ARE ALCOHOLICS IN BAD JOBS?

By

Don Kenkel
Department of Policy Analysis and Management
Cornell University
120A MVR
Ithaca, NY 14685
Phone: 607-255-2594; Fax: 607-255-0799
E-mail: dsk10@cornell.edu

and

Ping Wang
Department of Economics
The Pennsylvania State University
601 Kern Building
University Park, PA 16802
Phone: 814-865-1525; Fax: 814-863-4775
E-mail: pxw4@psu.edu

June 1998

* Forthcoming in an NBER Conference volume on *The Economic Analysis of Substance Use and Abuse: An Integration of Econometric and Behavior Economic Research*, Chicago University Press, Chicago, IL. Part of this paper was completed while the second author was visiting Rochester, Tilburg (the Netherlands) and Washington (Seattle). We would like to thank Eric Bond, Frank Chaloupka, Sharon Hall, Mark Kleiman, John Mullahy, and, especially, Mike Grossman, as well as seminar participants at Cornell, Miami, Penn State, Syracuse, and at the 1996 Southern Economic Association, the 1997 American Economic Association Meetings, and the 1997 NBER Conference for useful comments and suggestions. The usual disclaimer applies.

Abstract

Alcohol abuse has important implications for the productivity of the U.S. workforce. The lost earnings of workers suffering from alcohol problems have been estimated at $36.6 billion in 1990. After completing schooling, young workers face critical labor market choices with long-ranging consequences for future jobs and lifetime earnings, while many of them also drink alcohol to excess. In this paper, we provide evidence on whether the drinking choices of young adults also have long-ranging consequences for future jobs and lifetime earnings. In doing so we extend previous research on the productivity effects of alcohol to include non-wage job attributes as part of total employee compensation. The goal of this research is to establish benchmark empirical patterns describing relationships between alcoholism and job choice. Our empirical results based on the National Longitudinal Survey of Youth (NLSY) data show that male alcoholics are less likely to receive a variety of fringe benefits, are more likely to be injured on the job, and work for smaller firms. When the conventional methodology is extended to include non-wage job attributes, of an estimated total loss of $2380 per alcoholic, about $450, or almost 20% of the total, is the value of the lost fringe benefits. The data also show that male alcoholics are less likely to be in a white collar occupation, but conditional upon being in a white collar occupation their earnings are similar to their non-alcoholic peers. While alcoholics are more likely to be in a blue collar occupation, conditional upon being in such an occupation they are estimated to earn 15 percent less than their non-alcoholic peers. These findings can help evaluate more systematically and more accurately the potential effects and interactions between alcohol, education, and income policies and health policy.

1. Introduction

The abuse or excessive consumption of alcohol can lead to a variety of adverse consequences. The health and safety consequences are perhaps the most dramatic, but alcohol abuse also has important implications for labor market productivity. As much as 10 percent of the U.S. labor force meets criteria for a current diagnosis of alcohol abuse or dependence (Stinson, Debakey and Steffens 1992). The most recent comprehensive study of the economic cost of alcohol abuse estimates the lost earnings of workers suffering from alcohol problems at $36.6 billion in 1990 (Rice 1993). However, when methodological problems are addressed there is uncertainty as to the size or even the existence of alcohol's direct effect on wages (Cook 1991, Kenkel and Ribar 1994). The accumulating empirical evidence suggests that some of the most important productivity effects of alcohol abuse are through indirect channels (Mullahy and Sindelar 1994); for example, there is good evidence that drinking reduces individuals' investment in schooling (Cook and Moore 1993). Nevertheless, the relationship between alcohol abuse and post-schooling human capital investment remains largely unexplored.

After completing schooling, young workers face critical labor market choices. Young workers "job-shop" as they search for productive and durable employment relationships (Topel 1991). They must find their first job, and then typically will change jobs several times before settling into more stable employment. When searching, the young workers compare jobs that pay different wages, provide different levels of fringe benefits, and offer different potentials for wage growth and advancement. Furthermore, the search involves choices about occupation, industry of employment, and firm size. These job choices made by young adults have long-ranging consequences for future jobs and lifetime earnings.

Many young adults also drink alcohol to excess. Based on national survey data, the percentage of people aged 18-29 meeting criteria for current alcohol dependence is over 80 percent higher than those aged 30-44, and quadruple of those aged 45-64 (Grant et al. 1991). The survey data are corroborated by the fact that young drivers are over represented in drunk driving statistics; for example, in 1994 the 14 percent of U.S. drivers aged 16 to 24 accounted for 28 percent of drinking driver deaths (Campbell et al. 1996).

In this paper, we provide some evidence on whether the drinking choices of young adults have long-ranging consequences for future jobs and lifetime earnings. In doing so we extend previous research on the productivity effects of alcohol to include non-wage job attributes as part of total employee compensation. The goal of this research is to establish benchmark empirical patterns describing relationships between alcoholism and job choice.

We examine data on young adult men from the 1989 wave of the National Longitudinal Survey of Youth (NLSY) to document the empirical relationships between alcoholism and a comprehensive array of job attributes not considered in previous work. As discussed in section 2, studies find that alcoholism (or some other measure of problem drinking) has important effects on labor market productivity, as measured by income or wages. As we argue in section 3, however, if the non-wage attributes of the jobs of alcoholics also vary, wage losses are an unreliable measure of productivity losses. We elaborate based on a formal theory the economic significance of the underlying differences. The empirical results in section 4 show that alcoholics are less likely to receive a variety of fringe benefits, are more likely to be injured on the job, and work for smaller firms. Section 5 extends the conventional methodology of estimating productivity losses due to alcoholism to include non-wage job attributes. The

illustrative results suggest that the total loss of alcoholism is at least 20 percent larger than the wage loss.

In section 6, we extend our analysis to explore some relationships between alcoholism and occupational choice. Without controlling for their occupational status, alcoholics are estimated to earn 9.8 percent less than their non-alcoholic peers, but alcoholism appears to have a much different impact on earnings for blue collar than white collar workers. We find that alcoholics are less likely to be in a white collar occupation, but conditional upon being in a white collar occupation their earnings are similar to their non-alcoholic peers. While alcoholics are more likely to be in a blue collar occupation, conditional upon being in such an occupation they are estimated to earn 15 percent less than their non-alcoholic peers.

In section 7 we explore the extent to which alcoholics earn less because they bring less human capital to the job. Controlling for human capital variables including schooling, marital status, job tenure, occupation, firm size, and training attendance, the wage loss associated with alcoholism is reduced from 9.8 percent to 4.6 percent. Our results suggest that in addition to a direct effect of alcoholism on wages, alcoholism has important indirect effects through these human capital variables. For the sample of young adults considered here, it also suggests that the consequences of alcoholism are likely to persist and grow over time. By investing in less human capital as young adults, alcoholics tend to place themselves on much different career and lifetime earnings tracks. Finally, in section 8 we apply similar analysis to investigate, in addition to alcoholism, relationships between smoking status and occupational choice. We find that while drinking status has stronger adverse impacts on paid sick leave, paid vacation and retirement plans compared to smoking, the latter is somewhat more influential in dental and life

insurance as well as m(p)aternity leave.

In a companion paper, Kennel and Wang (1996), we develop a generalized rational addiction model in which occupation and post-schooling human capital accumulation are endogenously determined along with alcohol consumption patterns. A growing number of empirical studies of cigarette, alcohol, and drug consumption are based on the rational addiction model proposed by Becker and Murphy (1988). To date, empirical tests of the model focus on estimating demand for an addictive good as a function of the addictive stock, emphasizing consistent estimates of price elasticities (Chaloupka 1991, Keeler et al. 1993, Becker, Grossman and Murphy 1994, Moore and Cook 1994, Waters and Sloan 1995, Grossman, Chaloupka and Brown 1996, and Grossman, Chaloupka and Sirtalan forthcoming). As a logical extension of the Becker-Murphy model, we argue that a rational addict will anticipate the labor market consequences of alcoholism and make job choices accordingly. Extending the model of rational addiction to incorporate occupational choice will thus provide new leverage for empirical tests of this controversial theory. The results presented in this paper do not provide definitive tests, but as discussed in the concluding section 8, shed some light on the usefulness of our approach.

A comment on terminology is in order at this point. We find it convenient to use the terms "alcoholic" and "alcoholism" because they are succinct and familiar to general audiences. In the empirical work below we use the more precise term "alcohol dependent," where alcohol dependence is defined based on the American Psychiatric Association criteria listed in Table 1. For some of the analyses we also use a measure of heavy drinking, defined as the number of times in the past month with 6 or more drinks on one occasion. As might be expected, someone who meets diagnostic criteria for alcohol dependence is likely to do a good amount of heavy

drinking measured in this way. The average male alcohol dependent reported 5.3 days of heavy drinking in the past month, compared to 1.16 days for non-dependents (Kenkel and Ribar 1994). However, it is important to recognize that different measures capture somewhat different drinking behaviors that may have different labor market consequences. In an extremely useful illustrative exercise, Sindelar (1993) estimates the effects of alcohol consumption on income using ten alternative measures of alcohol use. The estimated coefficients on the alcohol measures vary not only in magnitude but in sign. A crucial step is to use measures, as we do here, that allow empirical distinctions between consumption at levels that are likely to cause problems from more moderate or responsible drinking.

2. Productivity Losses from Alcoholism

Most studies of the effect of alcohol abuse in the labor market have been conducted within the static human capital framework using cross-sectional data. Since critical reviews of these studies exist elsewhere (Cook 1991 and Mullahy 1993), it is only necessary to highlight here some of the main results and shortcomings. These studies estimate models in which current earnings or income are specified to be a function of exogenous current drinking. They generally conclude that problem drinking causes earnings losses in the range from 10 to over 20 percent (Harwood, et al. 1984 and Rice, et al. 1990).[1] In contrast, moderate drinking appears to be associated with higher earnings (Berger and Leigh 1988, Cook 1991, and French and Zarkin 1995).

[1]The findings are somewhat controversial. Heien and Pittman (1989) were unable to replicate the results of Harwood et al., even though both used the same data from the 1979 National Alcohol Survey.

Several other aspects of the productivity effects of alcoholism have been explored. First, there is good evidence that the effects of alcohol abuse on schooling are significant. As in an earlier study by Benham and Benham (1982), Mullahy and Sindelar (1989) conclude that alcoholism is associated with lower schooling attainment. Using data from the NLSY, Cook and Moore (1993) find that frequently drunk youths are less likely to matriculate and graduate college than those not frequently drunk. Second, the relationship between alcohol abuse and earnings appears to change over the life cycle, where large negative impacts of alcohol abuse are evident only after age 40 or so. Mullahy and Sindelar (1993) speculate that non-alcoholic young adults' wages are initially depressed because they stay in school longer and begin their career jobs later than their alcoholic peers. A related explanation is that alcoholics and non-alcoholics start at similar wages, but non-alcoholics earnings profiles are steeper because of higher returns to tenure. Of course, cross-sectional evidence, where different individuals of different ages are compared at a point in time, can be misleading on the pattern of wages over the life cycle for a given individual.

A methodological shortcoming of many of the studies just cited is that they implicitly treat alcohol abuse akin to a disease randomly striking a portion of the population. There are several reasons the corresponding econometric assumption that alcohol abuse is exogenous in an earnings function may be violated. First, many personal and family background factors associated with the development of alcohol problems plausibly have direct effects on productivity and earnings (Zucker and Gomberg 1986). An ordinary least squares (OLS) regression of earnings on alcohol abuse that omits these personal attributes yields a biased estimate that overstates the negative effect of drinking. Second, there may be reciprocal

causality between drinking and earnings. Simultaneity, where through the budget constraint income is a determinant of alcohol consumption, means that OLS results are biased away from finding any negative effect of drinking on earnings. This source of bias may help explain estimates of a positive relationship between drinking and earnings. Kenkel and Ribar (1994) conduct an in-depth empirical analysis using the NLSY data that uses family- and individual-fixed effects models to control for heterogeneity, and instrumental variables (IV) models to address simultaneity. The complex pattern of results suggests that alcohol problems have a direct negative impact on earnings and marital status. Using the 1988 National Health Interview Survey, Mullahy and Sindelar (1996) also find important differences between OLS and IV estimates of the effects of problem drinking on employment status.

3. Measuring Productivity Losses When Non-wage Job Attributes Vary

As the brief review above indicates, estimating the impact of alcoholism on earnings has proven to be a difficult methodological challenge. This paper focuses on a methodological shortcoming that has received little attention to date: Wage differences are unreliable estimates of the productivity losses from alcoholism if there are important differences in the non-wage attributes of the jobs of problem drinkers.[2]

To see the possible biases, it is useful to consider a simple model of job choice depicted graphically in Figure 1. The indifference curves drawn are based on the assumption that the worker has homothetic preferences over after-tax wage earnings (W) and the level of a fringe

[2]This shortcoming is explicitly noted by Mullahy and Sindelar (1989) and Mullahy (1993), but they were unable to address it due to data limitations.

benefit (F) (or other non-wage job attribute). The assumption of homothetic preferences implies that the worker chooses to receive the same proportions of fringe benefits and wages at any level of total compensation.[3] The worker's opportunity set is described by the negatively sloped schedule W(F) showing possible combinations of wages and fringes employers can offer, given the worker's level of productivity. This assumes the worker's productivity level is observed by the firm and the labor market functions so that the worker's productivity is reflected in wages. For the sake of simplicity, it will be further assumed that W(F) is linear and its slope is -1.[4] The worker's optimizing job choice is given by the tangency of an indifference curve and the W(F) schedule.

Figure 1 shows the case where the measured earnings loss underestimates the productivity loss associated with problem drinking. A drinking problem means that the worker faces a lower schedule W'(F) of available combinations of wages and fringes reflecting his lower productivity. For the case shown in Figure 1, in response to his lower productivity the worker's optimizing choice involves lower wages and lower fringes; this is like the income effect in standard consumer demand theory. The observed wage loss thus underestimates the true productivity loss, which is given by the vertical distance between the W(F) and W'(F) schedules.[5] More specifically, for the case when the slope of W(F) is equal to -1, it can be easily

[3]Graphically, the assumption of homothetic preferences means that along a ray from the origin all indifference curves have the same slope.

[4]In the presence of a favorable tax treatment of fringe benefits, the slope of W(F) would be less in absolute value than -1, and could vary across workers who face different marginal tax rates.

[5]Notice that the vertical distance between W(F) and W'(F) is also the compensating variation in income for the labor market consequences of alcoholism. That is, with that amount of extra income added to his earned income an alcoholic worker reaches the same indifference

seen from Figure 1 the productivity loss is exactly the sum of the wage and fringe losses. In practice, the favorable tax treatment of fringes over wages means that the slope of W(F) is less in absolute value than -1. In this case, the productivity loss is greater than the wage loss but less than the sum of the wage and fringe losses.

Mullahy (1993) emphasizes that the observed wage loss may overestimate the productivity loss. This possibility is illustrated in Figure 2, where the alcoholic is assumed to have stronger preferences for the fringe benefit than does a non-alcoholic. For example, the alcoholic might be more willing to accept lower wages in return for more generous health insurance, flexible hours, and sick leave. In this case, part of the observed difference in the wages earned by alcoholics and non-alcoholics is actually the compensating differential for the higher level of fringe benefits. Put differently, even if there were no productivity loss from alcoholism, alcoholics would choose to earn less but receive more generous fringes.

Figure 3 shows an alternative case, where the alcoholic has weaker preferences for the non-wage job attribute than does a non-alcoholic. This case can be motivated several ways. First, Becker, Grossman and Murphy (1991) argue that people with relatively high rates of time preference are more likely to become addicts. If the typical alcoholic has an exogenously higher rate of time preference than the typical non-alcoholic, he will discount more heavily pensions and other benefits that accrue in the future. By the same token, the alcoholic will be less willing to give up current wages for future wage growth, and so could be expected to sort into jobs with relatively flat age-earnings profiles. Alternatively, in a rational addiction framework Kenkel and Wang (1996) build a model where alcohol consumption endogenously raises the time discount

---

curve or level of satisfaction as does a non-alcoholic worker with only his earned income.

rate, with the alcoholic becoming more impatient given an increased probability of alcohol-related death.[6] Since the discount rate depends on the consumer's choice variable, our model follows in the spirit of the existing endogenous or recursive preference literature (Epstein 1987, Becker, Boyd and Sung 1989, Obstfeld 1990, Becker and Mulligan 1993, and Palivos, Wang and Zhang 1997). This model also implies that the rational alcoholic will place a lower value on fringe benefits like pensions and will sort into jobs with relatively flat age-earnings profiles.

In the case shown in Figure 3 the observed earnings losses again underestimate the true productivity loss. The preference effect reinforces the income effect shown in Figure 1. It is notable that as long as the slope of W(F) is -1, the true productivity loss can still be measured by the sum of the wage and fringe losses. This can be seen easily from Figure 3 in which alcoholism moves the optimal point from E to A. The productivity loss is given by CA, which equals the wage loss of BA plus the distance CB. The fringe benefit loss is given by the distance BE. Since the slope of W(F) is -1, BE is equal to CB, thus verifying the assertion that the productivity loss equals the sum of the wage loss and the fringe loss.

Finally, Figure 4 shows the case where alcoholics face a different tradeoff between wages and fringes than do non-alcoholics: the schedule W'(F) has a steeper slope than the schedule W(F), as well as a different intercept. For example, providing health insurance to alcoholics may be more costly to employers, changing the rate at which wages can be traded for fringes.[7] In one

---

[6]Scientific evidence on mortality risks suggests that this endogenous time-discounting effect would be even more relevant for smoking behavior.

[7]This raises interesting and difficult questions about the effects of asymmetric information, where the employer does not perfectly observe an employee's alcoholism. The conditions required to reach a market equilibrium that avoids adverse selection problems remain unexplored in the literature.

large Fortune 500 firm, insurance claims related to substance abuse accounted for about 20 percent of the medical expenditures of workers aged 18 to 34 (McClellan and Wise 1995). Similarly, the cost of providing a safe working environment may be a function of the worker's alcoholism. In addition, the cost of net investments in a worker's human capital increases if alcoholism increases human capital depreciation (Kenkel and Wang 1996).

In Figure 4 the increase in the relative price of fringe benefits causes the alcoholic to substitute towards wage compensation. This once again creates a bias such that observed earnings losses underestimate the true productivity loss of alcoholism. Moreover, when the slope of W(F) is -1, we can show that the productivity loss from alcoholism exceeds the sum of the wage and fringe losses. In Figure 4, alcoholism moves the optimal point from E to A. The productivity loss from alcoholism is measured by CD = CB + BD.[8] The corresponding wage and fringe losses are BD-AF and BE+DF, respectively. Since the slope of W(F) is -1, CB is equal to BE. Also, the slope of W'(F) is steeper than the -45^{o} line, implying that AF is greater than DF. Thus, we can show that CD = CB + BD = (BE + AF) + (BD - AF) > (BE +DF) + (BD -AF); that is, the productivity loss due to alcohol abuse is larger than the sum of wage and fringe losses.

According to the formal dynamic general-equilibrium model rational addiction and occupational choice by Kenkel and Wang (1996), it is possible *a priori* to categorize job characteristics as "alcoholic-preferred," "non-alcoholic preferred" or "neutral." Of the fringe

[8]The distance CD represents the productivity loss from alcoholism in that it is the compensating variation in income for the labor market consequences of alcoholism. The case shown in Figure 4 differs from earlier cases because there are two components to the loss. First, even if all compensation were paid in the form of wages, the alcoholic worker would receive less. Second, the alcoholic worker that receives any fringe benefits suffers an additional loss because he or she has to give up more in wages to get the fringe benefits.

benefits considered in the empirical work below, compared to their non-alcoholic peers alcoholics are expected to have stronger preferences for health insurance, paid sick leave, and a flexible work schedule. Non-alcoholics are expected to have stronger preferences for life insurance, retirement plans, profit-sharing, and employer-provided training and educational opportunities. There seems to be no strong reason, however, to expect alcoholics and non-alcoholics to have systematically different preferences for the other fringe benefits measured (dental insurance, paid vacation, maternity/paternity leave, employee discounts, child care, meals, and parking).

In summary, by documenting the relationships between alcoholism and a variety of fringe benefits, the results will provide evidence on the empirical importance of the four cases reviewed corresponding to Figures 1 - 4. Based on Kenkel and Wang (1996), we argue that the alcohol consumption stock not only has an addiction effect on preferences, but is allowed to result in a higher subjective discount rate. In contrast to the existing literature, we argue further that job selection and human capital investment should also be influenced by addictive behavior because workers' drinking status is, in essence, part of the job requirements, and because alcohol consumption can increase the speed of human capital depreciation.

Finally, we emphasize that our empirical examination of the possible effects of alcoholism on an array of labor market outcomes is only a first step towards our long-term goal. In our model a worker who selects a higher value job that requires more strictly nondrinking behavior also faces a higher human capital maintenance cost, thus providing a bi-directional feedback between occupational choice and addictive behavior (Kennel and Wang 1996). In order to account for the possible endogeneity of addictive behavior in the context of labor market

decisions, one must carefully study not only the alcohol demand schedule and the underlying preferences but also the relevant incentive and regulatory structures. Due to its consequent complexity, the far more demanding empirical task of identifying a structural model along these lines by incorporating the endogenous use and abuse of alcohol has not yet been undertaken in the present study.

4. Comparing the Jobs of Alcoholics and Non-alcoholics

The primary data to be used in this analysis comes from the 1989 wave of the NLSY. The NLSY contains detailed economic and demographic information for 12,686 individuals who were fourteen to twenty-one years old in 1979. Retention is roughly 90 percent. After restricting the sample to men who were employed in 1989, and eliminating observations with missing values, the sample sizes analyzed are around 3700 respondents.

The NLSY has become a standard data source for empirical labor economics, and contains a rich array of labor market outcomes including measures of fringe benefits and other job attributes. In several years the survey also addresses alcohol consumption. Based on responses to a set of questions asked in 1989 we constructed a measure of alcohol dependence that corresponds to the American Psychiatric Association's *Diagnostic and Statistical Manual of Mental Disorders III (DSM-III)* definitions. About 18 percent of the sample of young adult men meet the criteria for alcohol dependence; this is roughly comparable to national prevalence estimates for young adult men (Grant et al. 1991).

Table 2 reports estimates of the effect of alcohol dependence on the probability the respondent reports receiving various fringe benefits.[9] The estimates are from fourteen separate

[9] Every fringe benefit included in the NLSY questionnaire is included in the analysis.

probit models that control for various individual, family and cultural background. These additional independent variables include year of birth, ethnicity, mother's and father's education, number of siblings, and the respondent's score on the Armed Forces Qualifying Test (AFQT), a standardized intelligence test. An additional set of variables measured when the respondent was aged 14 indicate nonintact family, religious attendance, magazine subscriptions, and ownership of a library card. The probit coefficients have been transformed to show the effect on the probability of a discrete change of the alcohol dependence dummy variable from zero to one; the proportion of the sample receiving each fringe benefit is also reported for a point of reference. Alcohol dependence is associated with a 5 to 10 percentage point reduction in the probability of receiving most major fringe benefits, including health insurance, paid sick leave, paid vacations, and retirement plans.

Table 3 reports estimates of the effect of alcohol dependence on several other job characteristics and labor market outcomes. The results remain consistent with the idea that alcoholics are in bad jobs and suffer worse labor market outcomes. Alcohol dependent workers are less likely to be in a white collar occupation and more likely to be injured on the job. The 3.3 percentage point increase in the on-the-job injury rate associated with alcohol dependence is a very substantial increase (a 37.5 percent increase) compared to the sample average injury rate of 8.8 percent. There is also a substantial difference in the size of the firms where alcohol dependent workers find employment. Compared to their non-alcoholic peers, alcohol dependents work at firms that employ 23.5 percent fewer workers (as measured by the number of employees at the same worksite). In terms of employment status, alcohol dependent workers are more likely to be unemployed, and if employed are less likely to be in a full-time job. When

employed, they are also more likely to be in jobs where compensation is partly in the form of tips and bonuses rather than straight wages or salaries.

For the models reported in Tables 2 and 3 alcohol dependence is assumed to be an exogenous explanatory variable. For the reasons discussed above in section 2, the econometric exogeneity assumption can be questioned on several grounds. A particular concern in the present context is reverse causality, where workers are more likely to become alcohol dependent because they are in a bad job that offers poor fringe benefits and other working conditions.

Several pieces of preliminary evidence suggest that reverse causality may not be an important phenomenon.[10] The first piece of evidence is in Table 3, where alcohol dependence is estimated to have a *positive* but statistically insignificant effect on the probability the worker reports liking his job "very much." If reverse causality were operative, presumably alcohol dependent workers would be less satisfied with their jobs.

Additional evidence on the importance of reverse causality is contained in Table 4, that compares the effect of current (1989) heavy drinking and past (1984) heavy drinking on the probability of receiving fringe benefits in 1989. The reasoning is that poor working conditions in 1989 can not cause heavy drinking in 1984, so the estimated effect of past heavy drinking is not contaminated by reverse causality.[11] The simple correlation between past and current heavy

---

[10] A more structural approach is to develop a simultaneous model of alcohol and labor market decisions. This model would suggest exclusion restrictions to motivate an instrumental variables approach.

[11]This reasoning is not strictly consistent with rational addiction because in that model the future can cause the present. For example, Becker, Grossman and Murphy (1994) estimate that current cigarette consumption is a function of future cigarette prices. If poor working conditions in 1989 are anticipated, the rational addict will increase consumption in earlier periods. The intertemporal linkages suggested by the rational addiction model make sorting out

drinking is only about 0.35, indicating that many workers' drinking habits were quite different in the two time periods. However, the estimated effects of past heavy drinking on the current probability of receiving the fringe benefits are often nearly as large as the estimated effects of current heavy drinking. This is suggestive evidence that heavy drinking in 1984 had consequences for future job outcomes, consistent with the causal relationship asserted in this empirical study.

5. Estimating the Productivity Loss Due to Alcoholism

It is notable that alcohol dependents are estimated to be less likely to receive a variety of fringe benefits. In particular, they are estimated to be 6.4 percent less likely to receive health insurance benefits and 10.5 percent less likely to receive paid sick leave, even though on *a priori* grounds these benefits were categorized as alcoholic-preferred. Interpreted in the simple model developed in section 3, it appears that any effect due to alcoholics' stronger preferences for certain fringe benefits is outweighed by some combination of the income effect of their lower productivity and the substitution effect of the higher cost of providing fringe benefits to alcoholics. That is, the estimated net effects of alcohol dependence on fringes seem to lend support to the cases elaborated in Figures 1, 3 or 4. In these cases there is an important implication: observed wage losses underestimate the productivity loss of alcoholism. By incorporating other employee compensation, the sum of wage losses and fringe benefit losses provides either an approximation or a lower bound to the true loss.

Calculating the true productivity loss due to alcoholism is simple in the special case described by Figure 1 where alcoholics and non-alcoholics have identical, homothetic

---

causality extremely challenging. We thank Michael Grossman for this insight.

preferences between wages and fringe benefits.[12] The assumption of homothetic preferences implies that workers always take the same proportion of total compensation as fringe benefits. Hence, a one percent decline in productivity causes wages to fall by one percent and causes fringe benefits to fall by one percent. The wage loss understates the total productivity loss by the same proportion as wage compensation understates total compensation. In 1989 for the nation as a whole the value of fringe benefits (excluding legally required payments) made up about 29 percent of total payroll (U.S. Chamber of Commerce, 1990). This suggests the wage loss will understate the productivity loss due to alcoholism by about 29 percent.

The above calculation of the relationship between the wage loss and the total productivity loss due to alcoholism rests on the strong assumptions behind Figure 1. A more data-driven approach is to combine the results of Table 2 of the relationship between alcoholism and fringe benefits with data on employers' costs of fringe benefits. Table 5 lists employers' 1989 fringe benefits costs per employee, from the U.S. Chamber of Commerce (1990). Based on the results from Table 2, the expected fringe benefit cost of a typical alcoholic worker is estimated to be $450 or almost 7 percent lower than the expected fringe benefit cost of a non-alcoholic worker. For the case shown in Figure 3 above the total productivity loss of alcoholism is estimated as the sum of the wage loss and the value of the fringe benefits lost. Below we report estimates that alcohol dependence is associated with a 9.8 percent reduction in earnings, implying that the average wage loss per alcoholic is $1928. The total productivity loss is thus estimated at $2378, and lost earnings understate the total productivity loss by about 20 percent.

Previous research on the productivity effects of alcoholism have used a number of

[12]We thank Michael Grossman for the argument developed in this paragraph.

outcome measures including personal income, household income, and wages, but have failed to include fringe benefits (Mullahy 1993). Our analysis and empirical results suggest these studies using the conventional methodology may have understated the total productivity loss by 20 percent or more.[13] Should the substitution effect described in Figure 4 become a dominant force, our estimate above would still underestimate the true productivity loss. Moreover, due to a possible consequence of alcoholism for increased probability of death, health-related quits and layoffs, the above static measure of productivity loss has further downward bias.

Of course, our estimate is developed by extending the conventional methodology for estimating productivity losses to include the value of fringe benefits. Consequently, it shares the shortcomings noted of that methodology in determining whether the negative relationship between alcoholism and fringe benefits is causal. It should also be noted that neither the conventional methodology nor the calculations above distinguish between internal costs to the alcoholic and external costs the alcoholic imposes on others (Manning et al. 1991).

6. Alcoholism and Occupational Choice

Choice of occupation is a good example of a decision typically made in young adulthood but with potentially lifetime consequences. A systematic relationship between alcoholism and occupational choice is accordingly of great concern. Based on Kenkel and Wang (1996), we argue that job selection and addictive behavior should be jointly determined by a rational

[13]Rice et al. (1990) assume alcoholism reduces employer contributions for social insurance, private pensions, and welfare funds by the same percentage as it reduces wages. The study does not contain direct evidence on this, but as shown above this is consistent with an implicit assumption that workers' preferences over wages and fringe benefits are homothetic.

optimizing worker. Specifically, we can sort jobs according to their characteristics in terms of their requirements or expectations about workers' drinking characteristics: the lowest value job represents the least concern about drinking status and is thus more suitable for problem drinkers, whereas the highest value job represents the most concern about workers' drinking status and is more suitable for non-alcoholics. Alcohol consumption can also increase the speed of human capital depreciation. When the size of this detrimential effect of alcohol on human capital is assumed job-specific (i.e., for a job more suitable for problem drinkers, human capital depreciation is less sensitive to alcohol additions), selecting a job with a high value of a characteristic will increase productivity and hence the rate of return on human capital, but it is at the expense of higher human capital maintenance cost (as reflected by the alcohol-specific responses to human capital depreciation). This tension will provide an endogenous determination of occupational choice, depending on the preference side of the addictive behavior.

Occupational requirements concerning workers' drinking habits are not directly observable. To begin to explore general occupational differences, Table 6 presents simple tabulations from the NLSY comparing the proportions of alcohol non-dependents and dependents in different occupational categories. About 37.5 percent of non-dependents are in white collar occupations, compared to only 30.9 percent of dependents. In contrast, only 48.1 percent of non-dependents are in blue collar occupations, compared to 57.9 percent of dependents. There is also a somewhat smaller difference showing that alcohol dependents are less likely to be service occupations.

Table 7 presents mean and median earnings by occupation and alcohol dependence

status. Among those workers in white collar occupations, alcohol dependents appear to earn nearly as much as non-dependents. There are virtually no differences in median earnings between the two groups, while mean earnings are somewhat higher for non-dependent workers. In contrast, in terms of either median or mean earnings, alcohol dependent workers in blue collar occupations earn less than non-dependent workers. Alcohol dependent service workers earn somewhat less than non-dependents. There appears to be a large difference in the earnings of non-dependent and alcohol dependent farm workers, but this should be interpreted cautiously due to the small cell sizes.

Table 8 presents estimated earnings functions, to explore some of the patterns detected in Table 7 in a multivariate context. As a benchmark, across all occupations alcohol dependent workers are estimated to earn 9.8 percent less than their non-dependent peers. Additional regression results confirm that most of the earnings loss associated with alcoholism appears to be concentrated in the blue collar occupations. Conditional upon being in a white collar occupation, the estimated effect of alcohol dependence is statistically insignificant, although the point estimate is that dependence reduces earnings by 5 percent. In contrast, conditional upon being in a blue collar occupation, alcohol dependence is estimated to reduce earnings by 15.4 percent (which is statistically significant at the .01 level).

7. Alcoholism and Human Capital

In this section we estimate alternative specifications of earnings functions to explore the extent to which alcoholics earn less because they bring less human capital to the job due to their lower incentive to undertaking post-schooling learning and higher human capital maintenance

cost (as reflected by the endogenous human capital depreciation).

The first specification in Table 9 estimates the effect of alcohol dependence on earnings without controlling for human capital investment.[14] This model reproduces the benchmark model presented in the last section (Table 8), and indicates that the total effect of alcohol dependence on earnings is a 9.8 percent loss.

The second specification in Table 9 is an earnings function that includes schooling, marital status, job tenure, occupation, firm size, and training attendance. Each of these human capital variables has statistically and economically significant effect on earnings. For example, each additional year of schooling raises earnings by 5.4 percent, marriage raises earnings by 24.4 percent, and training attendance raises earnings by 15.1 percent. White collar workers earn 31.7 percent more and blue collar workers earn 22.5 percent more than workers in the omitted occupational categories (service and farm workers).

Once aspects of human capital are controlled for, the estimated earnings loss associated with alcohol dependence falls to 4.6 percent. Therefore, of the total earnings loss of 9.8 percent only 4.6 percent is the direct effect of alcoholism, while the remaining 5.2 percent is the indirect effect of alcoholism through measured human capital variables. Of course, there may be additional unmeasured aspects of human capital that are also systematically related to alcoholism. Viewed this way, a 4.6 percent earnings loss is an upper bound estimate of the direct effect of alcoholism.

---

[14]By including the AFQT score, the model does control for ability differences. While ability is an aspect of human capital, it is not an investment choice variable of the individual. For a study of schooling on alcohol consumption via health knowledge, see Kennel (1991). For characterizing endogenous human capital accumulation in a dynamic general equilibrium framework, the reader is referred to Bond, Wang and Yip (1996).

The pattern of results in Table 9 means that alcohol dependence is systematically related to the set of human capital variables added in the second specification. Table 10 presents direct evidence on these relationships. Alcohol dependence is associated with about one-third of a year less schooling and a 13.7 percent lower probability of being married. Alcohol dependence is also estimated (somewhat imprecisely) to reduce tenure on the job by 2.4 months (compared to a median job tenure of 24 months in this sample of young adults). Consistent with the patterns in Table 6, alcohol dependence is estimated to decrease the probability of being in a white collar occupation by 4.7 percent and to increase the probability of being in a blue collar occupation by 9.1 percent. Alcohol dependence is estimated to have a negative effect on the probability of attending training, but the effect is small and statistically insignificant.

8. Job Choice and Smoking Status

Alcoholism is an interesting addiction to study in a labor market context because there are clear channels through which alcohol abuse can directly reduce worker productivity. Cigarette smoking is an alternative common addiction where the direct productivity effects are probably much less important.[15] However, smoking is still expected to be associated with the individual rate of time preference, both because high discounters are more likely to become addicted to cigarettes and because smoking reduces life expectancy thus endogenously

[15]Particularly in a sample of young adults, where the long-term health effects including lung cancer, chronic obstructive pulmonary disease and heart disease will not yet be manifested. While this is also true for the chronic effects of heavy drinking, such drinking also has acute effects such as hangovers and lost sleep, not to mention the productivity effects of on-the-job drinking. Levine, Gustafson and Velenchik (1996) estimate that smoking reduces wages by roughly 3 to 8 percent, but suggest this may mainly reflect higher health insurance costs for workers who smoke.

increasing the discount rate. This section reports preliminary results on the relationships between alcoholism, smoking status, and job characteristics. Viewing smoking status as a proxy for time preference, the results shed light on the relative importance of the productivity and human capital depreciation effects of alcoholism compared to the role of individual preferences between present and future consumption.

Table 11 presents estimates of the effects of alcohol dependence and smoking status on the probability of receiving the same fringe benefits considered in Table 2. Smoking status is measured on a lifetime basis, from survey responses indicating having ever smoked more than 100 cigarettes.[16] Controlling for lifetime smoking status, alcohol dependence continues to be associated with lower probabilities of receiving major fringe benefits. However, compared to the results in Table 2, controlling for smoking status results in smaller (in absolute value) estimated effects of alcohol dependence; some estimates also lose statistical significance. Lifetime smoking status itself is associated with statistically significantly lower probabilities of receiving major fringe benefits. Moreover, our results indicate that while drinking status has stronger adverse impact on fringes of paid sick leave, paid vacation and retirement plans compared to smoking, the latter is somewhat more influential in dental and life insurance as well as m(p)aternity leave. One interpretation of these patterns is that job choices, and consequently fringe benefit choices, reflect both variation in individual rates of time preference and the productivity effects of alcohol abuse.

[16]Questions on smoking are included in the 1984 and 1992 waves of the NLSY. We use responses from the 1992 wave to measure lifetime smoking as of 1989; respondents who started smoking after 1989 are given a value of zero.

9. Concluding Comments

Our analysis of data from the NLSY suggests that young men who meet criteria for alcohol dependence are indeed in bad jobs. Their jobs are less likely to offer major fringe benefits, are more dangerous, and are at smaller firms. Their jobs also pay less, in part because alcoholics bring less human capital to the job than do their non-alcoholic peers. Of course, these patterns are open to several interpretations. Particularly because of the important role human capital variables play, some of the benchmark patterns are consistent with the job choices of rational addicts who anticipate the labor market consequences of alcoholism. Many of the results, especially the results in section 8 that show that smokers are in bad jobs, suggest that differences in individual rates of time preference may have important labor market consequences. This is again consistent with job choices of rational addicts, but is also consistent with other models of addictive behavior. Sharper tests of the labor market implications of the rational addiction model await future work.

Studies of alcohol abuse in the labor market, including ours, have not attempted to distinguish separate supply-side and demand-side effects. Previous empirical studies investigate whether in equilibrium workers who abuse alcohol are paid less; our analysis extends the approach to consider a much wider array of job attributes. The effects of alcoholism are often assumed to be primarily supply-side phenomena, reflecting individuals' labor supply decisions. This is more plausible for some of the indirect effects of alcohol abuse, such as lower schooling attainment, and less plausible for other effects, such as the increased unemployment of alcohol abusers. The observed patterns reported above might be at least partly demand-side phenomena. If employer screening is effective, alcohol abusers will be unemployed or placed in less

demanding low wage jobs where drinking has fewer safety and productivity consequences. In a general model of employer search, Barron, Bishop and Dunkelberg (1989) suggest that employers will increase search efforts when filling positions that require more training. They estimate that higher levels of training provided in the first month are associated with more extensive and intensive employer search. They also estimate that the level of on-the-job training is associated with the number of applicants screened and the average screening time per applicant. To the extent employers' search efforts weed out problem drinkers, an occupational sorting will result where problem drinkers end up in jobs that require little training. This provides an alternative explanation for the labor market consequences explored here, with obvious implications for our model of consumer/worker behavior.

As noted earlier, this present research, based on the examination of the 1989 wave of the NLSY data for men, serves only as a first step toward understanding the interplays between alcohol addictive behavior and labor market outcomes. Future work along these lines may also consider using other waves, including women to investigate gender differences (Mullahy and Sindelar 1991), comparing our findings with those experimental outcomes by behavioral economists, undertaking careful cross-cultural comparisons and, of particular interest, examining the alcohol consequences of quit and layoff probabilities.[17]

[17]For analysis on job spell and search duration in the context of labor market, see Abraham and Farber (1987) and Laing, Palivos and Wang (1995). The relationships with alcoholism, however, remain open to be explored.

References

Abraham, Katharine and Henry S. Farber, 1987. "Job Duration, Seniority, and Earnings," *American Economic Review* 77(3): 278-297.

Barron, John M., Dan A. Black, and Mark A. Loewenstein, 1989. "Job Matching and On-the-Job Training," *Journal of Labor Economics* 7(1): 1-19.

Becker, Gary, Michael Grossman and Kevin Murphy, 1991. "Rational Addiction and the Effect of Price on Consumption," *American Economic Review, Papers and Proceedings*, 81: 237-241.

Becker, Gary, Michael Grossman and Kevin Murphy, 1994. "An Empirical Analysis of Cigarette Addiction," *American Economic Review* 84 (3): 396-418.

Becker, Gary and Casey Mulligan, 1993. "On Endogenous Time Preferences," mimeo, Department of Economics, University of Chicago.

Becker, Gary and Kevin Murphy, 1988. "A Theory of Rational Addiction," *Journal of Political Economy* 96 (4): 675-700.

Becker, Robert A., John H. Boyd III and B.Y. Sung, 1989. "Recursive Utility and Optimal Capital Accumulation. I. Existence," *Journal of Economic Theory* 47: 76-100.

Benham, Lee and Benham, A., 1982. "Employment, Earnings, and Psychiatric Diagnosis," in Victor Fuchs, editor, *Economic Aspects of Health*. Chicago: University of Chicago Pres, pp. 203-220.

Berger, Mark C. and J. Paul Leigh, 1988. "The Effect of Alcohol Use on Wages," *Applied Economics* 20: 1343-1351.

Bond, Eric, Ping Wang and Chong K. Yip, 1996. "A General Two-Sector Model of Endogenous Growth with Physical and Human Capital: Balanced Growth and Transitional Dynamics," *Journal of Economic Theory* 68: 149-173.

Campbell, Karen E., Frederick S. Stinson, Terry S. Zobeck, and Darryl Bertolucci, 1996. *Trends in Alcohol-Related Fatal Traffic Crashes, United States, 1977-94*. National Institute on Alcohol Abuse and Alcoholism, Surveillance Report #38.

Chaloupka, Frank, 1991. "Rational Addictive Behavior and Cigarette Smoking," *Journal of Political Economy* 99(4): 722-742.

Cook, Philip, 1991. "The Social Costs of Drinking," In *Expert Meeting on Negative Social Consequences of Alcohol Use*. Oslo: Norwegian Ministry of Health and Social Affairs, 49-74.

Cook, Philip and Michael J. Moore, 1993. "Drinking and Schooling," *Journal of Health Economics* 12: 411-429.

Epstein, Lawrence, 1987. "A Simple Dynamic General Equilibrium Model," *Journal of Economic Theory* 41: 68-95.Farber, Henry S., 1994. "The Analysis of Interfirm Worker Mobility," *Journal Labor Economics* 12(4): 554-593.

French, Michael and Gary Zarkin, 1995. "Is Moderate Alcohol Use Related to Wages? Evidence from Four Worksites," *Journal of Health Economics* 14 (3): 319-344.

Grant, Bridget F., T.C. Harford, S.P. Chou, F.S. Stinson, and J. Noble, 1991. "Prevalence of DSM-III-R Alcohol Abuse and Dependence: United States, 1988." *Alcohol, Health & Research World* 15: 91-96.

Grossman, Michael, Frank Chaloupka and Ismail Sirtalan, forthcoming. "An Empirical Analysis of Alcohol Addiction: Results from the Monitoring the Future Panels," *Economic Inquiry.*

Grossman, Michael, Frank Chaloupka and Charles Brown, 1996. "The Demand for Cocaine by Young Adults: A Rational Addiction Approach," National Bureau of Economic Research Working Paper No. 5713, August.

Harwood, H.J., A.M. Cruze, P.L. Kristiansen, J.J. Collins and D.C. Jones, 1984. *Economics Costs to Society of Alcohol and Drug Abuse and Mental Illness: 1980*. Research Triangle Park, N.C.: Research Triangle Institute.

Heien, Dale M. and David J. Pittman, 1993. "The External Costs of Alcohol Abuse," *Journal of Studies on Alcohol* 54: 302-307.

Keeler, Theodore E., The-wei Hu, Paul Barnett and Willard Manning, 1993. "Taxation, Regulation, and Addiction: A Demand Function for Cigarettes Based on Time-Series Evidence," *Journal of Health Economics* 12(1): 1-18.

Kenkel, Donald S., 1991. "Health Behavior, Health Knowledge, and Schooling," *Journal of Political Economy* 99 (2): 287-305.

Kennel, Donald S. and David Ribar, 1994. "Alcohol Consumption and Young Adults' Socioeconomic Status," *Brookings Papers on Economic Activity-Micro*, (June): 119-161.

Kenkel, Donald S. and Ping Wang, 1996. "Rational Addiction, Occupational Choice, and Human Capital Accumulation." Working paper, November 1996.

Laing, Derek, Theodore Palivos and Ping Wang, 1995. "Learning, Matching and Growth," *Review of Economic Studies* 61 (1), January: 115-129.

Levine, Phillip B., Tara A. Gustafson, and Ann D. Velenchik, 1996. "More Bad News for Smokers? The Effects of Cigarette Smoking on Labor Market Outcomes." Working paper.

Manning, Willard G., Emmett B. Keeler, Joseph P. Newhouse, Elizabeth M. Sloss, and Jeffrey Wasserman, 1991. *The Costs of Poor Health Habits* (Cambridge, Massachusetts: Harvard University Press).

McClellan, Mark B. and David A. Wise, 1995. "Where the Money Goes: Medical Expenditures in a Large Corporation." National Bureau of Economic Research Working Paper No. 5294, October.

Moore, Michael J. and Philip J. Cook, 1994. "The Demand for Alcohol by Youths: Empirical Models of Habit Formation and Addiction with Unobserved Heterogeneity," mimeo, The Fuqua School of Business, Duke University.

Mullahy, John, 1993. "Alcohol and the Labor Market," in Gregory Bloss and Michael Hilton, editors, *Economics and the Prevention of Alcohol Related Problems*. Rockville, MD: National Institute on Alcohol Abuse and Alcoholism, 141-174.

Mullahy, John and Jody Sindelar, 1989. "Life-cycle Effects of Alcoholism on Education, Earnings, and Occupation," *Economic Inquiry* 26 (2): 272-282.

Mullahy, John, and Jody Sindelar, 1991. "Gender Differences in Labor Market Effects of Alcoholism," *American Economic Review Papers and Proceedings*, 81 (2): 161-165.

Mullahy, John, and Jody Sindelar, 1993. "Alcoholism, Work and Income," *Journal of Labor Economics* 11 (3): 494-520.

Mullahy, John and Jody Sindelar, 1994. "Alcoholism and Income: The Role of Indirect Effects," *The Milbank Quarterly* 72: 359-375

Mullahy, John and Jody Sindelar, 1996. "Employment, Unemployment, and Problem Drinking," *Journal of Health Economics* 15: 409-434.

Obstfeld, M., 1990. "Intertemporal Dependence, Impatience, and Dynamics," *Journal of Monetary Economics* 26: 45-75.

Palivos, Theodore, Ping Wang and Jianbo Zhang, 1997. "On the existence of Balanced Growth Equilibrium," *International Economic Review*.

Rice, Dorothy P., 1993. "The Economic Cost of Alcohol Abuse and Dependence, 1990," *Alcohol Health and Research World* 17 (1): 10-12.

Rice, Dorothy P., Sander Kelman, Leonard S. Miller, and Sarah Dunmeyer, 1990. *The Economic Costs of Alcohol and Drug Abuse and Mental Illness: 1985*. Report submitted to the Office of Financing and Coverage Policy of the Alcohol, Drug Abuse, and Mental Health Administration, U.S. Department of Health and Human Services. San Francisco, CA: Institute for Health & Aging, University of California.

Sindelar, Jody, 1993. "Measurement Issues in Alcohol Survey Data," in Gregory Bloss and Michael Hilton, editors, *Economics and the Prevention of Alcohol Related Problems*. Rockville, MD: National Institute on Alcohol Abuse and Alcoholism, 201-228.

Stinson, Frederick, Scar DeBakey, and Rebecca Steffens, 1992. "Prevalence of DSM-III-R Alcohol Abuse and/or Dependence Among Selected Occupations, United States 1988," *Alcohol Health & Research World* 16(2): 165-72.

Topel, Robert., 1991. "Specific Capital, Mobility, and Wages: Wages Rise with Job Seniority," *Journal of Political Economy* 99(1): 145-176.

U.S. Chamber of Commerce, 1990. *Employee benefits*. (Washington D.C., Chamber of Commerce of the United States of America).

Waters, Teresa M. , and Frank Sloan, 1995. "Why Do People Drink? Tests of the Rational Addiction Model," *Applied Economics* 27: 727-736.

Zucker, Robert A. and Edith S. Lisansky Gomberg, 1986. "Etiology of Alcoholism Reconsidered: The Case for a Biopsychosocial Process," *American Psychologist* 41 (7): 783-793.

Figure 1: Productivity Vs. Wage Losses with Homothetic Preferences

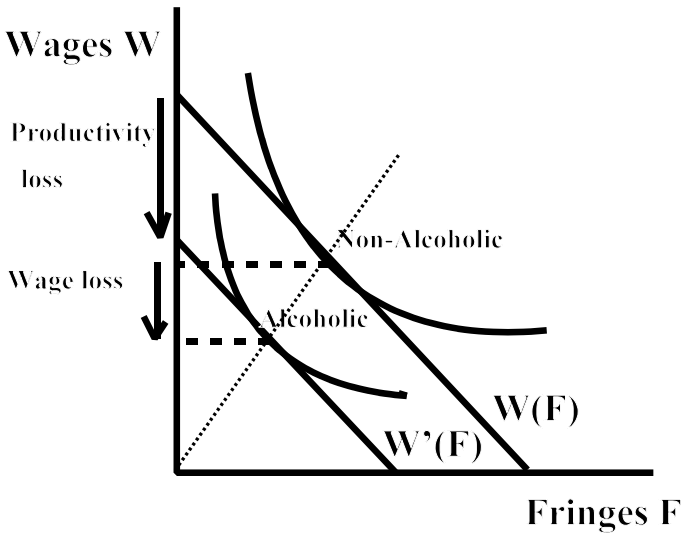

Figure 2: Productivity Vs. Wage Losses with Non-homothetic Preferences I

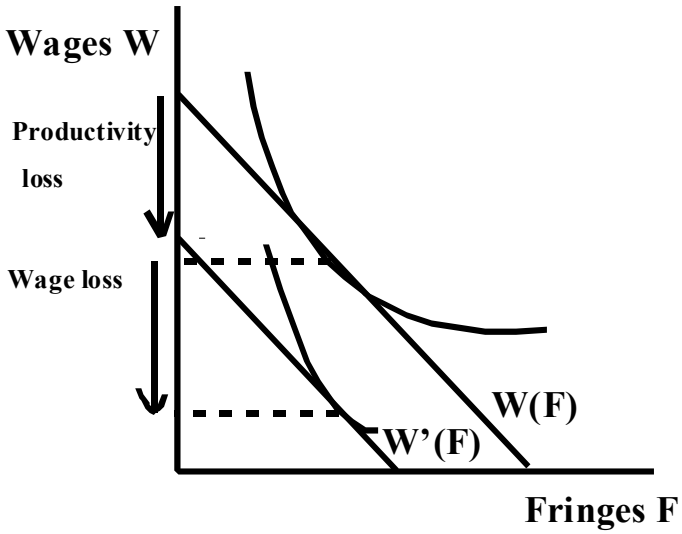

Figure 3: Productivity Vs. Wage Losses with Non-homothetic Preferences II

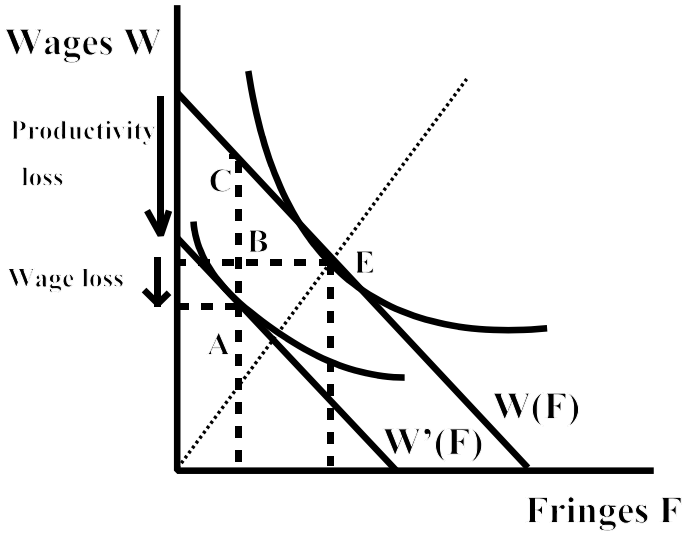

Figure 4: Productivity Vs. Wage Losses with Non-homothetic Preferences and Wage-Fringe Tradeoff

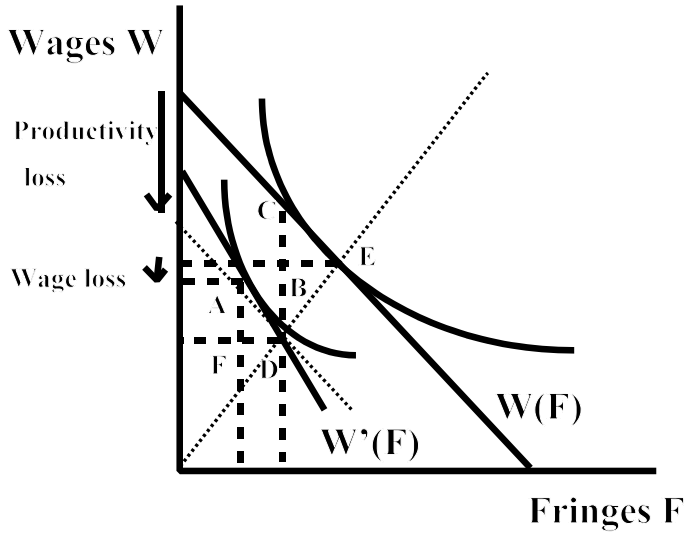

Table 1: Psychiatric Criteria for Alcohol Dependency

American Psychiatric Association, Diagnostic and Statistical Manual of Mental Disorders, Third Edition, Revised (DSM-IIIR) defines criteria for diagnosis of alcohol abuse and dependence. A diagnosis of **alcohol dependence** requires that an individual meets at least three of nine criteria below, and some symptoms of the disturbance have persisted for at least one month, or have occurred repeatedly over a longer period of time.

(1) substance often taken in larger amounts or over a longer period than the person intended

(2) persistent desire or one or more unsuccessful efforts to cut down or control use

(3) a great deal of time spent in activities to get alcohol, drinking, or recovering from its effects

(4) frequent intoxication or withdrawal symptoms when expected to fulfill major role obligations at work, school, or home or when substance use is physically hazardous

(5) important social, occupation, or recreational activities given up or reduced because of use

(6) continued use despite knowledge of having a persistent or recurrent social, psychological, or physical problem that is caused or exacerbated by use

(7) marked tolerance

(8) characteristic withdrawal symptoms

(9) substance often taken to relieve or avoid withdrawal symptoms

Table 2: Alcohol Dependence Status and Fringe Benefits

	Sample Proportion	Effect of alcohol dependence on probability
health insurance	0.764	-0.064*** (0.018)
life insurance	0.643	-0.055*** (0.021)
paid sick leave	0.575	-0.105*** (0.022)
dental insurance	0.509	-0.046** (0.022)
paid vacation	0.774	-0.059*** (0.018)
m(p)aternity leave	0.485	-0.047** (0.023)
retirement plan	0.534	-0.090*** (0.022)
employee discounts	0.453	0.006 (0.022)
flexible work schedule	0.437	0.018 (0.022)
profit-sharing	0.288	-0.012 (0.020)
training/education opportunities	0.423	-0.037* (0.022)
child care	0.042	0.001 (0.008)
paid/subsidized meals	0.160	0.001 (0.016)
parking	0.540	-0.007 (0.021)

Notes: Probit models based on 1989 data from NLSY for men. Probit coefficient has been transformed to show the effect on the probability of a discrete change of the alcohol dependency dummy variable from zero to one. Standard errors are in parenthesis. Models are estimated with additional explanatory variables, including year of birth, ethnicity, nonintact family/religious attendance/magazines/library card at age 14, mother's and father's education, siblings, and AFQT score. *, ** and * denote, respectively, statistical significance at the .10, 05 and .01 level.**

Table 3: Alcohol Dependence Status and Job Characteristics

	Sample Proportion (or mean of continuous variable)	Effect of alcohol dependence on probability (or OLS coefficient for continuous variable)
white collar occupation	0.159	-0.025* (0.013)
like job very much	0.328	0.029 (0.018)
injury/illness occurred at job	0.088	0.033*** (0.011)
ln (number of employees at job)	0.392	-0.235*** (0.090)
shift work	0.151	-0.013 (0.014)
Employment Status		
unemployed	0.061	0.019** (0.009)
out of labor force	0.065	0.002 (0.007)
employed full-time, if employed	0.931	-0.025** (0.010)
Compensation		
piece rate	0.035	0.008 (0.007)
commission	0.069	0.005 (0.010)
tips	0.027	0.016*** (0.006)
bonus	0.137	0.029** (0.014)

Note: See Table 2.

Table 4: Heavy Drinking and Fringe Benefits

	Effect of current (1989) heavy drinking on probability	Effect of past (1984) heavy drinking on probability
health insurance	**-0.008*** (0.002)**	**-0.006** (0.002)**
life insurance	**-0.012*** (0.003)**	**-0.007*** (0.003)**
paid sick leave	**-0.018*** (0.003)**	**-0.007*** (0.003)**
dental insurance	**-0.009*** (0.003)**	**-0.002 (0.003)**
paid vacation	**-0.009*** (0.002)**	**-0.007*** (0.002)**
maternity/paternity leave	**-0.009*** (0.003)**	**-0.009*** (0.003)**
retirement plan	**-0.010*** (0.003)**	**-0.007** (0.003)**
employee discounts	**0.001 (0.003)**	**-0.001 (0.003)**
flexible work schedule	**0.005 (0.003)**	**-0.0002 (0.003)**
profit-sharing	**-0.001 (0.003)**	**-0.002 (0.003)**
training/education opportunities	**-0.006** (0.003)**	**-0.006** (0.003)**
childcare	**-0.001 (0.001)**	**-0.001 (0.001)**
paid/subsidized meals	**0.005** (0.002)**	**0.004* (0.002)**
parking	**-0.005 (0.003)**	**-0.004 (0.003)**

Note: See Table 2.

Table 5: The Costs of Fringe Benefits

	1989 cost per employee
health insurance	2,665
life insurance	158
paid sick leave	398
dental insurance	188
paid vacation	1,728
m(p)aternity leave	1
retirement plan	1320
employee discounts	58
flexible work schedule	n.a.
profit-sharing	242
training/education opportunities	63
child care	3
paid/ subsidized meals	25
parking	n.a.

Source: U.S. Chamber of Commerce, *Employee Benefits: Survey Data from Benefit Year 1989*, Table 8.

Table 6: Occupation by Alcohol Dependence Status

Occupational Status	Alcohol Non-dependent	Alcohol dependent
White Collar	37.5	30.9
Professional and technical	13.9	10.1
Managers and administrators	11.4	10.5
Sales workers	4.3	3.2
Clerical workers	7.9	7.1
Blue Collar	48.1	57.9
Craftspeople	19.2	25.0
Operatives	19.1	20.1
Nonfarm laborers	9.9	12.8
Service workers	12.0	9.6
Farmers/ farm workers	2.2	1.5

Source: 1989 data from NLSY.

Table 7: Earnings, by Occupation and Alcohol Dependence Status (Men)

Occupational Status	Median Earnings ($)		Mean Earnings ($)	
	Non-dependent	Dependent	Non-dependent	Dependent
White Collar (n=1619)	25,000	25,000	28,398	27,252
Professional and technical (n=584)	29,000	29,300	31,186	31,325
Managers and administrators (n=505)	26,000	25,000	30,087	29,505
Sales workers (n=181)	25,750	27,000	30,412	25,467
Clerical workers (n=349)	18,950	18,500	20,056	18,994
Blue Collar (n=2,202)	18,000	15,000	18,941	16,807
Craftspeople (n=898)	20,400	16,500	21,224	18,378
Operatives (n=853)	18,000	15,000	18,758	16,718
Nonfarm laborers (n=451)	12,000	14,000	14,763	13,805
Service workers (n=513)	15,000	13,000	16,032	15,433
Farmers/ farm workers (n=94)	10,000	5,000	13,012	6,257

Source: 1989 data from NLSY.

Table 8: Regression Estimates of the Effect of Alcohol Dependence on Earnings by Occupation

	All occupations	White collar	Blue collar
alcohol dependent	-0.098**	-0.050	-0.154***
	(0.035)	(0.049)	(0.044)

Notes: OLS regressions with ln (earnings) as the dependent variable. Standard errors are in parenthesis. Models are estimated with additional explanatory variables, including year of birth, ethnicity, nonintact family/religious attendance/magazines/library card at age 14, mother's and father's education, siblings, and AFQT score. *, ** and * denote, respectively, statistical significance at the .10, 05 and .01 level.**

Table 9: Alcohol Dependency and Earnings

	(1)	(2)
alcohol dependent	**-0.098** (0.035)**	**-0.046* (0.030)**
schooling		**0.054*** (0.007)**
tenure		**0.003*** (0.0003)**
married		**0.244*** (0.025)**
white collar occupation		**0.317*** (0.040)**
blue collar occupation		**0.225*** (0.036)**
log (number of employees at job)		**0.055*** (0.005)**
attended training		**0.151*** (0.033)**

Note: See Table 8.

Table 10: Alcohol Dependence and Human Capital

	Sample Proportion (or mean of continuous variable)	Effect of alcohol dependence on probability (or OLS coefficient for continuous variable)
schooling	**12.469**	**-0.355*** (0.067)**
tenure	**34.560**	**-2.433* (1.495)**
married	**0.670**	**-0.137*** (0.019)**
white collar occupation	**0.348**	**-0.047** (0.020)**
blue collar occupation	**0.512**	**0.091*** (0.021)**
log (number of employees at job)	**0.392**	**0.055 (0.005)**
attended training	**0.160**	**-0.014 (0.014)**

Note: See Tables 2 and 8.

Table 11: Alcohol Dependence Status, Smoking Status, and Fringe Benefits

	Effect of alcohol dependence on probability	Effect of smoking status on probability
health insurance	-0.035* (0.020)	-0.051*** (0.016)
life insurance	-0.031 (0.024)	-0.064*** (0.018)
paid sick leave	-0.080*** (0.025)	-0.064*** (0.019)
dental insurance	-0.029 (0.025)	-0.069*** (0.019)
paid vacation	-0.046** (0.020)	-0.027* (0.016)
m(p)aternity leave	-0.027 (0.026)	-0.087*** (0.021)
retirement plan	-0.074*** (0.025)	-0.044** (0.019)
employee discounts	0.033 (0.025)	-0.006 (0.019)
flexible work schedule	0.031 (0.025)	-0.039** (0.019)
profit-sharing	-0.022 (0.023)	-0.004 (0.018)
training/education opportunities	-0.016 (0.025)	-0.078*** (0.019)
child care	-0.001 (0.010)	-0.004 (0.007)
paid/ subsidized meals	0.006 (0.018)	-0.012 (0.014)
parking	0.007 (0.024)	-0.038 (0.019)

Note: See Table 2.