BEER TAXES, WORKERS’ COMPENSATION, AND INDUSTRIAL INJURY

Robert L. Ohlsfeldt and Michael A. Morrisey*

Abstract—The apparent effects of beer taxes, workers’ compensation rules, and other factors on reported rates of lost work-days due to injury are estimated. The data used are for injury rates for two-digit SIC industries at the state-level pooled over 1975–85. The results indicate that higher beer tax rates are associated with lower rates of injury lost work-days. More generous workers’ compensation payments generally are associated with higher reported injury lost work-days.

I. Introduction

In 1991, about 9,900 persons were killed on the job, and 1.7 million suffered permanent or temporary disability from a work-related injury, together resulting in a loss of 125 million potential work-days of productivity (U.S. Statistical Abstract (1993)). Reported industrial injury rates have increased over the past decade. Lost work-days due to non-fatal workplace injuries were 56.2 per 100 FTE worker in 1975, increasing to 69.9 in 1987 (U.S. Statistical Abstract (1980, 1990)). In contrast, work-related fatality rates in manufacturing industries declined from 8 per 100,000 workers in 1975 to 4 per 100,000 in 1991 (U.S. Statistical Abstract (1993)). However, less than 1% of serious workplace injuries are fatal.

A variety of public policy mechanisms have been used to try to address the problem of industrial injury. These include tort reform, workers’ compensation programs, and direct safety regulation through OSHA. The purpose of this paper is to examine the extent to which higher beer taxes may serve as another policy tool to reduce industrial injury.

There is a growing body of literature supporting a general alcohol-price/health-status relationship. The primary mechanism generating reduced alcohol-related health problems is the response of alcohol consumers to tax-induced price increases. Alcohol abusers may be more price responsive than nonabusers, at least among youth (Coate and Grossman (1988)). Given the price response of alcohol abusers, higher taxes may reduce a variety of alcohol-related health problems, including alcohol-related industrial injury.

It seems reasonable to suggest that alcohol plays some role in industrial injury, though quality data are limited (Stallones and Kraus (1993)). Past studies indicate that between 0 to 30% of fatally injured workers were intoxicated at the time of injury (Smith and Kraus (1988) and Stallones and Kraus (1993)). In the case of industrial injury, however, as in the case of motor vehicle injury, an individual’s abuse of alcohol increases his or her risk of injury as well as the risk of injury for others. Among other limitations, past studies of alcohol and industrial injury do not account for the indirect effects of alcohol use on injury. There is the oft noted estimate that alcohol use is involved directly or indirectly in about 50% of all fatal motor vehicle injuries (NIAAA (1990)). Although working while intoxicated or otherwise impaired by alcohol may be less prevalent that driving while impaired, the literature suggests the potential for reduced industrial injury through higher alcohol taxes.

There is, to our knowledge, no economic literature on alcohol consumption and industrial injury. A few epidemiologic studies examine alcohol-related injury, usually within a single firm or for an industry within a small geographic area (e.g., county). In a recent review, Stallones and Kraus (1993) characterize the epidemiologic literature as sparse and often flawed, in that past studies generally lack adequate control groups, rigorous definitions of alcohol consumption, and fail to control for factors such as existing health problems and exposure to job hazards.

Economic analyses of industrial injury often have focused on the impact of workers’ compensation on reported injury. Workers’ compensation essentially substitutes a no-fault insurance mechanism for tort liability as means of compensating workers injured on the job. Thus, in exchange for payment of medical and disability claims resulting from work-related injury, workers are precluded from suing employers for damages. Employers’ premiums for their workers’ compensation insurance are at least partially experience rated (i.e., determined by past claims history).

The incentives under such a program are clear. Workers have an incentive to be less careful (moral hazard) and/or to report more injuries. Employers have incentives to improve the workplace safety and/or to discourage injury reporting to control their insurance premiums. Empirical studies of this issue generally find more generous workers’ compensation insurance benefits are associated with higher reported injury rates (Ehrenberg (1988) and Moore and Viscusi (1990)). It is not clear, however, the extent to which this effect represents a true increase in injury or merely an increase in reported injury.2

II. Empirical Model

Following past literature, industrial injury rates are assumed to be related to wage rates (WAGE), workers’ compensation rules (WC), work force characteristics (Xw), and firm characteristics (XF). Our theoretical model adds the proportion of workers impaired by alcohol

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1 Literature reviews are provided in Grossman (1989) and Phelps (1988).

2 Increases in reported non-fatal injury rates may be the result of improvements reducing what injury prevention experts contend is substantial under-reporting of industrial injury (National Committee for Injury Prevention and Control (1989)). On the other hand, changes in the structure of workers’ compensation benefits may provide incentives to workers to report injuries that would not have been reported previously (Ehrenberg (1988)), Moore and Viscusi (1990), focusing on fatal injury (where pure “reporting effects” are assumed to be small), conclude that fatal injury decreased dramatically due to workers’ compensation. Butler and Worrall (1991) examine indemnity and medical claims expenditures by workers’ compensation over the period 1954 to 1981, and conclude that both safety and claims reporting had increased.
model in place of the unobserved alcohol abuse variable. That is, let variables hypothesized to affect alcohol abuse are used in the empirical model. Following Saffer and Grossman (1987), beer tax rates and other factors are used. The year 1982 was excluded because injury data at the 2-digit SIC level by state and year are missing. The reduced-form model to be estimated is

\[ I = i(A, WAGE, WC, X_L, X_F) \] (1)

where subscripts indicate the industry \((i)\), state \((s)\), and year \((t)\), and \(e\) is an error term. The \(D\)'s are industry and year dummy variables. Sample means, standard deviations, and data sources are presented in the appendix.

The injury rate \((INJ)\) measure is lost work-days due to non-fatal injury per 100 FTE workers. Total reported injury cases include fatalities, non-fatal lost work-day cases, and non-lost work-day cases. Fatalities are too rare to be analyzed at this level of aggregation. The non-lost work-day injury rate may be more significantly influenced by pure “reporting effects” than the relatively less ambiguous lost work-day cases. Therefore, we focus on lost work-days as a more reliable indicator of serious injury than the total case injury measure.

The beer tax \((TAX)\) is measured as the real excise tax per six-pack inclusive of federal and state levies, plus the state sales tax, if any, applicable to beer. The nominal federal excise tax did not change over the time period studied, which translates into a substantial decrease in the real tax per unit. Most states increased their excise taxes at least once over this period. In many states beer sales are subject to general sales tax or additional sales taxes on the retail price. To construct the tax variable, the sum of state and federal excise tax per six-pack of beer is combined with an estimate of the sales tax, and then

\[ INJ_{st} = f(TAX_{st}, WC_{st}, X_{Ast}, X_{Lst}, X_{Fst}, D_t, D_e, e_{st}) \] (2)

The estimate of the beer tax coefficient in a version of the model including an endogenous wage variable was not substantially different than the coefficient estimates reported in table 1, but the estimated coefficients of the workers' compensation variables were more substantially affected. When included, the estimated coefficient of the endogenous wage variable is positive and significant. However, because available instruments are weak and the identification restrictions arbitrary, only the reduced-form model estimates are reported.

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\footnote{2} The real tax per unit. \footnote{4} Fatality rates are not reported separately. Differences between total-case rates and the sum of non-fatal lost work-day case rates and non-lost work-day case rates (i.e., the fatal injury rates) are lost in rounding error.

\footnote{3} The estimated coefficient of the beer tax variable in a model with total injury case rates as the dependent variable is \(-1.45\) (significant at the 0.01 level), with an elasticity of \(-0.08\) (at sample means).

\footnote{6} In 1991, the federal excise tax on beer increased for the first time since 1951, from 16¢ to 32¢ per six-pack. However, a 162% increase would have been needed to equal the real tax rate in 1951 (Grossman et al. (1993)).
deflated by a state-level price index (1985 = 1). The sales tax is estimated by multiplying the applicable sales tax rate and the estimated retail price of beer in the state.7

Our empirical model includes beer taxes but excludes other alcohol taxes for two reasons. First, states with relatively high beer taxes also tend to have relatively high wine and distilled spirits taxes. Thus, the three state tax measures tend to be highly collinear. The omission of the other alcohol tax variables may inflate the estimated effect of the beer tax per se, if some of the impact on injury results from higher taxes on wine and distilled spirits correlated with higher beer taxes. However, Laixuthai and Chaloupka (1993) report no difference in the estimated effect of beer taxes on youth alcohol demand when beer, wine, and distilled spirits taxes were used or when beer taxes alone were considered. Second, “control states” do not have explicit excise taxes on distilled spirits because distilled spirits are sold only through state-controlled vendors. Including the distilled spirits excise tax in the model results in the loss of almost one-half of the data, due to the missing distilled spirits tax variable for control states.

Large differences in state beer tax rates suggest the possibility of border crossing by residents of high tax states to purchase beer in low tax states. To account for this in the model, the state beer tax variable is adjusted for beer taxes in neighboring states. The border-state adjusted tax rate for each state is the weighted average of the state’s tax rate and the minimum of the state’s tax rate and the tax rate in a neighboring state, across all neighboring states. The weights are the percentages of a state’s population living within 20 miles of the border of each bordering state, with a residual weight for the percentage of the population not within 20 miles of any other state.

Almost all state workers’ compensation schemes pay injured workers two-thirds of their usual weekly wage, subject to certain limits. We use three variables to represent these limits within state workers’ compensation rules (WC). The first is the maximum weekly payment to an injured worker under the state’s workers’ compensation system divided by the average wage in the industry. The second measure is the ratio of the minimum weekly payment to average wages in the industry. As either ratio increases, the “value” of an injury to a worker increases. Thus, injury rates may increase as either ratio increases, either as a result of a pure reporting effect or through moral hazard effects. On the other hand, increases in either ratio increase potential workers’ compensation costs to employers, giving firms an incentive to reduce reported injury.8 The sign of the effect of benefit ceilings and floors in the model thus is ambiguous. The final WC measure in the model is the waiting period (in days). The sign of the waiting period effect is also ambiguous.

Labor force characteristics (Xf) include educational attainment (percentage of college graduates in the state), the proportion of female employment in the industry, the age–cohort size of the state labor force, and the state unemployment rate. Greater educational attainment may be associated with better knowledge of safety issues but also may be associated with better knowledge about workers’ compensation rules and benefits. Females may be concentrated in less hazardous occupations within industries. The prevalence of alcohol abuse also is lower among females than among males (NIAAA (1990)). For both reasons, injury rates may be lower in industries with relatively high percentages of female employees. Knowledge and experience with safety issues may increase with employee age but physical agility may decrease with age. The unemployment rate is intended to capture business cycle effects on incentives (Chelius (1974)).

The firm characteristic (Xf) is the mean number of employees per firm by industry. Large firms may be able to secure scale economies in safety enhancement. Also, large firms’ workers’ compensation premiums are more completely experienced rated, thus providing stronger safety incentives than in small firms (Moore and Viscusi (1990)).

Year dummies (Di) and two-digit SIC industry dummies (Di) are included in the model. The time dummies capture any effects of changes in OSHA regulations (e.g., Gray and Jones (1991)) and other time-related shocks on injury rates. The two-digit SIC industry dummies account for systematic differences in risk of injury across types of industries. State dummies are not included in the model because the variance is predominantly cross-sectional (i.e., the within-state variation in model variables often is small). Thus, the model as estimated assumes fixed period and industry effects, but not state fixed effects.9

However, a particular state’s beer tax may reflect the underlying attitudes of the population regarding alcohol consumption. If community sentiments are important and operate through the beer tax, estimates of the beer tax effect will be overstated. Although some potential impact of alcohol-related auto injuries on beer tax rates is plausible, non-fatal industrial injury rates probably have little effect on beer tax rates, so beer tax rates are assumed to be exogenous for industrial injury rates. Nonetheless, if there are omitted variables correlated with both the beer tax rate and the use of alcohol, the beer tax variable will be correlated with the error term in the injury model. To address this issue, following Saffer and Grossman (1987), the model is estimated with and without several state-level variables reflecting attitudes about alcohol use (Xa) to assess the robustness of the estimated coefficients. They are the proportion of the state population residing in a “dry” county, and the percentages of the population affiliated with various religious denominations (Catholic, fundamentalist Protestant, no active religion, and the residual “other” category).10 Finally, a Hausman test is used to determine if the beer tax variable is significantly correlated with the error term in the injury model (due to omitted state variables or other factors).

III. Results

As shown in table 1, the estimated beer tax coefficient in the injury model is negative and statistically significant at the 0.01 level or better.
in all specifications. For the model specification including the alcohol sentiments variables (column 1), the beer tax coefficient is estimated to be −22.7, indicating that a 10¢ increase in the beer tax (in 1985 dollars) is predicted to decrease reported lost-work days due to injury by about 2.27 days per 100 FTE employees, ceteris paribus.11 As expected, when the alcohol sentiments variables are dropped from the model (column 2), the estimated beer tax coefficient increases in magnitude to −32.2 (a 44% increase in magnitude). Thus, controlling for factors correlated with beer taxes that are potentially correlated with alcohol use is essential to isolate the impact of beer taxes on injury.12 In contrast, excluding the workers’ compensation variables from the model does not produce dramatically different coefficient estimates for the remaining independent variables (compare column 3 to column 1).

In terms of the workers’ compensation variables, the benefit ceiling effect on the lost work-day rate is positive and statistically significant. This suggests that moral hazard or reporting effects of the increased benefit ceiling overwhelm the effects of incentives to firms for safety enhancements to reduce potential workers’ compensation claims costs. The estimated benefit floor effect is negative and statistically significant, as is the estimated waiting period effect. Both appear to reduce injuries or discourage reporting injuries. Excluding the beer tax variable from the injury model (column 4) has some impact on coefficient estimates of the workers’ compensation variables. Most notably, the magnitude of the estimated coefficient of the benefit minimum decreases by 55% when the impact of the beer tax is not accounted for in the model.

Regarding other model variables, unemployment is associated with higher lost work day rates, as expected. Higher educational attainment is associated with lower lost work-day injury rates, if the state alcohol sentiment variables are included in the model. Larger firms tend to have more lost work days per 100 FTE workers, other things equal.13 A larger percentage of women employed in the industry is associated with fewer lost work days. Relative to the percent of workers aged 16–24, when more workers are in the 45–54 age cohort reported lost work-day rates are lower, but injury rates are higher in virtually all other age cohorts. Finally, the alcohol sentiment variables suggest that firms in states with greater proportions of Catholic, fundamentalists, and non-religious persons had higher lost work-day rates. The state’s “dry” population is not statistically significant.14

The coefficient of the beer tax variable represents the net effect on injury of the beer tax and potential compensating behaviors associated with the tax, not the structural impact of taxes on injury. Compensating behaviors include possible substitution into other drugs (e.g., marijuana) and potential changes in safety effort by workers or firms in response to tax-induced changes in alcohol use.

For the model with the alcohol sentiments variables, a Hausman test could not reject the null hypothesis of no correlation between the beer tax variable and the error term in the injury model at any standard level of significance (p = 0.3). To conduct the Hausman test, the beer tax was estimated using all of the remaining independent variables in the injury model and the following variables: indexes of state political liberalism and state government inter-party political competition, the share of civilian employment in beverage industries, and total state government tax revenues divided by state personal income. These variables are hypothesized to affect tax rates but not injury rates.

We had hypothesized that larger firms would benefit from economies of scale of safety activities and would capture more benefits from safety enhancement due to greater experience rating in the workers’ compensation insurance market. Our empirical results do not support these hypotheses about firm-size effects.

States with relatively high percentages of fundamentalist and “dry” population tend to be southern states. Compared to other regions, the south has a higher prevalence of both alcohol abstainers and abusers (NIAAA (1990)). Since light alcohol consumption may not affect injury rates, the coefficients of the fundamentalist and dry population variables may be plausible as markers of relatively high rates of alcohol abuse in the state.

Although injury rates in agriculture are relatively high (79.7 lost work-days per 100 FTE worker), the injury data and many of the independent variables in the model are measured poorly for agricultural industries at the state level. The industry-level analysis thus focuses on the remaining industry categories.

As Saffer and Grossman (1987) note, the beer price elasticity is likely to be larger than the tax elasticity, since a 10¢ increase in the beer tax represents a larger percentage increase in the tax than the resulting percentage increase in the retail price of beer, assuming all of the tax increase is passed on to consumers. The relatively large finance/insurance elasticity may be due in part to a small injury rate base (12.4 lost work-days per 100 FTE workers), or may be due to enhanced knowledge of workers’ compensation benefits among workers in such industries.

<table>
<thead>
<tr>
<th>Table 2.—Summary of Estimated Effects of Beer Tax on Lost-Work Days, by Industry Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impact of 25¢ Tax Increase (Work Days, 1,000s)</td>
</tr>
<tr>
<td>N</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td>Full Sample</td>
</tr>
<tr>
<td>Mining/Construction</td>
</tr>
<tr>
<td>Manufacturing</td>
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<tr>
<td>Transportation</td>
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<tr>
<td>Trade</td>
</tr>
<tr>
<td>Finance/Insurance</td>
</tr>
<tr>
<td>Services</td>
</tr>
</tbody>
</table>

11 Estimated coefficients from industry group samples using reduced-form models (analogous to column 1, table 1). All tax coefficients are statistically significant at the 0.01 or higher, except the trade industry coefficient, which is statistically significant at the 0.1 level.
12 Estimated reduction in lost-work days due to injury associated with a 25¢ increase in the 1992 beer excise tax rate, based on estimated tax coefficient and industry FTE employment in 1992.

13 States with relatively high percentages of fundamentalist and “dry” population variables may be plausible as markers of relatively high rates of alcohol abuse in the state.
14 Although injury rates in agriculture are relatively high (79.7 lost work-days per 100 FTE worker), the injury data and many of the independent variables in the model are measured poorly for agricultural industries at the state level. The industry-level analysis thus focuses on the remaining industry categories.
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16 The relatively large finance/insurance elasticity may be due in part to a small injury rate base (12.4 lost work-days per 100 FTE workers), or may be due to enhanced knowledge of workers’ compensation benefits among workers in such industries.
A number of studies have demonstrated several types of health benefits of higher alcohol taxes. This research provides some preliminary evidence regarding a previously unexplored benefit of higher taxes—lower industrial injury rates. The results indicate that higher beer taxes would reduce serious non-fatal industrial injury. For example, our model estimates imply that a 25¢ increase in the nominal tax on a six-pack of beer in 1992 would have reduced lost work-days due to injury by about 4.6 million days, thereby reducing lost productivity by $491 million (based on median daily total compensation of $107 in 1992). Although our model does not examine fatal injuries, it is reasonable to speculate that higher beer taxes also would reduce work-related fatal injuries. For example, if the fatal injury tax elasticity is −0.085 (half of the lost work-day tax elasticity), a 25¢ increase in the beer excise tax in 1992 would have reduced fatalities by about 240 lives.

A 25¢ increase in the beer tax is relatively modest—doubling or trebling the beer tax has been proposed (Pouge and Sgontz (1989), Saffer and Chaloupka (1994), Kenkel (1996), and Grossman et al. (1993)). Larger tax increases would tend to produce more substantial reductions in industrial injury. Of course, the “optimal” tax on beer is determined by the extent to which costs created by alcohol-related injury are external (social) costs, as well as the magnitude of losses in consumer surplus among nonabusers of alcohol brought about by tax-induced price increases (e.g., Kenkel (1996) and Saffer and Chaloupka (1994)). It seems likely that at least some of the costs associated with alcohol-related industrial injury are social costs, but such a determination is beyond the scope of our study. Nonetheless, the results imply that efforts to calculate optimal alcohol tax rates should consider changes in social costs of industrial injury associated with changes in alcohol taxes.

A final implication is that future studies of the effects of workers’ compensation systems on industrial injury should consider accounting for the role of state-level mechanisms to control access to alcohol (such as beer taxes). Given the apparent effects of taxes on injury rates, the failure to account for state taxes and other alcohol control policies may cause misleading results from workers’ compensation research studies.

REFERENCES


### APPENDIX

#### Table A1.—Means, Standard Deviations, and Data Sources

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>STD Dev</th>
<th>Source</th>
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<tbody>
<tr>
<td>Total Cases</td>
<td>8.11</td>
<td>3.392</td>
<td>[1]</td>
</tr>
<tr>
<td>Lost Workdays</td>
<td>61.093</td>
<td>38.358</td>
<td>[1]</td>
</tr>
<tr>
<td>Real Beer Tax</td>
<td>0.48</td>
<td>0.168</td>
<td>[2], [9]</td>
</tr>
<tr>
<td>WC Max Index</td>
<td>0.856</td>
<td>0.446</td>
<td>[3]</td>
</tr>
<tr>
<td>WC Min Index</td>
<td>0.237</td>
<td>0.186</td>
<td>[3]</td>
</tr>
<tr>
<td>WC Waiting Period</td>
<td>4.899</td>
<td>1.902</td>
<td>[3]</td>
</tr>
<tr>
<td>Real Wage Rate</td>
<td>354.468</td>
<td>119.643</td>
<td>[4], [9]</td>
</tr>
<tr>
<td>Unemployment</td>
<td>0.072</td>
<td>0.023</td>
<td>[5]</td>
</tr>
<tr>
<td>Education</td>
<td>0.142</td>
<td>0.036</td>
<td>[6]</td>
</tr>
<tr>
<td>Firm Size</td>
<td>35.857</td>
<td>40.334</td>
<td>[4]</td>
</tr>
<tr>
<td>Age 25–34</td>
<td>0.266</td>
<td>0.023</td>
<td>[7]</td>
</tr>
<tr>
<td>Age 35–44</td>
<td>0.175</td>
<td>0.016</td>
<td>[7]</td>
</tr>
<tr>
<td>Age 45–54</td>
<td>0.165</td>
<td>0.012</td>
<td>[7]</td>
</tr>
<tr>
<td>Age 55–64</td>
<td>0.156</td>
<td>0.013</td>
<td>[7]</td>
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<tr>
<td>Age 65+</td>
<td>0.177</td>
<td>0.028</td>
<td>[7]</td>
</tr>
<tr>
<td>Female Employment</td>
<td>0.358</td>
<td>0.22</td>
<td>[7]</td>
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<tr>
<td>Catholic</td>
<td>0.175</td>
<td>0.137</td>
<td>[8]</td>
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<tr>
<td>Fundamentalist</td>
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<td>0.125</td>
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<tr>
<td>No Religion</td>
<td>0.494</td>
<td>0.116</td>
<td>[8]</td>
</tr>
<tr>
<td>Dry</td>
<td>0.005</td>
<td>0.107</td>
<td>[2]</td>
</tr>
<tr>
<td>Hours Worked</td>
<td>36.518</td>
<td>3.989</td>
<td>[4]</td>
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<tr>
<td>Non-White</td>
<td>0.098</td>
<td>0.082</td>
<td>[7]</td>
</tr>
<tr>
<td>Unionization (Private)</td>
<td>0.173</td>
<td>0.083</td>
<td>[5]</td>
</tr>
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