

ALCOHOL USE AND THE LABOR MARKET IN URUGUAY

KEY WORDS: alcohol use, labor force participation, employment, absenteeism, Latin America

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SUMMARY

This paper is one of only a few studies to examine potential labor market consequences of heavy or abusive drinking in Latin America and the first to focus on Uruguay. We analyzed data from a Uruguayan household survey conducted in 2006 using propensity score matching (PSM) methods and controlling for a number of socio-demographic, family, regional, and labor market characteristics. As expected, we found a positive association between heavy drinking and absenteeism, particularly for female employees. Counter to the findings for developed countries, however, our results revealed a positive relationship between heavy drinking and labor force participation or employment. This result was mostly driven by men and weakened when considering more severe measures of abusive drinking. Possible explanations for these findings are that the Uruguayan labor market rewards heavy drinking, that employment in this country facilitates or encourages alcohol use, or that labor market characteristics typical of less developed countries, such as elevated safety risks or job instability, lead to problem drinking. Future research should explore these possible mechanisms.

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INTRODUCTION

There is a large body of literature documenting the adverse social consequences of problem drinking. A study by Rehm *et al.* (2006) examining the costs of substance use in Canada revealed that productivity losses accounted for 61% of the total estimated costs of substance use in 2002, followed by health care (22%) and law enforcement (14%). In the US, lost earnings due to alcohol-related illnesses were estimated to be \$86.4 billion in 1998 (almost 50% of the total estimated cost of alcohol abuse), and the rate increased to 73% of the total cost when lost future earnings due to premature births, fetal alcohol syndrome, and crime or victimization were taken into consideration (Harwood, 2000).

Problem drinking can lead to productivity losses through a diverse array of mechanisms, including decreased quality of individual work, problems with co-workers due to verbal or physical aggressiveness, higher likelihood of physical problems and accidents within and outside the workplace, absenteeism, lower likelihood of having full-time and/or high-quality jobs, and lower odds of employment.¹ Estimating these consequences is not an easy task because of the recursive nature of the relationship between problematic alcohol use and labor market outcomes. There are certain types of jobs that may contribute to the initiation or aggravation of abusive drinking. Such is the case with jobs that require special physical skills (e.g., construction, heavy industries), jobs in which the employee spends many hours on his own (e.g., transportation), jobs in which workers often participate in activities that involve the use of alcohol (e.g., sales, management,

¹ Other consequences that have effects on future labor market costs and have been considered in longitudinal studies are lost earnings due to fetal alcohol syndrome and lost earnings because of alcohol-related lower educational achievement. This study focuses on the contemporaneous labor market effects of problem drinking.

professional sports), or activities with social patterns historically rooted around alcohol consumption, such as those of artists, soldiers, and sailors (Holcom *et al.*, 1993; Gleason *et al.*, 1991; Harford and Brooks, 1992; SAMHSA, 1996).

Unemployment may similarly reinforce problematic drinking, or it may be that unobserved individual characteristics (such as mental health problems) are significantly correlated with both substance use and job success. Failure to account for these characteristics could result in spurious associations between alcohol use and labor market outcomes.

The next section reviews the literature on labor market consequences and costs of problematic alcohol use. To the best of our knowledge, most of the existing studies focus on developed and high-income countries. Less is known about the impact of problem drinking in underdeveloped or developing countries. To fill this gap, the present study analyzes data from a household survey administered in 2006 in Uruguay, South America, and estimates the labor market effects of problematic alcohol use in this less developed country. Our results provide empirical support for recent policies aimed at regulating the use of substances in the workplace that have begun to take place in Uruguay (Presidency of the Republic, 2006).²

BACKGROUND

Labor market consequences of problematic alcohol use

Studies investigating the socio-economic consequences of alcohol use have uncovered both negative and positive effects. In general, and regardless of the outcome analyzed (e.g., health, legal, work-related), the literature usually identifies a non-linear effect of alcohol use, whereby low to moderate amounts of consumption are generally associated with positive outcomes (relative to abstaining) such as

² The program, a joint venture between the government and a local ONG, assists and trains entrepreneurs and union leaders on how to fight substance-related problems at the workplace and on how to help employees with drug or alcohol problems.

better health and higher wages (Berger and Leigh, 1988; Bray, 2005; French and Zarkin, 1995; Hamilton and Hamilton, 1997; Heien, 1996; Zarkin *et al.*, 1998) while heavy use results in detrimental effects. The literature review that follows focuses exclusively on the labor market consequences of heavy or abusive alcohol use.

Heavy or abusive alcohol use and labor supply. As first pointed out by Mullahy and Sindelar (1991, 1993), the negative effects of problem drinking on income occur mainly through reduced labor force participation and employment, and to a lesser degree through lower wages. Mullahy and Sindelar (1996) found that heavy drinking increased the likelihood of unemployment and decreased the odds of being employed, a result later confirmed by Terza (2002), who refined the estimation methodology to account for endogeneity and non-linearities in the estimation. Similar effects were found by Johansson and colleagues (2007) when analyzing a sample of Finnish employees. In their study, alcohol dependence was associated with decreases in the probability of full-time or part-time work that ranged between 11 percentage points for women and 14 percentage points for men. Along the same lines, MacDonald and Shields (2004) estimated that problem drinking among English adults reduced the probability of working by between 7% and 31%. Bray and colleagues (2000) analyzed data from the US National Household Survey on Drug Abuse and showed that substance use (including alcohol) with symptoms of dependence was associated with lower employment rates both for men and women and a lower number of hours worked for men, but not for women. Feng *et al.* (2001), on the other hand, did not find a significant relationship between problem drinking and employment after using bivariate probit models to account for endogeneity. Their analysis used data from a sample of employees from six southern states in the US.

Rather than focus on employment per se, Kenkel and Wang (1999) studied the impact of alcohol use on job quality, as measured by non-wage characteristics. They found that alcoholics were less likely to be employed in white-collar jobs or to receive fringe benefits such as health insurance and paid vacation, and were more likely to be injured on the job or to work for smaller firms. Conditional on being in a blue-collar job, alcoholics earned less than non-alcoholics.

Other authors have examined the reverse relationship, whereby unemployment affects problem drinking. In a longitudinal study of a group of unemployed individuals from Norway, Claussen (1999) found that the high prevalence of heavy drinking among the unemployed was explained mainly by unemployment causing alcohol abuse rather than vice versa. Dooley and Prause (1998) analyzed two pairs of consecutive years' data from the National Longitudinal Survey of Youth and demonstrated that job loss, involuntary part-time jobs, and jobs with poverty-level wages increased the risk of alcohol misuse.

Alcohol use and wages. Heien (1996) identified a concave quadratic relationship between alcohol use and earnings similar to that encountered between alcohol consumption and risks of coronary artery disease. In this study, heavy drinkers and abstainers had lower income levels compared to moderate drinkers. French and Zarkin (1995) utilized a database of employees at four worksites to test for nonlinear relationships between alcohol use and wages. Their findings also suggested an inverse U-shaped relationship between alcohol consumption and wages with a peak at approximately 1.5 to 2.5 drinks per day, on average. A replication of the French and Zarkin study using data from the National Household Surveys on Drug Abuse could not find evidence of a turning point in the effect of alcohol consumption on

wages and identified only positive effects of moderate alcohol use on labor market income (Zarkin et al., 1998).

Alcohol use and productivity: work efficiency, work-related injuries, and absences.

Ames, Grube, and Moore (1997) studied 832 hourly workers from a manufacturing plant at a Fortune 500 company. They detected moderate yet positive correlations between drinking at work and coming to work hung over, conflicts with peers and supervisors, health problems and injuries, absences, and sleeping on the job. Blum, Roman, and Martin (1993) examined the work performance of a sample of male employees, including data from both self-reports and reports of workplace collaterals. While the self-reported data did not reveal negative work-related outcomes, data from collateral reports showed that heavier drinkers were more likely to score lower on self-direction appraisals, conflict avoidance, and interpersonal relations at work. In a similar but more extensive study at 16 worksites, Mangione et al. (1999) found that moderate/heavy and heavy drinkers reported more work performance problems than very light, light, or moderate drinkers. Jones, Casswell, and Zhang (1995) estimated the alcohol-related effects on productivity and absenteeism among a sample of New Zealand employees surveyed between 1990 and 1992. Approximately 12% of the sample reported reduced efficiency days due to alcohol and approximately 4% reported alcohol-related absences.

Alcohol-related job injuries appear to be an important cause of absenteeism and lost productivity. Stallones and Xiang (2003) found that the quantity and frequency of alcohol consumption were positively and significantly associated with farm-related injuries in a prospective sample of Colorado farm residents. Webb et al. (1994) did not detect a direct relationship between the use of alcohol before an accident and the likelihood of having work injuries in a study of 833 employees at a

single worksite. However, conditional on having injuries, they found that problem drinking increased the odds of having two or more injuries. They also found a relationship between problem-drinking and injury-related absences. Another study by Wickizer *et al.* (2004) used a pre–post design to assess the impact of a publicly sponsored drug-free workplace program on injury risk. The intervention was associated with a decrease in injury rates for three industry groups (construction, services, and manufacturing) and with a reduction in the incidence rate of more serious injuries involving four or more days of lost work time for the construction and services industries.

We identified very few studies analyzing the associations between problem-drinking and productivity in Latin America. In Trucco *et al.* (1998), blood and urine samples were obtained from patients admitted to a hospital in Chile within 6 hours of a job accident severe enough to require hospitalization. The analyses revealed that 30% of men and 17% of women had used alcohol or drugs a short time before the accident, with alcohol being the most common substance. Only 2 out of 60 positive cases, however, admitted to substance use during a follow-up interview. Jimenez and Mata (2005), on the other hand, explored the associations between drug use, accidents, and absenteeism among a sample of Costa Rican employees visiting a general physician. They found a correlation between any drug use and accidents, although the association lost statistical significance when they attempted to individualize the substance used.

Alcohol consumption in Uruguay

According to a World Health Organization Global Status report on Alcohol (2004), only 1.3% of Uruguayans were classified as heavy hazardous drinkers (i.e., consumed 40 grams or more of pure alcohol per day for males and 20 grams or

more for females) compared to 5.7% in the US.³ The same report revealed that the prevalence of alcohol dependence, defined on the basis of DSM-IV criteria, was 5% in Uruguay in 2001 and 7.7% in the US in 2002.⁴

Using data from the fourth National Household Survey on Substance Use, we estimate that 63% of the Uruguayan population aged 12 to 65 consumed alcohol in 2006. Among alcohol consumers, 14% reported drinking heavily or to intoxication in the past 30 days and 8% showed at least one symptom of dependence. These prevalence rates are even higher for the population aged 18 to 65 who are also participating in the labor force. Use of alcohol among this population in the past 12 months was 70%, with 16% reporting drinking abusively or to intoxication and 10% demonstrating at least one symptom of alcohol dependence.

DATA SOURCE, SAMPLE, AND MEASURES

Data

The current analysis used data from the “4th National Survey on Substance Use in Uruguayan Households 2006” developed by the Uruguayan “Junta Nacional de Drogas” (National Board on Drug Related Issues) together with the United Nations and the Organization of American States (OAS). The survey was administered to individuals aged 12 to 65 living in urban areas (population greater than 10,000) in Uruguay. The survey design was based on the 2004 Uruguayan Census of Households and Housing and was representative of the Uruguayan population. The survey resulted in a total of 7,000 useable observations (response rate = 69%),⁵ which included a supplemental sample of uneducated youth. Sampling

³ Source for Uruguay: 2003 World Health Survey; source for the US: 1995/1996 WHO GENACIS study.

⁴ The source for Uruguay was the 2001 National Survey on Prevalence and Consumption of Drugs and the source for the US was a 2002 national survey.

⁵ Non-response was due to one the following reasons: (1) there was no one in the household or the selected individual could not be contacted after three attempts, (2) there were no individuals aged 12

weights were constructed to make each observation representative of its age and gender cohort in Uruguay. Because our focus was on the relationship between alcohol consumption and labor market outcomes, we restricted the analysis to people between the ages of 18 and 65 at the time of the survey (N = 6,015).

Measures

Labor market outcomes. We selected and constructed seven labor market outcomes that have been previously studied in the literature. *Labor force participation* was defined as a dichotomous variable taking the value of one if the individual reported having a job or having looked for a job in the past 30 days and zero otherwise. Among those in the labor force, *employment* was set to one if the individual reported being employed in the past 30 days and zero otherwise. *Work intensity* was defined as one if the individual reported full-time employment in the past 30 days and zero if he/she was in a part-time or temporary job. The variable *workplace accidents* took the value of one if the employee reported being involved in an accident on the job in the past 12 months. The other three outcomes measured work absenteeism. The survey asked each employed individual about the number of full days that he/she had been absent from work in the past 12 months due to (1) health problems or accidents or (2) other reasons. Using the summation of days from both questions, we constructed a count measure of the *number of days absent* in the past year (including those who had no absences), a dichotomous indicator for *any absence*, and a *conditional* (on at least one absence in the past 12 months) *count of days absent*.

Alcohol use. After considering several dimensions of problematic drinking (e.g., high intensity, high frequency, heavy drinking on the basis of total number of drinks,

to 65 in the household, and (3) the selected individual refused to answer the survey. Gender, age, and geographic characteristics were compared across households that participated in the survey and those refusing to participate. No significant differences were detected across the two samples.

measures based on symptoms of dependence), we selected three indicators of problematic alcohol use: (1) *heavy drinking*, which we defined as one if the respondent reported having drunk 100 cubic centimeters or more of alcohol in a single session in the past 30 days (at least two litres of beer, one litre of wine, or a quarter litre of spirits)⁶ or having drunk to intoxication at least once in the past 30 days;⁷ (2) *symptomatic of dependence*, which was set as one if the respondent reported experiencing at least one symptom of alcohol dependence in the past 12 months (out of seven symptoms suggested in the DSM-IV criteria (American Psychiatric Association, 2000); and (3) at least *two symptoms of alcohol dependence* in the past 12 months.⁸ We considered initially using an indicator of alcohol dependence on the basis of the DSM IV definition (at least three symptoms of dependence), but only 1.3% of respondents were classified as alcohol dependent according to this criterion. Problems with the sequence of the questions in the survey and under-reporting may have contributed to the small number of alcohol dependent individuals in the sample. According to a former WHO survey, the prevalence of alcohol dependence in Uruguay in 2001 was around 5%. The WHO estimate lies between the prevalence of having at least one symptom of dependence in the current survey (8%) and the prevalence of having two or more symptoms of dependence (3%).

Socio-demographics, workplace characteristics, and other control variables. Other variables used in the analysis were gender, age, education (dummies for no secondary education, incomplete secondary education, high school graduation,

⁶ "In the past 30 days, how many times did you consume in a single episode two or more litres of beer, one litre of wine, or five or more measures of whisky?"

⁷ "In the past 30 days, how many times did you drink to intoxication?"

⁸ We constructed indicators for seven symptoms of dependence on the basis of 12 questions asked in the survey. The symptoms were abstinence, tolerance, absence of self-control, willingness to stop drinking, increased time devoted to alcohol-related activities, abandonment of social and productive activities, and failure to pay attention to health related problems.

incomplete college, and college graduation), marital status, smoking status, drug use among family members, region of residency (Montevideo, South, North, West, and Central), employment status (full time, part time, temporary job, self-employed), dummies for ten industry groups, firm size, and regional labor market characteristics.

Descriptive statistics

Table 1.1 presents mean values for the problem-drinking measures and labor market outcomes for the full sample (individuals aged 18 to 65), by gender, and compares means across individuals with and without symptoms of alcohol dependence. Thirteen percent of the sample reported drinking heavily or to intoxication at least once in the past thirty days. The prevalence of heavy or intoxicating drinking was above 50% for those with at least one symptom of alcohol dependence. Eight percent of respondents reported at least one symptom of dependence in the past twelve months and 3% reported two or more symptoms. The rates of problematic drinking were three to four times higher for men than for women.

Labor force participation was higher among individuals with at least one symptom of alcohol dependence (73% versus 60% for respondents with no symptoms). That pattern was consistent across men and women, although the overall rate of labor force participation was substantially lower for women than men. On the other hand, no significant differences between problem drinkers and non-problem drinkers were observed for rates of employment or work intensity. The prevalence of work-related accidents was 3% of the full sample in 2006 (and slightly higher in the case of men) and reached almost 6% for those with at least one symptom of alcohol dependence. Approximately one third of the full sample and more than 50% of those experiencing a symptom of alcohol dependence reported

having been absent from work for at least 1 day in the past 12 months. The average number of days absent for those with dependence symptoms was 9 days in the past year, almost double the number of days absent for those with no symptoms of alcohol dependence. Women were more likely to have an absence than men (0.40 versus 0.34) and reported more days absent, on average.

Table 1.2 reports mean values for other individual, regional, and labor market characteristics that were used in the analysis as controls. Respondents with symptoms of alcohol dependence were more likely to be male and to have lower levels of education. They were more likely to be single, less likely to be married or cohabitating, and showed higher odds of having family members who used drugs. They were also more likely to report a temporary job, to be smokers, and to live in Montevideo (the capital of the country) relative to other regions in Uruguay. Those with at least one symptom of alcohol dependence had lower ages of onset of alcohol use.

ESTIMATION METHODS

The effects of problematic alcohol consumption on work-related outcomes were estimated using propensity score matching (PSM) techniques. This method compares a group of “treated” individuals (those classified as problematic alcohol consumers) with a group of “untreated” individuals (those with similar characteristics for all of the non-work-related measures who were not categorized as problem drinkers). As Tables 1.1 and 1.2 demonstrate, before adjusting for similar characteristics, the group with symptoms of alcohol dependence differed systematically from those not classified as problematic drinkers across many dimensions. Simple multivariate analyses (e.g., ordinary least squares or logistic regression), are likely to produce biased estimates of the effect of problematic

drinking, even when a rich set of covariates are used to control for demographic, family, and socioeconomic characteristics.

Estimation bias is likely for several reasons. First, the control variables may be related to problematic alcohol use in a nonlinear fashion. Second, the distribution of the covariates might have little overlap across the treated and untreated individuals (Rubin, 1974; Imbens, 2000). Third, it is possible to over-control the estimation if the number of covariates entering the equation exhausts the degrees of freedom in the model. Finally, single-equation multivariate models cannot account for important unmeasured or unobserved factors that may be jointly correlated with problem drinking and the outcomes of interest. PSM can address some of the limitations associated with standard regression models by statistically selecting a subset of untreated individuals for whom the distribution of covariates is similar to the distribution in the treated group (Rubin, 1974; Rosenbaum and Rubin, 1983). Although this technique will not mimic the virtuous statistical properties of a randomized controlled trial (i.e., important unmeasured or unobserved factors could still create bias if they are orthogonal to the included controls), PSM, when performed properly with quality data, enables researchers to make valid comparisons between treated and control individuals and produces estimates that perform well compared to experimental designs (Rosenbaum and Rubin, 1983; Smith and Todd, 2001; Heckman *et al.*, 1997; Michalopoulos *et al.*, 2004).

To execute PSM, we first estimated each respondent's propensity for being classified as a problematic drinker on the basis of a set of socio-demographics, job characteristics, regional labor market factors, and family substance use. In the second stage, we matched each "treated" individual with an "untreated" individual that had a similar propensity score. This produced a new, balanced control group

that did not differ systematically from the treated group in terms of the available covariates. The balance of these characteristics across treatment and control individuals was tested using t or z-tests and statistical matching was satisfied in all cases (results of these tests can be provided upon request). Finally, for each work-related outcome, we computed the mean difference between the treated and untreated group, or what is known in the literature as the average treatment effect on the treated (ATT). We used the command *psmatch2* in Stata version 9 to estimate propensity scores, match treated with untreated individuals, test the balance of the treated and untreated groups, estimate the differences in the outcomes of interest, and compute standard errors.

To form the untreated group, our default-matching criterion was nearest neighborhood matching with three neighbors ($k=3$). This method matched each treated individual with the three neighbors who had the closest propensity score. In addition, we tested for robustness using other matching algorithms: single nearest neighbor with and without replacement, nearest neighborhood matching with five neighbors, and radius matching with calliper of 0.0005. We also bootstrapped the standard errors of the matched outcome when using nearest neighborhood with $k=3$.

In addition to running the PSM analysis for the full sample, we conducted separate analyses for women and men. The literature provides numerous examples of differing behaviors by gender, both in terms of labor market outcomes and patterns of drinking, that justify independent analyses (Hupkens *et al.* 1993; Robbins and Martin 1993; Wilsnack *et al.* 2000; Berger and Leigh, 1988; Mullahy and Sindelar, 1991, 1996, 1997; Ames and Rebhun, 1996).

RESULTS

Propensity score matching (PSM) analysis

Tables 2.1 to 2.3 show the PSM average treatment effects on the treated, or the differences between the labor market outcomes of respondents in the treatment group (those showing some type of problematic use of alcohol) and the outcomes of respondents with similar socioeconomics and job characteristics in the control group. Each table pertains to the effects of a different measure of problem drinking (heavy/intoxicating drinking in Table 2.1, any symptoms of dependence in Table 2.2, and at least two symptoms of dependence in Table 2.3) for the full sample, men, and women. The columns in each table denote the labor market outcomes and the rows show the mean value of each labor market outcome for the matched sample of treated individuals, the means for the untreated individuals, the mean difference between these two groups (average treatment effect on the treated), and the standard error of the difference in parentheses.

Counter to our expectations and findings in the literature for developed countries (e.g., Bray *et al.*, 2000; MacDonald and Shields, 2004; Johansson *et al.*, 2007), those drinking heavily or to intoxication in the past 30 days had higher rates of labor force participation and were less likely to be unemployed if in the labor force (Table 2.1). Heavy/intoxicating drinking was associated with an increase of 7.1 percentage points in labor force participation from a baseline rate of 67% for those in the untreated group. This effect was mainly driven by men: heavy/intoxicating drinking men showed rates of labor force participation that were 9.6 percentage points above those of non-heavy drinkers in the matched sample. Having at least one symptom of alcohol dependence was also significantly and positively related to labor force participation, with a magnitude slightly below that found for heavy/intoxicating drinkers (Table 2.2). However, the effect on employment decreased substantially in magnitude and lost statistical significance when the

treatment group was restricted to those with at least one symptom of dependence. Finally, no significant association was encountered between problem drinking and labor force participation or employment when problem drinking was defined as at least two dependence symptoms.

When analyzing outcomes for those employed, the results were more in line with expectations.⁹ Having at least one alcohol dependence symptom (Table 2.2) raised the likelihood of being absent from work by 12 percentage points (from 42% to 54%) and increased the number of days of absenteeism from an average of 4.4 days per year to 9.3 days when including those with no absences, and from 9 to 17 when conditioning on those with at least one absence. The effects on absenteeism from problematic drinking were much larger for women than for men. Also, the adverse effects of problematic alcohol consumption increased with the severity of the problem: Table 2.3 shows that the negative association between problematic alcohol use and work absences was even stronger when problematic drinking was defined as at least two symptoms of dependence.

Besides absenteeism, problem drinking appeared to have a detrimental effect on workplace accidents, although the results were not as robust in this area. Having at least one symptom of dependence increased the probability of having a work-related accident by 3 percentage points, but the effect was only significant at the 10% level.

To verify the stability of all results, we conducted several alternative PSM estimations (see Appendix tables). The positive association between problematic drinking (measured both in terms of heavy/intoxicating drinking and symptoms of dependence) and labor force participation was confirmed in all of the different

⁹ There were some counter-intuitive results when estimating the effects of heavy/intoxicating drinking on absenteeism for men, but these were only significant at the 10% level and were not robust to specification.

matching specifications, as was the relationship between heavy/intoxicating drinking and employment. The alternative PSM methods also confirmed the finding of a positive relationship between dependence symptoms and absenteeism. The only result that was not robust to alternative matching criteria was the effect of dependence symptoms on work-related accidents.

We replicated the analysis for workplace accidents and absenteeism, restricting the sample to those employed full-time. The results described above were robust when using this selected sample.

Alternative methods to address endogeneity of problem drinking

While PSM corrects for some types of estimation biases that may appear in single equation OLS, logistic, or probit regressions, biases may still remain if unobserved differences between the constructed treatment and control groups are not correlated with measured characteristics. To further investigate whether these types of biases were confounding our results, we re-estimated the effects of problem drinking on absenteeism and work accidents using two alternative estimation methods: (1) simultaneous equation models (either recursive bivariate probit or two stages least squares estimation) and (2) two stages residual inclusion estimation (Terza *et al.*, 2008). The former approach jointly estimates the likelihood of being a problematic user of alcohol and the work-related outcome of interest (Greene, 2000). The latter technique first estimates the residuals from the linear probability model of drinking problematically (controlling for other observed covariates) and then employs a second stage equation to estimate the work-related outcome as a function of other covariates and the first stage residuals. Both methods rely on the availability of intuitively sound and statistically valid instrumental variables (IVs). These IVs should be sufficiently correlated with problematic alcohol consumption and uncorrelated with

work absenteeism or accidents at the job. The instrument we selected was the respondent's age of onset of drinking. Earlier ages of onset of alcohol use is significantly related to more severe alcohol problems later in life (Grant and Dawson, 1997; Grant *et al.*, 2001). On the other hand, age of onset is not expected to directly affect labor market outcomes. While some unmeasured personality trait could underly both age of drinking onset and work behavior, the time lag between both measures debilitates potential links. This instrument was sufficiently predictive of our measures of problem drinking described earlier, with p -values < 0.001 .¹⁰

Both the recursive bivariate probit estimates and the analysis using two-stage residual inclusion reinforced the previous findings of a significant and positive relationship between heavy alcohol use and labor force participation as well as a positive and significant effect of alcohol dependence symptoms on the likelihood and number of work absences (estimation results available upon request). In addition, we found a negative and significant effect of problem drinking (as measured by heavy drinking and by symptoms of dependence) on the likelihood of working full time. Despite these consistencies in significance and sign across models, the magnitudes of the estimates (and corresponding standard errors) were much larger than those from the PSM estimation and far above what common sense would indicate, suggesting potential instrument problems. Thus, we view the IV results as interesting and supportive of the PSM estimates, but we have limited confidence in the point estimates.

Further analysis of absenteeism

Given the significant and intuitively predictable results for absenteeism, we conducted further analysis to investigate potential links between problem drinking

¹⁰ Because Uruguay is a small country with most major policy making conducted at the national level, it was not possible to obtain region-specific alcohol policy variables to serve as IVs

and workplace absences (again, results are not shown, but can be provided by the authors upon request). Two new dichotomous measures were constructed. The first one indicated whether the respondent had suffered any health problem in the past 12 months that had required staying in bed or resting for at least one day. The other one was set equal to one if the respondent mentioned having had an accident of any kind in the past 12 months that had limited his/her regular activities for at least one day.

Using any accident as an outcome in the PSM analysis (matching was conducted on the three nearest neighbors), the probability of suffering an accident was 6 percentage points higher for individuals with any alcohol dependence symptoms from a baseline of 7% for matched respondents in the control group. Having a symptom of dependence also increased the likelihood of being absent due to health problems by 10 percentage points.

DISCUSSION AND CONCLUSIONS

This paper is one of the few studies to examine the labor market consequences of problematic drinking in Latin America, and the first to focus specifically on Uruguay. We analyzed data from a Uruguayan household survey conducted in 2006 using PSM methods and controlling for a number of socio-demographic, family, regional, and labor market characteristics. We found a positive and robust association between heavy/intoxicating drinking and labor force participation/employment status, although the associations turned weaker both in magnitude and statistical significance as more severe measures of problematic alcohol use were considered. Having symptoms of alcohol dependence was positively related to various measures of workplace absenteeism, with stronger effects for more severe measures of problem drinking. The labor force participation

and employment effects were driven primarily by men whereas female problem drinkers were much more likely to be absent from work.

While the positive association between problem drinking and workplace absenteeism is well documented in the literature (Ames *et al.*, 1997; Jones *et al.*, 1995), the positive relationship we encountered between some forms of problem drinking and labor force participation is opposite of what the literature would predict (Mullahy and Sindelar, 1991, 1993; Johansson *et al.*, 2007; MacDonald and Shields, 2004). There are several potential explanations to these findings. First, it is possible that the positive PSM effects of problem drinking on labor force participation and employment reflect a dominant reverse relationship moving from labor market characteristics to alcohol use, particularly when less severe measures of problematic drinking are considered. Given that workplace conditions are often more dangerous and stressful in most of Latin America than in North America and Europe, it is reasonable to assume that Latin American workers are more likely to be exposed to poor working conditions and workplace stressors that trigger an increase in alcohol consumption (see Reed *et al.*, 2005 for an analysis of the effect of job stressors on alcohol use). Alternatively, labor force participation and employment in Uruguay could be leading to heavier alcohol consumption through a greater number of social interactions or by providing the resources to purchase it (i.e., income effect). A third explanation is that heavy alcohol consumption is viewed positively by coworkers and supervisors leading to labor market rewards, particularly when it doesn't exceed certain severity thresholds. Finally, the failure to find negative associations between problem drinking and labor force participation/employment could be explained by differences in the perception of alcohol in Latin American countries relative to most developed countries. In the U.S., for example, many workplaces have strict alcohol

and drug policies, often enforced through pre-employment and random testing programs. Employment records are also carefully reviewed in the U.S., which could negatively impact the likelihood of future employment for a problem drinker. Such an awareness backed by workplace policies and penalties is not nearly as advanced in Latin America. Furthermore, this situation would not only help explain the positive association between problem drinking and labor force participation but also reinforces the finding of increased absenteeism for those problem drinkers that secure employment.

Regardless of the possible mechanisms, the analysis shows that the positive association between problem drinking and labor force participation or employment weakens and eventually disappears with increasing severity of problem drinking. As the intake of alcohol increases and problem drinking becomes more severe, it is likely that these effects are being increasingly neutralized by adverse effects of problem-drinking such as absenteeism, loss of employment, and/or decreases in labor force participation.

The analysis also highlighted some interesting gender differences. The findings of a positive association between problem-drinking and labor market participation or employment applied to men, but not to women. On the other hand, the adverse effect of problem drinking on absenteeism was driven mainly by women. These findings raise some new questions. For instance, are women more likely to react to symptoms of alcohol dependence than men? Do they experience these symptoms differently? Are men more likely to be rewarded in the labor market for their consumption of alcohol, or are they more likely to turn to alcohol in response to job stress and unpleasant labor market conditions? Are South American workers

different than North American or European workers? Future investigations should attempt to address these questions.

There are some limitations to the analysis. First, PSM methods may help to reduce, but do not eliminate entirely the endogeneity between problem drinking and labor market outcomes. Thus, the analysis allows us to speculate about the directions and strengths of the associations, but does not necessarily produce causal estimates. Future research should explore the nature of these relationships in Latin American countries. In particular, a good place to start is the apparent importance of either a labor market reward for consuming alcohol or a reverse effect going from labor market participation to problematic alcohol consumption. Second, there is a time disconnect between some of the problem drinking measures and the outcomes under study. Our measure of heavy/intoxicating drinking referred to the past 30 days whereas some of the labor market outcomes (i.e., those dealing with absenteeism and work accidents) pertained to the past 12 months. Similarly, symptoms of alcohol dependence were reported during the past 12 months while labor force participation, employment, and work intensity were measured during the past 30 days. Third, the survey did not identify pregnant women, who may be less likely to drink alcohol and more likely to be absent from work or outside the labor force. We considered restricting the female sample to women aged 45 to 65, but this group had very few observations in the treatment group. Fourth, the low prevalence of some of the outcomes analyzed, such as workplace accidents, raises concerns about the statistical power to detect these effects. Failure to find significant effects in this case could be related to lack of power rather than weak relationships. A fifth problem is the notorious under-reporting of symptoms of dependence, which could be biasing our estimates towards zero and leading to a failure to find a negative association

between labor force participation and problem drinking. Finally, the dataset we are using provides no information on wages, income, number of times fired, or conflicts with supervisors and co-workers, limiting the scope of the analysis on labor market outcomes.

Despite these limitations, we still believe this study makes an important contribution to the literature because it is one of the first to analyze the relationship between problematic drinking and labor market outcomes in a Latin American country. The analysis raises issues specific to less developed countries, which merit further exploration. While the quality of the data is usually poorer in Latin American countries relative to North America or Europe (longitudinal studies or rich cross-sectional data are extremely rare), research on the costs and consequences of alcohol use in these countries should be encouraged. More rigorous research will help governments, employers, and non-profit organizations in the design of substance abuse interventions and policies and will contribute to a better allocation of resources to fighting substance-related problems.

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Table 1.1
Sample Statistics: Labor market outcomes and problem drinking measures, by symptoms of dependence and gender.

	Full sample				No symptoms of depend.	At least 1 depend. symptom	t or z-test
	Mean	N	Min	Max	Mean	Mean	
FULL SAMPLE							
Problematic alcohol use ¹							
Heavy drinking/drinking to intoxication past 30 days	0.130	5977	0	1	0.097	0.511	**
At least one dependence symptom past 12 months	0.081	5987	0	1	0.000	1.000	n/a
At least two dependence symptoms past 12 months	0.029	5987	0	1	0.000	0.358	n/a
Labor force participation and employment							
Participated in the labor force past 30 days ¹	0.610	5985	0	1	0.600	0.731	**
Employed past 30 days (if in the labor force) ²	0.914	3653	0	1	0.915	0.899	
Outcomes for those employed in past 30 days ³							
Worked full time past 30 days	0.663	3337	0	1	0.663	0.668	
Any workplace accident past 12 months	0.032	3271	0	1	0.030	0.058	**
Any work absence past 12 months	0.374	3226	0	1	0.357	0.531	**
Number of full days absent past 12 months (unconditional)	5.065	3226	0	300	4.635	9.248	**
Number of full days absent past 12 months (conditional on at least one absence)	13.598	1205	1	300	12.990	17.430	*
MEN							
Problematic alcohol use ¹							
Heavy drinking/drinking to intoxication past 30 days	0.243	2248	0	1	0.182	0.644	**
At least one dependence symptom past 12 months	0.134	2252	0	1	0.000	1.000	n/a
At least two dependence symptoms past 12 months	0.051	2252	0	1	0.000	0.382	n/a
Labor force participation and employment							
Participated in the labor force past 30 days ¹	0.781	2251	0	1	0.773	0.831	*
Employed past 30 days (if in the labor force) ²	0.907	1757	0	1	0.907	0.904	
Outcomes for those employed in past 30 days ³							
Worked full time past 30 days	0.721	1593	0	1	0.726	0.690	
Any workplace accident past 12 months	0.035	1564	0	1	0.032	0.054	
Any work absence past 12 months	0.339	1535	0	1	0.316	0.478	**
Number of full days absent past 12 months (unconditional)	4.304	1535	0	270	3.778	7.414	**
Number of full days absent past 12 months (conditional on at least one absence)	12.680	521	1	270	11.952	15.528	
WOMEN							
Problematic alcohol use ¹							
Heavy drinking/drinking to intoxication past 30 days	0.062	3729	0	1	0.050	0.295	**
At least one dependence symptom past 12 months	0.050	3735	0	1	0.000	1.000	n/a
At least two dependence symptoms past 12 months	0.016	3735	0	1	0.000	0.319	n/a
Labor force participation and employment							
Participated in the labor force past 30 days ¹	0.508	3516	0	1	0.505	0.568	*
Employed past 30 days (if in the labor force) ²	0.920	1896	0	1	0.922	0.886	
Outcomes for those employed in past 30 days ³							
Worked full time past 30 days	0.611	1744	0	1	0.611	0.613	
Any workplace accident past 12 months	0.030	1707	0	1	0.028	0.066	*
Any work absence past 12 months	0.405	1691	0	1	0.390	0.663	**
Number of full days absent past 12 months (unconditional)	5.784	1691	0	300	5.337	13.820	**
Number of full days absent past 12 months (conditional on at least one absence)	14.298	684	1	300	13.680	20.848	*

¹ Population aged 18 to 65.

² Only individuals participating in the labor force aged 18 to 65 (excludes full time students, housekeepers, retired individuals, and individuals reporting no activity in the past 30 days). Includes individuals employed full or part time and unemployed.

³ Only individuals employed in the past 30 days aged 18 to 65 (same as footnote 2, but excluding the unemployed).

** Difference between those with symptoms of dependence and those without symptoms statistically significant at $p < 0.01$; * difference statistically significant at $p < 0.05$

Table 1.2

Sample statistics: socio-demographics, regional, and job characteristics used as controls, by symptoms of dependence ¹

	Full sample		Min	Max	No symptoms of depend.	At least 1 depend. symptom	t or z-test
	Mean	N			Mean	Mean	
Male	0.477	3337	0	1	0.453	0.708	**
Age	40.172	3337	18	65	40.614	35.984	**
No secondary education	0.201	3332	0	1	0.200	0.210	
Incomplete secondary education	0.313	3332	0	1	0.311	0.327	
High school graduate	0.188	3332	0	1	0.195	0.126	**
Incomplete collage	0.202	3332	0	1	0.199	0.233	
College graduate	0.096	3332	0	1	0.095	0.104	
Married or co-habiting	0.530	3328	0	1	0.544	0.398	**
Single	0.288	3328	0	1	0.272	0.436	**
Other marital status	0.182	3328	0	1	0.184	0.166	
Smoker	0.381	3335	0	1	0.356	0.620	**
Family member uses drugs	0.057	3321	0	1	0.047	0.149	**
Region: Montevideo	0.597	3337	0	1	0.583	0.730	**
Region: South	0.153	3337	0	1	0.159	0.091	**
Region: North	0.090	3337	0	1	0.093	0.060	*
Region: West	0.096	3337	0	1	0.097	0.085	
Region: Center	0.064	3337	0	1	0.068	0.034	*
Worked full time past 30 days	0.677	3337	0	1	0.677	0.670	
Worked part time past 30 days	0.247	3337	0	1	0.250	0.223	
Had a temporary job past 30 days	0.076	3337	0	1	0.073	0.107	*
Not self-employed	0.681	3263	0	1	0.683	0.667	
Agriculture, Forestry, Breeding, Minery	0.028	3260	0	1	0.029	0.019	
Manufacturing Industry	0.094	3260	0	1	0.094	0.089	
Construction	0.087	3260	0	1	0.084	0.123	**
Trade and Commerce	0.181	3260	0	1	0.181	0.177	
Transportation	0.036	3260	0	1	0.036	0.041	
Health or Education	0.184	3260	0	1	0.188	0.152	
Hotels, restaurants, and leisure	0.063	3260	0	1	0.062	0.079	
Public sector	0.056	3260	0	1	0.055	0.067	
Services in private sector	0.137	3260	0	1	0.135	0.146	
Other industry	0.136	3260	0	1	0.139	0.108	
Firm size (1=smallest to 4=largest)	1.946	3202	1	4	1.934	2.062	*
Regional labor force participation rate	61.293	3337	53.5	66.1	61.268	61.528	*
Regional unemployment rate	9.810	3337	6.3	12.4	9.831	9.611	**
Consumed alcohol before age 16	0.332	3185	0	1	0.310	0.529	**

¹ The sample for this table is the population aged 18 to 65 who reported being employed in the past 30 days. We chose to display sample statistics for this group because most outcomes analyzed are restricted to this sample. Note, however, that when analyzing employment as an outcome, the total sample also includes those that were looking for a job in the past 30 days, and when analyzing labor force participation, the sample also includes housekeepers, retired and disabled individuals, full time students, and respondents who reported no activity in the past 30 days.

** Difference between those with symptoms of dependence and those without symptoms statistically significant at $p < 0.01$; * difference statistically significant at $p < 0.05$

Table 2.1
Effects of heavy/ intoxicating drinking on labor market outcomes (PSM) ^{1,2}

	In the labor force	Employed if in the labor force	Worked full time past 30 days	Any workplace accident past 12 months	Any work absences past 12 months	Number of work days absent past 12 months	Number of work days absent conditional on any absence
FULL SAMPLE							
Matched treated sample	0.742	0.911	0.709	0.042	0.437	4.272	9.783
Matched control sample	0.671	0.853	0.666	0.041	0.405	6.117	13.757
Difference	0.071**	0.058**	0.043	0.001	0.032	-1.845	-3.974
(Standard error)	(0.024)	(0.020)	(0.031)	(0.014)	(0.034)	(1.255)	(2.806)
MEN							
Matched treated sample	0.838	0.916	0.738	0.049	0.408	3.787	9.284
Matched control sample	0.742	0.865	0.693	0.049	0.439	6.228	15.963
Difference	0.096**	0.051*	0.045	0.000	-0.031	-2.441#	-6.680#
(Standard error)	(0.026)	(0.021)	(0.035)	(0.018)	(0.039)	(1.420)	(4.006)
WOMEN							
Matched treated sample	0.507	0.890	0.585	0.011	0.553	6.234	11.269
Matched control sample	0.533	0.896	0.582	0.057	0.436	8.362	12.064
Difference	-0.026	-0.006	0.004	-0.046*	0.117#	-2.128	-0.795
(Standard error)	(0.044)	(0.039)	(0.065)	(0.020)	(0.064)	(2.705)	(3.653)

¹ Average treatment effect on the treated using PSM with nearest 3 neighbors

² Heavy drinking is equal to 1 if the individual reported drinking at least two litres of beer, one litre of wine, or a quarter litre of whisky at one occasion, or reported drinking to intoxication once or more in the past 30 days

** Statistically significant at $p < 0.01$; * statistically significant at $p < 0.05$; # Statistically significant at $p < 0.10$

Table 2.2 Effects of having symptoms of dependence on labor market outcomes (PSM) ^{1,2}

	In the labor force	Employed if in the labor force	Worked full time past 30 days	Any workplace accident past 12 months	Any work absences past 12 months	Number of work days absent past 12 months	Number of work days absent conditional on any absence
FULL SAMPLE							
Matched treated sample	0.738	0.895	0.673	0.061	0.540	9.299	17.236
Matched control sample	0.654	0.877	0.691	0.032	0.415	4.354	9.374
Difference	0.084**	0.018	-0.017	0.030#	0.125**	4.945**	7.862*
(Standard error)	(0.027)	(0.022)	(0.034)	(0.016)	(0.038)	(1.830)	(3.210)
MEN							
Matched treated sample	0.835	0.901	0.701	0.057	0.488	7.234	14.824
Matched control sample	0.769	0.878	0.718	0.045	0.415	5.424	10.497
Difference	0.066*	0.023	-0.017	0.013	0.073#	1.810	4.327
(Standard error)	(0.029)	(0.025)	(0.040)	(0.021)	(0.045)	(1.937)	(3.799)
WOMEN							
Matched treated sample	0.574	0.880	0.605	0.071	0.671	14.561	21.709
Matched control sample	0.579	0.893	0.663	0.024	0.419	4.654	13.333
Difference	-0.004	-0.013	-0.058	0.048	0.252**	9.907*	8.376
(Standard error)	(0.046)	(0.039)	(0.063)	(0.031)	(0.065)	(4.685)	(7.096)

¹ Average treatment effect on the treated using PSM with nearest 3 neighbors.

² At least one symptom of dependence in the past 12 months (DSM IV)

** Statistically significant at $p < 0.01$; * statistically significant at $p < 0.05$; # Statistically significant at $p < 0.10$

Table 2.3
Effects of at least two symptoms of alcohol dependence on labor market outcomes (PSM) ^{1,2}

	In the labor force	Employed if in the labor force	Worked full time past 30 days	Any workplace accident past 12 months	Any work absences past 12 months	Number of work days absent past 12 months	Number of work days absent conditional on any absence
FULL SAMPLE							
Matched treated sample	0.720	0.884	0.654	0.088	0.500	14.275	28.549
Matched control sample	0.692	0.895	0.609	0.020	0.395	3.918	13.660
Difference	0.028	-0.011	0.045	0.069*	0.105#	10.356*	14.889#
(Standard error)	(0.042)	(0.035)	(0.057)	(0.030)	(0.060)	(4.437)	(8.910)
MEN							
Matched treated sample	0.825	0.872	0.650	0.077	0.449	9.077	20.229
Matched control sample	0.754	0.852	0.675	0.056	0.423	4.850	12.229
Difference	0.070	0.021	-0.025	0.021	0.026	4.226	8.000
(Standard error)	(0.044)	(0.042)	(0.064)	(0.035)	(0.069)	(3.678)	(8.056)
WOMEN							
Matched treated sample	0.500	0.926	0.667	0.125	0.667	31.167	46.75
Matched control sample	0.537	0.951	0.681	0.056	0.417	5.486	10.167
Difference	-0.037	-0.025	-0.014	0.069	0.250*	25.681#	36.583#
(Standard error)	(0.081)	(0.057)	(0.114)	(0.075)	(0.124)	(14.740)	(21.095)

¹ Average treatment effect on the treated using PSM with nearest 3 neighbors.

² Symptoms of dependence measured in the past 12 months

** Statistically significant at $p < 0.01$; * statistically significant at $p < 0.05$; # Statistically significant at $p < 0.10$

Appendix: Robustness analysis using alternative matching methods

Table A.1: PSM effects of heavy / intoxicating drinking in past 30 days on labor market outcomes

	In the labor force	Employed if in the labor force	Worked full time past 30 days	Any workplace accident past 12 months	Any work absences past 12 months	Number of work days absent past 12 months	Number of work days absent conditional on any absence
PSM method 1 ¹	0.070* (0.028)	0.057* (0.024)	0.04 (0.033)	0.001 (0.016)	0.032 (0.04)	-1.845 (1.48)	-3.974 (3.175)
PSM method 2 ²	0.062** (0.023)	0.049** (0.018)	0.049 (0.03)	-0.003 (0.014)	0.022 (0.033)	-1.733 (1.123)	-4.853# (2.697)
PSM method 3 ³	0.065* (0.031)	0.091** (0.025)	0.049 (0.03)	-0.003 (0.014)	0.022 (0.033)	-1.733 (1.123)	-7.783* (3.798)
PSM method 4 ⁴	0.068** (0.024)	0.042* (0.019)	0.026 (0.029)	-0.002 (0.013)	0.019 (0.032)	-0.934 (0.995)	-4.870* (2.313)
PSM method 5 ⁵	0.051* (0.024)	0.061** (0.018)	0.049 (0.032)	-0.005 (0.013)	0.034 (0.036)	-0.767 (1.309)	-12.185** (3.893)

¹ PSM with nearest 3 neighbors and bootstrapped standard errors

² PSM with nearest 5 neighbors

³ Single nearest neighbour PSM

⁴ Single nearest neighbour PSM without replacement

⁵ Radius matching with calliper of 0.0005

Table A.2: PSM effect of any symptom of alcohol dependence in past 12 months on labor market outcomes

	In the labor force	Employed if in the labor force	Worked full time past 30 days	Any workplace accident past 12 months	Any work absences past 12 months	Number of work days absent past 12 months	Number of work days absent conditional on any absence
PSM method 1 ¹	0.079** (0.029)	0.015 (0.025)	-0.016 (0.038)	0.03 (0.02)	0.125** (0.045)	4.945* (2.146)	7.862* (3.780)
PSM method 2 ²	0.087** (0.025)	0.022 (0.020)	-0.009 (0.033)	0.027 (0.017)	0.121** (0.036)	4.874** (1.811)	6.998* (3.231)
PSM method 3 ³	0.114** (0.034)	-0.003 (0.026)	-0.009 (0.033)	0.027 (0.017)	0.121** (0.036)	4.874** (1.811)	8.408* (3.439)
PSM method 4 ⁴	0.086** (0.030)	0.015 (0.024)	-0.027 (0.038)	0.024 (0.018)	0.121** (0.041)	4.183* (2.101)	6.796* (3.427)
PSM method 5 ⁵	0.075** (0.026)	0.011 (0.021)	-0.026 (0.035)	0.009 (0.016)	0.165** (0.038)	5.023* (2.056)	12.377* (4.750)

¹ PSM with nearest 3 neighbors and bootstrapped standard errors

² PSM with nearest 5 neighbors

³ Single nearest neighbour PSM

⁴ Single nearest neighbour PSM without replacement

⁵ Radius matching with calliper of 0.0005

Table A.3: PSM effect of at least two symptoms of alcohol dependence in past 12 months on labor market outcomes

	In the labor force	Employed if in the labor force	Worked full time past 30 days	Any workplace accident past 12 months	Any work absences past 12 months	Number of work days absent past 12 months	Number of work days absent conditional on any absence
PSM method 1 ¹	0.026 (0.046)	-0.014 (0.043)	0.045 (0.062)	0.069# (0.036)	0.105 (0.067)	10.356* (4.215)	14.889# (8.448)
PSM method 2 ²	0.036 (0.040)	0.007 (0.034)	0.040 (0.054)	0.026 (0.031)	0.123* (0.057)	10.059* (4.361)	15.459# (8.649)
PSM method 3 ³	0.042 (0.053)	-0.025 (0.040)	0.058 (0.070)	-0.020 (0.042)	0.069 (0.073)	11.108* (4.314)	14.569 (10.155)
PSM method 4 ⁴	0.030 (0.050)	-0.033 (0.039)	0.048 (0.067)	0.000 (0.040)	0.099 (0.070)	11.421* (4.309)	14.647 (9.776)
PSM method 5 ⁵	0.016 (0.040)	-0.018 (0.034)	-0.046 (0.058)	0.012 (0.032)	0.130* (0.061)	9.310# (4.979)	15.431 (12.216)

¹ PSM with nearest 3 neighbors and bootstrapped standard errors

² PSM with nearest 5 neighbors

³ Single nearest neighbour PSM

⁴ Single nearest neighbour PSM without replacement

⁵ Radius matching with calliper of 0.0005