UNIVERSITY OF WARWICK

DEPARTMENT OF ECONOMICS

EC331 Research in Applied Economics

0910588

17 April 2012

4,971 Words

DOES DRINKING ENHANCE OR DAMAGE YOUR CAREER?

THE EFFECT OF ALCOHOL CONSUMPTION ON EARNINGS

ABSTRACT

This paper investigates the effects of alcohol consumption on wages among a large cross section of working-age males in full-time employment. Initially, under OLS, I confirm that there is an inverted U-shape relationship. The paper then rejects the hypothesis of a social capital effect and finally it shows the importance of solving the endogeneity problem of alcohol consumption. Under an IV regression, the income maximising level of weekly alcohol consumption falls significantly to 24.26 units, from 36.41 units under OLS.

CONTENTS

I. INTRODUCTION

Alcohol consumption is a "hot-topic" among many Governments, especially the British Government. In England, binge drinking is considered a major social problem and one which successive governments have fought to tackle e.g. in the last week (week commencing 19/03/12), David Cameron has proposed that a minimum price on alcohol be implemented across the UK in order to curb the anti social effects of alcohol (BBC News, 2012). The direct and immediate effects of alcohol on the human body have been known since the first evening and subsequent morning after the discovery of alcohol as a drug. For example, according to the British Crime Survey, 'alcohol was a factor in half of all violent offences in 2009-10… and in more than 1 million hospital admissions' (The Economist, 2012). The long term health effects of alcohol, to include liver damage, mental illness, drink driving, street violence etc. have also long been well documented. The Economist compares drinking in Britain to other European countries:

Figure 1 (The Economist, 2012)

Britain can be considered an anomaly where drinking levels are exceptionally high. The percentage of the population that drink more than four times a week is on a par with the EU average however the percentage that drink more than five drinks a session is 2.5 times higher than the EU average. One would normally expect (as is the case in other

countries) that as the frequency of drinking increases, the quantity per session decreases - this does not seem to hold in the UK.

Based on simple economic production functions, output is a function of capital and labour. The UK economy is the 8th largest in the World and the 3rd largest in Europe, behind Germany and France (who both, from fig. 1, drink slightly below trend). The UK labour force is over 30 million strong and very skilled (CIA, 2012). Given these facts and the effects of alcohol mentioned above, it seems pertinent to investigate how drinking affects labour market outcomes in the UK.

Further, on a more personal level, as a student who intends to enter the labour market in 5 months time, I think it would be interesting to learn whether current drinking habits are detrimental to the income that I (and many others) will receive.

In this paper, I will investigate the effects of alcohol consumption on income in the UK. The three key objectives/contributions to the literature of this study are:

1. To investigate the income alcohol relationship using UK data from 2006 - after the introduction of the 24-hour drinking law in 2005 (BBC, 2005) – in order to extend and update the only previous work on UK data, which was from 2001.
2. Test the hypothesis of the social capital effect and provide conclusive evidence on its existence/non-existence.
3. Show the importance of solving for the endogeneity problem of alcohol consumption.

In the following section I will carry out a detailed literature review; section III discusses the theory and objectives of the paper; section IV describes the data and methodology; section V examines the models and results; section VI concludes.

II. LITERATURE REVIEW

There are many well-documented studies in the medical literature which detail the health effects of alcohol consumption. The World Health Organisation (World Health Organisation, 2007) estimated that in 2002, 3.7% of all global deaths were caused by alcohol[1]. The medical literature (to include DeLabry et al. (1992), Jackson et al. (1991), Klatsky et al. (1990), Razay (1992) & Rimm (1991)), finds evidence for a U-shaped relationship between alcohol consumption and general health and risk of death by an array of diseases.[2]

In the economics literature, Grossman (1972) formalised the concept of health capital and theorised that health is a commodity to workers akin to knowledge i.e. he said that the human capital of a worker must include acquired knowledge and experience as well as their health. Grossman's idea, coupled with the medical literature has laid the groundwork for study on the effects of alcohol consumption on wages. The results of these subsequent papers suggest that there is a level of alcohol consumption which maximises health and that this level will therefore maximise a worker's health capital. This allows agents to maximise their human capital and under simple neoclassical assumptions, maximising a worker's human capital will maximise their productivity and hence maximise their wage.

Berger and Leigh (1988) were the first to formally investigate the "alcohol-wage" puzzle. They used a simple dichotomous choice model and, consequently, the results were limited, however they did find evidence of a positive relationship between alcohol consumption and wages. Their explanation of this result stemmed from the idea that

[1] Excessive drinking can cause liver damage, heart disease, stomach ulcers, throat cancer, alcoholism (a medical addiction) and can damage mental capacity.
[2] Alcohol consumption initially risk of death however there is a turning point beyond which, alcohol consumption starts to increase risk of death.

moderate alcohol consumption has beneficial physiological and psychological effects on health and so an enhanced general wellbeing would enhance labour market outcomes. Peters & Stringham (2006) and Peters (2009) both use an OLS framework to formalise a positive relationship between drinking and social capital. They said that moderate drinking in a social situation allows an expansion of the individual's network of associates and increases their social capital. They said that social capital includes a person's social skills, charisma, contacts and overall ability to take rewards from market and non-market interactions. The literature generally overlooks the social capital effect.

Hamilton & Hamilton (1997) produced some of the first research which documented an inverted U-shape relationship between alcohol consumption and wages. They controlled for the effect alcohol consumption may have on job status by only including individuals who were employed in the previous week and whose 'main activity in that week was work' (Hamilton & Hamilton, 1997, p. 139). Through analysis of prime-age males (aged 25-59), they find that moderate drinkers earn a wage premium above non-drinkers and heavy drinkers and also that heavy drinkers have 'flatter age-earnings profiles and attain lower returns for education than non and moderate drinkers' (Hamilton & Hamilton, 1997, p. 135). They also note a self-selection issue i.e. heavy drinkers choose to be heavy drinkers because they know they can handle it; they control for this by separating the sample into non-, moderate and heavy drinker categories and estimating the results separately.

Hamilton & Hamilton acknowledge the potential endogeneity issues of these tests, namely that alcohol can be considered a normal good (also noted by Macdonald & Shields (2000), Barrett (2002), Renna (2008)); so while alcohol consumption can increase wages, increased wages can increase alcohol consumption. They control for it by using a multinomial logit model that allows self-selection into alcohol consumption

groups. Barrett (2002) employs instrumental variable analysis to control for the endogeneity problem. He too finds evidence of an inverted U-shape relationship, however this is only borne out once the endogeneity is controlled for. Barrett also considers the level of intoxication rather than the frequency of drinking.

The literature suggests that one factor which plays a role in reducing the level of alcohol consumption is the individual's social responsibility. MacDonald & Shields (2000) note that dependent children significantly reduce drinking levels for men and it is noted in many of the papers that heavy drinking men are less likely to be married and/or have children. However, they also note that care must be taken here as there could easily be reverse causality. The aim of the MacDonald & Shields paper is to address the endogeneity of alcohol consumption with respect to wages (they do so using IV regressions). They use a range of instruments such as specific illnesses that would limit the ability of the individual to drink e.g. diabetes; the number of children as this responsibility is thought to affect the level of drinking; and the smoking status of the parents as this acts as a good proxy for parental drinking status and thus also for family drinking attitudes.

Kenkel & Ribar (1994) also aim to solve the endogeneity problem – they too use the IV regression method. They use the percentage of the population residing in dry counties, and family and relative alcoholism levels as their instruments. Both papers find that, when endogeneity is controlled for, moderate drinkers earn a wage premium over non-drinkers and heavy drinkers.

It is important to point out however, that while this result is common, it is not unanimous. Zarkin et al. (1998) (in contrast to earlier work by Zarkin & French (1995))

found no evidence of an inverted U-shape relationship, rather that drinkers earn a 7% wage premium above non-drinkers.

Extensions to the literature have included work by Mullahy & Sindelar (1991) who found that the effects of alcohol consumption on males was significantly larger than the effects on females. Ziebarth & Grabka (2009) tested for the effects of different alcoholic beverages. They found that those who drank wine had significantly improved labour market outcomes.

While the current literature is fairly extensive, only the MacDonald & Shields paper has been carried out on data from the UK. Further, the MacDonald & Shields paper was carried out before the introduction of the 24-hour drinking rule in the UK in 2005 (BBC, 2005). Many newspaper articles e.g. (Boseley, 2007) and (Whitehead, 2010) have reported how the 24 hour drinking laws have led to increases in violent crime and alcohol related illnesses.

This is also the first paper to generate an actual value for income maximising *weekly* alcohol consumption. Aside from French and Zarkin (1995), which estimated that income was maximised with a daily amount of 1.5-2.5 drinks *per day*, all other papers measure drinking by category e.g. non-drinkers, moderate drinkers and heavy drinkers. These categories tend to be broad and as such, the recommendations/conclusions drawn are more vague than those presented here.

III. THEORY & OBJECTIVE

The theory underlying this study combines the theory presented in the papers mentioned above. The consensus view is that there is an inverted U-shape relationship between alcohol consumption and income i.e. as alcohol consumption increases from

zero, the income received increases also; this effect is predicted to continue until a level of alcohol consumption, *x*, is reached beyond which income starts to decrease:

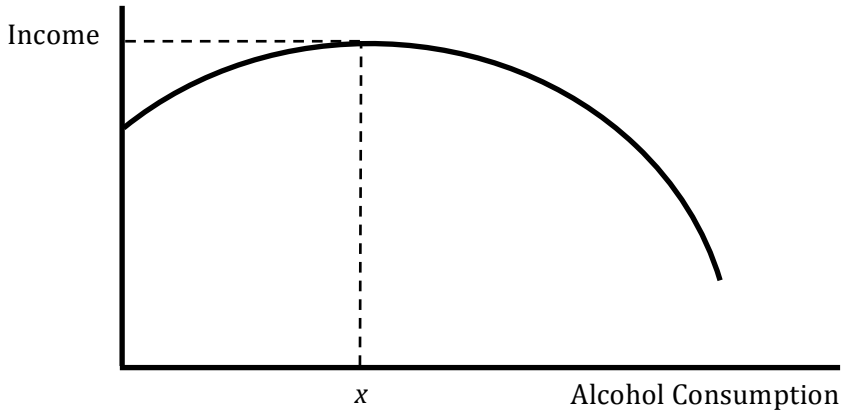

Figure 2

Testing for the existence of this relationship is the first of the three key objectives and contributions of this paper (from p. 5). The idea behind this thinking comes from two effects: the health capital effect and the social capital effect. Both concepts are extensions to the neoclassical model of human capital. They provide differing explanations of why income may increase with moderate alcohol consumption however there is a largely accepted consensus that income decreases with heavy alcohol consumption due to the marked drop in productivity which it causes.

III.I. *Health Capital*

This idea is older and more commonly used as an explanation for the inverted U-shape relationship. I shall not explain its history, as that has been done in the literature review, however the theory states that the health of a worker is an important factor in their human capital. Therefore, maximising health maximises human capital and the medical literature has shown that a moderate amount of alcohol consumption improves health. Hence, a moderate amount of alcohol consumption improves health capital and so should improve human capital and therefore worker productivity and output. We assume that the wage a worker receives is representative of his productivity and output,

so higher productivity and output leads to a higher wage. Bray (2005) formalises a neat and simple equation to express the idea:

$$\ln(w) = \alpha + \beta_1 X + \beta_2 K + \beta_3 H + \varepsilon \quad (1)$$

Where *X* is a set of standard demographic characteristics which affect the wage rate; *K* is the stock of human capital; *H* is the stock of health capital and $\beta_1, \beta_2, \beta_3 > 0$. Obviously then, higher health capital, ceteris paribus, leads to a higher wage.

III.II *Social Capital*

Glaeser et al. define social capital as a 'person's social characteristics – including social skills, charisma and the size of his Rolodex – which enables him to reap market and non-market returns from interactions with others' (Glaeser et al., 2002, p. 441). So, the wider your network and the more personable you are, the higher wage you should receive. An example of this concept is as follows: if A and B are in the same job but A has better social skills than B, then A will have a better relationship with his boss and will also build up a wider network of colleagues. Then, when a promotion becomes available, the boss will look more favourably on A due to the better relationship. There is also the possibility of job offers being made to the individual as a result of recommendations by one of his friends. Companies prefer to hire from recommendations as it saves them the search cost. This idea ties in with drinking due to the fact that 'drinking is and always has been a social activity, and to be sociable is one of the reasons people drink' (Peters, 2009, p. 2213). Testing for the social capital effect is the second of the three key objectives of this paper.

The final key objective is to solve the problem of endogeneity. Endogeneity can be caused if we assume that alcohol is a normal good. Then, an increase in income increases alcohol consumption. It is important to address the issue of endogeneity because otherwise, the estimates will be biased and the results will not be reliable.

IV. DATA & METHODOLOGY

IV.I. *Raw Data*

The dataset that I use for my study is the 2006 UK General Household Survey (GHS). The GHS is a cross-sectional, 'multi-purpose continuous survey carried out by the ONS collecting information on a range of topics from people living in private households in Great Britain', more specifically, it includes variables on individuals which cover 'migration/citizenship/national identity/ethnicity, employment, pensions, education, health, child care, smoking, drinking, family information, financial situation, and income' (ESDS, 2012). The raw dataset has over 15,000 observations and over 1,500 variables. The wide range of social topics and categories which are considered in this dataset have allowed me to test and control for a large number of social factors and have also provided an extensive list of variables for consideration as instruments. Further, the high number of observations allow for numerous restrictions to be used on the data without making the number of data points too low.

IV.II. *Methodology & Variables of Interest*

In my first and second model I use an OLS regression and in my preferred third model I use an IV regression.

The dependent variable in all three models is the log of income (measured as income in £ per week). To measure drinking, I use the continuous variable *units* which gives the quantity of units of alcohol drunk in the past week. I have generated $units^2$ so as to capture the inverted U-shape relationship.

Beyond this, I have used an extensive range of demographic variables to control for other factors that affect income (such as age, race and educational attainment), this allows me to tease out the effect of alcohol consumption on earnings. Within these

demographic variables, I feel I should note that there is a variable for general health. This variable is important so that I can control for other illnesses which may affect health capital; it allows the units variable to pick up the direct affects of alcohol on labour market outcomes, directly through its effects on health capital. For a full list of variables see appendix 1.

I have imposed a series of restrictions on the data used in my regressions. These restrictions allow for a much sounder analysis and remove the problem of spurious results. The restrictions I have used are as follows:

Owing to the different labour market behaviour of men and women, as well as their different drinking preferences and the different effects of alcohol on each gender, analysis of men and women requires separate regressions (rather than a gender dummy). Due to the remit of this paper (it is not to analyse the gender differences of alcohol) and the word limit I am faced with, I have decided to proceed on from here focussing only on males. There are a larger number of males in my sample (3161) and, on average, they drink more than women (16.74 units per week for males vs. 8.99 for females), hence it stands to reason that alcohol plays a larger role in the lives of males than females.

I have restricted the sample to individuals in full-time employment, as I do not want to include individuals who drink more because they have more free time. Further, I have placed a lower bound on the income of the individuals in the sample of £161.60 per week. I have decided on this value because it corresponds to an individual working four days a week and earning the 2006 minimum wage of £5.05 per hour for an eight hour day (£5.05 x 8 x 4 = £161.60) (Low Pay Commission, 2012). A restriction on income as well as employment status was necessary as there were individuals in the sample who

were recorded as being in full-time employment but with a weekly wage of £0.19. A four-day week can still be considered full time employment and this also allows individuals who work five days a week but less than eight hours a day to be considered in the sample.

I have limited the age band to individuals aged between 25 and 59 inclusive. This is the prime working age group; 25 has been chosen as the lower bound because by that age, individuals are more likely to have found a permanent job than immediately after graduating and I also wanted to remove the effect of an automatic wage increase as a result of e.g. the completion of a graduate programme; 59 has been chosen as the upper bound because it is sufficiently before the retirement age without removing the older individuals from the sample.

Finally, a very important step with regards to meaningful results was to restrict the alcohol consumption variable. I was initially hesitant to restrict the variable I am investigating however it was necessary as there were some blatantly incorrect data points entries. I feel that a satisfactory cut-off is at the 95th percentile, this makes the data points much more realistic while maintaining a good range of values. I therefore have excluded those individuals whose quantity of alcohol consumption is in the top 5% of the overall sample – this restricts alcohol consumption to a maximum of 63.174 units of alcohol a week (see figure 3).

The histogram below is for the male group and the red line shows where the 95th percentile cut off is (0.159% corresponds to one individual). Before being excluded, the individuals at the upper end were skewing the results, and their claims of units drunk are clearly unrealistic e.g. more than 200 a week.

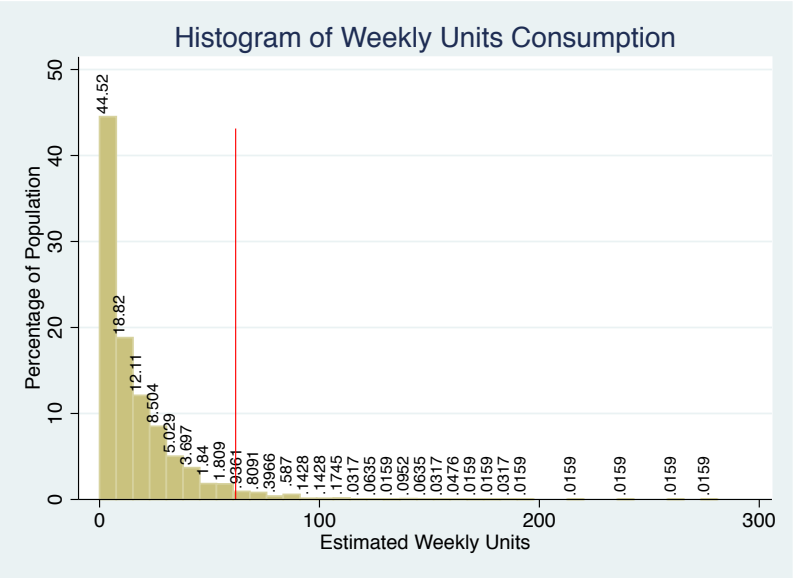

Figure 3

To summarise my restrictions on the data:

Employment Status	Full time employment
Income	Income ≥ £161.60
Units	Units ≤ 63.174
Age	25 ≤ age ≤ 59

Table 1

Once these restrictions have been taken into consideration, I have 3161 males in my dataset and, on average, they earn £37,201.50 per year and drink 16.74 units of alcohol per week.

The initial methodology is to use an OLS model to establish whether the inverted U-shape relationship exists in this sample. After this, I will use OLS again to investigate the social capital effect and finally I will use an IV regression to account for the endogeneity problem.

V. MODELS & RESULTS

I have developed three different models in my analysis, model 1 is the OLS model, model 2 uses OLS also and digs deeper into the investigation of the social capital effect and

model 3 solves the endogeneity problem. Each model addresses one of the three key objectives of the paper, the model number corresponds to the objective number. Details of the tests performed and the full results tables can be found in the appendix.

V.I. *OLS*

My OLS model (model 1) is formed as:

$$\ln(inc) = \alpha + \beta_1 units + \beta_2 units^2 + \beta_3 age + \beta_4 age^2 + \beta_5 edage + \beta_6 edage^2 + \beta_7 GenHealth + \beta_8 FreqMtFriend + \beta_9 Black + \beta_{10} Managerial + \beta_{11} Managerial\_HighQual + \beta_{12} Managerial\_MedQual$$

The model also uses robust standard errors to control for the problem of heteroscedasticity.

ln(*income*)	**Coefficient**	**Robust s.e.**	**t**
units	0.0106402	0.0017861	5.96
units²	-0.0001461	0.0000343	-4.26
age	0.0860149	0.0089026	9.66
age²	-0.0009247	0.0001049	-8.82
edage	0.1540528	0.0244046	6.31
edage²	-0.002909	0.0005909	-4.92
GenHealth	-0.0559695	0.01514	-3.70
FreqMtFriend	0.0055611*	0.0081577	0.68
Black	-0.3096402	0.0754994	-4.10
Managerial	0.2091327	0.0344346	6.07
Managerial_HighQual	0.1862219	0.0389978	4.78
Managerial_MedQual	0.1296656	0.0418575	3.10
Constant	2.398225	0.3248957	7.38
Number of Observations	2925		
R-Squared	0.2450		

* denotes coefficient is insignificant

Table 2

Model 1 provides evidence in support of the inverted U-shape relationship – note the coefficient is positive on *units* and negative on *units²*. Differentiating ln(*income*) with respect to *units* allows us to see what the income maximising level of alcohol consumption is. In this model, income is maximised at 36.41 units of alcohol per week.

This value seems particularly high; especially since the recommended weekly alcohol consumption for males in the UK is 21 units (patient.co.uk, 2012).

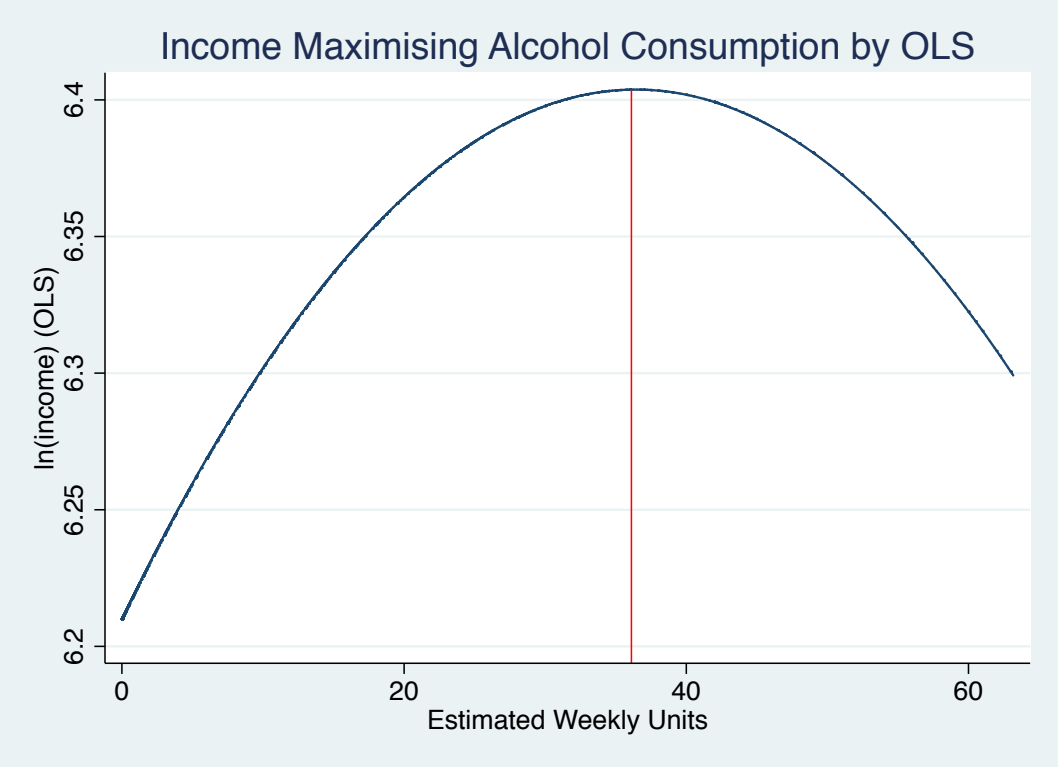

Figure 4

The coefficients on the *age* and *edage* variables show that there is a quadratic relationship, as was expected.[3] Individuals in this sample maximise their earnings at an age of 46.5 years. There is a negative coefficient on *GenHealth* because an increasing value of this variable indicates a worsening of health.[4] A worsening of general health reduces health capital, and thus human capital also – therefore lowering productivity and hence wage.

[3] As your age increases, mental capacity and productivity falls and as such income should fall. With *edage*, there is a trade-off between educational attainment and work experience. The longer you stay in education, the less time you have to gain valuable work experience and so the less attractive you are to employers. Also, individuals wishing to e.g. go into academia require a lot of education (PhD etc.) but the academia profession is not at the top end of the pay scale.
[4] The options for *GenHealth* are very good, good, fair, bad, very bad.

There is racial wage discrimination with black males earning 31% less than their colleagues. This was to be expected as work by Tebaldi & Kim (2011), Lang & Manove (2011), Smith (2012), Rojas-Hayes (2008) and Huyser et al. (2010) are just a few examples of studies describing racial discrimination in the labour market.

We also find that managers earn 21% more than non-managers, however, a manager with a medium level qualification earns an additional 13% above that while managers with high qualifications earn an additional 18.6% above the original 21% increase. The logic here is that a more qualified person is able to enter a career path with a steeper earnings profile and so reaching the position of manager has larger benefits e.g. a manager in an office vs. a manager in a fast-food restaurant.

The coefficient on *FreqMtFriend* is insignificant, so model 1 provides no evidence to support the social capital theory. However this variable has no specific links to drinking and so this leads us to the development of model 2 to investigate social capital further.

V.II. *Social Capital*

For model 2, I have used OLS again; I have created variables which combine drinking frequency (*drinktype*) with drinking quantity (*units*). *Drinktype* classes individuals as non-drinkers, moderate drinkers or heavy drinkers (type 1, 2 or 3 respectively) in terms of the frequency of their drinking. I have created low, medium and high groups for the units of alcohol consumed, and created a variable which classes individuals according to their frequency and quantity of drinking:

Drinking Frequency		Drinking Quantity	
Drink Type 1	Drink less than once or twice a month	Not applicable as units is insignificant on wages	
Drink Type 2	Drink between one and four days a week	Low	units ≤ 5
		Medium	5 < units ≤ 25
		High	25 < units
Drink Type 3	Drink more than four days a week	Low	units ≤ 10
		Medium	10 < units ≤ 30
		High	30 < units

Table 3

e.g.: if an individual is in the group *drinktype*2*_h* then they drink between one and four days per week and more than 25 units per week. In model 2 *drinktyp1* is the default as *units* has an insignificant effect on wages for individuals in this category.

Model 2 uses robust standard errors and is estimated as:

$$\ln(inc) = \alpha + \beta_1 drinktype2\_l + \beta_2 drinktype2\_m + \beta_3 drinktype2\_h + \beta_4 drinktype3\_l + \beta_5 drinktype3\_m + \beta_6 drinktype3\_h + \beta_7 age + \beta_8 age^2 + \beta_9 edage + \beta_{10} edage^2 + \beta_{11} GenHealth + \beta_{12} Black + \beta_{13} Managerial + \beta_{14} Managerial\_HighQual + \beta_{15} Managerial\_MedQual$$

ln(*income*)	**Coefficient.**	**Robust s.e.**	**t**
drinktype2_l	0.060095*	0.0489457	1.23
drinktype2_m	0.1336337	0.0228531	5.85
drinktype2_h	0.1907859	0.0317047	6.02
drinktype3_l	-0.1484714*	0.1659798	-0.89
drinktype3_m	0.0865296	0.0376116	2.30
drinktype3_h	0.1571424	0.0349383	4.50
age	0.0887107	0.0087006	10.20
age²	-0.000953	0.0001019	-9.35
edage	0.1539905	0.0237004	6.50
edage²	-0.0029239	0.0005737	-5.10
GenHealth	-0.0541069	0.0147806	-3.66
Black	-0.3279534	0.0688124	-4.77
Managerial	0.2239961	0.0337793	6.63
Managerial_HighQual	0.1808624	0.0382477	4.73
Managerial_MedQual	0.121638	0.0406724	2.99
Constant	2.348896	0.3186068	7.37
Number of Observations	3159		
R-Squared	0.2461		

*denotes insignificant coefficient

Table 4

Model 2 allows us to test whether simply going for a drink increases your wage or whether it is the actual drinking itself. Insignificant coefficients on both *drinktype2_l* and *drinktype3_l* show that those who go for a drink between once a week and every day of the week but drink very little while they are there do not earn a wage premium above those individuals who do not drink or hardly drink at all. The increase in wages is only due to the quantity of alcohol consumed, not the frequency of consumption. Therefore, model 2 provides evidence to conclusively reject the hypothesis of the social capital effect; in order to earn a wage premium above non-drinkers, the individual has to drink more than them, not just go to the pub and socialise. Perhaps those individuals who go to the pub but do not drink get isolated as non-drinkers and are unable to build the informal relationship with their boss which would serve them well in the future.

The signs of the coefficients on all the other variables remain unchanged. As I have proved that there is no social capital effect, from here on, I will just consider the units variable for alcohol consumption.

V.III. *IV*

By considering alcohol as a normal good, the OLS model suffers from endogeneity. Predicting the residuals from model 1 and regressing these on the units variables shows that there is a significant correlation thus proving that the *units* variable is endogenous; and therefore, by construction, so is $units^2$ (see A4).

Searching for relevant and exogenous variables has been an arduous process. I have found two dummy variables; firstly *uk* states whether the individual was born in the UK and *devout* states whether the individual is devoutly religious. The country of birth acts as a proxy for drinking attitudes while all major religions frown upon drinking.

Theoretically, both variables should impact alcohol consumption but have little effect on income. Table 4 below reports the estimates for model 3.

ln(*income*)	**Coefficient**	**Robust s.e.**	**t**
units	0.0332583	0.103047	0.32
units²	-0.0006854	0.0027952	-0.25
age	0.0849656	0.0208524	4.07
age²	-0.0009062	0.0002597	-3.49
edage	0.1422053	0.069019	2.06
edage²	-0.0025921	0.0017974	-1.44
GenHealth	-0.0482423	0.0219976	-2.19
Black	-0.2731312	0.119644	-2.28
Managerial	0.216835	0.0376133	5.76
Managerial_HighQual	0.1676473	0.0553971	3.03
Managerial_MedQual	0.1078168	0.0747019	1.44
Constant	2.415281	0.7408493	3.26
Number of Observations	3159		
R-Squared	0.1790		

(*units & units²* instrumented)

Table 5

The insignificance of the *units* and *units²* variables is due to the fact that with IV regressions, fitted values are used instead of exact values and this brings greater uncertainty. The coefficients can however still be interpreted as normal.

Once endogeneity is controlled for, the income maximising alcohol consumption level falls from model 1's unrealistically high level of 36.41 units per week to 24.26 units per week. This seems a much more plausible level as it is much closer to the recommended weekly amount of 21 units. This change shows the importance of controlling for endogeneity.

It is interesting to note that the income maximising level of alcohol consumption of 24.26 units per week is over 7.5 units per week higher than the sample average of 16.74 units.

Once endogeneity is controlled for, we can see that alcohol has a "steeper" impact on wages, i.e. that wages increase and decrease with alcohol consumption at a faster rate than in model 1:

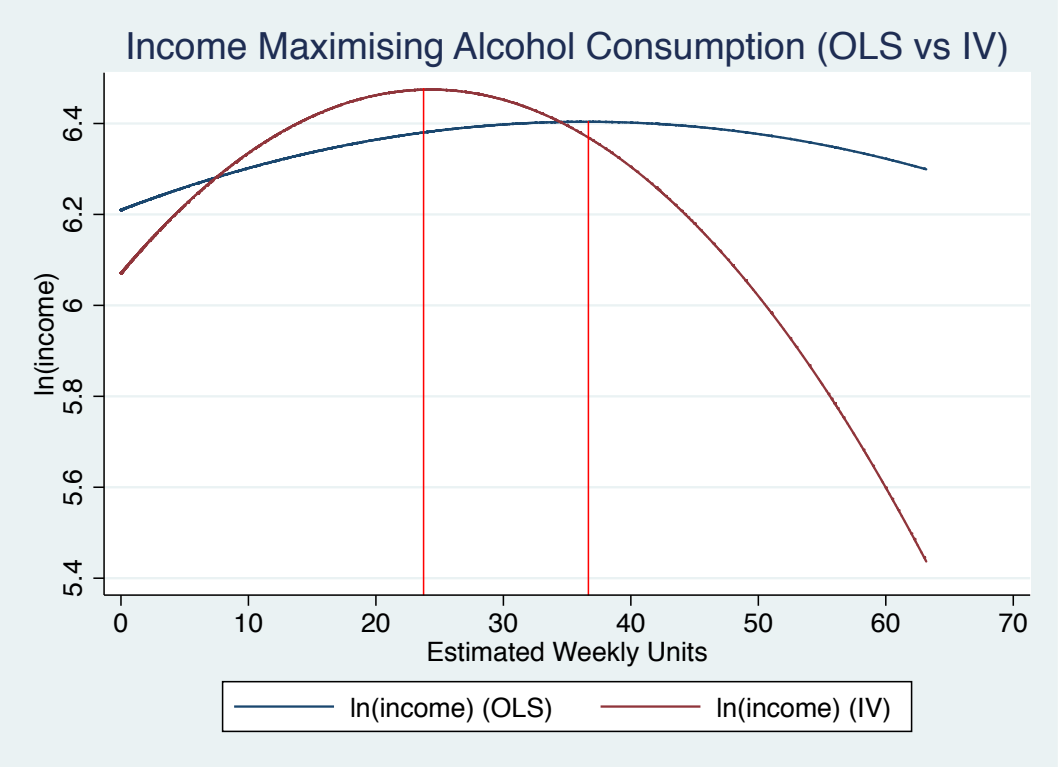

Figure 6

As in model 2, there is very little change from model 1 on the coefficients of all the other variables. This fact suggests that the instruments are good since their use has only affected the *units* and $units^2$ terms.

VI. Conclusions & Extensions

In this paper I have investigated the impact of alcohol consumption on income on a 2006 sample of UK full-time working males. Model 1 provided evidence to support the theory of the inverted U-shape relationship found in some of the other literature. While the relationship between income and alcohol consumption was as the literature would suggest, the income maximising level of alcohol consumption seemed unrealistically high at 36.41 units.

Model 2 investigated the social capital effect formalised by Peters (2009) and Peters & Stringham (2006). The model presented conclusive evidence to reject the concept of the social capital effect in this data. Model 2 does provide room for further research, investigating the frequency of drinking with work colleagues would provide a more robust conclusion. A further possibility of social capital in general would be to investigate whether the individual socialises with work colleagues, regardless of drinking. The link between social capital and drinking is based on the theory that the majority of work socialising takes place in a drinking environment; one could argue that if work colleagues socialise in a non-drinking environment then they have a stronger social relationship and this may reap larger returns in the labour market. I was unable to do this due to unavailability of this data in my dataset.

Model 3 solved for the problem of endogeneity of alcohol consumption by instrumenting with variables for country of birth being in the UK and being devoutly religious. This IV regression reduced the income maximising level of alcohol consumption to what appears to be a much more sensible level of 24.26 units per week. While the empirics are econometrically sound and the results realistic, there are other variables which present a more theoretically appealing case to be used as instruments. Such variables include parental drinking status, proximity to a vendor of alcohol, friend/work colleague attitudes to drinking. Again, none of these variables were available to me in my dataset.

One final extension would be to use a panel data set to see how individual drinking habits affect income over time, and it would be interesting to use a dataset that spanned either side of the introduction of the 24-hour drinking law in 2005.

The results of this paper imply certain policy implications, namely that Governmental action to sharply reduce the level of alcohol consumption could have adverse effects and

instead, they should seek to promote a moderate level of alcohol consumption which will maximise worker productivity, wages and hence overall society welfare through a higher national income.

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VIII. APPENDIX

A1: *Full list of variables*

Variable	Definition
ln(income)	Natural logarithm of income
units	Continuous variable of the estimated number of units of alcohol consumed in a week.
units^2	The squared term of *units*.
edage	The age that the individual left full-time education.
edage^2	The squared term of *edage*.
GenHealth	Health in general. Individuals respond very good, good, fair, bad or very bad.
FreqMtFriend	Records the answer to the question "How often do you see friends?" Answers range from daily to never.
Black	A self-generated dummy variable which takes a value of 1 if the individual is black; 0 otherwise.
managerial	A self-generated dummy variable which takes a value of 1 if the individual works as a manager; 0 otherwise.
managerial_qual_h	A self-generated dummy variable which takes a value of 1 if the individual is a manager with a high qualification.
managerial_qual_m	A self-generated dummy variable which takes a value of 1 if the individual is a managers with a medium qualification.
mdrinktype2_l	A self-generated dummy variable which takes a value of 1 if the individual is in *drinktype*2 for frequency and a low quantity drinker.
mdrinktype2_m	A self-generated dummy variable which takes a value of 1 if the individual is in *drinktype*2 for frequency and a medium quantity drinker.
mdrinktype2_h	A self-generated dummy variable which takes a value of 1 if the individual is in *drinktype*2 for frequency and a high quantity drinker.
mdrinktype3_l	A self-generated dummy variable which takes a value of 1 if the individual is in *drinktype*3 for frequency and a low quantity drinker.
mdrinktype3_m	A self-generated dummy variable which takes a value of 1 if the individual is in *drinktype*3 for frequency and a medium quantity drinker.
mdrinktype3_h	A self-generated dummy variable which takes a value of 1 if the individual is in *drinktype*3 for frequency and a high quantity drinker.
uk	A self-generated dummy variable which takes a value of 1 if the individual was born in the UK.
devout	A self-generated dummy variable which takes a value of 1 if the individual is devoutly religious.
jobstatus	Gives an individual's employment status. Answers can be unpaid family worker, NA, child, working, unemployed, inactive.

A2: *Model* 1

From STATA, a test for heteroscedasticity:

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
H_0: Constant variance
Variables: fitted values of ln(*income*)

$chi^2(1)$ = 114.23
Prob > chi^2 = 0.0000

Hence we reject the null of homoscedastic standard errors and use robust standard errors.

Full results table:

ln(*income*)	**Coefficient**	**Robust s.e.**	**t**	**P>t**	**95% Confidence Interval**	
units	0.0106402	0.0017861	5.96	0.000	0.0071381	0.0141423
units²	-0.0001461	0.0000343	-4.26	0.000	-0.0002134	-0.0000788
age	0.0860149	0.0089026	9.66	0.000	0.0685588	0.103471
age²	-0.0009247	0.0001049	-8.82	0.000	-0.0011304	-0.000719
edage	0.1540528	0.0244046	6.31	0.000	0.1062008	0.2019048
edage²	-0.002909	0.0005909	-4.92	0.000	-0.0040675	-0.0017504
GenHealth	-0.0559695	0.01514	-3.70	0.000	-0.0856556	-0.0262833
FreqMtFriend	0.0055611	0.0081577	0.68	0.495	-0.0104344	0.0215566
Black	-0.3096402	0.0754994	-4.10	0.000	-0.4576779	-0.1616026
Managerial	0.2091327	0.0344346	6.07	0.000	0.141614	0.2766514
Managerial_HighQual	0.1862219	0.0389978	4.78	0.000	0.1097559	0.2626879
Managerial_MedQual	0.1296656	0.0418575	3.10	0.002	0.0475924	0.2117389
Constant	2.398225	0.3248957	7.38	0.000	1.761176	3.035274

F- test critical values:

F(1,∞)	
1%	6.63
5%	3.84
10%	2.71

test FreqMtFriend
(1) FreqMtFriend = 0
F(1, 2912) = 0.46
Prob > F = 0.4955
-> Do no reject null of the coefficient = 0.

A3: *Model* 2

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
H_0: Constant variance
Variables: fitted values of ln(*income*)

$chi^2(1)$ = 125.52
Prob > chi^2 = 0.0000

Hence we reject the null of homoscedastic standard errors and use robust standard errors.

Running the regression for only *drinktype1* and testing for the significance of *units* and *units²* yielded:

test units_w
(1) units_w = 0
F(1, 549) = 4.96
Prob > F = 0.0263

test units_w_sq
(1) units_w_sq = 0
F(1, 549) = 1.96
Prob > F = 0.1624

So we are unable to reject the null that the coefficients are different from 0. So *drinktype1* is used as the default.

Full results table:

ln(*income*)	**Coefficient**	**Robust s.e.**	**t**	**P>t**	**95% Confidence Interval**	
mdrinktype2_l	0.060095	0.0489457	1.23	0.220	-0.0358738	0.1560639
mdrinktype2_m	0.1336337	0.0228531	5.85	0.000	0.0888253	0.1784422
mdrinktype2_h	0.1907859	0.0317047	6.02	0.000	0.1286219	0.2529499
mdrinktype3_l	-0.1484714	0.1659798	-0.89	0.371	-0.4739111	0.1769683
mdrinktype3_m	0.0865296	0.0376116	2.30	0.021	0.0127838	0.1602753
mdrinktype3_h	0.1571424	0.0349383	4.50	0.000	0.0886381	0.2256466
age	0.0887107	0.0087006	10.20	0.000	0.0716514	0.1057701
age²	-0.000953	0.0001019	-9.35	0.000	-0.0011529	-0.0007531
edage	0.1539905	0.0237004	6.50	0.000	0.1075207	0.2004603
edage²	-0.0029239	0.0005737	-5.10	0.000	-0.0040486	-0.0017991
GenHealth	-0.0541069	0.0147806	-3.66	0.000	-0.0830874	-0.0251263
Black	-0.3279534	0.0688124	-4.77	0.000	-0.4628751	-0.1930317
Managerial	0.2239961	0.0337793	6.63	0.000	0.1577643	0.2902279
Managerial_HighQual	0.1808624	0.0382477	4.73	0.000	0.1058695	0.2558553
Managerial_MedQual	0.121638	0.0406724	2.99	0.003	0.041891	0.2013851
Constant	2.348896	0.3186068	7.37	0.000	1.724198	2.973594

Significance Tests:

test mdrinktype2_l (1) mdrinktype2_l = 0 F(1, 3143) = 1.51 Prob > F = 0.2196	Do not reject null of the coefficient = 0
test mdrinktype2_m (1) mdrinktype2_m = 0 F(1, 3143) = 34.19 Prob > F = 0.0000	Reject null of the coefficient = 0
test mdrinktype2_h (1) mdrinktype2_h = 0 F(1, 3143) = 36.21 Prob > F = 0.0000	Reject null of the coefficient = 0
test mdrinktype3_l (1) mdrinktype3_l = 0 F(1, 3143) = 0.80 Prob > F = 0.3711	Do not reject null of the coefficient = 0
test mdrinktype3_m (1) mdrinktype3_m = 0 F(1, 3143) = 5.29 Prob > F = 0.0215	Reject null of the coefficient = 0
test mdrinktype3_h (1) mdrinktype3_h = 0 F(1, 3143) = 20.23 Prob > F = 0.0000	Reject null of the coefficient = 0

A4: *Model* 3

Tests for instrument relevance and exogeneity

Instrument relevance w.r.t. *units*: test devout uk (1) devout = 0 (2) uk = 0 F(2, 3147) = 34.10 Prob > F = 0.0000	Instruments are relevant
Instrument relevance w.r.t. $units^2$: test devout uk (1) devout = 0 (2) uk = 0 F(2, 3147) = 17.09 Prob > F = 0.0000	Instruments are exogenous
Instrument exogeneity w.r.t. *units*: test devout uk (1) devout = 0 (2) uk = 0 F(2, 3147) = 0.00 Prob > F = 1.0000 J = 2 x 0.00 = 0.00	Instruments are relevant
Instrument exogeneity w.r.t. $units^2$: test devout uk (1) devout = 0 (2) uk = 0 F(2, 3147) = 0.00 Prob > F = 1.0000 J = 2 x 0.00 = 0.00	Instruments are exogenous

Full results table:

ln(*income)*	Coef.	Robust s.e.	t	P>t	95% Confidence Interval	
units	0.0332583	0.103047	0.32	0.747	-0.1687101	0.2352268
units^2	-0.0006854	0.0027952	-0.25	0.806	-0.0061639	0.0047931
age	0.0849656	0.0208524	4.07	0.000	0.0440956	0.1258355
age^2	-0.0009062	0.0002597	-3.49	0.000	-0.0014151	-0.0003973
edage	0.1422053	0.069019	2.06	0.039	0.0069305	0.2774800
edage^2	-0.0025921	0.0017974	-1.44	0.149	-0.0061149	0.0009308
GenHealth	-0.0482423	0.0219976	-2.19	0.028	-0.0913568	-0.0051279
Black	-0.2731312	0.119644	-2.28	0.022	-0.5076291	-0.0386333
Managerial	0.216835	0.0376133	5.76	0.000	0.1431143	0.2905557
Managerial_HighQual	0.1676473	0.0553971	3.03	0.002	0.0590710	0.2762236
Managerial_MedQual	0.1078168	0.0747019	1.44	0.149	-0.0385963	0.2542298
Constant	2.415281	0.7408493	3.26	0.001	0.9632432	3.8673190