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Unemployment Duration, Schooling and Property Crime

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CONTENTS

ABSTRACT

It is well known that there is no consensus with respect to the relationship between unemployment and crime. As well, there is very little research on the linkages between crime and the educational experiences of young people. In this paper we show a very strong positive relationship between criminal activity and the extent of youth male long-term unemployment. We also show that criminal activity is negatively associated high school completions, and positively associated with high school non-completion rates.

The analysis suggests that labour market and education policies have the potential to significantly reduce property crime. However, increased high school participation of the targeted group only decreases crime if it results in graduation. This suggests that the effectiveness of education policy is a critical influence on crime activity, a unique finding for the literature.

1 Introduction

Research into the relationship between unemployment and crime has a long history but has not produced a consensus. It is almost trite to observe that aggregate-level studies generally yield inconsistent results. As Chamlin and Cochran (2000) so eloquently point out:

> 'It has become almost obligatory to begin any macro-level discussion of the unemployment-crime relationship with the observation that extant research findings are varied, complex, and/or equivocal. Typically, this lament serves as a segue into a recapitulation of the numerous, and often countervailing, theoretical processes that are thought to mediate the effects of unemployment and crime, sophisticated methodological critiques of recent efforts to estimate the unemployment-crime association, and ultimately, the development of alternative statistical techniques and modelling strategies better to take into account the intricacies of the causal linkages between unemployment and crime' (Chamlin and Cochran, 2000: 443).

Chamlin and Cochran contend that mismeasurement of unemployment is the principal reason for the failure to observe a consistent association between unemployment and crime. This article provides support to their conclusion. We argue, however, that the measurement problems they identify are symptomatic of more general theoretical weaknesses in the literature on unemployment and crime. In particular, too little attention has been paid to the inter-relationships between property crime, unemployment duration and high school completion.

Just as the term 'crime' denotes a wide variety of types of criminal activities which can respond differently to changes in unemployment, so unemployment is a heterogenous construct, varying in terms of age, gender, period of unemployment and the educational qualifications of those who find themselves unemployed. Given that engagement in criminal activity is a choice made by individuals in the context of the relative attraction of legitimate activities (employment) and illegitimate activities these are very important distinctions. Each is highly pertinent to an individual's future expectations of legitimate employment and earnings prospects. Yet, the fact remains that unemployment is mostly treated as an homogenous entity with direct and uncomplicated linkages to crime.

This study, therefore, aims to investigate the impact of unemployment duration and school participation on aggregate rates of property crime. In particular, we analyse data on one type of crime only (household break, enter and steal) and from one State of Australia (New South Wales (NSW)) over the period January 1989 to December 1999. We focus on two aspects of unemployment composition generally overlooked in time series analysis of links between unemployment and crime: the duration of unemployment and the age composition of the unemployment stock. In addition, we explore the links between high school completion and the level of criminal activity.

The plan of the paper is as follows. Section 2 provides a brief review of the literature on the link between unemployment and crime, on the one hand, and participation in post-compulsory education and crime, on the other hand. Section 3 proposes a theoretical structure, and this is utilised to promote understanding of the link between unemployment duration and crime. Section 4 describes the data and Section 5 presents empirical tests of the model. Section 6 illustrates the meaning of the results through consideration of the effectiveness of a number of hypothetical policy scenarios concerning targeted labour market programs and educational participation with respect to their impact on property crime levels.

2 The Literature

Aggregate-level studies on unemployment and crime

As Chiricos (1987) pointed out in his seminal review of the literature more than a decade ago, most of the inconsistency among aggregate-level studies of unemployment and crime stems from time series rather than cross-sectional studies. Nothing much has changed since his review. Land, Cantor and Russell (1995) found a positive relationship between unemployment and crime in post-War United States. Kapuscinski, Braithwaite and Chapman (1998) found a strong positive relationship between unemployment and trends in homicide in Australia between 1917 and 1987. Weatherburn, Lind and Ku (2001), however, found no evidence of any relationship between unemployment and crime in a study of the effect of the last Australian recession on break, enter and steal, and motor vehicle theft. Field (1990, 1999) found no effect of unemployment on post-War British crime trends.

From time to time, the inconsistent results obtained in aggregate-level time series studies of unemployment and crime have prompted researchers to question whether there is any causal relationship between them. Freeman (1983:89) contended that the empirical evidence showed at best only 'a moderate link between unemployment and crime'. Chiricos (1987:188) has spoken of the 'consensus of doubt' surrounding the relationship between unemployment and crime. Field (1990:40) expressed serious doubts about the relevance of unemployment to an understanding of British crime trends. Gottfredson and Hirschi (1990:164) have argued that the relationship between unemployment and crime is 'too small to be of theoretical import' and 'tends to be in the wrong direction'. Pyle and Deadman (1994) have suggested that unemployment may be less important to crime than other indicators of economic activity.

A close reading of the relevant literature, however, suggests that the inconsistent results obtained in time series studies of the relationship between unemployment and crime may stem from lack of theoretical subtlety in the way unemployment has been seen to influence crime.

Conceptualising the unemployment effect

Most aggregate-level studies ignore what might be called unemployment composition effects. The unemployed (or young unemployed males) are implicitly treated as a homogenous stock of individuals, all equally disposed to respond to unemployment by becoming involved in crime. Yet, as we noted earlier, the pool of unemployed at any

given time consists of individuals who vary markedly in terms of factors (e.g. age, gender, education and period of unemployment) which affect their future employability. One would expect an individual's future employment prospects to exert a significant effect on the way they respond to unemployment, regardless of whether the unemployed turn to crime in response to frustration, social alienation or for reasons of material gain.

The longer the period of joblessness, for example, the greater the atrophy in human capital (Rummery, 1989). As a consequence, the longer the period of unemployment, the lower is the probability of acquiring a job. Even if the expected returns from illegitimate income earning activity do not increase with the period of unemployment, over time the overall balance of effort and reward must begin to tip away from (legitimate) job search behaviour toward illegitimate income earning activity. Similar effects can be expected in relation to those whose job prospects are compromised by criminal conviction or lack of education. Their commitment to socially approved behaviour or ways of earning income is likely to be more severely challenged by the experience of being unemployed than those who see unemployment as a transient phase between school and work.

If the characteristics of the unemployed play a role in shaping their reaction to unemployment we should expect characteristics of the labour market to exert the same effect. Individuals becoming unemployed during a period of high demand for labour can be expected to form different views about the expected costs and benefits of involvement in crime to those entering unemployment at a time of high demand for labour. In the latter case there is less reason to expect the period of unemployment to be long or the financial returns to employment to be small.

Longitudinal research on unemployment and crime

Longitudinal studies bear out some of these expectations. Thornberry and Christensen (1984) found that the relationship between unemployment and arrests was much stronger for those who had a prior history of delinquency and those who worked in 'blue collar' occupations. Farrington et al.(1986) found that the tendency to offend more frequently during periods of unemployment was more pronounced among individuals whose family or social background pre-disposed them to involvement in crime and among those whose employment since leaving school was in low status occupations. Fagan and Freeman (1999) cite several European studies indicating that human capital variables mediate the effect of unemployment; those having a high school degree or coming from a higher SES background being far less likely to respond to unemployment by becoming involved in crime.

Thornberry and Christenson (1984) found that a strong concurrent relationship between the proportion of time spent unemployed in a particular year and the number of arrests in that year. Good, Pirog-Good and Sickles (1986) obtained similar results. These studies did not control for developmental factors which might have increased both the risk of unemployment and the risk of involvement in crime. Studies which have attempted to control for pre-existing differences in propensity to offend, however, also find evidence of a relationship between unemployment duration and crime.

In a study of 168 individuals who left school without completing grade 12, Hartnagel and Krahn (1989) found a significant bi-variate correlation between the number of months an individual spent unemployed since leaving school and self-reported involvement in property and violent crime and officially recorded crime. This relationship did not survive the introduction of controls for a range of other factors, including the number of jobs since leaving school. But it is worth noting that Hartnagel and Krahn found a significant positive correlation between number of jobs since leaving school and period spent unemployed. The former variable may therefore have masked the effects of the latter. It is also worth noting that their multivariate analysis of effect of unemployment duration on crime was based on only about 100 cases. Its capacity to detect an effect of unemployment duration was therefore fairly limited.

In a much larger prospective longitudinal study of 1,265 children born in Christchurch New Zealand and followed up to age 18, Ferguson, Lynskey and Horwood (1997) found strong evidence of an unemployment duration effect. They classified their sample into those who reported no exposure to unemployment in a two year period, those who reported being employed for two months or less, those who reported being unemployed for between three and five months and those who reported being unemployed for six months or longer. They found significant and substantial differences between each of these groups in the mean level of self-reported property and violent offending and in the percentage arrested for and convicted of an offence. Importantly, these differences remained significant when controls were introduced for factors pre-disposing individuals to involvement in crime. This suggests that unemployment duration was not functioning as a proxy for other antecedents of involvement in crime.

The Chamblin and Cochran Study

To date, the only published aggregate-level study of the effect of unemployment duration on crime has been that conducted by Chamlin and Cochran (2000). Drawing on rational choice theory, they begin with the assumption that individuals will engage in illegal behaviour when the anticipated gains exceed the costs. They then point out that, since it is the *expected* costs and benefits which shape behaviour, individuals who do not expect to remain unemployed for long are much less likely to engage in crime than those who expect to remain unemployed for some period of time. The conventional Bureau of Labor Statistics (BLS) measure of unemployment in the United States mainly captures those experiencing short-term spells of unemployment. Thus Chamlin and Cochran argue that the best way to test for an effect of unemployment on crime is to measure unemployment duration.

Their analysis of the effects of unemployment duration on crime strongly supported their argument. Using ARIMA modelling techniques they found no relationship between the conventional BLS measure of unemployment and monthly trends in property crime in the United States between 1982 and 1996. They found a strong positive relationship, however, between monthly numbers of property crimes reported to police and the number unemployed for 15 weeks or more. They also found a strong negative relationship between the demand for labour and trends in property crime.

This is significant because one might expect a downturn in the demand for labour to signal increases in unemployment duration. While they make no claim to have 'solved' the unemployment-crime problem, Chamlin and Cochran's study provides further evidence that past studies of unemployment and crime may have used a flawed measure of unemployment.

This said, there are still some limitations in Chamblin and Cochran's analysis of the relationship between unemployment and crime. They suggest but do not fully explain why the net benefits of involvement in crime are likely to be greater for those experiencing long-term unemployment than for those experiencing short-term unemployment. They make no attempt to disaggregate unemployment by age or gender. Yet, as we have already argued, the opportunity costs of involvement in crime are surely different for men and women and for those who are young compared with those who are old. Their alternative measure of labour demand (the capacity utilisation rate) is hardly the most direct measure of demand for labour. Most importantly, they pay no regard to education factors, such as school performance and achievement, which might be expected to condition a young person's expectations in relation both to employment and future earnings potential.

School participation, school retention and crime

The transition between school and work is a critical one for young people. For those who succeed in school and can look forward with some confidence to a job, it marks the point at which at which the pleasures and privileges of adulthood become much more fully accessible. Those who do not do well at school often suffer the frustration of being denied this access. If they drop out of school, or fail to complete it and fail to obtain a job, their frustration coincides with a sharp diminution in the level of supervision and control characteristic of the school and work environment. Those who leave school around the age of sixteen experience this loss of control at precisely the age when they are most prone to involvement in crime.

The possibility that school variables may play an important role in shaping the relationship between unemployment and crime has recently been highlighted in Australia by Polk and White (1999). They point out that one of the most notable developments in Australia over the last two decades has been the collapse of the full-time labour market for 16-19 year olds. Whereas 25 years ago two-thirds of this age group were in full-time employment, by the 1990s this figure had fallen to well under 20 per cent. In the years between 1983 and 1992 this change was accompanied by an increase in school retention rates. Since 1992, however, school retention rates have been in decline. Those leaving school face now very limited full-time employment prospects and must make do with insecure, part-time poorly paid employment. These changes have coincided with a steep increase in several major categories of property crime (Australian Bureau of Statistics, 2001)

Surprisingly, no aggregate-level studies have been reported of the relationship between school retention rates and crime. The only research on this topic has focussed on the individual-level effects of poor school performance or 'dropping out' of high school. It shows that those who do poorly at school, particularly males, are

more likely to offend during their school years (Braithwaite, 1979; Schafer and Polk, 1967; West, 1984; Baker, 1997).

Elliott and Voss (1974) argued that early school leaving should decrease crime, on the grounds that dropping out should reduce school-related frustration and alienation, factors they regarded as primary causes of delinquency. Employing a longitudinal design they followed a cohort of students either to high school completion or (if they dropped out) up to the point at which they would have graduated, had they remained at school. High school dropouts were found to be more frequently involved in delinquency than high school graduates. However dropouts' involvement in delinquency actually declined after they left school. This may have been because many obtained full-time employment. Elliott and Voss found that unemployed and unmarried dropouts had significantly higher offending rates than unemployed or unmarried dropouts.

Farrington et al.(1986) found lower overall rates of offending among youths while they were at school than when they were in paid employment. He argued, however, that this effect was probably an artefact of the normal decline in offending rates with increasing age. At age 15 he found no difference between offending rates during periods at school and periods in employment. Unfortunately Farrington et al. did not specifically examine the relationship between early school leaving, unemployment and crime. The relevance of his study to our present purposes is also limited by the fact that most of the young people in the Cambridge study were living with their parents at the time and were not frequently exposed to long periods of unemployment (Farrington et al, 1986:352).

Bachman and his colleagues (Bachman et al., 1971, 1978) in their longitudinal study found results similar to those of Elliott and Voss. Generally speaking, those who dropped out of school exhibited higher rates of delinquency than those who completed school. However, dropping out of school did not appear to increase a young person's delinquency rate. As with Elliott and Voss, this last effect may be conditioned by the employment experience of those who dropped out of school. Hartnagel and Krahn (1989), for example, found that high school dropouts who were unemployed or experienced high levels of job instability were significantly more likely to admit to or find themselves convicted of an offence than high school dropouts who succeeded in obtaining a full-time job.

It seems likely that the effect of early school leaving depends, at least to some degree, upon the state of the labour market. For the reasons canvassed earlier, other things being equal, we would expect lower rates of school retention to produce higher rates of offending. However those dropping out of school early may be far less likely to become involved in crime where they either obtain or hold out a reasonable expectation of finding satisfactory employment. If this is true, the effect of lower school retention rates on aggregate crime rates will depend upon the ease and speed with which those not completing secondary school are able to find satisfactory employment.

3 Towards a Formal Model

Introduction

What now follows explores the relationships between a person's propensity to engage in property crime and factors associated with young people's labour market success, specifically unemployment duration and educational status. We adopt an economic modelling approach. In this context we follow the perspective of Becker and others, but this is not to suggest that individuals seek only material gain. Where apposite we note the possible relevance of alternative theoretical frameworks.

The basis of the model is the assumption that engagement in criminal activity is a choice made by individuals in the context of the relative attraction of legitimate alternative activities, specifically those associated with job search. A simple way to think about this is that in any given short period, unemployed individuals have a choice between engaging in job search or committing property crime.

It is assumed that this decision depends on the relative returns to these alternative activities, and that these returns are influenced in part by unemployment duration and educational experiences. We now explore these roles in detail.

The returns to criminal activity

In our analysis we are concerned principally with property crime, specifically activities associated with breaking-in, illegal entry and stealing from domestic residencies. It is assumed that the time period of our analysis is sufficiently short so that there are no major changes in technology associated with home security, and no significant variations in either the probability of arrest or the penalties associated with conviction.

Further, the net returns to criminal activity are assumed to be unrelated to unemployment duration. In other words, a person who has been unemployed a short time expects to receive the same (material) gains from theft as does a person who has been unemployed for a long period of time.

The above simplification is not critical to the empirical analysis, and different approaches can be accommodated. For example, there might well be psychic returns to crime influenced by unemployment duration. This could be the result of sociological factors, such as those experiencing high unemployment duration identifying more strongly with groups antagonistic to legal authority; this experience would mean that the overall returns to crime would increase with unemployment duration.

Our conceptual discussion of the returns to crime with respect to unemployment duration is parsimonious. This simplicity has been adopted to highlight what are seen to be fundamental relationships concerning the relationship between unemployment duration, education and the returns to job search, now explained.

The returns to job search activity: the effect of unemployment duration

To motivate our approach, imagine a person with a given stock of human capital who enters the labour market at a particular point in time and is initially unemployed. As unemployment duration increases there will be consequences relevant to labour market opportunities, and thus with respect to the returns to job search. These are as follows.

Higher unemployment duration for individuals has several distinct implications. The first is associated with skill atrophy, which is unavoidable given the non-use of human capital. Atrophy means that the value of a skill, and thus the return from a potential job (wage), falls with unemployment duration.

The second direct consequence of increasing unemployment duration is known as state dependence, which can be summarised as follows. The longer a person has experienced continuing unemployment, the lower is the probability of subsequently securing a job. There are two different factors at work (Chapman, 1993):

(i) ongoing unsuccessful job search diminishes a person's enthusiasm for the search, partly because the experience engenders a sense of alienation, anger and/or despair; and

(ii) employers are likely to use unemployment duration as a negative signal of an applicant's likely productivity. After all, employers might reason: "if this applicant has been unemployed for a long time it might be because she/he is of low productivity". And, given skill atrophy, some part of this rationalisation for not taking on the long-term unemployed is likely to be true.

The bottom line is that, for any given initial stock of an individual's human capital, higher unemployment duration decreases the average value of the stock of available jobs, and thus decreases the probability of securing any of the jobs in the available set. Since we assume that the *absolute* returns to theft are invariant to a person's unemployment duration, it must follow that the *relative* attractiveness of crime increases with unemployment duration.

The returns to job search activity: the role of education

The job search decision will also be influenced by a person's level of formal skills. Specifically, we assume that individuals' expected rewards from employment depend on employers' perceptions of the value of a person's human capital. Our approach considers two factors of potential relevance to an employers' hiring decision: formal measures of skill, and indicators of motivation as reflected in completion of educational experience.

On the first, it is well known fact in Australia and elsewhere that individuals with higher levels of completed education earn higher wages (Chapman & Withers, 2001; Preston, 1998). This could be because education directly affects labour

market productivity[1], or could be because individuals completing a course of study are seen by employers to be of relatively high "ability" or "motivation". For our analysis this implies that those with relatively high levels of formal schooling receive relatively high returns from employment, and thus from successful job search.

As with unemployment duration, it is assumed that the rewards from theft do not vary with the stock of a person's human capital, in this case, the level of formal education completed. Thus the role of higher levels of education is to diminish the relative attractiveness of criminal activity through their effect on the returns to employment.

On the other hand, it might be that employers use the non-completion of formal education to indicate relatively poor "ability" or "motivation". That is, individuals who enrol in the latter years of high school, for example, but do not graduate, might diminish their employment prospects, with this then impacting on job search activity.

A diagrammatic representation of the above relationships

Diagram 1 is a stylised representation of the above discussion. It illustrates for individuals the benefits of engaging in property criminal compared to searching for a job, with respect to unemployment duration. In particular, it compares the returns to crime (represented by the horizontal line) with returns to job search for three hypothetical individuals who differ only in terms of their education.

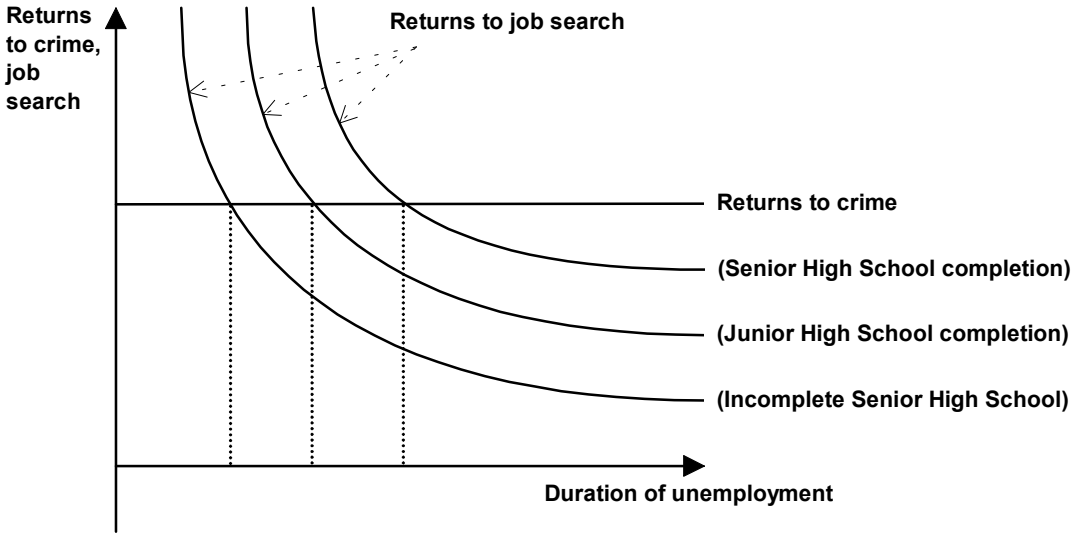


Diagram 1
Returns to job search and crime for hypothetical individuals.

[1] Such as through increasing a person's capacity to learn skills on the job.

As discussed above, the returns to crime line is assumed to be invariant to unemployment duration. The education lines show the returns to job search activity for individuals with three different levels of secondary schooling: senior high school graduation; completion of post-compulsory schooling with non-enrolment in further education (junior high school completion); and being enrolled in, but not completing the highest level of secondary schooling (incomplete senior high school).

The diagram should be interpreted as follows. Individuals face the choice of engaging in the alternative activities of job search or crime, with this decision depending on the relative returns. That is, searching for a job will be the preferred activity so long as the associated reward exceeds that from criminal activity. Thus crime will become preferred at the point of intersection of the education and crime lines, since this is when job search becomes the relatively unattractive option.

It is apposite to derive the essential empirical predictions from the diagram and the theoretical discussion, which are:

(i) at any given level of education, criminal activity becomes more attractive as unemployment duration increases;

(ii) at any given level of unemployment duration, individuals with higher levels of schooling will be less likely to commit crime; and

(iii) at any given level of unemployment duration, individuals starting but not completing education will be more likely to commit crime.

4 Empirical Analysis: Model Specification and Data

Introduction

The conceptual framework discussed above provides the basis for our statistical analysis and econometric modelling. However, there is an important contextual issue concerning the empirical relevance of the theoretical discussion. This is related to the nature of the data available to test the essential propositions.

In particular, while the conceptual framework focuses on individual incentives related to crime, we are unable to test directly these predictions. This is because the available data are not measures of the activities of individuals, and are, instead, time series of reported property crime and measures of both labour market and secondary education outcomes. Thus our approach implicitly assumes that the broad (non-individual) experience reflects accurately an aggregation of the decisions made by individuals. There is no obvious reason to suggest that this is inappropriate.

Model specification

The simplest model reflecting our discussion is:

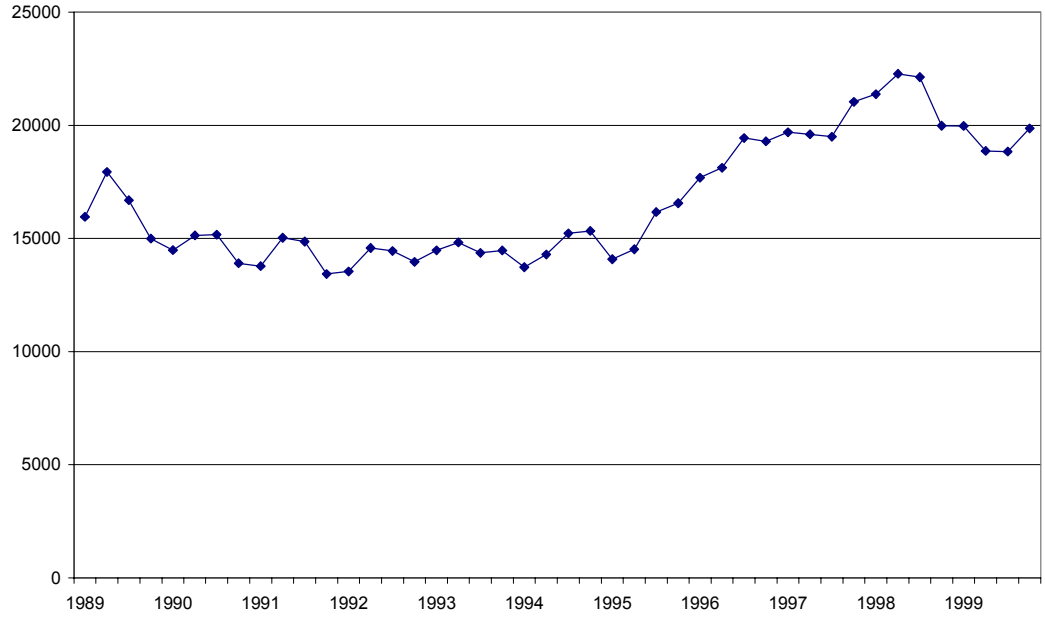
Crime = a * (Unemployment duration) +
b * (High school education success) +
c * (Other labour market measures) +
d * (Other economic controls)

where a, b, c, and d are parameter vectors. Our theoretical framework predicts that $a > 0$ and $b < 0$. The nature and meaning of the variables used to represent the above are now described[2].

Data: the dependent variable

Our analysis relates to one type of property crime - breaking, entering and stealing (BES) from a dwelling. This is the single largest category of crime recorded by the NSW Police Service, with about 80,000 occurrences annually. The data were obtained from 'COPS', the NSW Police Service database containing information on offences reported to the police. Figure 1 shows a plot of the quarterly aggregate of BES.

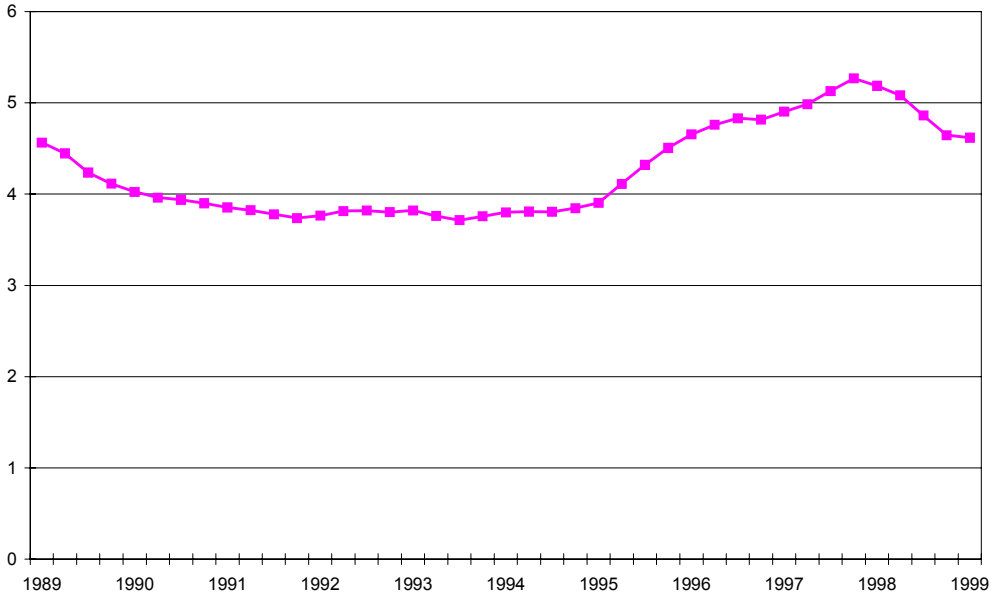
Figure 1: Break, enter and steal dwelling (BES) crimes in NSW: number, 1989.I - 1999.IV



[2] See also Appendix A for descriptive statistics of all the variables.

The total number of crimes reported is unlikely to be an accurate indication of the extent of criminal activity, since it takes no account of demographic changes. That is, the crime rate per head of population is a more correct measure. This is shown in Figure 2.

Figure 2: The rate of BES (per 1000 adult person): 1989.IV - 1999.IV



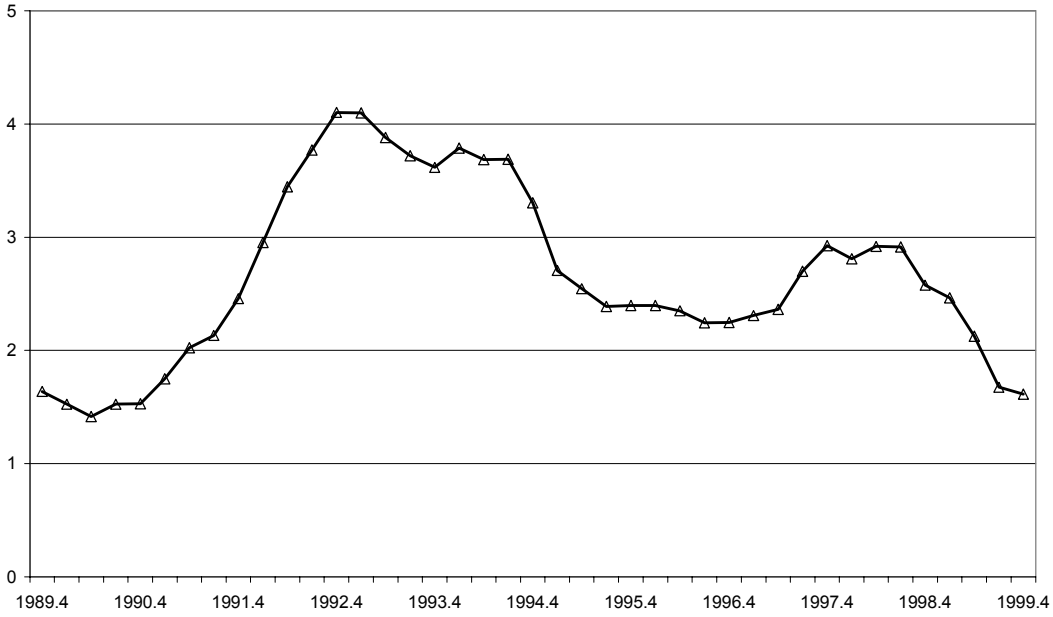
Note: The BES measure in this figure has been smoothed with a twelve month moving average. The period covered in the graph refers to the transformed series.

Independent variables: the duration of unemployment

Everyone in the civilian population aged 15 years and over is employed, unemployed, or not in the labour force. A person is defined as "employed" if he/she worked for one hour or more for pay or in a family business in the last week of the survey. To be classified as "unemployed" in the reference period a person must be: not employed (according to the previous definition of employment); actively looking for work; and, be available for work (see Australian Bureau of Statistics (ABS), Labour Force, Australia, Canberra).

The "duration of unemployment" is also provided by the ABS, and is measured as the length of time between the reference period and the date an unemployed person first began continuously looking for work. Long-term unemployment (LTU) is defined as being unemployed for 12 months or more, and the variable used reflects its incidence for young people (aged 15-24 years). That is, LTU is the proportion of all young people who have been unemployed for 12 months or more rather than just in relation to those who are in the labour force. We use separate measures for males and females, and Figure 3 shows the ratio for young males (corrected for seasonal influences) to total population of young males.

Figure 3: Ratio of NSW young male LTU to young male population: 1989.IV – 1999.IV, (deseasonalized)



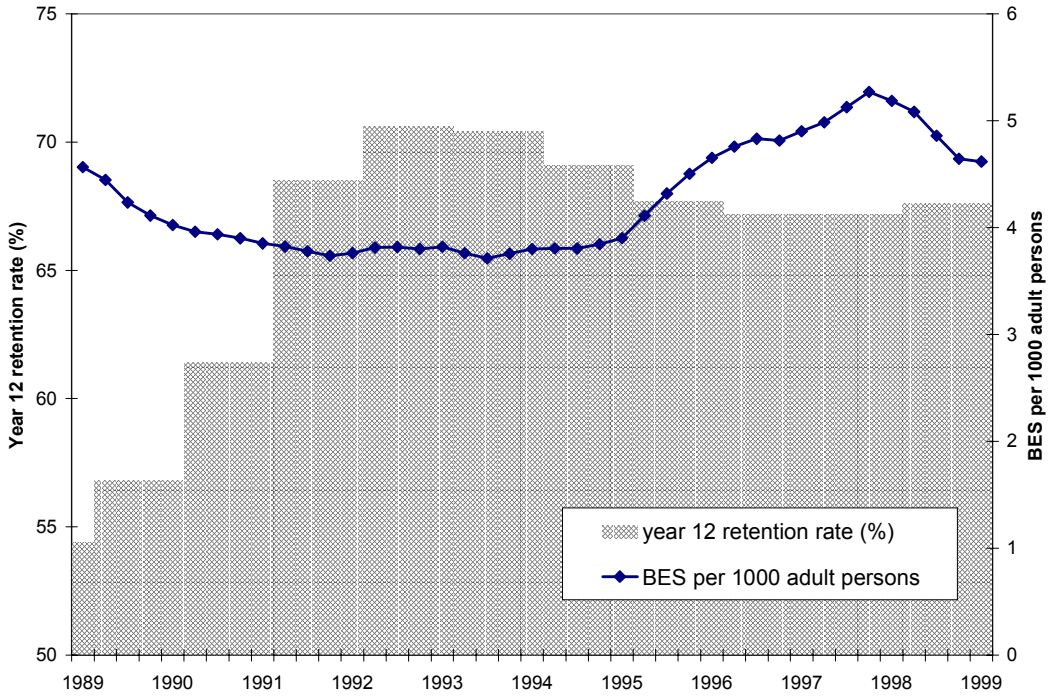
Independent variables: high school outcomes

We are interested in representing two dimensions of education: the percentage of young people graduating from high school; and the proportion of those enrolled in post-compulsory schooling who do not graduate. The first is relatively straightforward and is known in Australia as the school "retention rate". The retention rate is shown in Figure 4 and is measured as the proportion of high school students in a given cohort who graduate, and is thus an indication of the success of the education system. For comparative purposes the Figure also includes the BES rate data.

Representing the extent of high school non-completion turned out to be quite a challenge for our exercise, because such a variable is not available. However, given that the regression analysis uses the retention rate we are able to proxy non-completion in an indirect way, using the so-called age participation rate. This is now explained.

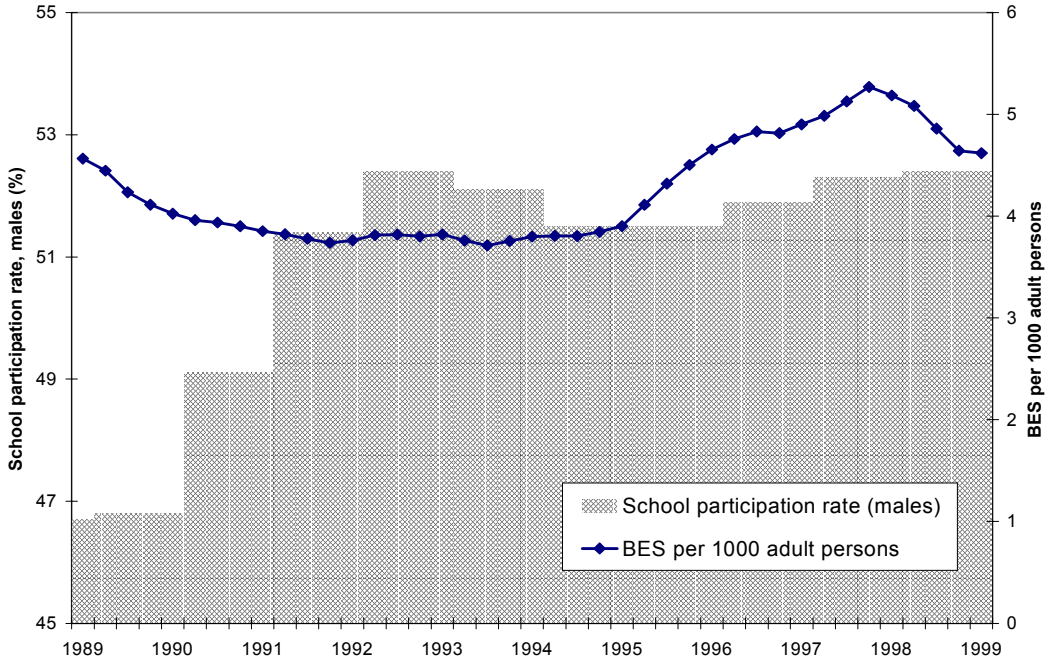
The age participation rate is the number of full-time students of a particular age and sex expressed as a proportion of the population of the same age and sex. That is, it reflects enrolments. Thus, the combination of retention rate and this variable can be interpreted as measuring the proportion of young people who begin, but do not complete, high school. Figure 5 contrasts the time profile of the BES rate with the school participation rate.

Figure 4: The rate of BES (per 1000 adult person, deseasonalized) and the NSW year 12 retention rate (persons): 1989.IV - 1999.IV



Note: BES is measured on the right-hand axis and the retention rate is measured on the left-hand axis.

Figure 5: The rate of BES (per 1000 adult person, deseasonalized) and the NSW school participation rate for 15-19 year olds: 1989.IV - 1999.IV



Note: BES is measured on the right-hand axis and the participation rate is measured on the left-hand axis.

Other independent variables

In common with other studies investigating the links between crime and unemployment, we include a number of measures of the state of the labour market. These should be interpreted as measures of both labour supply and labour demand, and thus reflect relative job opportunities. They are as follows:

(i) the labour force participation rate (LFPR): the number employed and unemployed as a proportion of the relevant population group (e.g. males aged 15-24);

(ii) the employment-population ratio (EP): the number employed as a proportion of the relevant population; and

(iii) the vacancy rate: the stock of unfilled jobs as a proportion of total employment.

Two additional controls included in the estimations represent scale (or opportunity) effects: the annual growth rate of NSW gross product per capita and per capita retail sales in department stores (in 1990 prices). Their inclusion in the model is designed to capture the effects of economic growth (and hence higher incomes) on household spending and thus on the availability of goods which can be stolen from dwellings.

Finally, we explored the role of heroin addiction. This is potentially a major issue given that a significant proportion of property crime in NSW is committed in order to finance the purchase of narcotics. Unfortunately there are no reliable data on the number of addicts. However, the NSW Government offers a Methadone program, and it is well known that expenditure in this area reflects the number of heroin addicts. We can thus proxy the effect of addiction on crime through the use of Methadone program user numbers.

4 Empirical Analysis: Estimation and Diagnostic Results

Model estimation

Before discussing the results of our estimation of models of property crime, it is worth pointing out that preliminary testing of stationarity and cointegration properties of variables revealed similarity of time-series characteristics of the relevant variables and, thus, appropriateness of estimation of classical regression models.

Table 1 presents empirical tests of the theoretical model, with several specifications being reported. First, we show the results of estimations employing the traditional approach used in the crime/unemployment literature. That is, property crime activity is modelled to be a function only of the aggregate unemployment rate and broad controls; measures of LTU and educational outcomes are excluded.

Also presented are the results of the model motivated by our theoretical discussion (Model A). Finally, Model B augments this specification with a proxy for drug dependence (the ratio of new methadone treatment cases to the population aged 15-24). Diagnostic tests for all the estimated models are given in Table 2.

Table 1: Estimated models of property crime, NSW, 1989.I - 1999.II

Variable	Traditional model		Model A		Model B	
	coefficient	t-ratio	coefficient	t-ratio	coefficient	t-ratio
LTU/population, males, 15-24			0.217	2.19**	0.186	2.17**
LTU/population, females, 15-24			-0.065	-0.56	0.039	0.37
UER: all males	1.630	0.52				
UER: all females	-3.602	-1.12				
UER: males, 15-24			-0.138	-0.22	-0.055	-0.10
UER: females, 15-24			1.013	1.23	1.190	1.67*
LFPR: all males	-2.490	-0.64				
LFPR: all females	6.239	1.10				
LFPR: males, 15-24			0.133	0.18	0.075	0.12
LFPR: females, 15-24			-1.274	-1.19	-1.525	-1.66*
Emp/population, all males	2.406	0.56				
Emp/population, all females	-6.794	-1.10				
Emp/population, males, 15-24			-0.121	-0.14	0.012	0.02
Emp/population, females, 15-24			1.509	1.23	1.761	1.67*
Vacancy rate	-0.694	-1.62	0.354	0.91	-0.302	-0.77
School participation rate			0.858	4.78***	0.706	4.36***
School retention rate to year 12			-0.367	-6.03***	-0.320	-5.89***
Gross product, NSW, $'000 p.c.	0.437	1.24	0.220	0.98	0.157	0.81
Retail sales, dept. stores, $'000 p.c.	6.419	0.49	-20.301	-1.92*	-4.988	-0.48
New methadone cases / pop. 15-24					2.588	3.15***
quarter 1	0.223	0.56	0.324	1.23	0.267	1.18
quarter 2	-0.274	-0.98	0.385	1.51	0.606	2.63***
quarter 3	0.273	1.08	0.415	1.80*	0.465	2.34**
Constant	36.267	0.83	-29.429	-2.39**	-33.604	-3.15***

Notes:

1. The dependent variable in all models is the break, enter and steal as a rate per 1000 adults.
2. The data on net methadone cases is available only untill the second quarter of 1999.
3. The asterisks indicate the significance of coefficients: three stars denote significance at 1% level, two denote significance at 5% level, one indicates significance at 10% level.

Table 2: Summary of diagnostics of the estimated models of property crime

Diagnostic	Traditional model	Model A	Model B
R-bar square	0.552	0.798	0.851
Regression F-test	5.21	11.12	14.77
SEE	0.359	0.241	0.207
Std.Dev (regressand)	0.537	0.537	0.537
Jarque-Bera test	0.713	1.658	0.062
Durbin-Watson	0.941	1.731	1.567
LM(1)	3.828	0.717	1.389
ACF: lag 1	3.03	0.52	1.10
ACF: lag 2	0.97	-1.64	-2.50
ACF: lag 3	-0.77	-0.84	-1.04
ACF: lag 4	-0.62	0.88	1.03
RESET (2)	0.391	0.342	0.070

Notes:

1. R-bar square is the adjusted regression coefficient of determination.
2. Regression F-test is the test that all coefficients are zero. The marginal significance value in all cases is less than 1%.
3. SEE is the standard error of the regression, while Std. Dev (regressand) is the standard deviation of the dependent variable.
4. Jarque-Bera test is the test for normality of regression residuals. The critical value is 5.99.
5. Durbin-Watson is a test for first-order serial correlation.
6. ACF is the residual autocorrelation function. The entries in the table are the t-ratios of the first four coefficients. The critical value at 1% level is 2.69.
7. LM(1) is the Lagrange Multiplier test for serial correlation of order one. The critical value at 1% level is 2.57.
8. RESET (2) is a test for regression misspecification. The critical value at 1% level is 4.46.

The important findings are as follows. First, the traditional model performs poorly and is not a satisfactory estimation in econometric terms. Specifically, while the equation explains more than half of the variation in the dependent variable, the explanatory power as indicated by the R-bar square is low for time series. As the same time virtually no regressors are individually significant. More importantly, the regression suffers from a number of econometric problems. To start with the presence of serial correlation (as indicated by low Durbin-Watson statistic and as demonstrated by the auto-correlation function (ACF)), indicates that the model is not properly specified and is not able to track adequately the behaviour of the dependent variable. Furthermore, the value of the regression standard error indicates that the model only marginally improves on the standard deviation of the rate of BES (i.e. the model only marginally is able to explain the variations in (or, in other words, the behaviour of) the time-series of our dependent variable). The significance of the overall fit of the regression (F-test) in conjunction with the insignificance of the individual regressors also suggests that the regression simply reflects common trends of the variables (see also the discussion of cointegration between the BES variable and the labour market variables in Appendix B).

It is worth emphasizing that this traditionally estimated specification also shows no relationship between aggregate unemployment and property crime. It is the type of result most often found in the literature and consequently is not a surprise.

The other models, A and B, are much more interesting, because the estimations are more valid representations of the potential role for property crime of unemployment duration and high school completion rates. They differ only in that B includes the heroin addiction proxy.

In more detail, both models appear statistically adequate with both regressions explaining significant proportion of variation in the BES rate (around 80 per cent for Model A and 85 per cent for Model B). Their standard errors are less than half of the standard deviation of the dependent variable and the diagnostic tests indicate satisfactory fit without any evidence of model misspecification.

A more detailed look at the estimation results reveals that Model A suggests a positive and significant relationship between the level of long-term unemployment among young (15-24 years) males and property crime, and a negative and significant relationship between crime and the school retention rate variable.

These results are preserved in Model B. Estimation of Model B also indicates that a number of control variables, in addition to the unemployment duration and the school retention rate variables, are also significant in explaining property crime. In particular, our proxy for the extent of heroin addiction appears to confirm the anecdotal evidence that a large proportion of property crime is undertaken to finance drug purchases by addicts.

In summary, the results from both Models A and B indicate that our theoretical specification of the link between crime and both human capital (schooling) and employment disadvantage (unemployment duration) is strongly supported. The size of these relationships, and the implications for policy, are now explained and illustrated.

6 Policy simulations

Since most variables included in our models are entered in the regressions as ratios, the interpretation of the estimated coefficients is not straightforward.[3] In order to aid the interpretation we now present a number of simulations based on a range of targeted labour market programs and education policy scenarios. Given that the emerging message from our modelling is the importance of the interaction and interdependence between the states of education, employment and unemployment, the scenarios are designed to evaluate the impact on property crime of *simultaneous* change of both the origin state (that is, LTU) and the destination state (education or not in education).

Our starting point of all scenarios is the reduction of the long-term unemployment among young males. This can be achieved either by creating jobs for them, by preventing them from becoming unemployed in the first place through continuing education, or by sending them to short-term training programs (which, at worst, will place them at the conclusion of training back in unemployment but in the

[3] Appendix C provides a list of elasticities estimated at the means.

short-term category). We can further distinguish between two types of education-related programs: those that only care about the beginning of the programs (ie. the beginning of the school year) and those that care about the outcome of education (i.e. the end of the school year). Table 3 summarizes the main features of these policy scenarios including the final activity outcome for the individuals involved (column headed 'final state').[4] The last column (headed 'policy outcome') simply indicates whether the primary objective of the policy is being achieved based on the postulated final state of individuals.

To evaluate the impact of these alternative policies we can ask what would be the result at a margin, say of a reduction in LTU by 1000 individuals (about 8% of the average number of 15-24 years old males in long-term unemployed), and what would be the result if all long term unemployment among 15-24 years old males is eliminated (which amounts to 7000 individuals at the end of our sample period). While we focus in the paper on the latter case, Appendix D includes for completeness the simulation outcomes for the first case.

Results and interpretation

The results of our simulations of eliminating LTU among young males are presented in Table 4.[5] The tabulations also present the contributions from our three variables of interest: the initial effect from the change in the LTU itself, the effect from the change in school participation rate and the effect from the change in the school retention rate.

[4] While the models presented in Table 1 include a range of labour market variables, our simulations are based only on the three key variables: long term unemployment, school participation and school retention. Given that none of the male labour market variables are significant, the extension of simulations to incorporate these variables would not have changed either the direction or the relativities of impacts of various policies although their numeric values would, of course, be different. Additional calculations which include these variables and also include other scenarios not possible with the three variables of interest are available on request from the authors. These simulations show that the annual change in the property crime under the successful education policy (which impacts on labour market variables through changes in unemployment rate and labour force participation rate) would amount to 15.1% (or just under 10,000 cases). Similarly, differentiation of the outcome in our policy III (which results in 7.56% reduction in property crime) between the case when a half ends up in employment as opposed to the case when a half ends up in unemployment would generate reductions of property crime of 6.0% and 7.6%, respectively.

[5] See Appendix D for the results of simulated reduction of LTU by 1000.

Table 3: Outline of simulation scenarios

Policy number	Policy type	Description	Initial transition	Further transition	Final state	Policy outcome
I	Targeted labour market program (LMP)	Permanent job creation for young people	LTU to employment	None	Employment	Success
II	Successful secondary education program	Putting youth through *complete* secondary schooling	LTU to education	None	Education	Success
III	Half-successful education program	Putting youth through *some* schooling but no incentives for staying.	LTU to education	Education to employment	Half in education, half not in education.	Partial success
IV	Completely unsuccessful secondary education program	Putting youth through *none of* secondary schooling	LTU to education	Education to short term unemployment	None in education, all in unemployment.	Failure

The results indicate a substantial cost of youth long-term unemployment. Using the preferred Model B results, we can see that a job creation program in NSW resulting in placing in employment all long-term unemployed males aged 15-24 would reduce property crime by close to 7 per cent. However, if this cohort of young people was educated in secondary schools rather than offered the choice of dropping out before finishing year 12, the reduction in crime from successful education would be twice as large – almost 15 per cent (or around 10,000 less cases of break, enter and steal). These outcomes are also illustrated in Figure 6 while Figure 7 presents the outcomes as percentages of the actual property crime during the last year of the simulation.

Table 4: Simulated effects on property crime (BES) of complete elimination of male long-term unemployment amongst males aged 15-24

Policy				Total effect	
	long-term unemployment	Retention rate	school participation rate	Number of BES	% of annual BES
	Model A				
I	-5211	0	0	-5211	7.87
II	-5211	-11248	5314	-11145	16.84
III	-5211	-5624	5314	-5521	8.34
IV	-5211	0	5314	103	-0.16
	Model B				
I	-4470	0	0	-4470	6.75
II	-4470	-9813	4370	-9913	14.98
III	-4470	-4907	4370	-5006	7.56
IV	-4470	0	4370	-100	0.15

Figure 6: The percentage reduction in property crime in NSW due to alternative policy scenarios when all male youth LTU is eliminated.

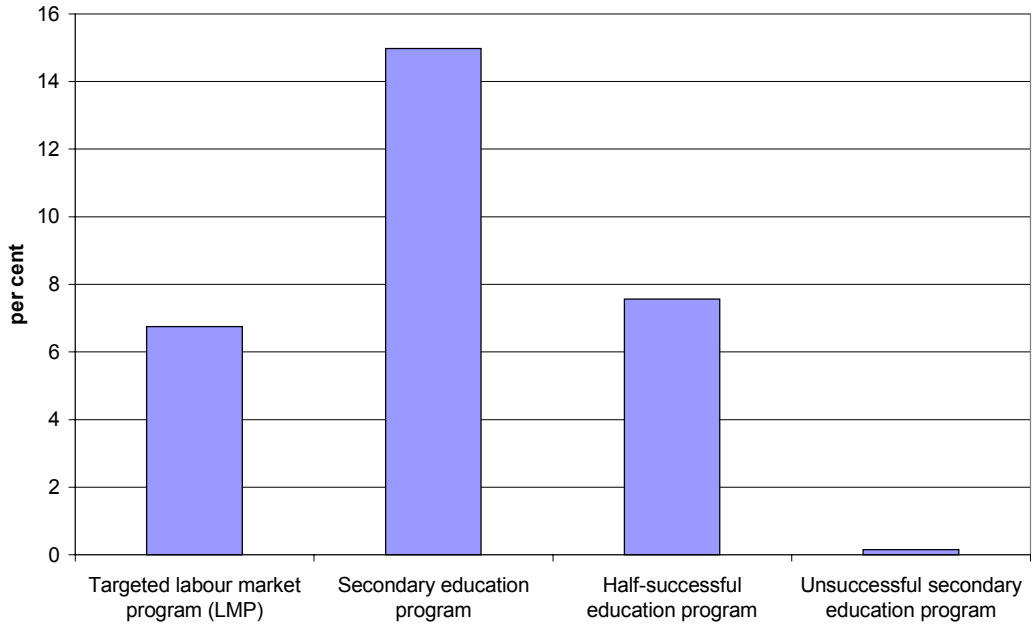
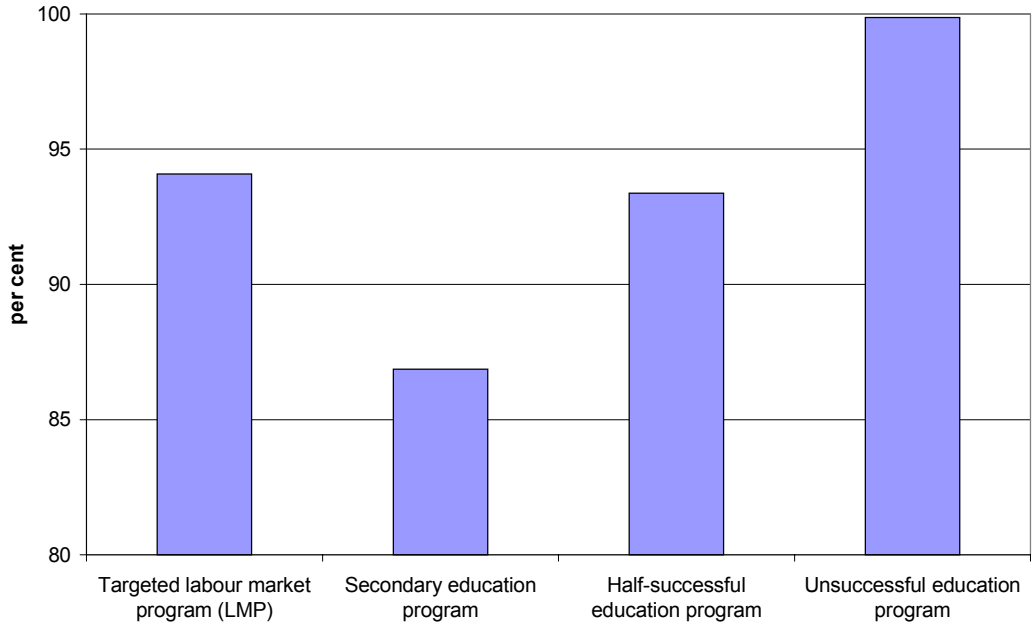
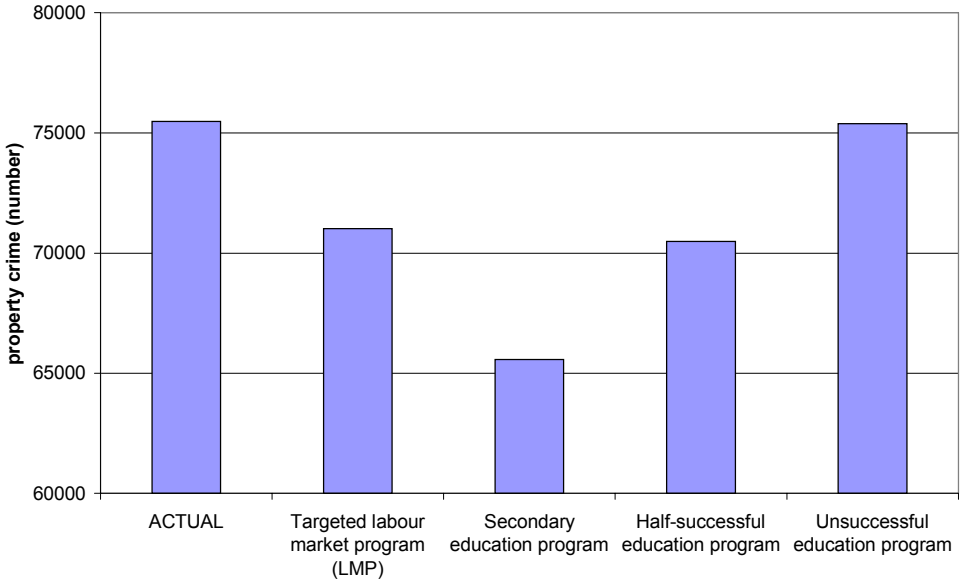


Figure 7: Property crime in NSW: alternative policy scenario outcomes as percentages of the actual outcome



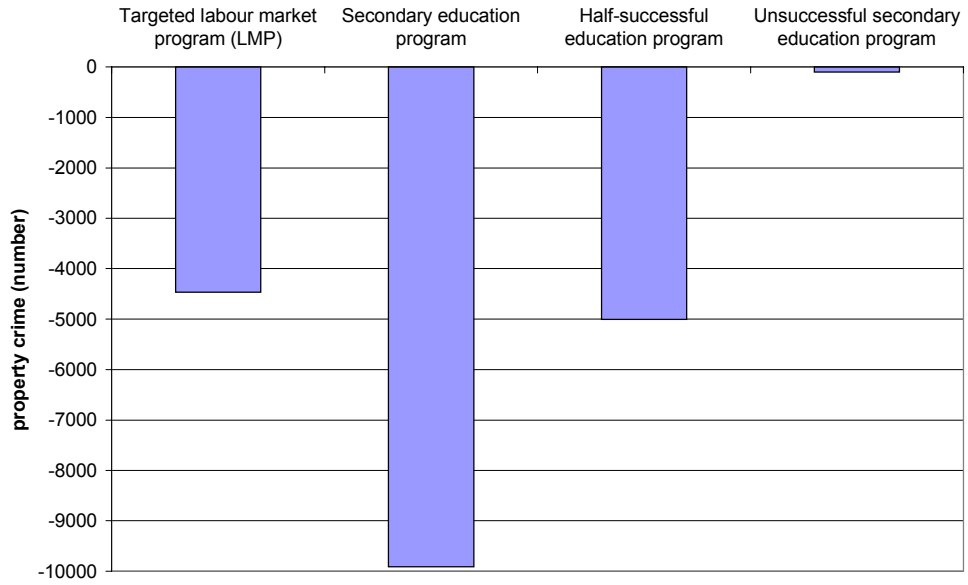
To put these percentages in perspective we have translated them into the numbers of break, enter and steal. These numbers are given under the heading 'number of BES' in the tabulations and we have also plotted these outcomes alongside the actual number of property crimes during the last year of our simulations (see Figure 8).

Figure 8: Property crime in NSW: actual number and simulated numbers with alternative policy scenarios when all male youth LTU is eliminated.



Our calculations also indicate that even some education is better than no education. In particular, if long-term unemployed males aged 15-24 are encouraged to continue with schooling but half of them drop out before finishing year 12, the gain in terms of lower crime is still larger than in the job generation case (around 0.8 percentage point on an annual basis or some 500 cases of property crime – see also Figure 9).

Figure 9: The numerical reduction in property crime in NSW under alternative policy scenarios when all male youth LTU is eliminated



6 Conclusions

This paper has proposed a new theoretical argument behind the link between unemployment and crime. Our modelling is based on the consequences for an individual of continuing unemployment duration and the relative returns to property crime conditional on one's education. In particular, we argue that the longer the person is unemployed the higher the relative attractiveness of crime. Further, we suggest that higher levels of education diminish the relative attractiveness of criminal activity through their effect on the returns to employment.

That is, in conceptual terms we offer three significant contributions to the literature on the determinants of crime. First, we treat the unemployed as a complex, heterogeneous group, specifically with respect to the duration of joblessness. Second, we explore the role of formal education. Third, we analyse the impact on the decision to commit a property crime with respect to the non-completion of high school education.

Our results support those of Chamblin and Cochran (2000) in suggesting that much of the inconsistency in studies of unemployment and crime seems to stem from poor conceptualisation of the way in which unemployment influences crime. On the other hand, our models which incorporate the sex and age specific unemployment duration data results in an adequate empirical specification and supports the theoretical expectations.

This does not mean there is no room for improvement in aggregate-level modelling of the unemployment-crime relationship. If unemployment duration increases involvement in property crime because of its corrosive effect on an individual's expectations of future employment, we would expect other variables having similarly corrosive effects (e.g. drug dependence, criminal conviction, racial discrimination, broken family backgound) to increase involvement in crime. The individual-level effect of these variables is, of course, much easier to measure than their aggregate-level effect. The fundamental challenge in developing an adequate theoretical account of the aggregate-level relationship between unemployment and property crime lies in identifying and measuring key determinants of the balance between the expected returns from legitimate activity and the expected returns from crime.

Finally, while there may be many theoretical and empirical issues left to resolve in relation to unemployment and crime, it is important not to lose sight of the policy implications of our findings. Simulations based on our models indicate that long term unemployment amongst young males has a substantial effect on property crime: elimination of male long term unemployment amongst males aged 15-24 by direct job creation would result in close to a 7 per cent reduction in property crime in NSW per annum. Better still, if these individuals continued in formal education to the end of year 12 (an extra 7000 individuals) the reduction in break, enter and steal over the course of a year would amount to almost 15 per cent. The results highlight the potential societal benefits in terms of crime reduction that might follow from the institution of policies that are effective in the reduction of long-term unemployment and promote young people's educational success.

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Appendix A: Descriptive statistics of variables

Variable	MEAN	ST. DEV.	MINIMUM	MAXIMUM
BES number	16546	2675.2	13428	22275
BES rate	4.27	0.54	3.58	5.40
UER: all males	8.54	1.89	5.68	12.38
UER: all females	7.89	1.25	5.88	10.82
UER: males, 15-24	15.60	3.11	8.16	20.71
UER: females, 15-24	13.38	2.24	9.23	17.43
LTU/population: males, 15-24	2.63	0.90	1.30	4.85
LTU/population: females, 15-24	1.71	0.62	0.67	3.17
LFPR: all males	73.15	1.13	71.24	75.79
LFPR: all females	51.67	1.17	49.10	53.78
LFPR: males, 15-24	72.11	2.34	68.32	77.26
LFPR: females, 15-24	66.61	2.69	62.02	73.18
EP: all males	66.91	1.87	63.50	70.99
EP: all females	47.60	1.32	45.02	49.94
EP: males, 15-24	60.87	3.14	55.14	67.17
EP: females, 15-24	57.68	2.56	52.93	63.41
Gross product, NSW ($'000 p.c.)	9.23	0.64	8.16	10.68
Retail sales, dept. stores ($'000 p.c.)	0.18	0.01	0.16	0.21
Vacancy rate	0.84	0.28	0.30	1.32
School retention rate to year 12	65.44	5.41	54.40	70.60
New methadone treatment rate	0.60	0.15	0.36	0.83

Appendix B: Analysis of time series behaviour of variables

Recent developments in econometrics have emphasized the role of time series properties of variables in correct inferences. In particular, non-stationarity of time-series may invalidate inferences due to the problem of spurious regression while different stationarity properties of regressors may indicate a lack of long-term relationship between variables of interest. We have subjected variables used in our analysis to a test for unit roots (i.e. non-stationarity). We should note, however, that due to the relatively short historical period of time (11 years), these results should be treated with caution.

The results, given in Table B1, indicate that the regressand (BES rate) is integrated of order one. For the regressors we can reject the hypothesis of non-stationarity only for all males unemployment rate, and age-specific female unemployment rate. Given that stationary variables can be used in regressions involving non-stationary regressand and regressors, these results suggest that our models can include the unemployment rate variable as one of the regressors.

Table B1: Tests of unit-root stationarity of variables.

Variable	DF test
BES rate	-2.45
UER: all males	-3.42 **
UER: all females	-2.81
UER: males, 15-24	-2.00
UER: females, 15-24	-3.78 **
LTU/population: males, 15-24	-2.14
LTU/population: females, 15-24	-1.69
LFPR: all males	-2.24
LFPR: all females	-2.57
LFPR: males, 15-24	-2.26
LFPR: females, 15-24	-2.05
EP: all males	-3.09
EP: all females	-1.90
EP: males, 15-24	-2.15
EP: females, 15-24	-1.95
Gross product, NSW ($'000 p.c.)	-1.35
Retail sales, dept. stores ($'000 p.c.)	-2.70
Vacancy rate	-2.95
School retention rate to year 12	-2.59
New methadone treatment rate	0.92

Notes:
1) DF is t-ratio in the Dickey-Fuller test for unit root.
2) The critical value at 5% is approximately –3.4, while the critical value at 10% is –3.1.

We have also carried out preliminary tests of long-term relationship (cointegration) between the BES variable and the unemployment rate variable under two conditions. In the first case, we tested for cointegration between BES and only the gender-specific (but not age-specific) unemployment rates. This corresponds to the usual framework of analysis of the link between unemployment

and crime. In the second case we replaced the all-person unemployment rates with gender-specific and age-specific equivalents and we also included the variables measuring the duration of unemployment and school retention rate. The results indicate that in the first case we can reject the null of cointegration (DF test = -7.7 with the critical value of –11.2), while in the second case we cannot reject such a hypothesis ((DF test = -14.2 with the critical value of –-11.2). Such results, while only indicative of the long-term links between our variables of interest, do provide, however, some empirical support to our theoretical arguments regarding the need to include a measure of unemployment duration and education success in models linking unemployment and crime.

Appendix C: Derived elasticities of model variables.

Variable	Traditional model	Model A	Model B
LTU/population, males, 15-24		0.13	0.11
LTU/population, females, 15-24		-0.03	0.02
UER: all males	3.26		
UER: all females	-6.66		
UER: males, 15-24		-0.50	-0.20
UER: females, 15-24		3.18	3.73
LFPR: all males	-42.69		
LFPR: all females	75.57		
LFPR: males, 15-24		2.25	1.27
LFPR: females, 15-24		-19.89	-23.81
Emp/population, all males	37.73		
Emp/population, all females	-75.79		
Emp/population, males, 15-24		-1.72	0.17
Emp/population, females, 15-24		20.40	23.81
School participation rate		9.95	8.18
School retention rate to year 12		-5.62	-4.91
Vacancy rate	-0.15	0.07	-0.06
Gross product, NSW, $'000 p.c.	0.95	0.48	0.34
Retail sales, dept. stores, $'000 p.c.	0.27	-0.86	-0.21
New methadone cases / pop. 15-24			0.36

Note: Elasticities are calculated at means.

Appendix D: Simulated effects on property crime (BES) of a decrease by 1000 in the number of male long-term unemployed aged 15-24.

Policy				**Total effect**	
	long-term unemployment	Retention rate	school participation rate	**Number of BES**	**% of annual BES**
	Model A				
I	-742	0	0	**-742**	**1.12**
II	-742	-1622	759	**-1604**	**2.42**
III	-742	-811	759	**-794**	**1.20**
IV	-742	0	759	**17**	**-0.03**
	Model B				
I	-637	0	0	**-637**	**0.96**
II	-637	-1415	624	**-1427**	**2.16**
III	-637	-707	624	**-720**	**1.09**
IV	-637	0	624	**-12**	**0.02**

Note: Policies are as described in Table 3 in the text.