THE WAGES OF SIN?
ILLEGAL DRUG USE AND THE LABOUR MARKET

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SUMMARY

We use data from the British Crime Survey (BCS) to analyse the relationship between illicit drug use and labour market outcomes for a sample of men and women aged 16 to 25. In using this data we highlight a serious design flaw in the BCS questionnaire structure that presents a serious barrier to statistical modelling of drug use at the individual level. We propose a simple way of overcoming this problem and proceed to estimate a model of occupational attainment jointly determined with unemployment and current drug use, conditional on past drug use. Separating the commonly abused drugs into a "hard" and "soft" category, we find that past hard drug use has a significant positive association with current unemployment, but find no significant association between past hard or soft drug use and occupational attainment. We also find no significant association between current drug use and attainment, although we observe that current drug use is associated with current unemployment. We suggest that previous research has tended to find a positive relationship between drug use and wages because of a failure to take into account current labour market status.

KEY WORDS - Illicit drug use, unemployment, occupational attainment.

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INTRODUCTION

The social consequences of illicit drug use and alcohol abuse present society and policy makers with a complex and difficult problem, the solutions to which are not well supported with readily available data. There is widespread concern about the connection between drug use and acquisitive crime, and the extent of the external health-related and labour market costs that are most likely associated with alcohol and drug abuse. This latter concern has stimulated a lot of academic interest in recent years, not least because of the emergence of large social surveys that yield sufficient information to analyse these problems in some detail. For example, the relationship between alcohol consumption and labour market outcomes has received a lot of attention in the empirical literature [1-8]. In addition, there is a growing body of empirical research that has considered the relationship between illicit drug use and wages or labour supply. What is intriguing about this research is that in allowing for drug use and labour market outcomes to be determined endogenously, there is a tendency to find a positive relationship between the two variables.

We first see this result in Kaestner [9]. Kaestner used data from the US National Longitudinal Survey of Youth (NLSY) and found that once endogeneity of drug use and wages was taken into account, increased frequency of illicit drug use (in this case cocaine or marijuana) was associated with higher wages. This result, consistent across gender and age groups, was also supported by Gill and Michaels [10] and Register and Williams [11], who used the same data but slightly different approaches to control for the self-selection of individuals into drug use and the labour market. Kaestner's [12] follow-up work, using two waves of the NLSY, lent further support to these findings, although the longitudinal estimates suggested that the relationship between drug use and wages tended to vary according to the type of drug and individual. Kaestner [13] also found that his longitudinal estimates did not support a systematic effect of drug use on labour supply. The possibility of a 'family' of different wage-drug use relationships was given further support by Kandel *et al*. [14], who found that the positive relationship disappeared as the cohort of NLSY respondents got older. In particular, whereas Kandel *et al*. found a positive relationship between drug use and wages for NLSY respondents in their twenties, for those later on in their career the relationship was negative.

Curiously, using the same data Burgess and Propper [15] were not able to replicate this result, finding that soft drug use has no impact on the earning of men in their twenties or thirties. Finally, Zarkin *et al*. [16] using data from the US National Household Survey on Drug Abuse (NHSDA) found that there was little evidence to support a negative impact of drug use on hours of labour supplied. However, although Zarkin *et al*. find that this result holds when subsequent NHSDA samples were treated to the same analysis, one must bear in mind that hours of labour supplied does not necessarily reflect the impact of drug abuse on actual employment.

In this paper we use data from the British Crime Survey (BCS) to explore the drug use-labour market outcomes relationship in a British context. We pay particular attention to the impact of early hard and soft drug use on current employment status and occupational attainment. This approach is new to the literature as we consider the current labour market status of the individual and his or her occupational attainment as jointly determined with current drug use. To explore these issues we proceed as follows. In the next section we provide a brief discussion of the current data set, following which we set out our empirical methodology. In doing this we highlight an observational deficiency that stems for the current BCS questionnaire design. We present our results and discussion in section 4 and conclude in section 5.

DATA

Unlike the US, the UK undertakes little by way of national monitoring of drug use. Apart from local surveys of users, the only source of national drug use information is the British Crime Survey (BCS). The BCS is a household victimisation survey, which also includes a number of questions about interviewees' use of drugs. The BCS lists 13 of the most commonly abused drugs plus the bogus drug Semeron (put in the survey to test for false claiming). BCS interviewees aged 16 to 59 are asked three questions about their use of the listed drugs: had they ever taken the drug, had they taken it in the past 12 months, or had they taken it in the past month. In effect, these questions provide information about an individual's lifetime prevalence of drug use, including recent and current use. Although these questions were first introduced into the survey in 1992, a

change in completion method (from paper-based to computer-based self-completion) has meant that researchers tend not to use the 1992 information for comparison with later years [17]. As such, we use the pooled data from the 1994 and 1996 surveys (the 1998 survey is not yet in the public domain). In addition, for this analysis we only focus on BCS respondents aged 16 to 25, although we have considered the labour market outcomes of older drug users elsewhere [18]. It is quite clear, however, that drug use is concentrated amongst younger people and that the majority of people 'mature out' of drug use in their late twenties or early thirties [19,20].

We have a number of options available in terms of what categories of drug use to consider. Survey respondents are asked about their use of many of the most commonly abused drugs including cannabis, cocaine, heroin and ecstasy. In this analysis we group the various drugs according to our assessment of the relative harm their use presents. Our assessment is influenced by the classifications given in Ramsay and Spiller [21], but also reflects the status of the drugs according to the Misuse of Drugs Act 1971. Thus we classify a group of "recreational" drugs that comprises of cannabis, amphetamines, Amyl Nitrite, ecstasy, LSD, and magic mushrooms, and a group of "dependency" drugs that includes cocaine, crack cocaine, heroin and unprescribed methadone. Henceforth, for simplicity, we refer to these groups as "soft" and "hard" respectively.

To allow us to consider the labour market outcomes of our sample of BCS respondents we make use of information provided in the survey about their current employment status. We concentrate on two groups: those who are currently in work, full time or part time; and those who are unemployed but are currently in job search. Unfortunately, data on individual earnings are not provided in the BCS, so we use mean hourly wage information from the Quarterly Labour Force Survey mapped to the BCS via interviewees' occupational codes (the 3-digit level of the Standard Occupational Classification). This approach, which is due to Nickell [22] and recently used by Harper and Haq [23] and MacDonald and Shields [6], allows us to rank each individual's occupational attainment in terms of the labour market status of that individual's current occupation. Although this is slightly different to considering individual wages, Harper and Haq have shown that the two methods of ranking occupational attainment yield surprisingly similar results.

Before we proceed to develop our empirical model we present some simple descriptive statistics for the dependent variables that will be used in our analysis. These are given in Table 1 and reveal some interesting features about the nature of drug use and labour market outcomes in our current sample, although these figures are only illustrative.

Table 1. Levels of drug use and employment outcomes

Level of drug use	No. of observations	Percent unemployed	Average hourly wage
None ever	1475	12.1	£5.75
None now, soft in past	346	14.2	£5.98
None now, hard in past	63	22.2	£5.74
Soft now (but not in past month)	184	11.4	£5.81
Soft now, hard in past	29	24.1	£6.61
Soft in last month, no hard ever	202	16.3	£5.76
Soft in last month, hard in past	100	24.0	£6.00
Hard now (but not in past month)	76	36.8	£5.80
Hard in last month	39	38.5	£5.63

Clearly, there is some association between drug use and unemployment. Bearing in mind that we are dealing with a sample of 16-25 year olds, the unemployment rates range from 12.1% for those who have never taken drugs, to almost 40% for those who report use of hard drugs in the past month. However, when we consider the average hourly wage associated with the occupations of those who are in work, there is no apparent negative association between drug use and wages. For example, the mean occupation wage for non-users is £5.75, whereas in six out of the nine drug use categories, the associated hourly wage is slightly higher.

QUESTIONNAIRE DESIGN AND THE EMPIRICAL ANALYSIS

Our analysis aims to answer two questions:

1. What is the dynamic pattern of drug use over time?
2. What is the eventual impact of drug use on labour market achievement?

To do this, we split time into two periods: the "current period", comprising the 12 months up to the date of interview; and the "past" lasting from birth to 12 months prior to interview. Note that the past period is of variable length, depending on the age of the respondent.

In addition to the occurrence of drug use, we try to incorporate an element of the intensity of drug use (which is only possible for the current period), by using survey information on whether or not the drugs in question have been used within the last month. Thus we have three possibilities for past drug use:

$$d_1 = \begin{cases} 0 & \text{if no drug use} \\ 1 & \text{if soft drug use only} \\ 2 & \text{if hard drug use} \end{cases}$$

However, the availability of frequency information for the current period gives 5 possibilities for the current drug use indicator:

$$d_1 = \begin{cases} 0 & \text{if no drug use} \\ 1 & \text{if only soft drug use only, but not within the last month} \\ 2 & \text{if soft drug use in the last month} \\ 3 & \text{if hard drug use, but not within the last month} \\ 4 & \text{if hard drug use within the last month} \end{cases}$$

In addition to these two indicators of current and past drug use, we also observe two indicators of current labour market achievement: a binary indicator *u* equal to 1 if the individual is unemployed at the time of interview and 0 otherwise; and for those in employment a continuous indicator, *a*, of occupational success.

However, there is a severe identification problem to be overcome in estimating the relationship between these four indicators. This arises from the design of the BCS questionnaire, summarised in Figure 1.

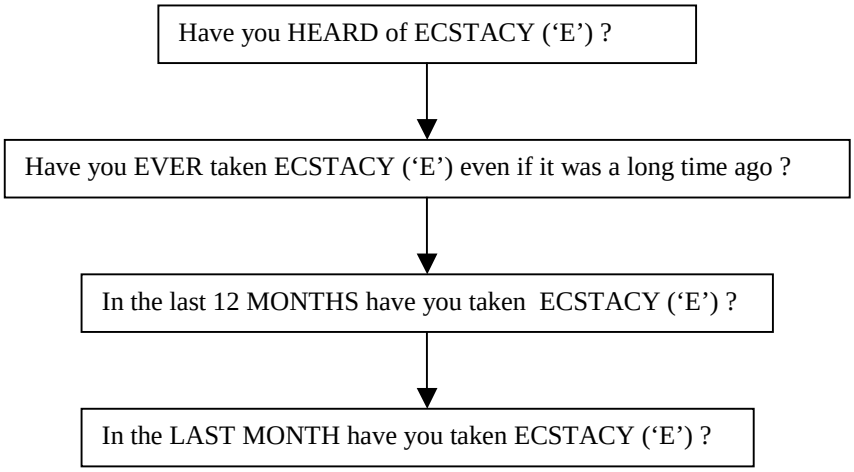

Figure 1 BCS questionnaire design for drug use questions

The difficulty arises from the sequencing of questions: if a particular class of drugs is used in the current period, then the response to the BCS question does not tell us whether or not it was also used in the past period. Thus, there is little direct sample information on the evolution of drug use over time. In terms of the outcomes for the drug use indicators d_1 and d_2, there are $3 \times 5 = 15$ possible combinations, but the question structure gives us only nine possible observable regimes. Thus, if $P_{ij} = \Pr(d_1 = i, d_2 = j)$, we can identify only the values of P_{00} , P_{10} , P_{20} , $(P_{01}+P_{11})$, P_{21} , $(P_{02}+P_{12})$, P_{22} , $(P_{03}+P_{13}+P_{23})$ and $(P_{04}+P_{14}+P_{24})$. Thus, without further assumptions, we can identify only P_{00} , P_{10} , P_{20} , P_{21} and P_{22}, which give us no information about increasing trajectories of drug use.

The first, and most important, of our conclusions can therefore be stated immediately: that this very commonly-used question structure is a serious barrier to statistical modelling of drug use at the individual level, and that survey designers should give serious attention to alternative designs (see MacDonald and Pudney [18]).

However, identification problems can be solved if it is possible to find plausible restrictions which impose sufficient *a priori* structure on the modelling process. We pursue this idea by working within a conventional linear normal framework, and using

ordered probit relationships to underpin the probabilities of possible combinations of drug use.

Past drug use is assumed to be generated as follows:

$$d_1^* = x_1\beta_1 + \varepsilon_1 \tag{1}$$

$$d_1 = r\,\mathrm{I}\left(d_1^* \in [C_{r1}, C_{r+11})\right) \tag{2}$$

where r = 0, 1, 2 and I(A) is the indicator function, equal to 1 if the event A occurs and 0 otherwise. The C_{r1} are fixed threshold parameters, with C_{01} = -∞ and C_{31} = +∞, x_1 is a row vector of personal and demographic attributes, β_1 is the corresponding vector of parameters, and ε_1 is a N(0,1) random error.

In the current period, drug use, unemployment and occupational attainment are given by the following system, conditional on past drug use:

$$\begin{aligned} d_2^* &= x_2\beta_2 + \xi_1\delta_{21} + \xi_2\delta_{22} + \varepsilon_2 \\ d_2 &= r\,\mathrm{I}\left(d_2^* \in [C_{r2}, C_{r+12})\right) \qquad r = 0....4 \end{aligned} \tag{3}$$

$$\begin{aligned} u^* &= x_3\beta_3 + \xi_1\delta_{31} + \xi_2\delta_{32} + \varepsilon_3 \\ u &= \mathrm{I}\left(u^* > 0\right) \end{aligned} \tag{4}$$

$$a = x_4\beta_4 + \xi_1\delta_{41} + \xi_2\delta_{42} + \varepsilon_4 \tag{5}$$

where x_2...x_4 are row vectors of personal and demographic attributes, β_2 ... β_4 are the corresponding vectors of parameters, and ε_2 ... ε_4 are errors with a trivariate normal distribution with zero means, unit variances and unrestricted correlations, conditional on x = {x_1, x_2, x_3} and d_1. The C_{r2} are threshold parameters subject to normalising restrictions as before. The variables ξ_1 and ξ_2 are dummy variables representing the level of past drug use, defined as $\xi_r = \mathrm{I}(d_1 = r)$.

Estimation of this structure proceeds by maximum likelihood. We classify the sample into sets of observations falling into each of the nine possible observational

regimes, and compute the probability of observing that outcome for each individual as a function of the explanatory variables and the parameter values. From these calculated probabilities the following log-likelihood is constructed:

$$L = \sum_{s=1}^{18} \sum_{i \in N_s} \ln\left[Q_i(s, a_i | x_i \right] \tag{6}$$

Note that there are nine possible combinations of answers to the drugs questions, and two possible answers to the unemployment question, so there are 18 possible observable regimes altogether. In (6), s indexes these 18 discrete outcomes, and $i \in N_s$ indexes the sampled individuals who give the s^{th} possible combination of answers to the drugs and unemployment questions. Q_s is the conditional probability of the observed response. We do not give detailed forms for the nine probabilities Q_s , since they are extremely tedious. However, as an example of the process of deriving them, consider the probability of observing an employed individual (u = 0), with occupational achievement level a, who has never used hard drugs, but has used soft drugs in the last year and not in the last month (d_1 = 0 and d_2 = 1 *or* d_1 = 1 and d_2 = 1). Since we are treating achievement as a continuous variable, the probability Q_i is a density with respect to a. In this case:

$$\begin{aligned} Q_i = {} & \Pr(d_1^* < C_{11}) \Pr(u^* < 0, C_{12} \le d_2^* < C_{22} \left| a, d_1 = 0 \right.) f(a \left| d_1 = 0 \right.) \\ & + \Pr(C_{11} \le d_1^* < C_{21}) \Pr(u^* < 0, C_{12} \le d_2^* < C_{22} \left| a, d_1 = 1 \right.) f(a \left| d_1 = 1 \right.) \end{aligned} \tag{7}$$

Probabilities like (7) require the evaluation of the bivariate normal distribution function. Detailed specifications of all 18 types of likelihood element are available (in the form of a GAUSS procedure) from the authors. An iterative optimisation algorithm is used to maximise the likelihood.

RESULTS AND DISCUSSION

We estimate the model developed above for our sample of BCS males and females aged 16 to 25. In Table 2 we give estimates for the determinants of past and current drug use.

The past drug use model is specified very simply, reflecting the previous literature and recent work that suggests factors such as family formation and educational attainment might well be endogenously determined with early life drug use [15]. In the current drug use model we treat these factors as exogenous given that family formation and educational attainment will already be established. We also condition current drug use on other factors including religious preference, being in rented accommodation, and current drinking practice. The omitted categories for the current drug use model are: no formal qualifications, white, and a non-typical household. In Table 3 we present our estimates for the determinants of unemployment and occupational attainment. These are specified in the same way as the current drug use model, although we interact marital status and gender in this specification to reflect the well-established differences in labour market outcomes between married and single men and women.

Table 2. The determinants of past and current drug use[a]

	Past drug use		Current drug use	
	Coefficient	|t|	Coefficient	|t|
Age at time of survey/10	0.244	1.99	-0.684	4.94
Male	0.321	5.51	0.296	4.52
Black	1.811	1.88	-0.228	1.74
Asian	-1.451	1.82	-0.338	2.80
Black * age	-0.877	1.97	-	-
Asian * age	0.438	1.20	-	-
Regular church attendance	-0.162	1.37	-0.291	2.02
Educational attainment				
Resident in inner city	-	-	0.110	1.62
Degree or higher	-	-	0.062	0.46
HND, BTEC, nursing qualification	-	-	-0.047	0.39
A levels, ONC, SCE Higher	-	-	0.202	1.84
High grade GCSE/equivalent	-	-	0.072	0.75
Low grade GCSE/equivalent	-	-	0.045	0.36
Other qualifications	-	-	-0.397	1.72
Family structure				
Single adult household	-	-	-0.121	1.02
Two adult household	-	-	0.212	2.04
Three or more adult household	-	-	0.041	0.45
Lone parent household	-	-	0.276	1.98
Two adult household with children	-	-	0.106	0.80
Married or cohabiting	-	-	-0.478	4.78
Regular drinker	-	-	0.339	4.37
Lives in rented accommodation	-	-	0.262	3.29
Lagged drug effects				
Past soft drug use	-	-	0.514	1.50
Past hard drug use	-	-	1.664	10.05
Threshold 1	1.171		-0.065	
Threshold 2	1.937		0.323	
Threshold 3	-		1.310	
Threshold 4	-		1.962	

[a] Included (but not reported) is a dummy for the survey year.

Table 3. The impact of drug use on labour market outcomes[b]

	Unemployment		Attainment	
	Coefficient	|t|	Coefficient	|t|
Age at time of survey/10	-0.249	1.60	0.237	9.32
Resident in inner city	0.288	3.96	-0.018	1.35
Educational attainment				
Degree or higher	-0.858	5.73	0.387	13.77
HND, BTEC, nursing qualification	-0.858	6.37	0.192	7.01
A levels, ONC, SCE Higher	-0.737	6.01	0.144	5.58
High grade GCSE/equivalent	-0.829	8.17	0.070	2.86
Low grade GCSE/equivalent	-0.415	3.40	0.067	2.31
Other qualifications	-0.428	2.13	0.044	1.14
Black	0.430	3.55	-0.051	2.31
Asian	0.375	3.86	-0.012	0.65
Family structure				
Single adult household	0.078	0.61	0.096	4.22
Two adult household	0.002	0.02	0.055	2.68
Three or more adult household	-0.085	0.86	0.036	2.07
Lone parent household	0.274	1.97	-0.003	0.13
Two adult household with children	0.294	2.11	-0.030	1.14
Single male	0.138	1.03	-0.024	1.05
Single female	-0.087	0.62	-0.089	3.82
Married female	-0.447	2.88	-0.098	4.58
Regular drinker	-0.029	0.31	0.011	0.79
Lagged drug effects				
Past soft drug use	0.162	1.62	0.005	0.33
Past hard drug use	0.574	5.37	0.016	0.75
Constant	-0.079		1.116	
$\rho_{d_2 u}$	0.099	2.01	-	-
$\rho_{d_2 a}$	-	-	0.046	1.34
Observations	2514		2514	

[b] Included (but not reported) is a dummy for the survey year

The results in Table 2 suggest that, for both past and current drug use, males are more likely to be drug users than females. Furthermore, contrary to some stereotypes, Asians are less likely than whites to take drugs, as are Blacks in the case of current drug use. Interestingly, it appears that the probability of past drug use increases with age, whereas the probability of current drug use declines with age. We also find that individuals who report regularly drinking are more likely to take drugs than those who do not, as are individuals who live in rented accommodation. These results also suggest that being married reduces the likelihood of current drug use, as does regular church attendance. Most importantly, the results in Table 2 reveal the positive relationship between past and current drug use. We observe that the estimated coefficients on the lagged effect of soft and hard drugs are positive, and in the case of hard drugs, highly significant (t = 10.05).

Turning our attention to the estimates for unemployment and attainment, our socio-economic variables behave as expected, with educational attainment being negatively associated with unemployment but positively associated with occupational attainment. In all cases these variables, with the exception of unlisted qualifications, are statistically significant at the 1% level. Our results also reveal a positive association between ethnic origin and current unemployment compared to whites, and a negative association with occupational attainment. We also observe that females, regardless of marital status, are more likely to be unemployed than married men and less likely to do well once employed. Finally, whereas there appears to be no association between regular drinking and labour market outcomes for this young sample, there is some apparent relationship between past drug use and unemployment. In particular, we find a significant (and large) association between past hard drug use and current unemployment. The association between past soft drug use and unemployment is also positive, but not particularly significant (t = 1.62). Looking at the relationship between drug use and occupational attainment, our results are broadly in line with previous studies in that the association is positive. However, although the estimated coefficients are positive, they are not statistically significant. This is also true for the association between current drug use and attainment ($\rho_{d_2 a}$), although the association between current drug use and unemployment ($\rho_{d_2 u}$) is positive and statistically significant.

Overall these results are quite revealing about the complex relationship between illicit drug use and labour market outcomes. Naturally we cannot make any claim about causality, however, our results clearly suggest that once employment status is taken into account when considering the relationship between drug use and occupational attainment, then unlike some other studies [9-12] there appears to be no apparent association. Having said this, just as we do not find a significant positive association between drug use and occupational attainment, nor do we find a negative association. This is an important result as it suggests that employment outcomes are more important than productivity issues.

CONCLUDING REMARKS

In this paper we have used data from the British Crime Survey (BCS) to estimate the impact of illicit drug use on the labour market outcomes of a sample of 2514 men and women aged 16 to 25.

We began by highlighting an observational problem that stems from the BCS questionnaire design, which makes identification of drug use transitions problematic. However, we were able to present an appropriate model that overcame this difficulty. Our estimates of this model revealed that the past use of hard drugs in particular is an important predictor of current drug use. The estimated coefficient on the past use of soft drugs, however, was not significant in the current drug use model. With respect to the relationship between illicit drug use and labour market outcomes our results appear to reveal the importance of employment outcomes over occupational attainment. We found that past drug use tends to increase the probability of current unemployment, particularly past hard drug use. On the other hand, although we found a positive association between past drug use and occupational attainment, the estimated coefficients were not statistically significant leading us to conclude that there is no relationship between these two variables. These results should be seen in the context of the recently published Government ten-year strategy for tackling drugs [24]. This makes references to new initiatives for dealing with workplace drug misuse, however, in the

light of these results, it is more likely that employment outcomes are more important than workplace issues.

ACKNOWLEDGEMENTS

The British Crime Survey comes from Crown copyright records made available through the Home Office and the ESRC Data Archive, and has been used by permission of the Controller of Her Majesty's Stationery Office.

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