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THE ASSOCIATION OF ALCOHOL DEPENDENCY WITH EMPLOYMENT PROBABILITY:

Evidence from the population survey "Health 2000 in Finland"

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ABSTRACT: In this paper we investigate to what extent alcohol dependent individuals fare worse in the Finnish labour market, using data from a large Finnish health survey. We used the ICD-10 criteria for alcohol dependence assessed by a structured diagnostic interview (CIDI). We find that there are substantial disadvantages for alcohol dependent men and women in the labour market, in the sense that they have lower employment probabilities. Treating alcohol dependence as an exogenous variable, we find that alcohol dependence is associated with a decrease in the probability of full time work of around 15% for men and 13% for women. However, accounting for endogeneity increases the negative effect to some 20-25% for men and to some 40-50% for women.

KEY WORDS: Alcohol, alcoholism, employment, Finland

JEL : I120, J230

JOHANSSON, Edvard, **ALHO,** Hannu, **KIISKINEN,** Urpo, **POIKOLAINEN,** Kari, **ALKOHOLIRIIPPUVUUS JA TODENNÄKÖISYYS OLLA KOKOPÄIVÄTYÖSSA**: **Tuloksia "Terveys 2000" aineistosta.** Helsinki: ETLA, Elinkeinoelämän Tutkimuslaitos, The Research Institute of the Finnish Economy, 2004, 28 s. (Keskusteluaiheita, Discussion Papers, ISSN 0781-6847; No. 921).

TIIVISTELMÄ: Tutkimus tarkastelee alkoholiriippuvaisten henkilöiden asemaa suomalaisilla työmarkkinoilla hyödyntäen suurta terveyskyselyaineistoa. Alkoholiriippuvuutta mitataan strukturoidun kyselymenetelmän (CIDI) avulla rakennetulla ICD-mitalla. Tutkimuksessa havaittiin, että alkoholiriippuvaisilla miehillä ja naisilla on huomattavasti ei-alkoholiriippuvaisia miehiä ja naisia alhaisempi todennäköisyys olla kokopäivätyössä. Käsiteltäessä alkoholiriippuvuutta eksogeenisena muuttujana, havaittiin että alkoholiriippuvaisilla miehillä on 15% ja alkoholiriippuvaisilla naisilla on 13% alhaisempi todennäköisyys olla kokopäivätyössä. Huomioiden ilmeinen alkoholiriippuvuuden endogeenisuus, havaittiin että miehillä on 20-25% ja naisilla 40-50% alhaisempi todennäköisyys olla kokopäivätyössä.

AVAINSANAT: Alkoholi, alkoholismi, työllisyys, Suomi

JEL : I120, J230

1 Introduction

Alcohol abuse has substantial negative social and economic effects. One particular issue concerns the negative effects of alcohol dependency on productivity and individual success in the labour market. As a response to this, there have been many examples of policies attempting to reduce the harmful effects on productivity arising from chronic heavy alcohol consumption by employees. One well-known example is Michael Gorbachev's attempt to raise productivity in the Soviet economy by raising the price of alcohol in order to reduce alcohol consumption in the mid 1980s. In the US and in some Scandinavian countries, the consumption of alcohol was completely prohibited during the 1930s. And still today, a state run monopoly is the only legal seller of alcohol in Finland, Sweden, and Norway.

Despite the potentially very large negative effects of alcohol abuse on productivity and the employment potential of the individual there is surprisingly little research done on the issue. And although there are a few studies using Canadian, UK, and Australian data, the bulk of the available research concerns the United States only. One likely reason for why more research has not been done on this topic is that data on alcohol consumption rarely are found in those datasets that economists use. This is particularly true for data on alcohol dependence that is not based on self-reported measures of alcohol consumption.

In this paper we investigate to what extent alcohol dependence affects labour market success in terms of the probability of full time employment, for men and women in Finland. We use information from a new, comprehensive Finnish population health survey, the "Health 2000" dataset. A unique feature of this dataset is that it contains, in addition to the more conventional measures of alcohol consumption and alcohol abuse, individual laboratory measures of markers of heavy alcohol consumption, such as HDL-cholesterol, and gamma glutamyltransferase. The data set is also very rich in terms of information on health and other background data, that potentially can be used as instruments to overcome the potential problem of alcohol dependency being endogenously determined, that is, being more or less related to other characteristics of the individual. Another strength of the data is, of course, that it has only recently been collected.

Furthermore, the Finnish case is also currently of special interest, as the high alcohol taxes have been reduced somewhat in anticipation of Estonia's entry into the European Union on the 1st of May, 2004. The major reason for the tax cut is to limit the amounts of cheap alcohol imported from Estonia by Finnish residents. Despite of this policy measure recent figures reveal that alcohol consumption has increased sharply in Finland, which in turn increases the risk of the occurrence of problem drinking and possibly productivity losses.

2 Previous research

The existing literature on the relationship between alcohol consumption and success in the labour market can be divided into two groups based on how alcohol consumption or alcohol dependency has been measured. In the first group of studies researchers have used self-reported amounts of alcohol (i.e. how many drinks a person has consumed during the last week or a similar measure) to explain various measures of labour market success, most often in terms of some measure of wages. In the second, smaller group of studies, some more medically oriented measure of problem drinking, such as alcohol dependence or alcohol abuse, has been related to labour market success.

In the first group of studies, the aim has mostly been to estimate some kind of Mincer-type earnings equation, with alcohol consumption as one of the explanatory variables. The fundamental problem in such studies is that alcohol consumption and earnings may be jointly determined. In most cases, researchers have attempted to overcome this problem by either employing instrumental variable techniques, or incorporating Heckman-style selectivity terms in the earning regressions. In both these techniques, instruments that are uncorrelated with labour market success but correlated with alcohol consumption are needed. Several different instruments have been used in these attempts. One strand of the literature has used long-term, non-acute illnesses, such as asthma or diabetes as instruments (McDonald and Shields, 2001). The reasoning is in this case that these illnesses inhibit drinking to some extent, but are not severe enough, in a statistical sense, themselves to affect labour market success. Another approach has been to use information on alcohol habits or alcohol dependency of the parents (e.g. Mullahy and Sindelar, 1996). Indeed, there is a large body of medical research showing that the probability of developing alcohol dependency is influenced by hereditary factors

(Nestker, 2000). However, it is not clear whether such an instrumental variable strategy always will be successful, as numerous factors from being raised in a family with an alcohol dependent individual probably influence the children's work. Thus, it is quite possible that parental alcohol dependency may be related to children's labour market success independently of drinking. A third approach has been to use indicators of a more macroeconomic type, such as differences in alcohol taxes between regions in a country, which affect alcohol consumption but not necessarily labour market success (e.g. Barrett 2001). Finally, Heien (1996) and Hamilton & Hamilton (1997) both used measures of religiosity as instruments. Thus, it is possible that religious individuals drink less, but they are doing as well as everybody else on the labour market.

In general, the results in this literature indicate that there is a non-linear relationship between labour market success and alcohol consumption, such that moderate drinkers have higher wages than teetotallers and higher wages than those who consume large quantities of alcohol (French and Zarkin, 1995, Heien 1996, Hamilton and Hamilton 1997, McDonald and Shields 2001, and Barrett 2002). Some studies however, find no penalties for heavy drinking, (Zarkin et al. 1998), while others find no evidence for benefits in terms of labour market success from moderate drinking over abstinence (Bryant et al. 1992)[1]. Interestingly, these results on the positive labour market effects of moderate alcohol consumption are reminiscent of recent medical studies that have reinforced the consistent finding of a J-shaped inverse association between alcohol consumption and cardiovascular disease morbidity and mortality, primarily due to an association between alcohol consumption and coronary heart disease. Epidemiological studies are surprisingly consistent in showing that light to moderate alcohol intake has an inverse association with the risk of cardiovascular disease morbidity and mortality compared with those who do not drink at all. The depth and width of the J-shaped inverse association is largely dependent upon the underlying lowered risk of coronary disease. Alcohol likely reduces the risk of cardiovascular disease through increases in plasma high density lipoprotein-cholesterol (HDL) levels (Sesso 2001). Further support for the HDL hypothesis comes from the lack of a differential effect of alcohol by beverage type, suggesting that ethanol is responsible for the protective effect. While other mechanisms for a reduced risk of cardiovascular disease by alcohol have been suggested - including hemostatic markers and improvements and insulin sensitivity - evidence remains preliminary (Yamada et al. 2003)

[1] An overview of the results in the literature on the labour market effects of alcohol consumption and alcohol dependency can be found in Table 1.

The other group of studies use some kind of indicator of alcohol dependency or alcohol abuse in order to investigate its effects on labour market success. In most cases, this indicator has been constructed with the help of data obtained by a professionally designed survey instrument, typically the Diagnostic Interview Schedule (DIS). This survey instrument consists of a series of questions on symptoms of alcohol consumption, and if the interviewee has a significant number of symptoms he or she is classified as being alcohol dependent. These measures have otherwise typically been used by psychiatrists in clinical settings. Thus, this type of research focuses more on the disease perspective of alcohol dependency. Indeed, in some of the studies in this category, alcohol dependency is treated as exogenous to labour market success (Mullahy and Sindelar, 1991, 1993). Other studies, (Kenkel and Ribar, 1994, and Mullahy and Sindelar 1996), treat alcohol intake as endogenous and use instrumental variable techniques similar to those described in the previous section. It should be noted that no study conducted outside the USA or the UK has used these kinds of survey instruments as measures of alcohol dependency in order to investigate the labour market effects of alcohol dependency.

These UK and US studies find in general that alcohol dependency is associated with substantial labour market penalties, in the form of lower wages, higher unemployment, and lower rates of labour market participation (Kenkel & Ribar 1994, Mullahy and Sindelar 1991, 1993, 1996, MacDonald & Shields, 2004). In addition the results of theses studies indicate that one needs to differentiate between “direct” and “indirect” effects of alcohol dependency. Thus it seems that alcohol dependency not only directly affects labour market success, but it also affects labour market success because alcohol dependent individuals, for example, tend to have less education, which in turn affects success in the labour market. There also seem to be gender differences in this respect, as the indirect effects of alcohol dependency seem to be more important for women than for men (Mullahy and Sindelar 1991).

3 Theoretical framework and empirical approach

Since Grossman (1972), measures of individual health status have been included in models of labour market success. In the basic framework, typically earnings or the probability of being employed is modelled as a measure of labour market success and as a function of human and health capital variables:

$$y = y(H, K) \tag{1}$$

where *y* is some measure of an individual's labour market success, *H* is a measure of an individual's health capital and *K* is a measure of an individual's other human capital. Obviously, better health and greater human capital are both assumed to improve an individual's labour market success. In our case, the health capital variable can be thought of as consisting of two parts, one of which is alcohol dependency and alcohol-dependent health problems and the second is other health capital.

In this paper we estimate, guided by the theoretical considerations just presented, models of the following type:

$$y_i = \alpha + \beta ALC_i + \overline{\delta X}_i + \varepsilon_i \tag{2}$$

where y_i is a measure of the labour market success of the individual *i*, α is an intercept, ALC_i is a measure of whether the individual is an alcohol dependent individual or not, $\overline{X}_i$ is a vector of human capital, health, and other control variables that may affect labour market success, and ε_i is an error term. β and $\overline{\delta}$ are parameters to be estimated. Because in this study we investigate whether alcohol dependency affects an individual's propensity to be employed or not, the dependent variable is binary, and consequently, equation (2) will be estimated by limited dependent variable (probit) methods[2].

Clearly, it is not unlikely that the health capital and human capital of an individual are correlated. Thus it is possible that, for example, alcohol dependent individuals acquire less human capital in terms of education than do non-alcohol dependent individuals. In the empirical investigation to follow, we acknowledge this fact by looking at both the effects of alcohol dependency on labour market success holding measures of human capital and health capital constant, and the "total" effects of alcohol dependency where these measures are not held constant. A priori, one would expect that controlling for human capital and other health indicators decrease the effects of alcohol dependency.

A further aspect concerns the possibility that our alcohol dependency measure is not exogenous in equation (2). Technically this means that the error term ε_i is correlated with our alcohol dependency measure ALC_i. If this is the case the coefficient β will be biased. If alcohol dependency is not exogenous in our equation for labour market success, then some kind of instrumental variable approach is needed. In such an approach one needs to instrument alcohol dependency with an instrument that is correlated with alcohol dependency, but uncorrelated with labour market success. However, *a priori* it is not clear whether alcohol dependency is endogenous in this kind of setting, and consequently there is, in an econometric context, a need to test whether this is the case. Several such tests have been developed. For example Smith & Blundell (1986) describe one such test. First, one runs an OLS regression, where alcohol dependency is explained by all exogenous variables in $\overline{X}_i$, as well as some instrument(s). The residual from that regression is then used as an additional regressor in the original probit equation, in this case equation (2). It is then possible to test whether the residuals have any explanatory power in the original probit equation. If this is the case, there is evidence that our alcohol dependency measure is endogenous in the equation for labour market success. This approach is also used in this paper.

4 Data

This study is based on the "Health 2000" population survey dataset[3]. This dataset has been constructed in order to give a comprehensive picture of the health and functional ability of the working-age and old-aged Finnish population. The basic dataset comes from a random sample of 10 000 individuals from the entire country, and the information has been collected during the year 2000 by means of personal interviews, telephone interviews, and professional health examinations. Supplementary information has been obtained from various government registers. Due to the fact that the data set includes results from clinical examinations, the sampling design had to include regional clustering. A stratified two-stage sampling design was used with local Health Center Districts (comprising one or several municipalities) as the first-stage sampling units (i.e. regional clusters). There were a total of 249 regional clusters in the popu-

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[2] The limited dependent variable takes the value 1 if the individual is in full time work, and 0 if the individual works part time, is unemployed, or outside the labour force.

[3] See Aromaa and Koskinen (2002) for a comprehensive discussion of the Health 2000 data set.

lation. A total of 15 certainty strata (the 15 largest towns) were first formed as clusters with probability of one. The remaining 234 clusters were then divided into five regional strata, covering the whole (mainland) Finland. A total of 65 clusters were drawn from these strata by systematic PPS sampling with inclusion probabilities proportional to the size of the target population in a cluster. Thus, the total number of strata and first-stage sample clusters was 20 and 80, respectively[4].

The second-stage sample (about 8,000 people aged 30 years or over) was allocated proportionally to the strata. People aged 80 or over were over-sampled with a double inclusion probability relative to the younger age groups. Finally, individual persons were selected from each stratum with systematic sampling from an implicitly stratified frame register. About 88% of the sample persons were interviewed, 80% attended a comprehensive health examination and 5% attended a condensed examination at home. The most essential information on health and functional capacity was obtained from 93% of the subjects.

Of course, estimation without taking into account the sampling structure of the Health 2000 dataset makes it possible that the estimates are biased. Consequently, in all estimations in this paper, the sampling structure has been taken into account by using appropriate survey estimation methods.

An advantage of the Health 2000 dataset is that it is extremely rich in information on health status and health behaviour of the individuals. The dataset not only contains very detailed information on individual drinking behaviour, but also data on medically verified alcohol dependence (i.e. alcohol dependency as it is defined in the SCID-II classification, Fogelson et al. 1991) and clinical measures of markers of heavy alcohol consumption, such as HDL-cholesterol, and gamma glutamyltransferase. However, it is less complete concerning labour market information. It is not, for example, possible to estimate earnings equations, as information on individual wages is not available in the data.

Table 2 provides descriptive statistics of the raw data variables used in this study. Although the marital status and labour market variables should be fairly self-explanatory, the health-related variables require some explanation. The dummy variable *alcohol dependence* is our

[4] See Lehtonen et al. (2002) for a more thorough description of how the Health 2000 dataset has been constructed

most important explanatory variable. An individual is considered to be alcohol dependent if he or she fulfils the ICD-10 (World Health Organization, 1993 diagnostic criteria for alcohol dependency). As can be seen from table 3, some 16% of the men and some 4% of the women in our sample are classified as alcohol dependent. These numbers are similar to those reported in Mullahy & Sindelar (1996) for the US. In their sample of 25-59 year olds, 15% of men and 5% of women were classified as either alcohol dependent or having abused alcohol.

Gamma glutamyltransferase (GGT) are what in medical terms is called a marker of heavy alcohol consumption. A raised level of GGT may indicate heavy alcohol consumption, but it may also be due to other factors, such as obesity, diabetes, or liver disease caused by something other than heavy drinking (for example hepatitis). There are two reasons why an economist may be interested in these markers of heavy alcohol use. First, they are laboratory test results, and are not subject to errors of memory or conscious manipulation of responses. In contrast, it is well known that self-report measures of drinking may suffer from underreporting, particularly by heavy users (Allen et al. 1995). Second, the measure is potentially useful as an instrument which is correlated with alcohol dependency but not necessarily with labour market success.

The other health-related variables are more straightforward. The self-reported health status differs, as may be expected, between age groups with older individuals having worse self-reported health on average. In the data there is also information about the childhood experiences of the subjects. Some 11% of men and some 12% of women report that one of their parents had alcohol problems. On the other hand, only around 1% of men and around 2% of women report that their mothers had alcohol problems. This variable is also potentially valuable as an instrument. We also have information on whether the individuals suffer from asthma or diabetes. Table 3 show that 6% of males and 9% of females have asthma, whereas between 4 and 5% of males have diabetes, and slightly more than 3% of females have diabetes. Older individuals suffer more often from diabetes than younger ones. In the 50-65 year old group, almost 7% of males and over 10% of females have diabetes. As was already mentioned in section 2, these variables have been used as instruments before in this context. The variable “never goes to church” is not really a health related variable, of course, but this dummy variable can potentially serve as an indicator of an individual’s religiosity. And as already explained, this information may be useful as an instrumental variable. Some 53% of men and some 37% of women never go to church. Older individuals on the other hand, are

more likely to attend church, as only 46% of men and 30% of women between 50 and 65 never go to church.

Before proceeding, we also briefly scrutinise the variables concerning labour market status, marital status, and other background characteristics. 70% of men aged 30-65 years work full time. The number for women is not surprisingly lower at 60%. Older individuals have lower probabilities of being employed full time. Education levels are higher on average for younger individuals. 25% of men and 23% of women aged 30-65 have tertiary education (according to the ISCED standards), whereas the numbers for the 50-65 year old group is 22% for men and 17% for women.

5 The correlation between alcohol dependency and employment in Finland

a) Some age-related considerations

Before turning to econometric estimates of the effect of alcohol dependency on employment, it is useful to consider some simple statistics concerning the probabilities that alcohol dependent individuals and not alcohol dependent individuals are employed full time per gender and age. Earlier research (Mullahy and Sinderlar 1993) has found that there are important life-cycle changes in the probability of full-time work for alcohol dependent individuals. They found that among individuals 20-29 years old, alcohol dependent individuals have a higher probability than non-alcohol dependent individuals of having full-time work. For individuals 30-60 years old, alcohol dependent individuals had a lower probability of full-time work than not alcohol dependent individuals. In the oldest age group, those aged 60-64, alcohol dependent individuals had again a higher probability of being in work full time. They suggest that this finding may be explained by the fact that alcohol dependent individuals drop out of school at an earlier stage, which may explain their higher probability of work at younger ages. As non-alcohol dependent individuals have acquired more human capital they have a higher probability of being at full-time work later in life. Non-alcohol dependent individuals also earn higher wages and accumulate more wealth. This enables non-alcohol dependent indi-

viduals, on the margin, to retire earlier, which would explains their lower probability of being in full-time work at higher ages.

Table 4 reports probabilities of full-time work for alcohol dependent individuals and non-alcohol dependent individuals per gender and age group for the Finnish case. A full comparison with the US case presented in Mullahy and Sindelar (1993) is not possible with our dataset as the youngest individuals in our data are aged 30. However, we can see that for men, alcohol dependent individuals have lower work probabilities for all age groups except for the ages over 60. So there is at least a small hint that older male alcohol dependent individuals in Finland, as in America, at least have as high probability of working as their non-alcohol dependent counterparts. For women, on the other hand, the picture is less clear-cut. The raw data suggest that non-alcohol dependent individuals have higher probabilities of being in full time work during the entire 30-65 year old span, but only for 36-40 year olds and for 46-50 year olds is the difference statistically significant.

b) Econometric estimates of the probability of full-time work

In line with previous research in the field (Mullahy and Sindelar 1991, 1993), we start by presenting some baseline estimates of the relationship between labour market status and alcohol dependency (i.e. of equation 2), where potentially important correlates of alcohol dependency have been omitted (Table 5). In this way, the coefficient of our alcohol dependency dummy is allowed to absorb the impact of these correlates, to the extent that these effects are present. As we can see, this "full" effect is some 21% for men and some 16% for women aged 30-65. These effects can be compared to those of Mullahy and Sindelar (1991), who report that for a sample of 30-59 year old males alcohol dependency reduces the probability of full time work by 11%, and for a similar sample of females by 19%.

We also consider a subsample of 50-65 year olds (columns 2 and 4), and a sample of 30-49 year olds. As can be seen, the results vary somewhat according to which age group is chosen, but there is no clear message. For women the coefficient for the older age group is larger than for the younger, but the opposite is true for males.

In table 6 we introduce more human and health capital variables into the vector of explanatory variables (Table 6 refers to results for males only). These variables are likely correlated, and

potentially associated with alcohol dependency. As we can see, the coefficient for the alcohol dependency dummy variable shrinks considerably when these additional covariates are introduced. In column 6, the most restrictive specification, the effect has shrunk to 16%. The effects of the other human and health capital variables are unsurprising. Men possessing secondary and tertiary education levels are more likely than men with only a primary education to be employed full time. Men who are not married and have never been married are less likely to be employed full time. And finally, the better an individual's self-reported health is, the larger is the probability of full-time work.

Table 6 shows the same exercise for women. All in all, the coefficients are somewhat smaller than those for men in table 6. As in the case of males, the coefficient for the alcohol dependency dummy variable shrinks when we introduce health capital variables. For women, the effects of the other human capital and health variables on the probability of working full time are relatively straightforward. Women with more education are more likely to be employed full time. Women with more children are less likely to be employed full time. And finally, having bad health is associated with a lower probability of being employed full time.

c) On the potential endogeneity of alcohol dependency

A question of major interest in a study like this is the potential endogeneity of alcohol dependency. Thus, it possible that the results reported in tables 6 and 7 are biased owing to the fact that our alcohol dependency measure might be correlated with the error term in equation (2). As already explained in section 3 it is possible to test for the endogeneity of our alcohol dependency dummy variable in a limited dependent variable setting by using the Smith & Blundell (1986) method. However, before doing that, we checked whether our candidates for instrumental variables, parents' alcohol problems, asthma, diabetes, religiosity measured by whether or not the respondent never goes to church, and the log of GGT have any power in explaining why someone is categorised as being alcohol dependent. This test was done by including these instruments, separately, in probit regressions where the dependent variable is alcohol dependency. As can be seen from table 8, parents' alcohol problems, asthma, non-religiosity, and GGT are significant for men whereas only parents' alcohol problems, and GGT are significant for women. For men the role of the asthma dummy variable, however, is surprising. *A priori*, we had expected it to be negative, as having asthma perhaps should limit an individual's drinking, and therefore decrease the risk of alcohol dependency. However, it is

possible that this positive association has to do with the fact that smoking and drinking are correlated. Alcohol dependent individuals smoke more than non-alcohol dependent individuals, and smoking may increase the risk of asthma. However, because of this result, the use of asthma as an instrument seems suspicious, and it is therefore excluded from the subsequent analysis.

We then go on to test for the potential endogeneity of the alcohol dependence by the Smith and Blundell (1986) method. As instruments we use those variables that were significant in the above mentioned probit regressions. The results can be found in table 9. For both men and women , it looks like that we cannot completely dismiss the idea that alcohol dependence may be endogenous, as the prob-values for GGT is around 0.05. In addition, it is clear that using parental alcohol problems as the instrument, alcohol dependence is endogenous in the case of men.

In order to account for the potential problems in relation to the alcohol dependency variable in the probability of work equation we run bivariate probit models, where one equation explains the probability of being in full-time work and the other the probability of being alcohol dependent, and letting the error terms be correlated (see MacDonald and Shields 2004 for a similar approach). In order to identify the alcohol dependence equation, we use the instruments described in the previous section. The instruments were used is separate regressions. Indeed Angrist et al. (1996) argue that the only effect an instrumental variable regression consistently estimate is the average treatment effect for those who change treatment status (e.g. become alcohol dependent because they comply with the assignments to treatment implied by the instrument(s)). This is referred to as the "local average treatment effect" (LATE). As MacDonald & Shields (2001, 2004) point out, different instruments may provide very different estimates of the effect of alcohol dependence on the probability of work. Thus, a sound research strategy is therefore to use several alternative instruments in order to test the robustness of the results.

The results of these regressions can be found in table 10[5]. For men, we can see that the effect of alcoholism is substantially larger when controlling for endogeneity. Interestingly, the three

[5] Note that owing to computational reasons, we have not corrected these estimates for the effects of survey design. However, correcting for survey design will likely only affect the estimates marginally. In table A1, we have compared the results from table 6, with the same estimates without correcting for survey design. And the differences are not big, particularly regarding the coefficients.

different instruments give somewhat similar results, and the marginal effects indicate that the effect of alcohol dependency on the probability of being in full time work is minus 20-25%, which is larger than the effect reported in table 6. It should be noted however, that none of the results are significant at conventional levels (although relatively close), and these results should accordingly be treated with caution. For women, the negative effect is larger, once endogeneity is accounted for, some minus 40-50%.

6 Concluding remarks

In this paper we examine to what extent alcohol dependent individuals underperform non-alcohol dependent individuals in terms of employment probabilities in the Finnish labour market. In order to do that, we use data from the Health 2000 dataset, a major new collection of information about the health and functional ability of the Finnish adult and older-aged population. We measure alcohol dependency not by self-reported alcohol consumption, but by alcohol dependence, a criterion determined by a professionally designed survey instrument. Our results indicate that both men and women face substantial labour market penalties owing to alcohol dependency. Treating alcohol dependence as an exogenous variable, we find that alcohol dependence is associated with a decrease in the probability of working full time of around 15% for men and 13% for women. However, accounting for endogeneity increases the negative effect to some 20-25% for men and to some 40-50% for women.

There are two obvious avenues for further research in this field. First, the effect of moderate alcohol consumption on labour market success should be investigated to a greater extent. In the existing literature, it has usually been found that moderately drinking individuals fare better on the labour market than teetotallers. However, the reasons for this have not been yet fully established. One hypothesis that should be tested further is whether the relative misfortune of abstainers on the labour market is due to the fact that they are former alcohol dependent individuals who have quit drinking completely, and have problems on the labour market owing to this. Second, alcohol dependency should be related to other labour market outcomes, most importantly individual wages. Such studies will give us a more refined picture of the consequences of alcohol dependency.

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Table 1: Summary of studies on the relationship between alcohol consumption, alcohol dependency and labour market success

Study	Data	Alcohol consumption/ alcohol dependency measure	Labour force success measure	Method	Result
Berger and Leigh (1988)	Quality of Employment Survey (US, 1972-1973)	Number of drinks (self-reported)	Individual hourly wages	OLS wage regressions with selectivity correction	Drinkers receive higher wages than nondrinkers
Mullahy and Sindelar (1991)	Epidemiological Catchment Area Survey (US, 1980-1981)	Alcohol dependence and abuse, according to DSM-III	Personal income, household income, labour force participation	OLS, probit	Alcohol dependent individuals fare worse on the labour market
Bryant, Samaranyake, and Wilhite (1992)	National Longitudinal Survey of Youth (US, early 80s)	Number of drinks (self-reported)	Individual hourly wages	OLS wage regressions with selectivity correction	No effect
Mullahy and Sindelar (1993)	Epidemiological Catchment Area Survey (US, 1980-1981)	Alcohol dependence and abuse, according to DSM-III	Personal income, household income, labour force participation	OLS, probit	Alcohol dependent individuals fare worse on the labour market
Kenkel and Ribar (1994)	National Longitudinal Survey of Youth (US, 80s)	Alcohol dependence and abuse, according to DSM-III, Number of drinks (self-reported)	Income, hours worked	OLS, panel data approaches, IV approaches	Alcohol dependent individuals receive lower wages, no effects on labour supply
French and Zarkin (1995)	Data from 4 worksites (US, 1991-1993)	Number of drinks (self-reported)	Weekly wages	OLS	Moderate drinkers have highest wages
Mullahy and Sindelar (1996)	Alcohol Supplement of the National Health Interviews (US, 1988)	Alcohol dependence and abuse, according to DSM-III, Number of drinks (self-reported)	Employment, unemployment	Multinomial instrumental variables approach	Problem drinking leads to reduced employment and increased unemployment

Table 1: Summary of studies on the relationship between alcohol consumption, alcohol dependency and labour market success (continued)

Study	Data	Alcohol consumption/ alcohol dependency measure	Labour force success measure	Method	Result
Heien (1996)	National Household Survey on alcohol use (US, 1979, 1984)	Number of drinks (self-reported)	Household income	Non-linear 3SLS	Moderate drinkers have highest wages
Hamilton and Hamilton (1997)	General Social Survey (Canada, 1995)	Number of drinks (self-reported)	Annual pre-tax income	OLS wage regressions with selectivity correction	Moderate drinkers have highest wages
Zarkin et al. (1998)	National Household Surveys on Drug Abuse (US, 1991, 1992)	Number of drinks (self-reported)	Hourly wages	OLS	Drinkers receive higher wages than nondrinkers
McDonald and Shields (2001)	Health Survey for England (1992-1996)	Number of drinks (self-reported)	Hourly wages	Instrumental variables approach	Moderate drinkers have highest wages
Barrett (2002)	Australian National Health Survey, (Australia, 1989-1990)	Number of drinks (self-reported)	Annual pre-tax income	OLS wage regressions with selectivity correction	Moderate drinkers have highest wages
McDonald and Shields (2004)	Health Survey for England (1997-1998)	Number of drinks (self-reported), Alcohol dependence and abuse,	Employment,	Instrumental variables approach	Problem drinking leads to reduced employment

Table 2: Variable definitions

	Definition
Glutamyl transferase	Level of Glutamyl transferase (U/l)
Age	Age in years
Income	Household income (€/month)
Children	Number of children
Working full time	0-1 dummy variable, = 1 if individual works full time
Alcohol dependence	0-1 dummy variable, = 1 if individual is diagnosed as alcohol dependent
Primary education	0-1 dummy variable, = 1 if individual has primary education according to the ISCED classification
Secondary education	0-1 dummy variable, = 1 if individual has secondary education according to the ISCED classification
Tertiary education	0-1 dummy variable, = 1 if individual has tertiary education according to the ISCED classification
Married	0-1 dummy variable, = 1 if individual is married
Cohabiting	0-1 dummy variable, = 1 if individual is cohabiting
Divorced	0-1 dummy variable, = 1 if individual is divorced
Widowed	0-1 dummy variable, = 1 if individual is widowed
Single	0-1 dummy variable, = 1 if individual is single
Good health	0-1 dummy variable, = 1 if individual is cohabiting
Rather good health	0-1 dummy variable, = 1 if individual has good health (self-reported)
Average health	0-1 dummy variable, = 1 if individual has average health (self-reported)
Rather bad health	0-1 dummy variable, = 1 if individual has quite bad health (self-reported)
Bad health	0-1 dummy variable, = 1 if individual has bad health (self-reported)
Parental alcohol problems	0-1 dummy variable, = 1 if one of parents had alcohol problems
Asthma	0-1 dummy variable, = 1 if individual has astma
Diabetes	0-1 dummy variable, = 1 if individual has diabetes
Never goes to church	0-1 dummy variable, = 1 if individual never goes to church

Table 3: Descriptive Statistics

	Men		Women	
	30-65	50-65	30-65	50-65
Glutamyl transferase	49.939	56.132	26.500	32.139
	(64.526)	(84.585)	(31.340)	(41.727)
Age	46.3	56.3	46.3	56.7
	(9.6)	(4.5)	(9.8)	(4.5)
Family size	2.74	2.21	2.73	2.03
	(1.41)	(0.96)	(1.35)	(0.48)
Working full time	0.701	0.500	0.599	0.453
Alcohol dependence	0.159	0.142	0.038	0.026
Primary education	0.167	0.232	0.142	0.224
Secondary education	0.581	0.543	0.632	0.609
Tertiary education	0.252	0.225	0.227	0.168
Married	0.608	0.694	0.608	0.616
Cohabiting	0.137	0.082	0.128	0.081
Divorced	0.093	0.108	0.122	0.146
Widowed	0.012	0.023	0.036	0.079
Single	0.150	0.093	0.106	0.077
Good health	0.367	0.246	0.393	0.252
Rather good health	0.297	0.280	0.321	0.322
Average health	0.243	0.321	0.222	0.320
Rather bad health	0.068	0.110	0.051	0.089
Bad health	0.025	0.043	0.014	0.019
Parental alcohol problems	0.109	0.107	0.119	0.140
Asthma	0.059	0.069	0.090	0.101
Diabetes	0.044	0.076	0.031	0.048
Smoked at age 18	0.151	0.113	0.078	0.031
Never goes to church	0.531	0.463	0.372	0.305

Note: Standard deviations in parentheses.

Table 4: Raw probability of full time work for alcohol dependent individuals and non-alcohol dependent individuals by age (%).

	Males				Females			
Ages	Alcohol dependent	N	Non-alcohol dependent	N	Alcohol dependent	N	Non-alcohol dependent	N
30-35	0.72**	73	0.92	297	0.57	28	0.68	395
36-40	0.75*	40	0.89	299	0.50**	18	0.69	345
41-45	0.70**	60	0.88	271	0.62	16	0.72	366
46-50	0.65**	64	0.87	302	0.54**	11	0.78	396
51-55	0.61**	51	0.78	341	0.67	12	0.73	369
56-60	0.24**	38	0.43	210	0.17	6	0.40	272
61-65	0.12	32	0.11	178	0.00	4	0.10	257

Note: **Difference significant on the 1%-level. * Difference significant on the 5%-level.

Table 5: Probit estimates of probability of full time work

	Men			Women		
Ages	30-65	50-65	30-49	30-65	50-65	30-49
Alcohol dependency	-0.213	-0.166	-0.196	-0.157	-0.183	-0.141
	(6.64)**	(3.23)**	(6.06)**	(2.90)**	(2.13)*	(2.29)*
Age	0.99	0.207	-0.012	0.151	0.448	-0.037
	(8.72)**	(1.56)	(0.50)	(14.17)**	(3.39)**	(1.20)
Age squared	-0.001	-0.002	0.000	-0.002	-0.005	0.001
	(10.34)**	(2.06)*	(0.38)	(15.46)**	(3.92)**	(1.40)
Observations	2256	912	1344	2495	991	1504

Note: The dependent variable takes the value 1 if the individual is working full time, and 0 if the individual is unemployed, working part-time or is outside the labour force. Coefficients are marginal effects, i.e. reports the change in the probability for an infinitesimal change in each independent, continuous variable and the discrete change in the probability for dummy variables. Absolute values of t-statistics in parentheses. ** indicates significance at the 1% - level, * indicates significance at the 5%-level.

Table 6: Probit estimates of probability of full time work for men

	(1)	(2)	(3)	(4)	(5)	(6)
Alcohol dependency	-0.206	-0.182	-0.183	-0.179	-0.159	-0.156
	(6.55)**	(5.65)**	(5.69)**	(5.63)**	(4.91)**	(4.91)**
Age	0.099	0.090	0.107	0.091	0.097	0.097
	(8.64)**	(7.81)**	(9.33)**	(7.86)**	(8.39)**	(8.39)**
Age squared	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
	(10.19)**	(9.43)**	(10.75)**	(9.40)**	(9.82)**	(9.78)**
Secondary education	0.078			0.054		0.034
	(2.81)**			(1.96)		(1.30)
Tertiary education	0.166			0.139		0.115
	(6.94)**			(5.47)**		(4.07)**
Family Size		0.001		0.001	-0.001	-0.001
		(0.08)		(0.10)	(0.10)	(0.02)
Cohabiting		-0.036		-0.026	-0.033	-0.025
		(1.12)		(0.82)	(1.03)	(0.78)
Divorced		-0.164		-0.154	-0.133	-0.125
		(3.15)		(2.94)	(2.49)	(2.33)
Widowed		-0.068		-0.058	-0.064	-0.057
		(0.67)		(0.59)	(0.62)	(0.56)
Single		-0.298		-0.279	-0.293	-0.279
		(6.26)**		(5.74)**	(6.26)**	(5.87)**
Good health			0.366		0.343	0.329
			(8.47)**		(7.71)**	(7.32)**
Rather good health			0.314		0.297	0.288
			(7.50)**		(7.09)**	(6.81)**
Average health			0.268		0.255	0.250
			(7.67)**		(7.17)**	(7.02)**
Rather bad health			0.114		0.104	0.099
			(2.34)		(2.12)*	(2.02)*
Observations	2256	2254	2253	2251	2251	2251

Note: The reference category for the education dummy variables, the marital status dummy variables, and the health dummy variables are “primary education”, “married”, and “bad health”, respectively. *. Otherwise, see notes to table 5.

Table 7: Probit estimates of probability of full time work for women

	(1)	(2)	(3)	(4)	(5)	(6)
Alcohol dependency	-0.157	-0.156	-0.122	-0.157	-0.124	-0.130
	(2.81)**	(2.80)**	(2.13)*	(2.72)**	(2.14)*	(2.16)*
Age	0.153	0.151	0.157	0.153	0.158	0.159
	(13.99)**	(13.79)**	(14.67)**	(13.60)**	(14.19)**	(13.89)**
Age squared	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
	(15.12)**	(15.10)**	(15.76)**	(14.79)**	(15.26)**	(14.90)**
Secondary education	0.164			0.166		0.148
	(5.73)**			(5.74)**		(5.03)**
Tertiary education	0.276			0.273		0.248
	(9.32)**			(9.12)**		(7.76)**
No. of children		-0.030		-0.032	-0.034	-0.036
		(2.75)**		(2.83)**	(2.99)**	(3.03)**
Cohabiting		-0.051		-0.045	-0.041	-0.037
		(1.47)		(1.26)	(1.20)	(1.06)
Divorced		-0.066		0.008	0.06	0.061
		(1.59)		(0.17)	(1.41)	(1.43)
Widowed		-0.173		-0.159	-0.159	-0.148
		(3.03)**		(2.71)**	(2.70)**	(2.47)**
Single		-0.025		-0.044	-0.022	-0.039
		(0.57)		(1.62)	(0.49)	(0.85)
Good health			0.440		0.440	0.398
			(6.03)**		(5.98)**	(5.38)**
Rather good health			0.400		0.400	0.370
			(6.03)**		(5.85)**	(5.41)**
Average health			0.309		0.310	0.290
			(4.44)**		(4.42)*	(4.11)*
Rather bad health			0.145		0.139	0.115
			(1.71)		(1.63)	(1.31)
Observations	2495	2493	2493	2491	2491	2491

Note: See notes to table 6

Table 8: Probit regressions of the probability of being alcohol dependent.

Variable	Men	Women
Parental alcohol problems	0.330**	0.468**
	(3.59)	(4.43)
Asthma	0.343**	0.022
	(2.63)	(0.12)
Diabetes	-0.133	0.071
	(0.83)	(0.24)
Never goes to church	0.150*	0.092
	(2.10)	(0.98)
Log of GGT	0.103*	0.262**
	(2.09)	(3.29)

Note: Dependent variable: probability of being alcohol dependent. Rows show the coefficients of separate regressions using the instruments indicated in column 1. Regressions also includes controls for age, education, marital status, and self-reported health status. ** indicates significance at the 1% - level, * indicates significance at the 5%-level.

Table 9: Testing for exogeneity of alcohol dependence in probability of work equation, prob-values

Instruments	Men	Women
Parental alcohol problems	0.033	0.442
Asthma	0.714	
Never goes to church	0.420	
Log of GGT	0.051	0.055

Table 10: Biprobit regressions of the probability of full time work.

Instrument used	Men	Women
Parental alcohol problems	-0.727	-1.030
	(1.86)	(1.61)
	[-0.252]	[-0.388]
Never goes to church	-0.586	
	(1.22)	
	[-0.198]	
Log of GGT	-0.656	-1.541
	(1.49)	(3.30)**
	[-0.225]	[-0.521]

Note: Coefficients refer to coefficients on the alcohol dependence dummy in the probability of work equation, for the indicated instruments. T-statistics in parentheses. Numbers in brackets refer to marginal effects. Regression also includes controls for age, education, marital status, and self-reported health status.

Table A1: Comparison between probit estimates for men with survey design correction and no correction

	Survey design correction	No correction
Alcohol dependency	-0.474	-0.469
	(5.35)**	(5.43)**
Age	0.326	0.324
	(8.79)**	(9.02)**
Age squared	-0.004	-0.004
	(10.32)**	(10.97)**
Secondary education	0.115	0.110
	(1.33)	(1.29)
Tertiary education	0.444	0.443
	(3.44)**	(3.35)**
No. of children	-0.082	-0.080
	(0.80)	(0.73)
Cohabiting	-0.377	-0.369
	(2.55)*	(2.86)**
Divorced	-0.178	-0.142
	(0.59)	(0.51)
Widowed	-0.799	-0.790
	(6.42)**	(6.65)**
Single	-0.002	0.001
	(0.06)	(0.02)
Good health	1.295	1.275
	(6.24)**	(5.96)**
Rather good health	1.181	1.163
	(5.64)**	(5.47)**
Average health	1.079	1.060
	(5.38)**	(4.97)**
Rather bad health	0.383	0.361
	(1.72)	(1.53)
Constant	-5.941	-5.892
	(7.02)**	(6.72)**
Observations	2251	2251

Note: See notes to table 6.

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