t, X) \qquad (1)$$

Equation (1) indicates that the additions to stock depend upon a vector X of socio-economic variables (specified later) and the size of the stock. The dependence of stock additions on stock size represents two countervailing influences: (i) the larger the stock size, the more 'acceptable' it will be to engage in criminal activities and hence the greater will be the additions to stock; (ii) the larger the stock size, the greater will be the competition for a limited number of criminal opportunities, and the smaller will be the additions to stock. Up to $\hat{S}$, increases in stock induce an increasingly larger number of entrants but further increases in stock are accompanied by decreasing numbers of entrants, reaching zero at $\bar{S}$ beyond which no further increases in stock take place.

Equation (1) represents the growth in the criminal stock in a 'state of nature', i.e.

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[8] The stock of criminals may, therefore, decrease because some persons, who were included in the stock of criminals at the beginning of period t, did not commit any crimes over period t. Conversely, it can increase because persons, who were not included in the stock of criminals at the beginning of period t, committed crimes over period t.

when government intervention is absent. The role of government, acting through the police and judiciary, is to 'extract' criminals from this stock. This it does through a process of detection, arrest, prosecution and conviction, described more succinctly by the term 'clear-up'. If P_t is the number of criminals extracted from the criminal stock in period t through 'clearing-up' of crime, then the 'clear-up' function may be written as:

$$P_t = P(S_t, Y), \quad \frac{\Delta P_t}{\Delta S_t} > 0 \tag{2}$$

where Y is a vector of policy variables, and the positive relation between P and S reflects the fact that the larger the number of criminals there are, the more will be caught. Figure 1 illustrates the relation between the 'growth of stock' function (equation (1)) and the 'clear-up' function of equation (2).

In Figure 1, the $P(S, Y')$ and $E(S, X')$ curves[9] intersect[10] at A to yield a steady-state stock, S'; a different Y vector (Y'') would yield a different steady state stock, S''. Under government intervention, the rate of growth in the criminal stock is

$$\Delta S = (1 - \delta_E)E - \delta_S S \tag{3}$$

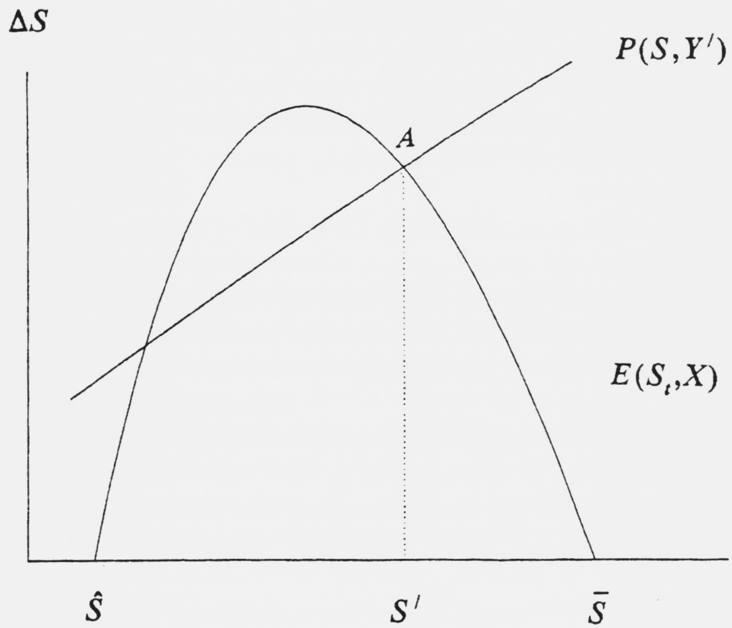

Figure 1. Relationship Between Growth of Criminal Stock and Clear-up of Criminals

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9 In Figure 1, the $P(\,)$ curve is, without loss of generality, taken to be linear in S.

10 There are two intersection points, but only point A represents a stable outcome.

where δ_S and δ_E are the proportions of the existing stock and new entrants, respectively that are 'cleared-up' in period t. In steady-state, $\Delta S = 0$ and S^*, the steady-state stock, is given by:

$$S^* = \frac{(1 - \delta_E) E}{\delta_S} \tag{4}$$

where $\frac{\Delta S*}{\Delta \delta_0}, \frac{\Delta S*}{\Delta \delta_1} < 0 \; \frac{\Delta S*}{\Delta E} > 0$

The long-run equilibrium level of criminal activity, C, depends upon the size of the steady-state criminal stock. By equation (4), S^* is determined by E, δ_S and δ_E; by equations (1) and (2), E, δ_S and δ_E are determined by the vectors X and Y. Amalgamating the latter vectors into a composite vector Z:

$$C = C(Z) \tag{5}$$

where some of the components of Z, in accordance with the earlier discussion, are hypothesised to be unemployment rates, long-term unemployment rates, truancy rates in schools, detection risk, severity of sentences, police resources, and lagged criminal activity (as a proxy for criminal stock).

Equation (5) represents a steady-state relation. In practice, C and Z will be in disequilibrium, perhaps moving towards an equilibrium. This means that the general disequilibrium relationship between C and Z may be written (in linear form) as:

$$\lambda(L)C = \theta(L)Z \tag{6}$$

where $\lambda(L)$ and $\theta(L)$ are polynomials in the lag operation $L, \lambda_0 = 1$
It is this general dynamic relation that forms the basis of the econometric specifications of later sections.

3. UNEMPLOYMENT AND THE ALLOCATION OF TIME BETWEEN LEGAL AND ILLEGAL ACTIVITIES

It is assumed that a person may earn income from carrying out legal and/or illegal activities. An illegal activity carries the possibility of detection (with probability p) or escape from detection (with probability $(1 - p)$). If α_L and α_I are the proportions of a person's 'working' time spent respectively on legal and illegal activities ($\alpha_L + \alpha_I = 1$, $\alpha_L, \alpha_I \geq 0$), then Y_e and Y_d, the incomes of the individual under the two states 'escape' and 'detection', are given by:

$$Y_e = W(\alpha_L) + V(\alpha_I) \quad \text{with probability } (1 - p) \tag{7}$$

$$Y_d = B + V(\alpha_I) - F(\alpha_I) \quad \text{with probability } p \tag{8}$$

where $W(\alpha_L)$ and $V(\alpha_I)$ are, respectively, the 'legal' and 'illegal' earnings functions. These functions represent the fact that income from such activities is an increasing function of the proportion of time[11] devoted to such activities (i.e. $W'(\alpha_L) > 0$ and $V'(\alpha_I) > 0$). When a person engaging in illegal activity ($\alpha_I > 0$) escapes detection, the legal earnings function, $W(\ )$, is undisturbed. When, however, a person engaging in illegal activity is detected as engaging in such activity, then both of two things are assumed to happen: (i) he/she is denied access to a legal earnings function $W(\ )$ - say, because of being dismissed from his/her current job and being refused jobs by other employers - and his (or her) legal income becomes instead a flat-rate, social-welfare payment B[12]; (ii) he/she is required to pay a fine[13], $F(\alpha_I)$, which reflects the scale of his/her illegal activity, and which is punitive, so that $F(\alpha_I) > V(\alpha_I)$ and $F'(\alpha_I) > V'(\alpha_I)$.

The problem before the individual is to choose α_L and α_I so as to maximise expected utility:

$$E(U) = pU(Y_d) + (1-p)U(Y_e) \tag{9}$$

subject to (7) and (8), where $U(Y)$ is the utility of income, $U'(Y) > 0$. The first order conditions for solving this problem are:

$$\frac{V'(\alpha_I) - W'(\alpha_L)}{F'(\alpha_I) - V'(\alpha_I)} = \frac{pU'(Y_d)}{(1-p)U'(Y_e)} \tag{10}$$

The term on the right in equation (10) represents the ratio of marginal utilities of income in the two states, 'escape' and 'detection', weighted by their respective probabilities; it therefore represents the rate at which an individual would *like to* exchange income in one state for income in the other. The term on the left in equation (10) represents the increase in income that would occur if more effort was expended on illegal activity at the expense of less effort on the legal activity (i.e., $d\alpha_I > 0$, $d\alpha_L < 0$, $d\alpha_I + d\alpha_L = 0$) in the 'escape' state relative to the 'detection' state. It therefore represents the rate at which income in one state *can* be exchanged for income in the other state, given existing economic and legal conditions.

The equilibrium levels of Y_e and Y_d (and, therefore, by equations (7) and (8), of α_I and α_L) are given by the tangency of an individual's indifference curve (the slope of which is given by the right-hand term of equation (10)) with the opportunity locus with which he is faced (the slope of which is given by the left-hand side of (10)). This is illustrated in Figure 2 in which the 'certainty' line (represented by the 45° ray

11 When, as is assumed, the amount of available time is fixed, this also represents an increase in the amount of time.

12 It would have been possible to assume, more generally, that conviction would lead to a reduced, but non-negative, probability of return to work. The more restricted assumption of zero probability of return to work does not affect the results.

13 Such a fine is to be thought of not just as an explicit payment to a public authority but also as the opportunity cost in terms of reduced lifetime earnings.

from the origin) represents all situations where $Y_e = Y_d$; the relevant portion of Figure 2 lies on, or to the left of the certainty line such that $Y_e \geq Y_d$.

The indifference curves show the rate at which a person would like to exchange Y_e for Y_d. The opportunity locus shows the rate at which he/she can exchange Y_e for Y_d. The tangency point between the two curves represents equilibrium. A person will choose to engage in illegal activity if and only if the point of tangency does not occur at the certainty line, that is if and only if:

$$\frac{V'(\alpha_I) - W'(\alpha_L)}{F'(\alpha_I) - V'(\alpha_I)} > \frac{p}{1-p} \tag{11}$$

$$V'(\alpha_I) - pF'(\alpha_I) > (1-p)W'(\alpha_L) \tag{12}$$

so that the expected marginal return from illegal activity exceeds that from legal activity.

Now consider the four labour market states: employed, unemployed (i.e., jobless but searching), inactive (i.e. jobless and not searching), and trainee/student. It is assumed that all persons, regardless of labour market status, face the same illegal earnings function $V(\,)$ and penalty function $F(\,)$; differences in labour market status are reflected in differences in the legal earnings function, $W(\,)$. For a person who is employed, $W(\alpha_L)$ is his (or her) wage function. If employment requires the working

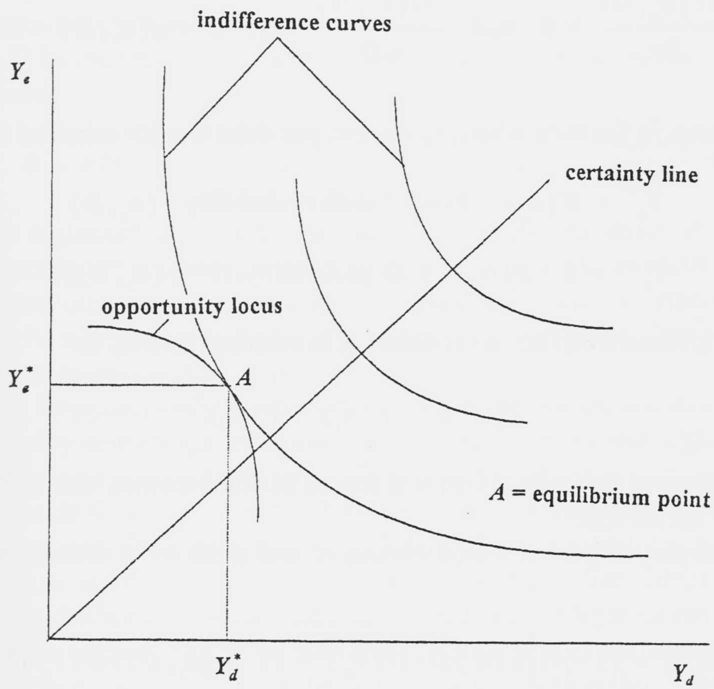

Figure 2. Equilibrium Choice of Y_e and Y_d

of a large number of hours ($\bar{\alpha}_L = 1$) or if $W'(\alpha_L)$ is very high (say, because of lucrative overtime payments) then an employed person would not engage in illegal activity, either because he or she had no time or because $W'(\alpha_L)$ was sufficiently high to ensure:

$$\frac{V'(\alpha_I) - W'(\alpha_L)}{F'(\alpha_I) - V'(\alpha_I)} = \frac{p}{1 - p} \tag{13}$$

If such a person did engage in illegal activity (because condition (11) rather than condition (13) prevailed) then such involvement is likely to be small either because $\bar{\alpha}_L$ is close to unity or because the excess of the left-hand side over the right-hand side in (11) is not very great.

Persons who are inactive (jobless and not searching) provide the polar extreme to persons who are employed. For such persons, $W(\alpha_L) = B$ and $\alpha_L = 0$. That is to say inactive persons receive a flat-rate benefit, B and do not have to expend any of their working time 'earning' this income. Since $W'(\alpha_L) = 0$, it is more likely that, for such persons, condition (11) will apply and that they will devote some part of their working time to illegal activity.

The case of a person who is unemployed (i.e. jobless but searching) lies in between the two polar cases analysed above. An unemployment person spends a proportion α_s of his working time searching for a job ($0 \le \alpha_s \le 1$) with probability $q(\alpha_s; D)$ of success where D is the duration of unemployment;

$$\frac{\partial q(\alpha_s, D)}{\partial \alpha_s} > 0 \quad \text{and} \quad \frac{\partial q(\alpha_s, D)}{\partial D} < 0, \quad 0 < q(\alpha_s, D) < 1.$$

His/her income, in the state where he/she escapes detection for criminal activity, is:

$$Y_e' = W(\alpha_L) + V(\alpha_I) \quad \text{with probability } q(\alpha_s, D) \tag{14}$$

$$Y_e'' = B + V(\alpha_I) \quad \text{with probability } (1 - q(\alpha_s, D)) \tag{15}$$

and his/her income when he/she is detected in criminal activity is:

$$Y_d = B + V(\alpha_I) - F(\alpha_I) \tag{16}$$

since it is assumed that with a criminal record he/she becomes 'unemployable' i.e. $q(\alpha_s, D) = 0$ for all α_s, D.

An unemployed person would choose α_s and α_I so as to maximise expected utility:

$$\begin{aligned} E(U) = {} & (1-p)\left[q(\alpha_s, D)\, U(Y_e') + (1 - q(\alpha_s, D))\, U(Y_e'')\right] \\ & + p\left[B + V(\alpha_I) - F(\alpha_I)\right] \end{aligned} \tag{17}$$

subject to (14), (15) and to $\alpha_S + \alpha_I = 1$.

For a unemployed person, the expected marginal gain from legal activity is:

$$\left[\left(W(\bar{\alpha}_L) + V(\alpha_I)\right) q(\alpha_S, D) + \left(B + V(\alpha_I)\right)\left(1 - q(\alpha_s, D)\right)\right](1 - p) \quad (18)$$

and the expected marginal gain from illegal activity is:

$$\left(F'(\alpha_I) - V'(\alpha_I)\right)p \quad (19)$$

where $\alpha_I + \alpha_S = 1$.

The closer that $q(\alpha_S, D)$ is to unity (for example due to high search activity and short unemployment duration) the closer will be the expected marginal gain from legal activity of an unemployed person to that of someone who is employed. Conversely, the closer that $q(\alpha_S, D)$ is to zero (for example, due to low search activity and long unemployment duration) the closer will be the expected marginal gain from legal activity of a unemployed person to that of an inactive person. Since the expected marginal gain from illegal activity (equation (19)) is, by assumption, invariant across labour market states, the propensity of an unemployed person to engage in illegal activity will be closer to that of an employed person or to that of an inactive person depending upon the relevant values of α_S and D.

The propensity of a trainee/student to engage in illegal activity may be analysed analogously to that of an unemployed person. Let α_T be the proportion of working time that a student spends on his studies and let F represent his class background. Let $r(\alpha_T, F)$ be the probability that a student, on completion of his/her studies, finds a job. Then:

$$0 < r(\alpha_T, C) < 1 \quad \text{and} \quad \frac{\partial r(\alpha_T, C)}{\partial \alpha_T} > 0, \quad \frac{\partial r(\alpha_T, C)}{\partial C} < 0 \quad (20)$$

By an argument identical to that used for unemployed person it can be shown that a person's employment prospects are poor (i.e. $q(\alpha_T, C)$ is small because little time is spent on study or because the domestic background is unfavourable) then there will be a greater propensity to engage in illegal activity than if the person's employment prospects were good.

On the foregoing analysis a person's labour market status, and more particularly his/her employment prospects, crucially determine his/her expected gain from illegal activity relative to that from legal activity. The fact of being employed (or having good prospects for employment) deters a person from illegal activity both because the expected gain from legal activity is high and also because the prospect of job loss, in the event of detection, reduces the expected gain from illegal activity. On the other hand when a person's prospects for securing employment are poor (because of long-term unemployment or inactivity or poor school performance), then the propensity to engage in illegal activities is higher because the expected marginal return from illegal activity (relative to that from legal activity) is high.

The next section reports results from estimating equations such as (19) on UK regional data.

4. ESTIMATION RESULTS

The previous section argued that persons with a weak attachment to the labour market or persons who expected that their prospects, on entry into the labour market, would not be very bright, would have a greater incentive to engage in illegal activity than persons with strong attachments or bright prospects. In this section this hypothesis is tested through the use of econometric methods. The general econometric model is of the form given by equation (21) below: y_{it} is the value of the dependent variable for region i at time t; X_{itk} is the value of the k^{th} explanatory variable for region i at time t; β_k is the coefficient on the k^{th} explanatory variable and ϵ_{it} is the error term for region i at time t.

The initial assumption was that the coefficients did not vary across the regions though, at a later stage of the analysis, the validity of this assumption was tested.

$$y_{it} = \sum_{k=1}^{K} \beta_k X_{itk} + \epsilon_{it} \qquad i = 1,\dots, N;\ t = 1,\dots, T \tag{21}$$

The dependent variable was the *recorded* number of burglaries per thousand of the population (ie. the burglary rate, denoted by BRG). The explanatory variables were:

- the unemployment rate
- the inactivity rate
- the proportion of persons leaving compulsory schooling without having acquired any qualifications (NED)
- the number of police employees per thousand of the population (POL)
- the clear-up rate for burglaries (CPB)
- the proportion of the population belonging to households whose income was below 50 per cent of UK mean household income (BUKM)
- the value of the Gini index[14] (GINI).

Different definitions of the unemployment rate were used. For measures based on a claimant count[15] they were:

- the overall unemployment rate (UA)
- the unemployment rate for males (UM)
- the unemployment rate for young males[16] (UYM)
- the long-term unemployment rate (URL), defined as the proportion of the labour

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14 The Gini index was the only variable whose value was not available on a regional basis. The value used was calculated on UK household income data for each year of the period 1983-92.

15 That is, those registered as unemployed for the purposes of claiming unemployment, or unemployment-related, benefit.

16 Between 16-24 years of age.

force unemployed for 12 months or more.

For 'search-based' measures[17] they were:

- the unemployment rate for males (UMS)
- the unemployment rate for young males (UYMS)

The set of explanatory variables also included:

- the (search-based) inactivity rates for young males (INYM)
- the (search-based) inactivity rates for all working-age males (INM).

The variable NED was introduced to reflect the prospects of school-leavers finding employment; the higher the value of NED, the poorer these prospects were likely to be, and hence greater the likelihood that persons in compulsory schooling would turn to crime. The sign on POL could not be predicted *a priori*: on the one hand, a greater number of policemen would have a deterrent effect and thus reduce the crime rate; on the other hand, it could improve the rate of recording crime and thus raise the (recorded) crime rate. An increase in poverty rates (BUKM) or in the degree of inequality (GINI) would also be expected to increase the crime rate; on the other hand, an increase in the clear-up rate (the number of crimes 'solved' - either through cautioning, or conviction, of offenders - to the number of crimes recorded) would be expected to decrease it.

Equation (21) was estimated with the variables (except for GINI) entered as first differences. There is the well-known difference in crime statistics between the 'true' crime rate and the crime rate recorded by the police. The latter depends on the propensity of victims to report crimes and of the police to record them. Typically, the recorded crime rate understates the true crime rate. However, as Dickson (1994) notes, *changes* in the recorded crime rate are apt to be a better guide to *changes* in the true crime rate, than recorded crime rates are of true crime rates.

Regressions on the reported burglary rate, using the different definitions of unemployment, showed that (see Table 1) for the claimant count measures, each of the rates (UR, UM and UYM) when introduced separately into a regression equation (along with the other explanatory variables, listed above) yielded coefficient estimates that were correctly signed and which did not accept the null hypothesis that the coefficients on these variables were zero. However, the explanatory power of the equation (as measured by R^2) was maximised when UM or UA was the chosen unemployment measure; however, when the claimant-count unemployment rates (UA, UM and UYM) were all (or in combination) introduced into the equation, it was only the coefficient on UM that was significantly different from zero. When similar experiments were conducted with the search-based measures it was the inclusion of UMS *and* UYMS that maximised explanatory power. The long-term unemployment rate did not have any significant explanatory power, nor was there ever, after the inclusion of the unemployment variables, a significant role for the two inactivity rates.

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17 Obtained from the Labour Force Survey which defines a person as unemployed if he or she is jobless; available for employment; and searching for work.

Table 1. OLS Results with Different Unemployment Definitions
Dependent Variable: Burglary Rate, 1983-92, 10 Regions

Variable	Model			
	(i)	(ii)	(iii)	(iv)
UA	67.936	-	-	-
	(7.14)			
UM	-	55.871	-	-
		(6.89)		
UYM	-	-	30.554	-
			(2.42)	
UMS	-	-	-	41.917
				(4.74)
UYMS	-	-	-	19.60
				(1.65)
NED	21.910	22.546	34.644	21.30
	(2.47)	(2.54)	(3.86)	(2.28)
POL	108.40	102.22	74.08	65.50
	(2.97)	(2.66)	(1.80)	(2.00)
CPB	-20.910	-21.283	-30.768	-24.50
	(4.99)	(5.11)	(5.95)	(4.71)
BUKM	8.4313	8.5630	14.04	10.76
	(1.19)	(1.20)	(1.78)	(1.72)
GINI	2738.3	2373.6	2310.7	1666.6
	(5.20)	(4.35)	(2.67)	(2.52)
CONSTANT	-801.48	-690.75	-639.74	-437.98
	(4.69)	(3.90)	(2.67)	(1.98)
(Figures in parenthesis are t-values)				
R^2 Adjusted	0.6192	0.6147	0.4594	0.5455
Sigma	134.90	135.69	160.73	147.39
D-W	1.7217	1.7254	1.5868	1.7025
Jarque-Bera Normality Test	$\chi^2(2) = 1.26$	$\chi^2(2) = 0.64$	$\chi^2(2) = 0.65$	$\chi^2(2) = 0.24$
LM Test for Autocorrelation	$\chi^2(23) = 35.58$	$\chi^2(23) = 37.09$	$\chi^2(23) = 63.33$	$\chi^2(23) = 42.38$
ARCH Test for Heteroskedasticity	$\chi^2(1) = 0.69$	$\chi^2(1) = 0.413$	$\chi^2(1) = 2.73$	$\chi^2(1) = 0.29$
Ramsey Test for Specification	F(1,82) = 1.5	F(1,82) = 1.63	F(1,82) = 0.85	F(1,82) = 0.92

The equation statistics (reported in the bottom half of Table 1) indicated that approximately 62 per cent of the variation in the dependent variable was explained when claimant count measures of unemployment were used and approximately 55 per cent of such variation was explained on the basis of search-based unemployment measures. All the equations reported in Table 1 indicated that (i) the residuals were generated by a normal distribution and could not be rejected (Jarque-Berra test), (ii) the errors were not serially related (Lagrange Multiplier test), (iii) there was no evidence of heteroscedasticity (ARCH test), and (iv) the equations were 'correctly'

Table 2. CHTA Model Results with Different Unemployment Definitions
Dependent Variable: Burglary Rate, 1983-92, 10 Regions

Variable	Model			
	(i)	(ii)	(iii)	(iv)
UA	68.335	-	-	-
	(8.32)			
UM	-	55.027	-	-
		(7.05)		
UYM	-	-	27.704	-
			(2.68)	
UMS	-	-	-	37.057
				(4.04)
UYMS	-	-	-	19.898
				(1.88)
NED	17.481	16.686	32.800	21.832
	(7.65)	(2.30)	(3.64)	(2.17)
POL	155.49	143.90	74.445	85.034
	(2.60)	(2.36)	(1.04)	(1.34)
CPB	-16.820	-17.246	-24.692	-20.854
	(2.98)	(5.92)	(6.93)	(5.51)
BUKM	8.406	8.512	11.145	8.555
	(1.67)	(1.74)	(1.85)	(1.51)
GINI	2516.9	2079.2	2422.6	1742.6
	(5.44)	(4.26)	(3.54)	(2.64)
CONSTANT	-736.86	-601.22	-671.14	-455.97
	(4.73)	(3.69)	(2.83)	(2.00)
(Figures in parenthesis are t-values)				
R^2 (Buse, 1973)	0.7045	0.6964	0.5099	0.6027
Rho	0.1667	0.1959	0.2782	0.2129

specified (Ramsey test).

The equations as specified in Table 1 were then re-estimated using Kmenta's (1986) "cross-sectionally heteroscedastic and time-wise autoregressive" (CHTA) model. In this model the assumptions on the error term are: (i) $E(\epsilon_{it}^2) = \sigma_i^2$ (heteroscedasticity); (ii) $E(\epsilon_{it}\epsilon_{jt}) = 0$ (cross-sectional independence); and (iii) $\epsilon_{it} = \rho_i\epsilon_{it-1} + u_{it}$ (auto-regression). These results are shown in Table 2. The use of this refinement improved the explanatory power of the equations but left the earlier results substantially unchanged.

After this, the assumption that the coefficients β_k, $k = 1,..., K$, were the same across the regions was tested. Define the dummy variables δ_i as unity for region i and zero for other regions. Then the variable coefficients model can be written as:

$$y_{it} = \delta_i + \sum_{k=1}^{K} \beta_{ik} X_{itk} + \varepsilon_{it} \tag{22}$$

Equation (22) was estimated using OLS (for the specification set out in Tables 1) and the hypothesis H_0: $\beta_{1k} = \beta_{2k} .... = \beta_{10k}$ was tested, for every $k = 1,..., K$. For no value of k, and for none of the specifications shown in Table 1, was the null hypothesis of coefficient equality across the regions ever rejected.

5. CONCLUSIONS

This paper tried to derive a theoretical model linking unemployment - and, in, particular, different types of unemployment - to crime rates. The model was tested on regional data for Great Britain, using burglary rates as the dependent variable, and controlling for a variety of other factors. The evidence was that, even after controlling for these factors, there was a significant relationship between unemployment rates and burglary rates. This significant relationship existed regardless of whether unemployment was defined on the basis of official definitions (that is, claimant count measures) or on the basis of search activity (that is, Labour Force Survey measures). Once unemployment had been taken into account, there did not appear to be any significant link between the duration of unemployment and burglary rates. This would then cast doubt on the validity of the hypothesis advanced in the theoretical section that persons weakly attached to the labour market would be more prone to committing crime. However, there did appear to be support for the other hypothesis advanced that the poor prospects of potential entrants to the labour market would offer them an incentive to engage in crime. This support came from the significant, and positive, link between the proportion of persons leaving school without qualifications and the burglary rate.

Poverty (as measured by the proportion of the population with incomes below half UK mean income) did not affect burglary rates, but there appeared to be a significant relationship between growing inequality (as measured by the Gini coefficient) and rising burglary rates. Rising numbers of police officers, *once clear-up rates had been controlled for*, appeared to have more effect on recording burglaries rather than on preventing them. But the significant and negative relation that existed between clear-up rates, which commonsense would suggest were related to the number of police personnel, and burglary rates suggested that the fear of apprehension acted as a clear deterrent to burglars.

This study was unable to detect any regional effects with respect to the relationship between the explanatory variables and the dependent variable. In other words, a given rise in the unemployment rate would have the same effect on burglary rates whether it was in the (poor) North of England or in the (affluent) South-East. The same conclusion held for every other region. The fact that burglary rates differ across regions is due to the unfavourable outcome for these regions with respect to the explanatory variables rather than due to the fact that people living in different regions react differently to the same outcomes.

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