THE EMPLOYMENT PROSPECTS OF SCOTTISH AND ENGLISH DRUG ABUSERS

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January 2002

ABSTRACT

In this paper the employment of Scottish and English self-reporting drug users is considered using data drawn from the Scottish and British Crime Surveys. Univariate and bivariate estimates of the probability of being employed reveal a robustly negative and statistically significant association between a number of measures of drug use and current employment. These results hold for separate samples of Scottish and English respondents, and confirm recent findings for the United States. We also highlight the paucity of data available for this type of research, particularly for Scotland, and suggest that this ought to be a serious concern for policy makers charged with implementing and monitoring polices aimed at tackling drugs misuse and its cost to society.

JEL Classification: K42; J24

Keywords: Illicit drugs; Unemployment; Endogeneity

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I INTRODUCTION

There is a growing literature in economics that considers the impact of problematic alcohol and drug use on labour market outcomes. The majority of this research is set in a North American context (see Berger and Leigh, 1988; French and Zarkin, 1995; Heien, 1996; Hamilton and Hamilton, 1997; Kenkel and Ribar, 1994 and Mullahy and Sindelar, 1991,1996 for studies of alcohol and see Buchmueller and Zuvekas, 1998; Burgess and Propper, 1998; Kaestner, 1991, 1994a,b; Gill and Michaels, 1992; Register and Williams, 1992 and Zarkin et al., 1998 for studies of drug use), although there are a few papers that consider this issue using UK data (MacDonald and Pudney 2000a,b,c; MacDonald and Shields, 2001a). The interest in the association between substance use and labour market outcomes is motivated by the estimated costs to society of the lost productivity (due to morbidity and impairment) of problem drinkers and drug users. For example, Harwood et al. (1998) report that in 1992 drug abuse cost American society $98 billion, of which $14.2 billion was attributable to lost productivity. In a similar type of study for Canada, Single et al. (1998) found that in total substance abuse cost Canadian society $18.45 billion in 1992 (approximately 2.7% of GDP), and that "the largest single cost is the indirect cost of productivity losses" (p. 999). Add to this the cost of workplace drug testing and health promotion programmes, then clearly, despite the obvious issues related to the precision and validity of these types of estimates, the labour market costs of substance abuse ought to be a serious concern for policy makers in determining resource allocations.

This paper contributes to the literature on the association between illicit drug use and employment through an analysis of the responses of 3,096 respondents from the Scottish Crime Survey and 11,275 respondents from the British Crime Survey. This is the first analysis of this type to consider the labour market impact of illicit drug use in Scotland and England separately, and in doing so represents a further contribution to the very small literature in this area that is set in a UK context. We explore the association between recent soft (recreational) and/or hard (problematic) drug use and the probability of being currently employed by estimating a bivariate probit model of employment and self-reported drug use. The results of this analysis show that univariate analysis results in biased coefficient estimates for the impact of drug use on current employment. The bivariate probit results suggest that regardless of how drug use is defined, it is significantly negatively associated with the probability of currently being employed, a result that holds for individuals residing in Scotland or England.

The balance of this paper is as follows. In Section II we present a review of the literature in this area, summarising the main conclusions. In particular, we explore the previous research into the association between illicit drug use and both labour market attainment (e.g. wages) and employment, and note that the latter tends not to generate much consensus in the literature. In Section III the empirical methodology is presented, with a particular emphasis on the issue of unobserved heterogeneity that arises in an employment equation with drug use as a covariate. Following this, in Section IV the current data are discussed, a preliminary analysis is presented, and the variables included in our model are described. Our empirical estimates are presented in Section V, concluding remarks follow.

II DRUG USE AND LABOUR MARKET OUTCOMES

The relationship between substance abuse and labour market status tends not to generate any consensus in the literature. There is some debate about causality between drug use and employment status. Sociological research tends to conclude that "high unemployment serves to foster drug use" (Peck and Plant, 1987, p.67), rather than the other way round. Economists, on the other hand, since the work of Becker (1964) and Grossman (1972), tend to look at causality in the other direction and view substance abuse as being detrimental to human capital formation. Most recent work, however, recognises the possible simultaneity of drug use and labour market outcomes and the existence of unobserved heterogeneity. The endogeneity issue follows from conventional consumption-labour supply theory in which substance use is treated only as one form of consumption, determined optimally in response to the market wage and non-labour income. Thus given that substance use is also considered to be detrimental to health and human capital formation, then causality between drug use and labour market outcomes must be bi-directional. The related issue of heterogeneity derives from existence of unobserved characteristics (e.g. an outgoing personality) that not only influence an individual's choice to consume drugs but also may be related to that person's success in the labour market, at least in the short run.

Despite the general recognition that substance use is not exogenous to labour market outcomes, there is a mixture of results reported in the literature that leave the impact of substance use on labour supply open to question. For example, in considering alcohol abuse and labour supply, Mullahy and Sindelar (1991) and Mullahy and Sindelar (1996) find a statistically significant negative association between these variables, whereas Kenkel and

Ribar (1994) do not (although they find a small statistically significant negative association between heavy drinking and the labour supply of males). The different conclusions that are drawn from these studies may relate to the different definitions of labour supply that are used. Kenkel and Ribar focus on the hours of labour supplied whereas both the Mullahy and Sindelar papers focus on participation. However, Kaestner (1994a), using the same data set as Kenkel and Ribar (the US National Longitudinal Survey of Youth – NLSY), finds a negative association between marijuana (cannabis) or cocaine use and the hours of labour supplied by young males.

These studies deal with the endogeneity of substance abuse and labour market outcomes in standard ways, yet there is a lack of consensus in the results. An alternative approach is taken by Zarkin et al. (1998), who suggest that substance abuse and hours worked are not endogenously determined. Following extensive tests for exogeneity of substance abuse variables, they estimate a single equation model of labour supply for a sample of 18 to 24 year old men taken from the US National Household Survey on Drug Abuse. They find no significant relationship between past month labour supply and the use of cigarettes, alcohol or cocaine in the past month. Although they find a significant positive association with past month cannabis use, they conclude that there is little evidence to support a robust labour supply-drug use relationship. However, in a recent paper, DeSimone (1999) argues that "the exogeneity test rejection merely implies that IV and OLS estimates are not significantly different and could therefore merely represent a weak correlation between the instruments and drug use" (p. 9). Furthermore, DeSimone is generally critical of the identifying restrictions used in many previous studies and the lack of validity tests reported by the authors. He suggests that quite often there is evidence to suggest that variables like drinking behaviour and prior delinquency (often used as instruments for substance use) are correlated with the employment outcome as well as drug use.

Beyond the issue of drug use and unemployment, recent research has considered the impact of drug use on attainment once in work. There is a growing body of empirical evidence in the labour economics literature that suggests that once endogeneity is accounted for one rarely finds a significant negative relationship between substance abuse and wages. This may not appear contentious given that firms are unlikely to adjust wages in the short term and individual productivity effects are difficult to observe, but some of the literature actually reports a positive association between drug use and wages. Kaestner (1991), using data from the NLSY, finds that, if anything, increased frequency of illicit drug use (in this case cocaine or marijuana) is associated with higher wages. Likewise, Gill and Michaels

(1992) and Register and Williams (1992), using the same data as Kaestner but slightly different approaches to control for the self-selection of individuals into drug use and the labour market, find very similar results. These findings echo the results that have been found for the relationship between alcohol and wages. For example, using different sources of data, French and Zarkin (1995), Heien (1996), Hamilton and Hamilton (1997) and MacDonald and Shields (2001a) present results that support an inverse U-shaped relationship between drinking intensity and wages.

There is, however, some research that questions this general view. For example, Kandel et al. (1995) suggest that the relationship between drug use and wages will vary with the stage of an individual's career. Using a follow-up cohort of the NLSY, they find a positive relationship between drug use and wages in the early stages of an individual's career, but a negative relationship later on in the career (in the mid-thirties). However, Burgess and Proper (1998), using the same data source, are not able to replicate this finding. In their analysis they consider the effects of early life behaviour (such as drug and alcohol consumption) and later life outcomes, including productivity. Their results suggest that adolescent alcohol and soft drug use has little or no effect on the earnings of men in their late twenties or thirties, although they do find that early hard drug use has a significant negative impact. Age differences have also been found by Buchmueller and Zuvekas (1998), who analysed data from the US National Institute of Mental Health's Epidemiological Catchment Area (ECA) survey that was collected in the early eighties. Buchmueller and Zuvekas make the same criticism of NLSY studies as Kandel et al., in that compared to the NLSY, the ECA covers prime-age (30-45 years old) workers as well as young people. Their results suggest that whilst there is evidence of a positive relationship between drug use and income for young workers, there is strong evidence to suggest that 'problematic' drug use by prime-age workers is associated with lower incomes.

In concluding this section we note that apart from MacDonald and Pudney (2000a,b,c) there is little work in this area that is set in a British context. MacDonald and Pudney (2000a,b) find little evidence to support the Kandel et al. (1995) life-span hypothesis, indeed, like Burgess and Propper (1998), if anything their results contradict it. In particular, MacDonald and Pudney (2000b) only find a positive association between past recreational drug use and the wages of older women. There is practically no evidence to suggest any positive returns to drug use for the younger cohort, particularly for men. On the other hand, the authors find a highly significant negative relationship between the use of 'hard' drugs and unemployment. The authors suggest that this represents the long-term harm to employment

prospects, particularly for young people who will miss out on vital human capital investment. MacDonald and Pudney (2000c) suggest that taking the relationship between drug use and unemployment into account may help explain why recent work has failed to find any significant negative relationship between drug use (except for recreational drug use in older men) and earnings. They show that drug use (particularly dependency drugs) greatly increases the risk of unemployment, and any association with earnings for those in work therefore misses much of the impact.

Overall, the empirical evidence on the labour market outcomes of illicit drug use is mixed, but there would appear to be some evidence of negative human capital effects in relation to drug users. In addition to this general conclusion, it is clear that two further issues emerge. Firstly, in taking account of the endogeneity of substance use and labour market outcomes care must be taken in choosing the appropriate set of identifying restrictions and tests of their validity ought to be reported, although it must be recognised that the extent to which is this is feasible can be determined by the quality of the data. The second issue concerns the age distribution of the data used in the analysis. It is evident that for reliable conclusions to be drawn about the drug use-employment relationship, the analysis should be based on data that cover a reasonably wide age range so that the full impact of drug use on labour market outcomes can be considered.

III EMPIRICAL APPROACH

In this paper we are interested in the impact of drug use on an individual's employment prospects. The probability of the discrete event of being employed is most naturally modelled as a reduced-form probit (or logit) relation, where an individual's unobserved propensity to be employed y_i^*, is related to the observed individual and demographic characteristics through the structural model:

$$y_i^* = X_i b_1 + d_i d + e_{1i} \tag{1}$$

where X_i is a vector of personal and demographic attributes for individual i, d_i is an indicator variable for whether or not the individual has taken drugs in the past year, b and δ are the parameters to be estimated, and e_{1i} is a normally distributed error term with mean zero and

variance one, which captures the unobserved determinants of employment. The observed outcome of being currently employed, y_i, takes a value of one if $y_i^* > 0$ and zero otherwise.

In the literature discussed in Section II, it is reasonably well established that a single equation model like (1) will lead to a biased estimate of d as drug use is unlikely to be exogenous. Due to drug use and employment being potentially endogenously determined and given the likely overlap in unobserved characteristics that determine both employment and the likelihood of being a drug user, the error term, e_{1i} in (1), will be correlated with the explanatory variable capturing drug use. We take account of the endogenous relationship between drug use and employment and potential unobserved heterogeneity by also estimating the model as a bivariate probit. The empirical specification of the bivariate model is as follows:

$$y_i^* = a_1 + X_i b_1 + d_i d + e_{1i} \tag{2}$$

$$d_i^* = a_2 + X_i b_2 + Z_i x + e_{2i} \tag{3}$$

where the error terms e_{1i} and e_{2i} are jointly distributed as bivariate normal with means zero, unit variances, and correlation r. The variables y_i, d_i and X_i are as before, Z_i is a vector of identifying restrictions[1], and b_1, b_2, d and x are the parameters of interest that we wish to estimate. In estimating this model we face the practical difficulty of finding a set of identifying restrictions that are significant determinants of the endogenous variable(s) but also orthogonal to the residuals of the main equation (i.e. not significantly associated with the probability of being employed). We discuss our choice of identifying restrictions in the next section.

III DATA AND PRELIMINARY ANALYSIS

The UK is not well endowed with survey information on illicit drug use. In the United States, drug use information is collected regularly at a national level via a number of household surveys, including the National Longitudinal Survey of Youth, the Monitoring the Future

Survey, and the National Household Survey on Drug Abuse. In the UK there have been a number of local surveys, the most notable being the 1992 'Four Cities Survey' (Leitner et al., 1993). Recently, small surveys of arrestees (covering only a few police force areas) have also helped build a picture of drug misuse (Bennett, 2000), but, like local surveys, such information is not representative of the whole population. National sources of drug use information are limited. Until recently the Home Office maintained an addicts index, but this was restricted to individuals with problematic drug use and was based on doctors' notifications. Additionally, the Regional Drug Misuse Database (Department of Health, 1996) collects information on the use of all drugs, but this information is only received from those individuals who present themselves to community-based agencies for problem drug misuse.

The paucity of appropriate data is exacerbated by our need for sufficient socio-economic detail at the individual level, in particular, information on labour market experiences, in addition to information about drug abuse. We are fortunate, however, to have data covering most of the UK via two surveys: the well-established British Crime Survey (BCS), which covers England and Wales[2], and the more recent Scottish Crime Survey (SCS).[3] Although the BCS and SCS are primarily victimisation surveys, designed to cover individuals' experiences of crime, drug use questions have been included in BCS since 1992, and in the SCS surveys of 1993 and 1996. To allow for comparison, we use data from the 1994 and 1996 sweeps of the BCS and the 1993 and 1996 sweeps of the SCS. Both surveys use the postcode address file (PAF) as the sampling frame, and are considered to be representative of the adult population residing in private households (i.e. excluding the institutional population). For more details of the sampling procedure for BCS survey see Hales and Stratford (1997), and for details of the SCS see MVA Consulting (1996).

Drug use information

The drug use questions in the BCS and SCS are reasonably similar. Drug use information is collected in both surveys via a computer-based self-completion questionnaire, administered to respondents aged 16 to 59. In each case the interviewees are asked about their use of the most

[1] Note that these restrictions are not strictly required for identification, but that their inclusion improves the precision of the estimates.
[2] Wales is excluded from this analysis to allow a strict comparison between respondents resident in Scotland and England, and because there are only 485 observation corresponding to Wales which presents a practical difficulty for estimation purposes.
[3] Previously most of Scotland (except the northern regions) was covered in the BCS.

commonly abused drugs plus the bogus drug Semeron (put in the survey to test for false claiming). In addition to being asked as to whether they had heard of the drugs, BCS respondents are asked whether they have ever taken them, taken them in the past year, or taken them in the past month. SCS respondents are also asked about whether they had heard of the drugs, ever taken them or taken them in the past year, but rather than the past month recall question, they are asked whether they had been offered the drugs in the past year. In both surveys the order of the questions gives rise to a serious observational problem because the 'ever used' question is asked before the 'used last year' question. This means that past drug use (i.e. drug use in the time before the last twelve months) is not observed in the data for those interviewees who also report drug use in the past year (see MacDonald (1999) for a more detailed discussion of this problem, and MacDonald and Pudney (2000a) for a discussion of a non-parametric approach to overcoming the problem for the purpose of investigating drug use dynamics). However, for the purposes of this analysis we simply focus on drug use in the past year, as we are interested in the association between recent drug consumption and current employment.

To simplify the presentation of the drug use information we allocate the drugs to two mutually exclusive categories (plus a further variant of each category). The first categorisation is motivated by the classification of the drugs in 1971 Misuse of Drugs Act and subsequent amendments. Following previous analysis (MacDonald 1999, MacDonald and Pudney 2000a) we define a group of 'hard' class A drugs (cocaine/crack, ecstasy, heroin, LSD, magic mushrooms and unprescribed methadone/physeptone), which carry stiffer penalties for their possession and/or intent to supply on the basis that they present more harm to users and society. We then define a group of 'soft' Class B and C drugs (amphetamines, cannabis, and unprescribed Temazepam or Valium). These carry much smaller penalties for possession and/or intent to supply compared to class A drugs. In addition to these two groups we also construct two groups of drugs that split them according to how they are perceived and/or used by young people. We define a group of 'recreational' drugs that includes amphetamines, cannabis, ecstasy, LSD and magic mushrooms, reflecting their association with the dance scene, and for cannabis, its general popularity. Our alternative to hard drugs is a category of 'problem' drugs that includes cocaine, crack cocaine, heroin and unprescribed methadone/physeptone. This group of drugs are those that receive most police attention and are the focus of recent policy announcements. In Table 1 we summarise the responses to the last year and ever-used questions by survey and age for these categories of drugs. We concentrate on individuals aged 16 to 44, splitting the sample into three age groups: age 16 to

24;25 to 34;35 to 44. We do this as previous research has shown that all but the heaviest of drugs users tend to 'mature out' of drug use in their late twenties/early thirties (MacDonald, 1999; LaBouvie, 1997). Thus in splitting our sample into three age groups that straddle this period of maturation we should observe a clear distinction in their drug use patterns and employment outcomes. In addition, we anticipate that employment problems will be more pronounced in older drug users as the cumulative effects of missed opportunities for human capital investment will be more pronounced.

TABLE 1

The percentages of respondents reporting drug use by age group*

	SCS			BCS		
	Age 16–24	Age 25–34	Age 35–44	Age 16–24	Age 25–34	Age 35–44
Drug use ever						
Any drug	38.5	25.5	18.3	40.4	34.0	26.0
	(2.12)	(1.21)	(1.08)	(1.08)	(0.67)	(0.67)
Hard drugs	21.6	10.1	5.0	19.1	12.1	7.8
	(1.80)	(0.84)	(0.61)	(0.87)	(0.46)	(0.41)
Soft drugs	38.3	24.6	18.1	39.0	32.8	25.4
	(2.12)	(1.20)	(1.08)	(1.08)	(0.67)	(0.67)
Drug use in the past year						
Any drug	24.3	9.2	4.4	25.9	12.8	5.6
	(1.87)	(0.81)	(0.57)	(0.97)	(0.47)	(0.35)
Hard drugs	12.5	2.4	0.5	8.5	2.4	0.6
	(1.44)	(0.43)	(0.19)	(0.62)	(0.22)	(0.12)
Problematic drugs	4.0	0.9	0.3	1.8	1.1	0.3
	(0.85)	(0.27)	(0.16)	(0.29)	(0.15)	(0.09)
Soft drugs	24.1	8.8	4.4	25.5	12.5	5.5
	(1.86)	(0.79)	(0.57)	(0.96)	(0.47)	(0.35)
Recreational drugs	24.3	8.7	4.2	25.8	12.4	5.2
	(1.87)	(0.79)	(0.56)	(0.97)	(0.47)	(0.34)
Observations	527	1292	1277	2059	4981	4235

* Standard errors in parenthesis

It is clear from Table 1 that regardless of survey, timing or categorisation, drug use declines with age (although the figures are likely to be picking up a cohort effect in addition to an age effect). However, is also clear that the decline in drug use by age group is more pronounced for the SCS than the BCS, particularly when considering lifetime use (used ever). For example, for each survey very similar proportions of the youngest age group report to

having used any drug ever (38.5% for the SCS and 40.4% for the BCS). For the SCS respondents this rate drops to 25.5% for the middle age group then to 18.3% for the oldest group, but for the BCS respondents the drop is only to 34.0% for the middle age group (a difference of 8.49% between the BCS and the SCS, t= 5.83), and then to 26.0% for oldest age group (a difference of 7.65% , t= 5.61). Although this pattern is repeated for the use of soft or recreational drugs in the past year, the difference is less pronounced for recent use of hard or problematic drugs. Indeed, not only do a greater proportion of SCS respondents report to having used these more dangerous drugs ever or in the past year when compared to BCS respondents, the decline in this use is less pronounced between age groups. For example, for the youngest age group (16–24), 12.5% of SCS respondents and 8.5% of BCS respondents report that they have used hard drugs in the past year (a difference of 4.02% , t = 2.84), whereas the rates for the middle age group (25–34) are 2.4% for both sets of respondents.

Labour market information

In analysing the association between drug use and employment we make the distinction between unemployment and non-participation explicit and only focus on those in employment and those seeking work. BCS and SCS respondents are classified as employed if they answer yes to being in paid employment or self-employment in the previous week. Thus, following the previous literature, for our unemployed category we include all the respondents who are not employed at the time of the survey but report that they are currently looking for work or are waiting to take up a job. Consequently we exclude individuals in full-time education, those who are sick or disabled, retired or looking after the home/family. In defining employment and unemployment in this way our unemployment rates are 14.95% for the SCS sample and 9.25% for the BCS sample. The reported drug use by employment status is summarised in Table 2.

TABLE 2

The percentages of respondents reporting drug use by employment status*

	SCS		BCS	
	Employed	Unemployed	Employed	Unemployed
Drug use ever				
Any drug	22.5	37.6	31.0	43.7
	(0.81)	(2.25)	(0.46)	(1.54)
Hard drugs	8.0	21.0	10.8	21.5
	(0.53)	(1.89)	(0.31)	(1.27)
Soft drugs	22.0	37.4	30.0	42.4
	(0.81)	(2.25)	(0.45)	(1.53)
Drug use in the past year				
Any drug	7.8	22.1	11.2	25.6
	(0.52)	(1.90)	(0.31)	(1.35)
Hard drugs	2.0	11.0	2.3	7.9
	(0.27)	(1.46)	(0.15)	(0.83)
Problematic drugs	0.7	4.1	0.7	3.1
	(0.16)	(0.92)	(0.08)	(0.53)
Soft drugs	7.6	20.7	10.9	24.9
	(0.52)	(1.89)	(0.31)	(1.34)
Recreational drugs	7.6	20.7	10.9	25.0
	(0.52)	(1.89)	(0.31)	(1.34)
Observations	2633	463	10232	1043

* Standard errors in parenthesis

The figures in Table 2 clearly reveal a marked difference in the drug use of individuals who are unemployed compared to those currently in work. Regardless of how we define the drug categories, or whether we consider lifetime or more recent drug use, those in employment have significantly lower reported rates of drug use compared to those not in employment. Interestingly, regardless of labour market status, SCS respondents have significantly lower rates of lifetime (drug use ever) and recent (past year) soft or recreational

drug use compared to BCS respondents. However, there appears to be a greater proportion of unemployed SCS respondents reporting recent hard or problematic drug use than unemployed BCS respondents (a difference of 3.15% [t=1.99] for hard drugs), although the rate of recent use of these drug is quite similar for the employed group. Overall, the figures in Tables 1 and 2 are sufficient to motivate a further analysis of the employment prospects of different groups of drug uses.

Variable selection

The specifications for the employment and drug use equations are chosen to be fairly parsimonious, reflecting earlier work and the limited information provided by the SCS. Summary statistics for all the variables used in this analysis are given in Table 3. We include variables to capture our age groups mentioned earlier (rather than estimate the models separately for each age group which drastically reduces the sample size for the SCS), and we control for differences in marital status, ethnicity[4], number of children, geographical location (to reflect differences in drug availability/prices and labour market conditions), survey year, and residence in the inner city. Rather than estimate models separately for males and females (the response rates for hard drugs preclude this), we interact marital status and gender to reflect the well-established differences in labour market outcomes between married and single men and women. However, compared to the literature there is one omission from our reduced form employment equation (and potentially the drug use equation) and that is educational attainment. Whilst this is available in the BCS it is not available in the SCS. Arguably educational attainment is more relevant to the determination of wages or relative success in the labour market as it reflects the demand for labour, but there is little doubt that the omission of education could mean that the residual of the employment equation will be a greater source of potential bias. To test the extent of this potential problem the employment equation was estimated using the BCS data only, and the results compared when educational attainment (captured by a set of dummy variables) was included or excluded. Interestingly there appeared to be little difference in the estimated coefficients for the main covariates. In all cases the signs on the coefficients remained the same and there was only a very slight impact on the t-values.

[4] Due to sample size we define only two ethnicity categories for the SCS: white and non-white. For the BCS we are able to define four categories: white, Black, Asian and 'other', which includes Chinese and respondents defining their ethnicity as 'other'.

TABLE 3

Descriptive statistics

	SCS		BCS	
Covariate	mean	Std. Dev	mean	Std. Dev
Age 16–24	0.170	0.376	0.183	0.386
Age 25–34	0.417	0.493	0.442	0.497
Age 35–44	0.412	0.492	0.376	0.484
Male	0.481	0.500	0.525	0.499
Married	0.582	0.493	0.598	0.490
Single male	0.199	0.400	0.203	0.402
Married male	0.282	0.450	0.322	0.467
Single female	0.219	0.413	0.199	0.399
Married female	0.300	0.459	0.276	0.447
Has children	0.900	1.101	0.922	1.111
White	0.991	0.095	0.809	0.393
Nonwhite	0.009	0.095	–	–
Black	–	–	0.087	0.282
Asian	–	–	0.081	0.273
Other	–	–	0.023	0.149
Large city	0.125	0.330	0.258	0.437
North Scotland	0.152	0.360	–	–
Central Scotland	0.360	0.480	–	–
South Scotland	0.488	0.500	–	–
North England	–	–	0.061	0.239
Yorkshire/Humberside	–	–	0.096	0.294
Northwest England	–	–	0.117	0.322
East Midlands	–	–	0.082	0.274
West Midlands	–	–	0.113	0.317
East Anglia	–	–	0.040	0.195
Southeast England	–	–	0.204	0.403
Southwest England	–	–	0.080	0.272
London	–	–	0.208	0.406
1996 year dummy	0.479	0.500	0.536	0.499
Rented accommodation	0.358	0.480	0.125	0.331
All male adult household	0.180	0.384	0.187	0.390
Area considered to have drugs problem	0.504	0.500	0.069	0.253
Victim of violent crime	0.039	0.195	0.067	0.250
Observations	3096		11,275	

As mentioned earlier, one of the issues we face in selecting our variables is what to use as identifying restrictions for drug use. DeSimone (1999) suggests that drugs prices are a natural instrument for drug consumption. In his study into the impact of past year cocaine and marijuana (cannabis) use on past year employment DeSimone is able to use the average past

year regional retail price of cocaine, taken from the Drug Enforcement Administration's System to Retrieve Information from Drug Evidence (STRIDE). DeSimone is not able to acquire this information for cannabis so instead uses an indicator of state cannabis decriminalisation as a proxy for variations in drug prices (the idea being that the 'effective price' of a drug (Moore, 1973) will be lower if criminal sanctions are lower or removed). Unfortunately neither measure of prices is available for the UK. In the UK the National Criminal Intelligence Service does collect some information on drugs prices, but it is nothing like that which comes from the STRIDE system and tends not cover many areas (Pudney, 2001). There are also some estimates of drugs prices made available on-line by the Independent Drug Monitoring Unit[5] but these only go back to 1995 and in this year the information was based on a survey of only 189 drugs users carried out at a music festival. Furthermore, although police forces in the UK have some discretion in how they enforce the Misuse of Drugs Act, there is no variation in the legal status of drugs across the country. In addition to these natural restrictions, family background measures are often used to identify substance use in this type of model. MacDonald and Shields (2001a) use parental smoking as instruments for alcohol consumption. Similarly, DeSimone uses early life parental supervision (whether both parents were present when the respondent was 14) plus parental alcoholism/problem drinking, whilst Mullahy and Sindelar (1996) use several measures of living with an alcoholic relative whilst growing up to identify drinking.

With the SCS and BCS we do not have access to the type of information used in previous studies (bear in mind these are victimisation surveys rather than specific substance use or health surveys). As such we are left with only few choices for identifying restrictions in our model. We include housing tenure (rented or not) as it is likely that drug users may be more transient than non-users. Indeed, for the SCS sample 23.3% of those in rented accommodation report any drug use in the past year compared to 10.8% of the respondents in non-rented accommodation (a difference of 12.5%, t = 13.59). The differences are less pronounced for the BCS sample (except for hard drug use) but they are still significantly different from zero (at the 1% level) for all types of drug use, with individuals in rented accommodation always reporting higher rates of drug use. Also included in the set of identifying restrictions are variables to capture whether or not the respondent has been a victim of violent crime, whether the respondent considers the area to have a 'drugs problem', and whether the respondent lives in an all male adult household (two or more male adults and

[5] http://www.idmu.co.uk/

no children). Victims of violent crime often have lifestyles that are associated with anti-social or offending behaviour or live in areas that increase their exposure to drugs and criminal activity. Indeed, using data from the Youth Lifestyles Survey, Deadman and MacDonald (2001) have shown that offenders are more likely than non-offenders to be victims of violent of non-violent crime. Looking at the current data, for the BCS sample 28.7% of victims report any drug use in the past year whereas 9.0% of non-victims report using drugs, a difference of 19.7% ($t = 7.23$). Similar results are found for the SCS sample and for all categories of drug use. The inclusion of the respondent's perception of the area's drugs problem is included in the set of identifying restrictions for similar reasons as victimisation. This works quite well for the SCS sample but for the BCS sample the difference in reported drug use between those who perceive the area to have a problem and those who do not tends not to be significantly different from zero. Finally, we include the nature of the household (in this case an all male adult household with no children present) as this is likely to influence behaviour. For all types of drug use we find that individuals living in an all male adult household are significantly more likely to report drug use than individuals living in mixed gender or all female households, or in households where children are present. In addition to these individual correlations, likelihood ratio tests suggest that the null hypothesis that $x = 0$ can also be rejected. Thus we can conclude that as a set, our identifying restrictions significantly improve the explanatory power of the drug use equation. In the next section we present the results of the univariate probit estimates and the bivariate probit estimates using these identifying restrictions.

V ESTIMATION RESULTS AND DISCUSSION

The estimated coefficients for the impact of drug use on the probability of employment are presented in Table 4. Seven separate models for the BCS and the SCS samples were estimated to reflect different categories of drug use. These categories, all for use in the past year, are: any drug use; use of hard drugs; use of problematic drugs; use of soft drugs; soft but not hard drug use; use of recreational drugs; recreational but not problematic drug use. The full set of results for the any, hard and soft drug use models are given in Appendix Tables A1–A3.[6] The omitted variables for all the estimates are white, single male, aged 35 to 44, and for the

[6] The complete results for all the estimated models are available from the author on request.

regional dummies we omit South Scotland for the SCS sample, and London for the BCS sample. In this discussion we concentrate on the estimated coefficients for drug use, but note that the other variables behave as expected: the probability of current employment decreases with age, is higher for females and married men compared to single men, is reduced as the number of children in the household increases, and tends to be higher for northern and central Scotland compared to southern Scotland for the SCS sample. For the BCS sample, ethnicity appears to be important in determining current employment, with individuals of Black or Asian origin having a lower probability of currently being employed. Additionally, for the BCS sample, respondents residing in the north tend to have a lower probability of current employment compared to those living in London, whereas those in the southeast tend to have a higher probability.

The impact of drug use on the probability of employment appears to be consistent across all the estimates. In almost all cases, for both the SCS and BCS samples the univariate probits reveal a statistically significant negative association between drug use and current employment (the one exception being the recent use of only soft drugs in the SCS sample where the estimated coefficient is negative but statistically not significantly different from zero). This result is also confirmed by the bivariate probit estimates. For every category of drug use, and for both the Scottish and English samples, the bivariate probit estimates of d are consistently negative but larger in magnitude than the univariate estimates. In addition the estimated correlation between the unobserved determinants of drug use and employment is positive and statistically significant. Thus the unobserved heterogeneity influencing the probability of employment is significantly and positively associated with the unobserved influences on the likelihood of being a drug user. That is, there are unobserved factors (perhaps personal characteristics such as rate of time preference) which both raise the probability of being employed and the probability of being a drug user. We can therefore conclude that univariate estimates overstate the impact of drug use on employment prospects, but that even when this is corrected via bivariate estimates there is little doubt about the negative association between these variables.

These results compare well to others found in the literature. Like the studies reported by Buchmueller and Zuveka (1998), DeSimone (1999), MacDonald and Pudney (2000a), these results reveal a negative and statistically significant negative association between recent use of illicit drugs and current employment. The current results also compliment the research in the area of problem drinking and employment, being broadly in line with Mullahy and Sindelar (1991), Mullahy and Sindelar (1996), and MacDonald and Shields (2001b), who all

find a statistically significant negative association between problematic drinking and employment.

TABLE 4

The estimated effect of drug use in the past year on the probability of current employment

	SCS			BCS		
	Univariate	Bivariate		Univariate	Bivariate	
	b	*b*	*r*	*b*	*b*	*r*
	(t-stat)	(t-stat)	(t-stat)	(t-stat)	(t-stat)	(t-stat)
Any drug	–0.401	–1.526	0.621	–0.386	–1.019	0.352
	(–4.59)	(–8.96)	(5.43)	(–8.27)	(–6.55)	(3.99)
Hard drugs	–0.716	–1.868	0.616	–0.474	–0.925	0.219
	(–5.34)	(–7.32)	(3.59)	(–5.82)	(–3.34)	(1.67)
Problematic drugs	–0.780	–2.384	0.720	–0.696	–1.671	0.394
	(–3.64)	(–5.89)	(2.69)	(–5.17)	(–3.46)	(1.92)
Soft drugs	–0.393	–1.501	0.609	–0.379	–1.014	0.353
	(–4.47)	(–8.64)	(5.31)	(–8.05)	(–6.47)	(3.97)
Soft drugs only	–0.136	–1.297	0.564	–0.287	–1.063	0.402
	(–1.28)	(–4.91)	(3.83)	(–5.55)	(–5.45)	(3.81)
Recreational drugs	–0.405	–1.502	0.603	–0.385	–1.020	0.354
	(–4.59)	(–8.50)	(5.19)	(–8.14)	(–6.53)	(3.99)
Recreational drugs only	–0.312	–1.379	0.566	–0.324	–0.936	0.335
	(–3.35)	(–6.74)	(4.52)	(–6.65)	(–5.45)	(3.52)
Sample		3096			11,275	

VI CONCLUDING REMARKS

In this paper the impact of illicit drug use on the probability of current employment has been considered using data drawn from the Scottish and British Crime Surveys. We began by presenting univariate probit estimates of the impact of seven alternative classifications of drug

use in the past year on the probability of current employment. In all cases we found that the association between recent drug use and current employment was negative and statistically significant. Interestingly, this means that regardless of whether individuals are consuming 'hard' or 'soft' drugs, or both, this consumption is associated with a reduced probability of being currently employed.

To extend this analysis, and following the literature that suggests that drug use and employment are most likely determined endogenously, we then proceeded to re-estimate the models as bivariate probits. We found that the bivariate estimates support the results of the univariate models, with drug use, however defined, being detrimental to employment prospects. Overall we found that the results presented here for Scotland and England compare well to others found in the literature, for North America and the UK. Like the studies reported by Buchmueller and Zuveka (1998) and DeSimone (1999) for the US, we are able to confirm the negative and statistically significant negative association between recent use of illicit drugs and current employment.

Finally, one issue that arises from this analysis is the quality of data available for this type of research set in a UK context. Data problems are particularly apparent in the SCS. It is unclear why the SCS contains less socio-economic information than the BCS and nor is it obvious why the SCS is repeated less frequently (the BCS is now an annual survey covering over 40,000 households). However, given the difficulties the Home Office are having in tracking the key performance targets of the Government's ten-year strategy for tackling drugs misuse in England and Wales (Home Office, 1998), then clearly policymakers in Scotland must face an even greater task. Having said this, the social costs of substance use through lost productivity appears to be an issue that is overlooked in both Scotland and England, or at least not given as much media and political attention as the costs to society from drug-related acquisitive crime.

APPENDIX

TABLE A1

The probability of employment with any drug use in past year

	Scotland				England			
	Univariate		Bivariate		Univariate		Bivariate	
	Coeff.	t-ratio	Coeff.	t-ratio	Coeff.	t-ratio	Coeff.	t-ratio
Intercept	0.849	9.520	0.979	11.240	1.303	19.890	1.410	20.840
Age 16–24	–0.475	–5.630	–0.301	–3.530	–0.221	–4.290	–0.118	–2.130
Age 25–34	–0.106	–1.540	–0.074	–1.110	–0.041	–0.980	–0.006	–0.130
Married male	0.708	7.740	0.553	6.080	0.428	8.310	0.356	6.650
Single female	0.221	2.750	0.093	1.170	0.321	6.520	0.259	5.110
Married female	0.960	9.990	0.771	7.930	0.845	14.130	0.746	11.790
Has children	–0.201	–7.000	–0.196	–6.990	–0.089	–5.170	–0.090	–5.330
Non-white	0.146	0.470	0.074	0.250	–	–	–	–
Black	–	–	–	–	–0.335	–5.620	–0.352	–5.990
Asian	–	–	–	–	–0.263	–4.250	–0.316	–5.110
Other	–	–	–	–	–0.222	–2.040	–0.230	–2.150
Large city	0.046	0.450	0.043	0.440	–0.364	–9.110	–0.340	–8.480
North Scotland	0.348	3.570	0.317	3.360	–	–	–	–
Central Scotland	0.171	2.480	0.181	2.700	–	–	–	–
North England	–	–	–	–	–0.280	–3.620	–0.328	–4.270
Yorkshire/Humberside	–	–	–	–	–0.101	–1.460	–0.130	–1.890
Northwest England	–	–	–	–	–0.070	–1.070	–0.095	–1.480
East Midlands	–	–	–	–	–0.017	–0.220	–0.063	–0.820
West Midlands	–	–	–	–	–0.105	–1.650	–0.164	–2.560
East Anglia	–	–	–	–	–0.106	–1.040	–0.150	–1.490
Southeast England	–	–	–	–	0.122	1.950	0.095	1.540
Southwest England	–	–	–	–	–0.068	–0.850	–0.095	–1.200
Year dummy	–0.003	–0.040	0.029	0.450	0.180	5.130	0.188	5.420
Any drug use	–0.401	–4.590	–1.526	–8.960	–0.386	–8.270	–1.019	–6.550
Correlation coefficient	–	–	0.649	6.656	–	–	0.359	3.835
Log Likelihood	–1156.26		–1982.79		–3111.81		–6763.76	
$\chi 2$ (d.f.)	300.03 (12)		786.60 (26)		728.47 (20)		1846.38 (42)	
Sample	3096		3096		11275		11275	

TABLE A2

The probability of employment with hard drug use in past year

	Scotland				England			
	Univariate		Bivariate		Univariate		Bivariate	
	Coeff.	t-ratio	Coeff.	t-ratio	Coeff.	t-ratio	Coeff.	t-ratio
Intercept	0.826	9.340	0.875	9.980	1.241	19.260	1.261	19.380
Age 16–24	–0.452	–5.320	–0.345	–4.050	–0.253	–4.950	–0.224	–4.190
Age 25–34	–0.105	–1.520	–0.098	–1.440	–0.063	–1.530	–0.057	–1.380
Married male	0.717	7.840	0.652	7.170	0.447	8.730	0.429	8.240
Single female	0.213	2.640	0.146	1.840	0.341	6.960	0.325	6.530
Married female	0.974	10.180	0.898	9.380	0.881	14.870	0.860	14.240
Has children	–0.198	–6.920	–0.196	–6.900	–0.086	–5.030	–0.086	–5.020
Non-white	0.195	0.620	0.208	0.680	–	–	–	–
Black	–	–	–	–	–0.327	–5.510	–0.333	–5.610
Asian	–	–	–	–	–0.235	–3.820	–0.250	–4.040
Other	–	–	–	–	–0.218	–2.010	–0.222	–2.050
Large city	0.050	0.490	0.056	0.550	–0.372	–9.330	–0.368	–9.220
North Scotland	0.343	3.520	0.331	3.430	–	–	–	–
Central Scotland	0.165	2.390	0.166	2.440	–	–	–	–
North England	–	–	–	–	–0.248	–3.210	–0.254	–3.300
Yorkshire/Humberside	–	–	–	–	–0.085	–1.230	–0.090	–1.300
Northwest England	–	–	–	–	–0.059	–0.900	–0.062	–0.960
East Midlands	–	–	–	–	0.001	0.020	–0.009	–0.120
West Midlands	–	–	–	–	–0.076	–1.200	–0.089	–1.400
East Anglia	–	–	–	–	–0.076	–0.750	–0.079	–0.780
Southeast England	–	–	–	–	0.124	1.990	0.115	1.840
Southwest England	–	–	–	–	–0.056	–0.710	–0.060	–0.760
Year dummy	–0.009	–0.140	–0.001	–0.010	0.181	5.170	0.185	5.290
Hard drug use	–0.716	–5.340	–1.868	–7.320	–0.474	–5.820	–0.925	–3.340
Correlation coefficient	–	–	0.668	4.414	–	–	0.250	1.580
Log Likelihood	–1152.47		–1484.85		–3128.74		–4313.81	
$\chi 2$ (d.f.)	307.62 (12)		552.37 (26)		694.61 (20)		1063.68 (42)	
Sample	3096		3096		11275		11275	

TABLE A3

The probability of employment with soft drug use in past year

	Scotland				England			
	Univariate		Bivariate		Univariate		Bivariate	
	Coeff.	t-ratio	Coeff.	t-ratio	Coeff.	t-ratio	Coeff.	t-ratio
Intercept	0.845	9.490	0.969	11.120	1.298	19.840	1.401	20.810
Age 16–24	–0.476	–5.640	–0.305	–3.570	–0.224	–4.350	–0.122	–2.200
Age 25–34	–0.108	–1.580	–0.081	–1.200	–0.043	–1.020	–0.008	–0.190
Married male	0.709	7.760	0.560	6.150	0.429	8.340	0.360	6.730
Single female	0.223	2.780	0.100	1.260	0.322	6.560	0.263	5.210
Married female	0.962	10.020	0.779	8.010	0.848	14.190	0.752	11.920
Has children	–0.200	–6.980	–0.195	–6.950	–0.089	–5.160	–0.091	–5.340
Non-white	0.147	0.470	0.079	0.260	–	–	–	–
Black	–	–	–	–	–0.334	–5.600	–0.351	–5.960
Asian	–	–	–	–	–0.260	–4.210	–0.313	–5.050
Other	–	–	–	–	–0.220	–2.030	–0.229	–2.130
Large city	0.047	0.460	0.046	0.460	–0.365	–9.130	–0.341	–8.520
North Scotland	0.349	3.580	0.320	3.380	–	–	–	–
Central Scotland	0.172	2.490	0.182	2.720	–	–	–	–
North England	–	–	–	–	–0.276	–3.570	–0.323	–4.200
Yorkshire/Humberside	–	–	–	–	–0.099	–1.430	–0.125	–1.830
Northwest England	–	–	–	–	–0.068	–1.040	–0.091	–1.420
East Midlands	–	–	–	–	–0.014	–0.180	–0.057	–0.750
West Midlands	–	–	–	–	–0.102	–1.600	–0.159	–2.480
East Anglia	–	–	–	–	–0.103	–1.020	–0.146	–1.450
Southeast England	–	–	–	–	0.124	1.990	0.100	1.610
Southwest England	–	–	–	–	–0.068	–0.850	–0.094	–1.200
Year dummy	–0.002	–0.030	0.032	0.500	0.179	5.110	0.187	5.410
Soft drug use	–0.393	–4.470	–1.501	–8.640	–0.379	–8.050	–1.014	–6.470
Correlation coefficient	–	–	0.639	6.356	–	–	0.360	3.827
Log Likelihood	–1156.82		–1972.76		–3113.58		–6721.61	
$\chi 2$ (d.f.)	298.92 (12)		769.99 (26)		724.94 (20)		1821.66 (42)	
Sample	3096		3096		11275		11275	

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