

Alcohol Taxes, Beverage Prices, Drinking
and Traffic Fatalities in Montana

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Summary

Alcohol taxes increase beverage prices and thus influence drinking among teens and adults. Higher taxes and prices have the potential to reduce alcohol abuse and traffic fatalities and injuries. This study examines alcohol taxes and beverage prices in Montana in relation to these issues.

Beer prices in Montana are in the middle of the range of prices in the region and slightly above the national average. Wine prices in Montana are also typical for the region, although about seven percent below the national average. Montana's price for a 750 ml bottle of J&B Scotch is 13 percent above the national average and the highest in the region, except for Washington State. On an inflation adjusted basis, real alcohol prices in Montana and other states have mostly trended downward over the last 30 years.

Montana's beer tax is about one-half of the national average, and wine and especially spirits taxes, are above national averages. Beer and wine excise taxes are levied as fixed dollar amounts per unit of beverage. Because they are changed quite infrequently, the real (inflation adjusted) value of these taxes has declined over time. Alcohol taxes, together with the profits from state liquor operations, amounted to \$37 million dollars in fiscal 2008, or about 2.5 percent of state General Fund revenues.

State taxes account for only about 0.8 to 1.5 percent of the retail price of beer, and 6 to 7 percent of the prices of wine and spirits. A doubling of state alcohol taxes is likely to increase retail beer prices by 1 to 3 percent, wine prices by about 8 percent, and spirits prices by 11 to 12 percent. If all of these taxes were doubled, the overall price of alcohol would rise by 5 to 6 percent.

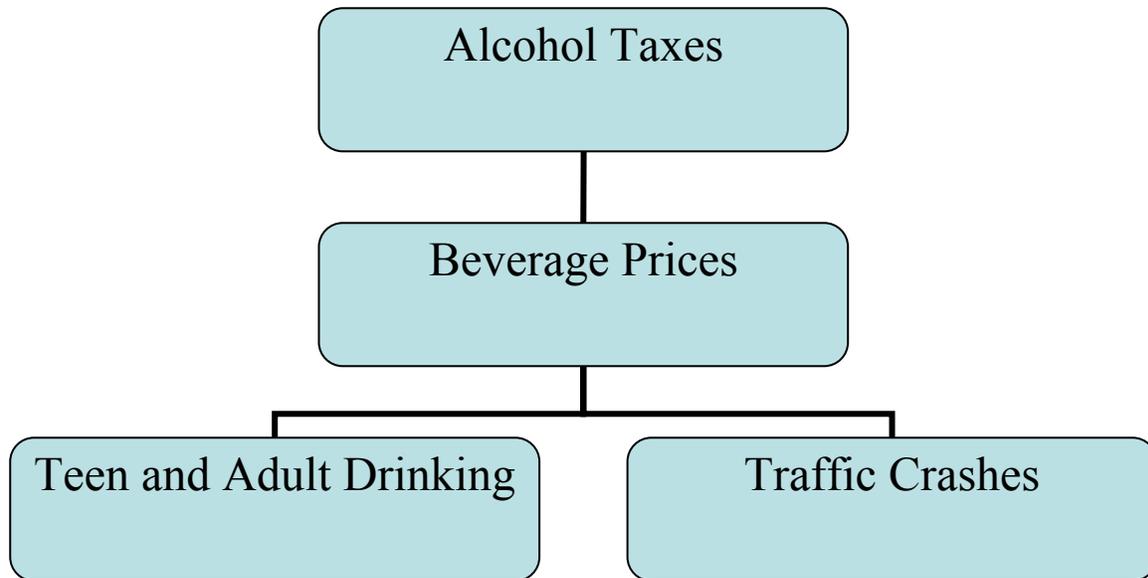
Higher alcohol prices discourage consumption and alcohol abuse such as drunk driving. A doubling of the state tax on beer would be expected to reduce consumption by 0.5 to 1.5 percent. A doubling of wine and spirits taxes would be expected to reduce consumption of these beverages by 5 and 9 to 10 percent, respectively.

The quantitative impact of increasing alcohol taxes and/or prices on traffic fatalities is subject to more uncertainty, because the literature contains widely varying estimates. A doubling of Montana's alcohol taxes is estimated to reduce overall traffic fatalities by 1.5 to 1.7 percent, but the actual result could be more or less. Most of the estimated impact stems from the increase in spirits taxes: Since they are already a relatively high fraction of retail prices, a doubling of these taxes would amount to a substantial increase in the cost of alcohol. In contrast, state beer taxes are a relatively small fraction of retail prices, and thus doubling these taxes would have a smaller impact on alcohol prices and consumption.

Alcohol use and abuse is affected by many factors besides taxes and prices, including the examples set by parents, drinking norms in the community, and educational programs; and laws on drinking and driving and their enforcement.

1. Introduction

Alcohol taxes affect teen drinking and traffic crashes via their effects on beverage prices, which in turn affect alcohol consumption and various forms of alcohol abuse. These relationships are represented in the schematic below.



Of course, many other factors besides taxes and prices influence drinking and other alcohol-related behaviors. The examples set by parents, drinking norms in the community, and educational programs also have important effects on teen and adult behavior.¹ However, these issues are beyond the scope of the current paper.

High levels of drinking and alcohol-involved traffic crashes in Montana have been documented elsewhere and are reviewed in sections 5 and 6 below. This paper begins by describing beverage prices in Montana, compares them with other states, and describes how they have changed since 1990. Alcohol taxes are documented next. The relationship between alcohol taxes and beverage prices is described in the fourth section. Specifically, this section provides evidence on how changes in alcohol taxes affect beverage prices. The fifth section draws on a large literature describing the relationships between taxes and/or prices and alcohol consumption. Section six considers traffic crashes. Section seven concludes.

¹ See for example, Cook and Moore (2001) for the importance of parents, peers and even statewide alcohol consumption as influences on teen drinking.

2. Beverage Prices in Montana

This section examines prices for beer, wine and spirits in Montana, compares them with prices in neighboring states and the national average, and documents changes in real (inflation adjusted) prices since 1990. Table 1 displays recent prices for beer, wine and spirits in Montana and neighboring states. The price data are based on surveys performed for ACCRA, formerly known as the American Chamber of Commerce Researchers Association, which are intended to compare the cost of living for “executives” in various cities across the United States.² The surveys report retail prices, exclusive of sales taxes, for specific beverages which are not necessarily representative of alcohol prices generally or those specifically associated with alcohol abuse such as drunk driving.³ The beverage definitions have changed over time, requiring adjustments to create a consistent time series.^{4,5} In addition, the data may not be consistent across states and over time because members of local chambers of commerce or economic development organizations are responsible for collection and reporting, and the number of cities sampled in each state varies from report to report. Data on spirits prices have not been collected since 2004. There are significant gaps in the data for various states and years.⁶ Despite these problems with the ACCRA data, they are the best available measures of price for making comparisons across states.⁷

² <http://www.coli.org/>

³ Currently the beverages are a six pack of Heinekens in 12 oz. containers, a 750 ml bottle of J&B Scotch, and a 1.5 liter bottle of Livingston Cellars or Gallo Chablis or Chenin Blanc.

⁴ Beer: 1982.1-1989.3: Six pack of Budweiser or Schlitz; 1989.4-1999.4: six pack of Budweiser or Schlitz.

Spirits: 1968.1 - 1988.3: Seagram's 7-Crown, 750 ml; 1988.4-1989.3: J&B Scotch, 1 liter.

Wine: 1982.1 - 1983.3: Paul Maissou Chablis, 750 ml; 1983.4 - 1990.4: Paul Maissou Chablis, 1.5 liter; 1990.4 - 1991.3: Gallo Sauvignon Blanc, 1.5 liter. See footnote 5 for the adjustments made in this paper.

⁵ They are linked by requiring the change in the national average price to match the change in the detailed CPI for that beverage. For example, the spirits beverage in 1988.3 was 750ml Seagrams 7, and in 1983.4 it was 1000ml J&B. The CPI values for spirits for the two periods were 116.5 and 116.9, a ratio of 1.00343. Thus, the ACCRA data prior to 1983.4 are multiplied by a factor which results in the same .343% change during the transition.

⁶ See Young and Bielinska-Kwapisz (2002, 2003) for additional discussion of these issues.

⁷ The detailed Consumer Price Index reports national prices for beer, wine and spirits purchased for both on-premise (restaurant and bar) and off-premise (“home”) consumption, but comparable data are not available across states.

a. Comparative Price Analysis

Table 1. Recent Beverage Prices (\$ per package).

	Beer	Wine	Spirits
	Six pack (72 oz.)	1.5 liter bottle	750 ml bottle
Montana	8.42	6.76	24.56
Idaho	8.19	5.95	21.18
North Dakota	8.89	5.79	20.72
South Dakota	8.48	7.43	20.42
Washington	8.12	6.27	25.86
Wyoming	8.57	8.35	20.55
U.S. Average	8.33	7.24	21.77

Source: ACCRA (see text for details). Data are for 2009 quarters 1-3, except spirits 2004

Notes: Beer - Six pack of Heineken in 12 oz containers

Wine - Gallo or Livingston Cellars Chablis, 1.5 liter

Spirits - J&B Scotch, 750ml

Montana's average price for a six pack of Heineken beer was \$8.42 during the first three quarters of 2009, based on retail prices sampled in Bozeman, Kalispell and Missoula. Of course, Heineken is not the most popular beverage – it ranked 9th in national sales in 2007 with 5 million barrels while the top brand was Bud Light with 41 million barrels.⁸ However, factors such as taxes or transport costs that make one brand more expensive in a particular state typically make other brands more expensive as well, so the ACCRA data are likely to be broadly representative of alcohol prices in comparison with other states. Idaho's price was about 21 cents lower, North Dakota's 47 cents higher, South Dakota's 6 cents higher, Washington's 30 cents lower, and Wyoming's 15 cents higher. Thus, Montana's beer price was in the middle of the range of prices for the region and 9 cents (1 percent) above the national average.

National averages of the ACCRA data track the CPI data quite well – much better than beer taxes, for example. See section 5 and Young and Bielinska-Kwapisz (2002).

⁸ A barrel of beer is 31 gallons, or 62 six packs of 12 ounce containers. Brand rankings from <http://wineauthorities.blogspot.com/2008/06/top-beer-brand-sales-2007.html>

Montana’s price for a 1.5 liter bottle of wine is also toward the middle of the range of prices in the region. Montana’s wine price is about seven percent lower than the national average, but it is higher than the prices in Idaho, North Dakota and Washington, while lower than the prices in South Dakota and Wyoming. Montana’s price for a 750 ml bottle of J&B Scotch is 13 percent higher than the national average, and the highest in the region, except for Washington. In summary, beverage prices in Montana in 2009 were mostly in the middle of the region’s price range, except spirits prices which were exceptionally high.

b. Price Trends Since 1990

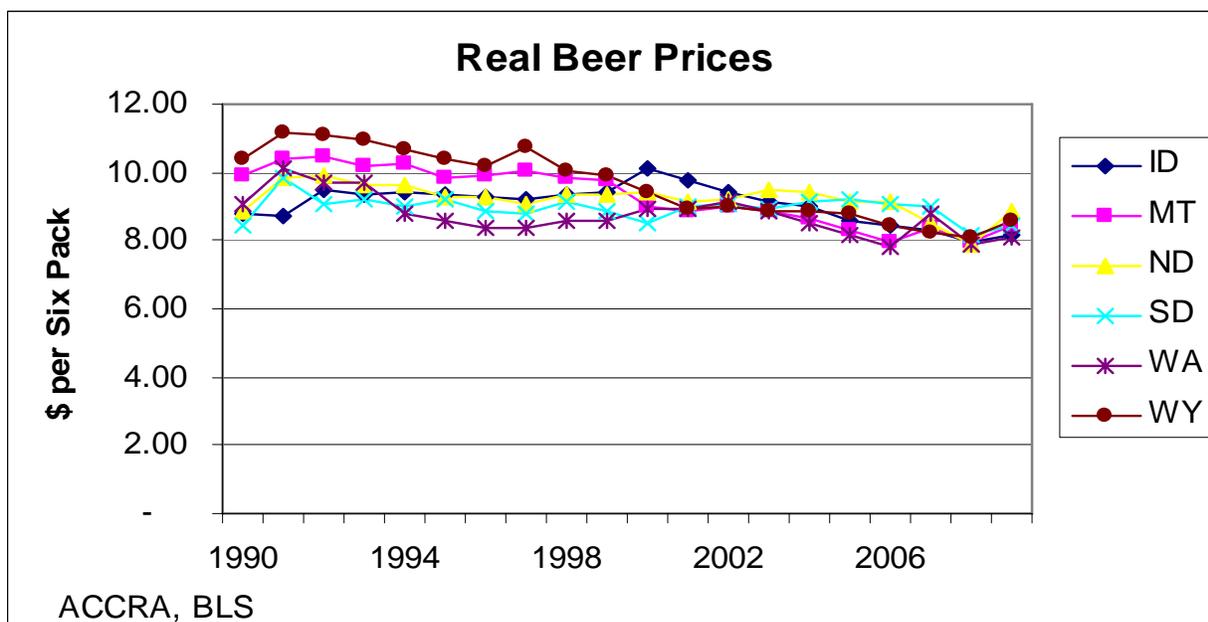


Figure 1. Beer Price Trends.

Figure 1 displays trends in real (inflation-adjusted) beer prices since 1990.⁹ Several points are noteworthy. First, real beer prices have declined over time in some states, which may contribute to higher consumption and traffic fatalities (see Section 6 below). The average decline

⁹ Nominal beer prices from the ACCRA data are deflated using the Consumer Price Index (U.S. Bureau of Labor Statistics series CUUR0000SA0).

in the United States was about three percent since 1990, according to the U.S. Bureau of Labor Statistics.¹⁰ Secondly, the ACCRA data indicate somewhat larger declines for some of the states in the region. Specifically, Montana beer prices are estimated to have declined 15 percent, after adjustment for inflation. This was the largest decline in the region, except for Wyoming where beer prices declined 18 percent. Washington's price declined 11 percent and Idaho's seven percent, while prices were essentially unchanged in North and South Dakota.

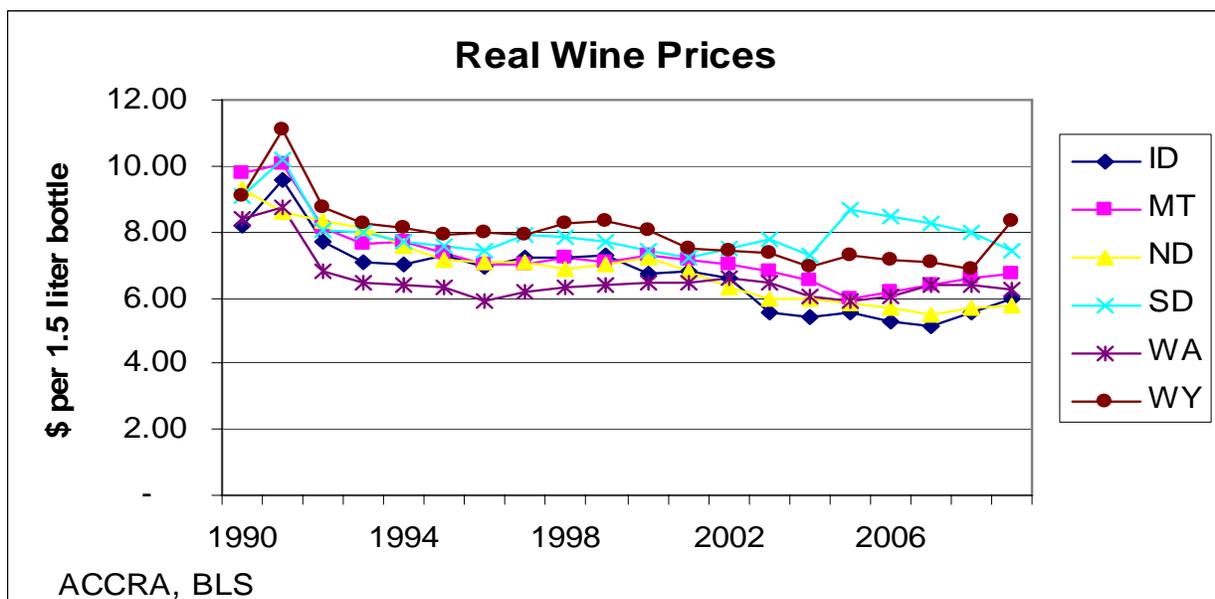


Figure 2. Wine Price Trends.

Real wine prices have also declined since 1990. The average decline in the region was 25 percent, considerably more than the national average decline of eight percent reported by the BLS. The real wine price in Montana declined 31 percent in the ACCRA data, second only to a 38 percent decline in North Dakota. Wine prices declined 27 percent in Idaho, 25 percent in Washington, 18 percent in South Dakota and 8 percent in Wyoming.

¹⁰ U.S. Bureau of Labor Statistics, Detailed CPI data, <http://data.bls.gov:8080/PDQ/outside.jsp?survey=cu> downloaded February 22, 2010. Note that this is an average price for *all* beer purchased for off-premise consumption, not just Heineken.

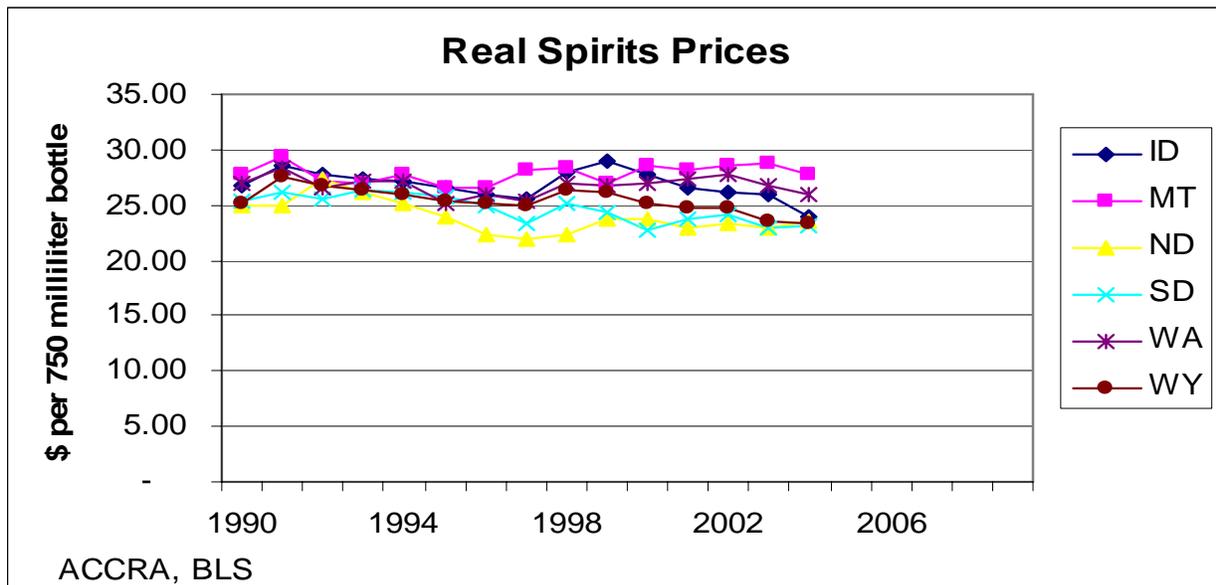


Figure 3. Spirits Price Trends.

Inflation adjusted spirits prices also declined between 1990 and 2004, the last year of ACCRA data on spirits. The average decline in the region was six percent, which is similar to the national decline of four percent in the BLS data.¹¹ Montana was an exception in this regard: Spirits prices did not change at all after adjustment for inflation. Spirits prices for the other states in the region declined between four and ten percent.

3. Alcohol Beverage Taxation

Federal, state and in some cases local governments levy taxes on alcoholic beverages. This section describes levels and trends in taxes, and the revenues collected by the state of Montana.

¹¹ The BLS data indicate an additional decline of about 4 percent between 2004 and 2009.

a. Comparative Taxes

Table 2 displays tax rates as of July 1, 2009. The Federal tax on beer is \$18 per 31 gallon barrel, which works out to \$0.29 per six pack of 12 ounce containers. Montana's tax varies with the size of the brewery (see section 3.c below), with most beer taxed at a rate of \$4.30 per barrel or about \$.07 cents per six pack. Idaho and North Dakota have similar tax rates on beer, South Dakota and Washington's rates are about twice as high – as is the national average – and Wyoming's tax is only about \$0.01 per six pack.¹²

Table 2. Federal and State Alcohol Taxes (\$ per package).

	Beer	Wine	Spirits
	Six pack (72 oz.)	1.5 liter bottle	750 ml bottle
Federal	\$0.29	\$0.42	\$2.14
Montana (a)	\$0.07	\$0.42	\$1.71
Idaho (a)	\$0.08	\$0.18	\$2.17
North Dakota	\$0.08	\$0.20	\$0.50
South Dakota (b)	\$0.14	\$0.37	\$0.78
Washington (a)	\$0.13	\$0.34	\$5.24
Wyoming (a)	\$0.01	(d)	(c)
State Average	\$0.14	\$0.32	\$1.33

Source: Tax Foundation

Notes: (a) State where government controls all spirits sales. Effective state rate estimated by Distilled Spirits Council of US (DISCUS).

(b) There is an additional 2% tax on the wholesale prices of wine and spirits.

(c) Control state where the implied excise tax rate as calculated by DISCUS is less than zero.

(d) Wine sales are controlled by the state in Wyoming; similar to spirits sales.

Excise taxes on wine are listed in the second column of Table 2. The Federal tax of \$1.07 per gallon works out to \$.42 on a 1.5 liter bottle.¹³ Montana's tax is about the same as the Federal tax. The other states in the region have lower taxes, and the average state tax is 24 percent lower than Montana's tax.

¹² In addition, some states tax beer of 3.2% alcohol content at a lower rate, some states tax stronger beer at higher rates, some states tax on-premise consumption differently than off-premise, and some states permit counties to levy additional taxes. See Federation of State Tax Administrators (2009) and Young and Bielinska-Kwapisz (2002) for details.

¹³ Federal and some state tax rates are higher for "strong" wine (14% alcohol or higher).

Taxes on spirits are listed in the last column of Table 2. The Federal tax of \$13.50 per proof gallon works out to \$2.14 on a 750 milliliter bottle of 80 proof spirits.¹⁴ State taxes on spirits are more complicated than for beer or wine, because some states employ per unit excise taxes (as the Federal government does), some employ percentage taxes based on wholesale or retail prices, and some employ both. In addition, in 18 “control” states – including Montana - spirits pass through state control at the wholesale and/or retail levels where various taxes, fees and markups are added, and the state typically earns a “profit.”¹⁵ As a result there is no simple way to compare spirits taxes across states. The figures in Table 2 were computed by the Distilled Spirits Council of the United States and are intended to represent the “implicit” tax rate which results from the combination of all the different policies just described. DISCUS estimates that the implicit tax in Montana amounts to \$1.71 per bottle, while neighboring states range from \$0.50 (North Dakota) to \$5.24 (Washington), and the national average is \$1.33 per bottle.

a. Trends in Alcohol Taxation

Most excise taxes change only infrequently. For example, the Federal excise tax on beer was constant at \$9 per barrel from 1952 until 1991, when it rose to the current value of \$18 per barrel. Because of inflation, the real Federal tax fell dramatically over most of this period. Figure 4 displays the nominal and real Federal beer tax since 1990. Although the nominal rate was doubled in 1991, when adjusted for inflation the rate in 2009 is only 22 percent above the 1990 level.

¹⁴ A proof gallon is one gallon that is 50% pure alcohol (ethanol), which is referred to as 100 proof. Federal and some state taxes are proportional to the alcohol content, so a 100 proof beverage would be taxed $\frac{1}{4}$ more than an 80 proof bottle of the same size. See the previous footnotes.

¹⁵ Montana’s Liquor Control Division provides a description and some history.

<http://revenue.mt.gov/revenue/forbusinesses/liquordistribution/learnaboutliquordistribution.asp>

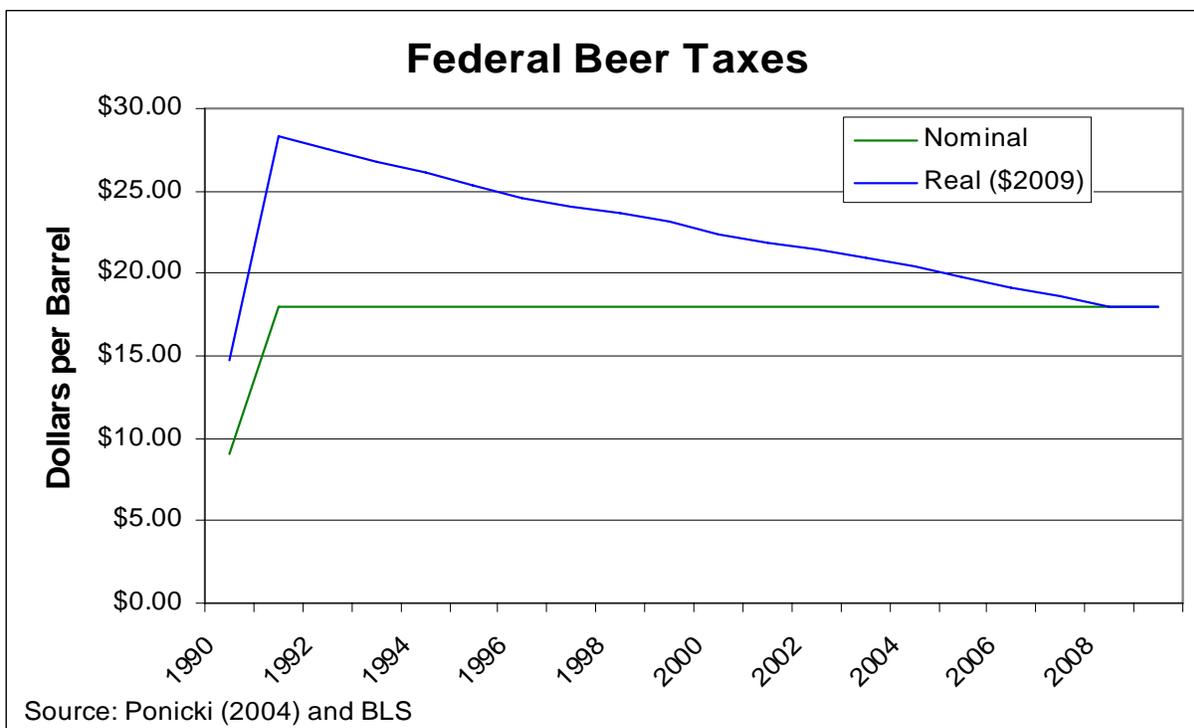


Figure 4. Federal Beer Tax Trends.

Montana beer taxes have also changed relatively infrequently (Table 3). As a result the real value of Montana’s beer tax has declined by 40 percent since 1990, and by 50 percent since it was last raised in 1985. Most of the states in the region have also maintained constant nominal tax rates and so seen similar declines in real rates (Figure 5). One exception is Washington, which raised its nominal tax rate three times during the 1990s. Nonetheless, these changes have only kept the real tax rate constant, after adjustment for inflation.

Table 3. History of Montana Beer Taxes (Dollars per Barrel).

1933-57	1958-68	1969-73	1974-76	1977-84	1985-current
\$1.00	\$1.50	\$3.00	\$3.25	\$4.00	\$4.30

Source: Ponicki (2004)

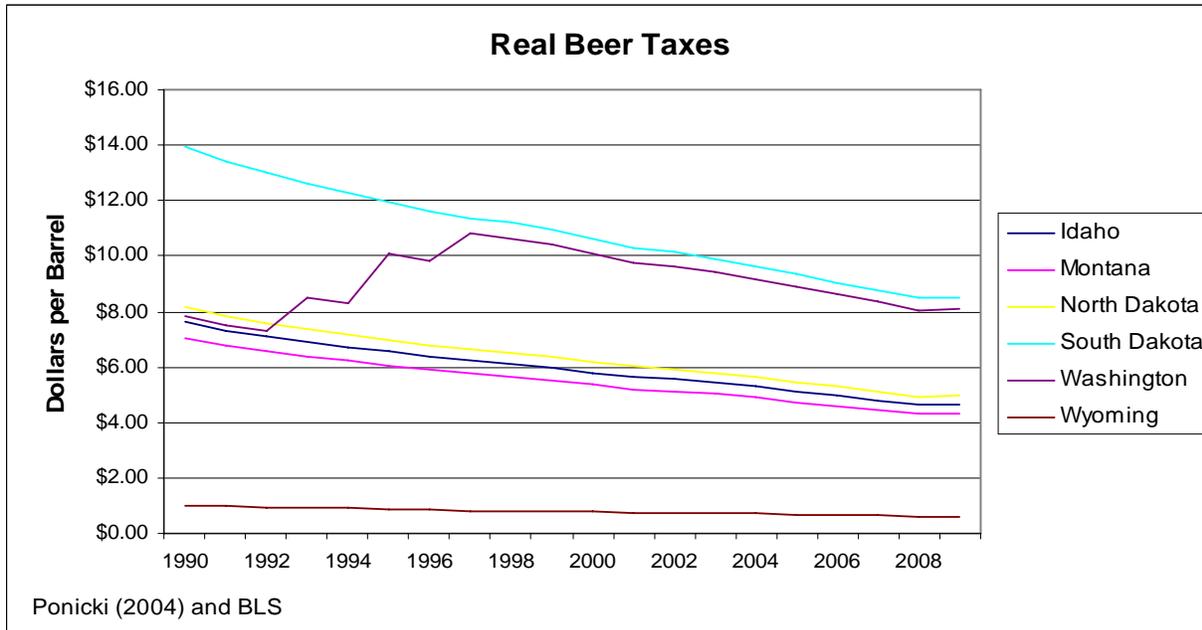


Figure 5. State Beer Tax Trends.

b. Beer Production by “Small” Breweries

As noted earlier, Montana’s beer tax varies with production volume (Montana Department of Revenue, 2009). Table 4 describes the tax rates and production volumes for fiscal years 2007 through 2009. The smallest breweries produce 5,000 or fewer barrels per year and face the lowest tax rates. These breweries account for two or three percent of total beer sold in Montana, while the largest breweries producing more than 20,000 barrels per year account for 96 to 97 percent of sales and an even larger proportion of tax revenues, since they are taxed at a higher rate.

Table 4. Beer Production by Brewer Volume (Barrels).

Tax Rate	\$1.30/bl	\$2.30/bl	\$3.30/bl	\$4.30/bl	Total
	5,000 or fewer barrels	5,000 to 10,000 barrels	10,001 to 20,000 barrels	20,001 and over barrels	
FY 2009	29,250	3,459	4,235	953,418	990,362
FY 2008	26,289	4,779	4,310	938,233	973,611
FY 2007	21,525	5,856	4,439	923,458	955,278
Percent of Total					
FY 2009	3%	0%	0%	96%	100%
FY 2008	3%	0%	0%	96%	100%
FY 2007	2%	1%	0%	97%	100%

Source: Montana Department of Revenue

c. Alcohol-Related State Revenues

All individuals and corporations intending to produce, import, or sell alcoholic beverages in Montana must be licensed (Montana Department of Revenue, 2009). These license and fee revenues, which are termed Non-Tax Liquor Collections, are used to fund the administrative and compliance expenses associated with enforcing the liquor laws of Montana by the Department of Revenue and the Department of Justice. Unused funds are deposited into the state General Fund. In fiscal years 2004 thru 2008, these deposits ranged from \$300,000 to \$1.4 million. The Liquor Distribution Bureau is responsible for warehouse inventory management, warehouse shipping and receiving, agents' order processing, agents' accounts receivable management, and customer service functions.

State revenues from alcohol-related collections are listed in Table 5. Beer excise tax revenues were \$4.2 million in fiscal year 2008, the tax on table wine yielded \$2.7 million, and taxes on spirits yielded \$20.3 million. Total collections were \$30.4 million in fiscal year 2008. A small portion of the liquor excise tax revenues is refunded to Indian tribes. Twenty-three percent of the beer tax and sixty-five percent of the liquor license tax are allocated to the Department of

Public Health and Human Services for the treatment of alcohol and chemical dependency prevention and rehabilitation programs. The balance of the alcohol related revenues, net of the administrative and compliance expenses noted above, are deposited in the state General Fund. Total alcohol-related revenues in fiscal year 2008 were \$37.4 million or about 2.5 percent of Department of Revenue State Tax Collections for that year (Montana Department of Revenue, 2009, p. 22).¹⁶

Table 5. Alcohol Revenues by Fiscal Year (\$ millions).

	Liquor Profits & License Fees	Beer Excise Tax	Table Wine Tax	Liquor Excise Tax	Liquor License Tax	Total
FY2004	7.2	3.9	2.1	9.0	5.6	27.8
FY2005	7.1	3.9	2.2	9.6	6.0	28.8
FY2006	7.8	3.9	2.4	10.7	6.7	31.3
FY2007	8.6	4.0	2.6	11.7	7.3	34.3
FY2008	10.2	4.2	2.7	12.5	7.8	37.4

4. Alcohol Taxes and Beverage Prices

This section discusses the relationship between taxes levied on alcohol and the prices paid by consumers. Table 6 displays state alcohol taxes as a percentage of price for beer, wine, and spirits. A striking feature is how small the percentages are, particularly for beer. Excise taxes on beer range from 0.1 percent (Wyoming) to 1.7 percent (South Dakota) of purchase price, with Montana about in the middle at 0.8 percent. Of course, these percentages depend in part on the quality and hence price of the beer. In the ACCRA data, beer prices are based on a six pack of Heinekens which sells for more than \$8. Other brands of beer are available for lower prices, especially if purchased in larger quantities. But even if one purchased cheaper beer – say a case of 24 12 ounce containers for \$16 (\$4 per six pack) – the excise taxes would only be about twice

¹⁶ Department of Revenue State Tax Collections exclude property and other taxes levied at the local level.

the percentages reported in Table 6. Thus, the excise tax on cheaper beer in Montana still only amounts to about 1.6 percent of the purchase price.

Table 6. Taxes as a Percentage of Price.

	Beer Six pack (72 oz.)	Wine 1.5 liter bottle	Spirits 750 ml bottle
Montana	0.8%	6.2%	7.0%
Idaho	1.0%	3.0%	10.2%
North Dakota	0.9%	3.5%	2.4%
South Dakota	1.7%	5.0%	3.8%
Washington	1.6%	5.4%	20.3%
Wyoming	0.1%	NA	NA
U.S. Average	1.7%	4.4%	6.1%

Sources: See Tables 1 and 2.

Excise taxes on wine are higher than those on beer, reaching 6.2 percent of price in Montana for the ACCRA beverage, 1.5 liters of Gallo or Livingston Cellars Chablis. As discussed for beer, wine excise taxes are a higher percentage of the price of less expensive brands and a smaller percentage of more expensive brands. Estimated spirits taxes vary considerably from state to state with Montana one percentage point above the U.S. average.¹⁷ Control states such as Montana generally have higher spirits taxes than “license” states such as North and South Dakota.

How much would a doubling of alcohol taxes affect the retail price of beverages? The answer depends both on how large the tax is to begin with, and how much the retail price rises when the tax is increased.¹⁸ As Table 6 indicates, state excise taxes are currently a small percentage of beverage prices, especially for beer. Thus if Montana’s beer tax were doubled, it

¹⁷ Recall the spirits taxes are estimated by the Distilled Spirits Council of the United States. See the discussion surrounding Table 2.

¹⁸ These issues are discussed in more formal mathematical terms in the Appendix.

would add less than 1 percent to a seller's cost of Heinekens, or less than 2 percent for a lower priced brand. But retail prices may rise by more or less than the increase in sellers' costs, depending on how much of the tax is shifted forward to consumers. Young and Bielinska-Kwapisz (2002) studied this issue using price and tax data across 48 states covering the period 1982-1997. They found that alcohol taxes are over-shifted to retail prices. That is, retail prices rise *more* than one for one with an increase in taxes. Over-shifting can occur when markets are less than perfectly competitive, i.e. when sellers have sufficient power to "markup" prices more than the amount of the tax increase.¹⁹ In the case of beer, retail prices are estimated to rise 1.5 to 1.9 times the increase in the excise tax. Thus, a doubling of Montana's beer excise tax would be expected to raise the retail price of Heinekens by 1.2 to 1.5 percent, and the price of lower quality brands by perhaps twice that amount.²⁰

Young and Bielinska-Kwapisz (2002) find that wine and spirits taxes are also over-shifted to retail prices. Thus a doubling of Montana's wine tax would be expected to raise retail prices by 7.7 percent, and a doubling of spirits taxes would raise retail prices by about 11-12 percent, based on the DISCUS estimates of Montana's effective tax rate. A price index for all alcohol (beer, wine and spirits combined) can be computed based on the Stone index which weights prices of the individual beverages by their shares in consumption expenditure.²¹ Using national shares estimated from BLS data, a doubling of all Montana's taxes on alcohol would increase the overall price of alcohol by 5 to 6 percent.

5. Alcohol Taxes, Beverage Prices and Alcohol Consumption

This section describes the relationship between beverage prices and alcohol consumption.

¹⁹ See Katz and Rosen (1985), Besley (1989) and Barzell (1976) for related work.

²⁰ This estimate is based on data from 47 states, including Montana. While tax shifting in Montana may differ from the national average, we do not know whether it would be greater or smaller.

²¹ See Young and Bielinska-Kwapisz (2006)

a. Trends in Alcohol Consumption in Relation to Prices

Figure 6 displays alcohol consumption for Montana and the United States since 1978 (National Institute on Alcohol Abuse and Alcoholism (NIAAA), 2009). These data are derived from sales of beer, wine and spirits, and incorporate differences across beverages and changes over time in ethanol content (NIAAA, 2006). Consumption is measured as gallons of pure alcohol (ethanol) per year per person aged 14+. National consumption peaked in 1981 at 2.76 gallons, declined to 2.14 gallons in 1997-98, and then rebounded to 2.31 gallons per person in 2007. The net decline from 1981 to 2007 was 16 percent. Montana consumption is 10-20 percent higher than the U.S. average, but the pattern of decline and rebound is similar. Montana consumption peaked in 1981 at 3.28 gallons per person, declined to 2.40 gallons in 1996, and then rebounded to 2.80 gallons per person. The net decline in Montana consumption from 1981 to 2007 was 15 percent.

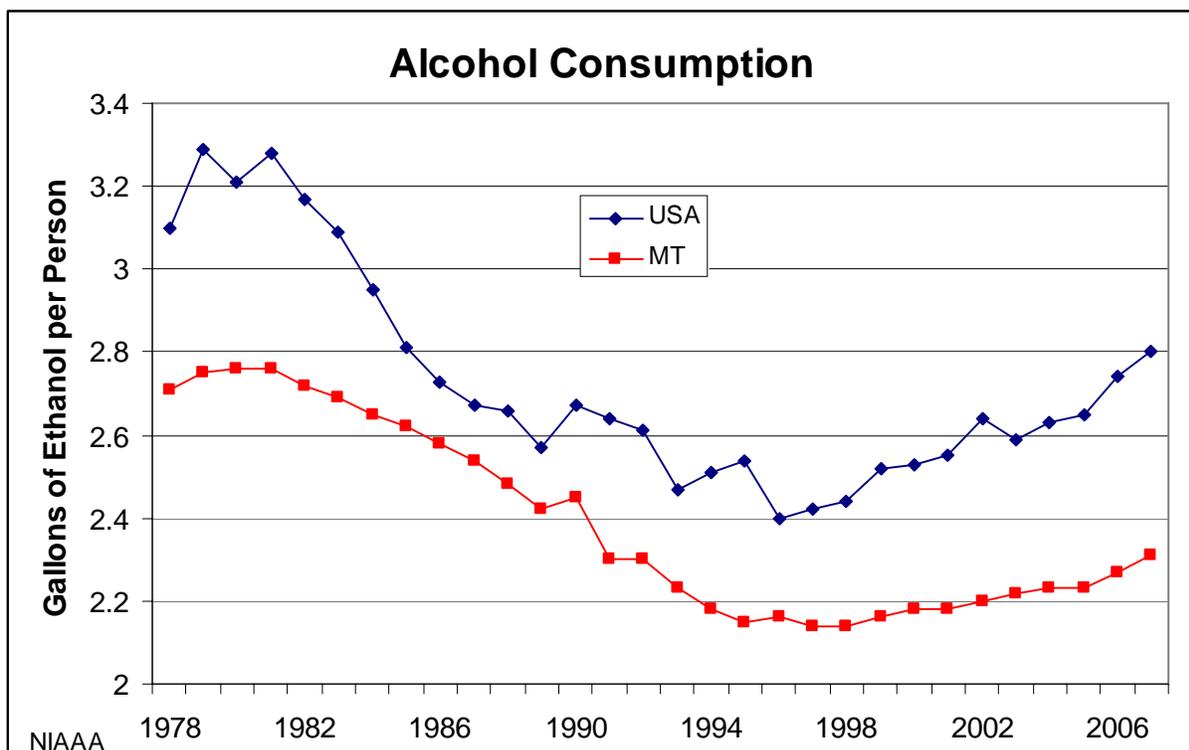


Figure 6. Alcohol Consumption in Montana and the USA.

Figures 6a-6c display trends in consumption of beer, wine and spirits in Montana and the United States. Beer accounts for an average of 59 percent of total alcohol consumption in Montana, somewhat higher than the 55 percent average for the nation as a whole. Montanans drink about 26 percent more beer per capita than the nation as a whole, which is the main factor accounting for Montana's relatively high total alcohol consumption. Montana's beer consumption declined 22 percent between the peak in 1981 and the mid-1990s, before a rebound that left consumption in 2007 16 percent below the 1981 level.

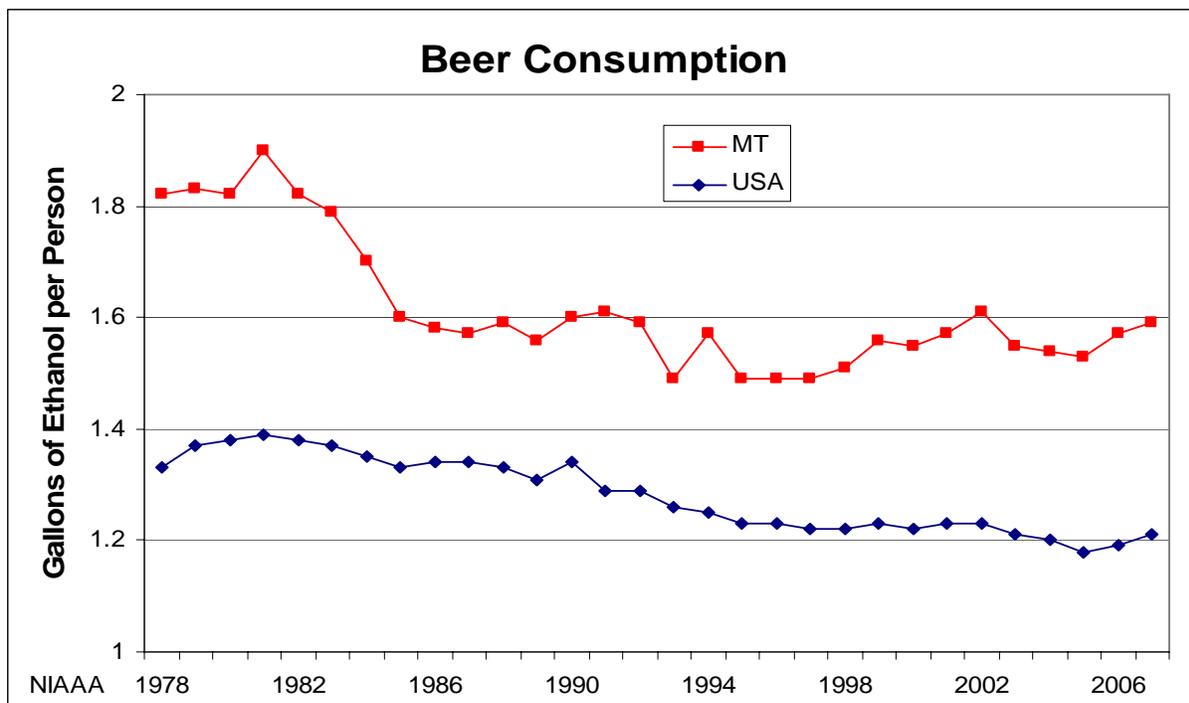


Figure 6a. Beer Consumption in Montana and the USA.

Wine consumption accounts for 11-14 percent of total alcohol consumption in Montana, a few percentage points less than for the nation as a whole. Montana's wine consumption was below national averages for most of the 1980s but has "caught up" in recent years. After declines in the late 1980s, wine consumption increased in both Montana and the nation, leaving consumption at near-peak levels.

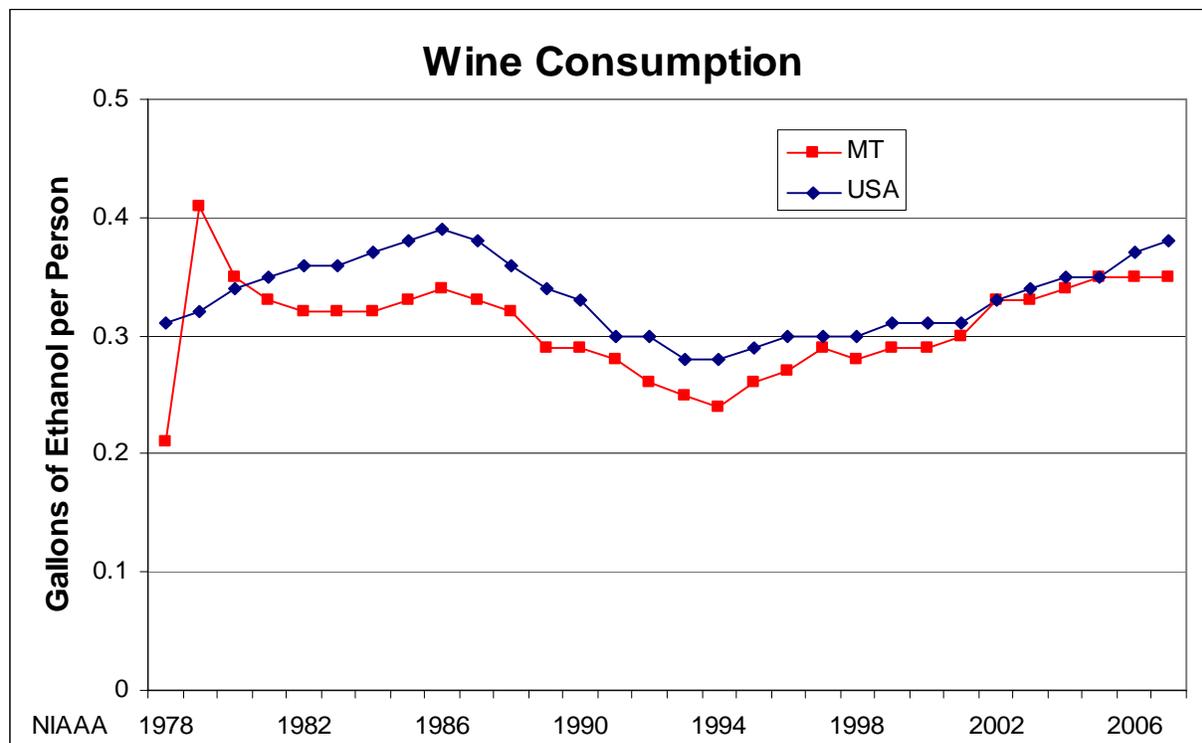


Figure 6b. Wine Consumption in Montana and the USA

Spirits account for the remaining 30-32 percent of total alcohol consumption in both Montana and the United States. Spirits consumption in Montana was close to national averages during most of the 1980s but increased more rapidly in recent years so that it is now 18 percent higher than in the nation as a whole. Nevertheless, spirits consumption in Montana has declined 20 percent from the level in 1978.²²

²² The spike in measured spirits consumption in Montana in 1995 may have been associated with the shift from state owned liquor stores to private agencies. Consumption data are based sales that occur at the wholesale level. See <http://revenue.mt.gov/revenue/forbusinesses/liquordistribution/learnaboutliquordistribution.asp>.

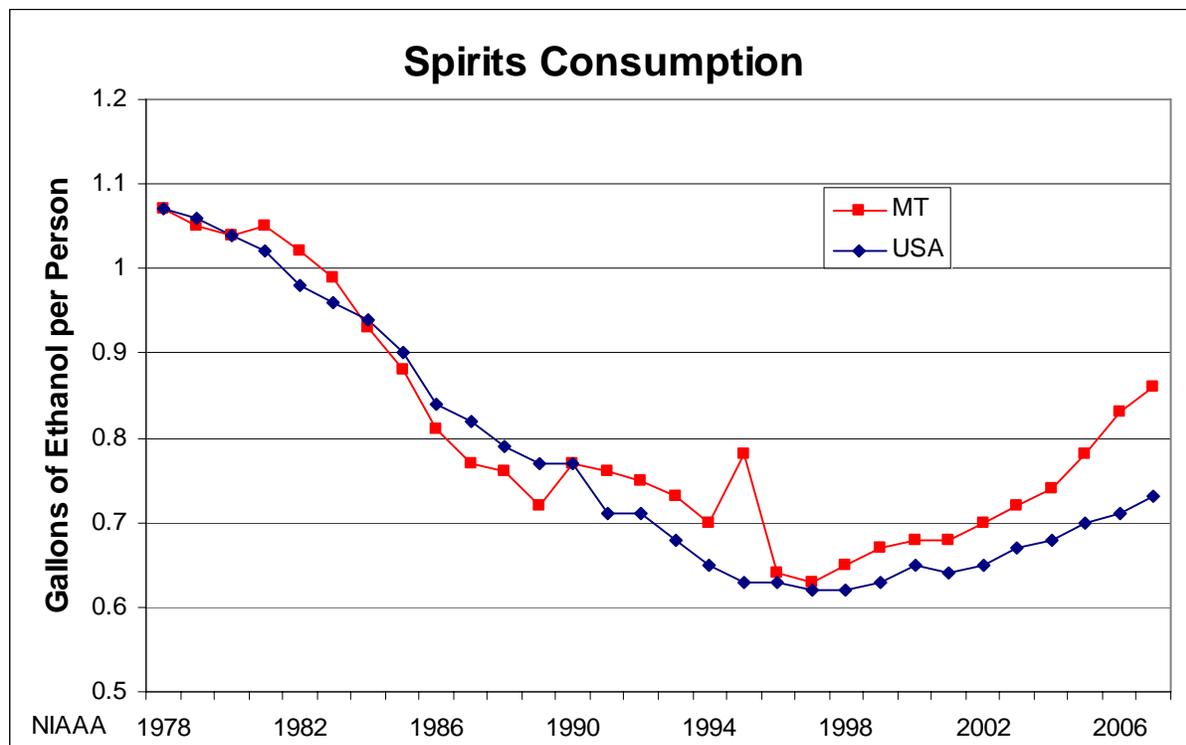


Figure 6c. Spirits Consumption in Montana and the USA.

Figure 7 displays national alcohol prices collected in connection with the Bureau of Labor Statistics' Consumer Price Index.²³ They are adjusted for inflation ("real") and indexed so that 1982-84 = 100. Beverage prices have trended downward over time, with the exception of increases in 1991 associated with Federal tax increases. Over the entire 1978-2007 time frame, beer prices fell by 17 percent, wine prices by 32 percent and spirits prices by 31 percent. The main reason that prices declined was that nominal taxes failed to keep up with inflation. For example, Ponicki et al. (2007) report that Federal and state real tax rates on beer fell by two-thirds between 1970 and 2003, as inflation more than offset increases in nominal tax rates.²⁴

²³ National prices are used here because they are available for a longer period of time and include both on-premise and off-premise consumption. As seen earlier, Montana prices are close to national averages.

²⁴ Prices for on-premise consumption increased over this time period, because labor and other costs of operating bars and restaurants increased faster than inflation.

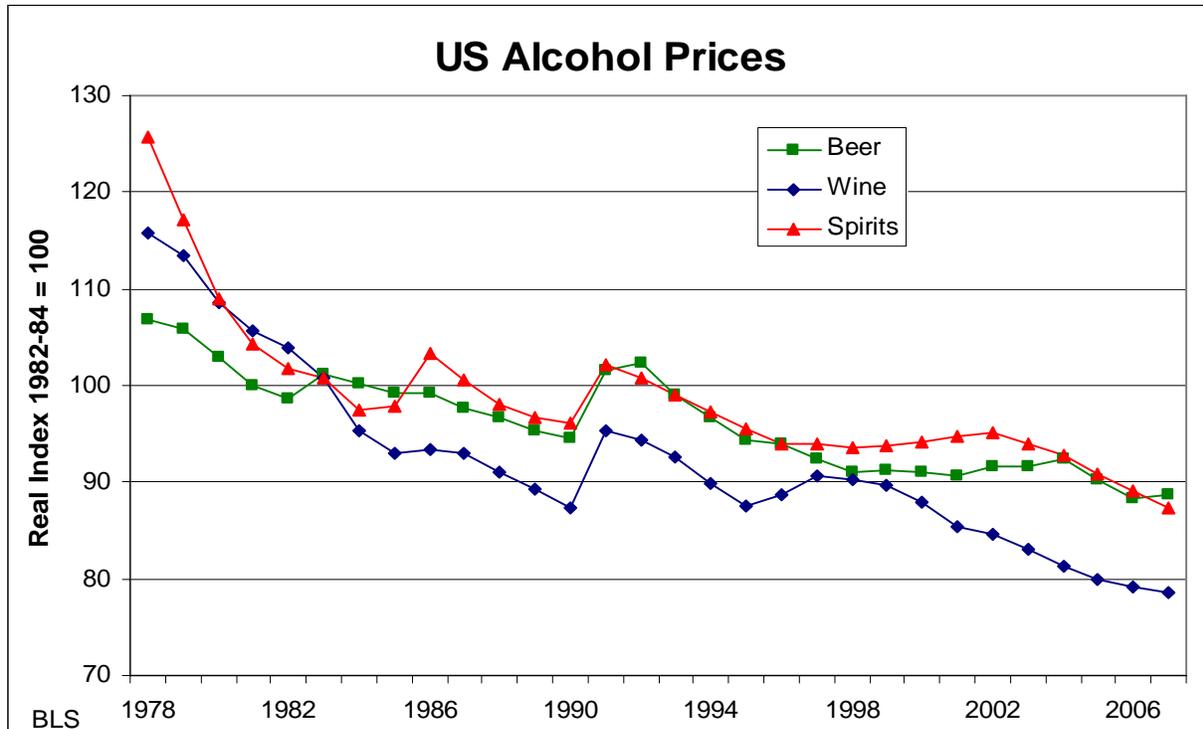


Figure 7. U.S. Alcohol Prices for Beer, Wine and Spirits.

The data in Figure 7 refer to prices for consumption “at home,” as opposed to on-premise consumption (“away”). Prices for on-premise consumption increased an average of 17 percent during 1978-2007, while the BLS index of combined “home” and “away” prices fell by 12 percent (BLS 2009). Which index is most appropriate? It depends on the particular measure of consumption under consideration. The BLS combined index is based on expenditure shares of approximately 56 percent on home consumption and 44 percent on consumption away.²⁵ Since alcohol is much more expensive in on-premise establishments, this suggests that most alcohol is purchased off-premise, and the “home” price index is most representative for total alcohol consumption. Responses from “place of last drink” studies indicate that about half of the drivers stopped for driving under the influence report that they obtained their last drink at a bar or

²⁵ U.S. Bureau of Labor Statistics (2007)

restaurant.²⁶ Thus, the combined index may be most appropriate when considering alcohol related fatalities. Finally, the vast majority of underage drinkers obtain alcohol from other persons rather than from on-premise establishments.²⁷ Thus, the “home” price index is most appropriate when considering underage drinking. In summary, the most relevant measures are the “home” and combined price indices, and they both showed substantial declines in the last quarter century.

Comparing Figures 6a-c and 7, it is apparent that taxes and/or prices are not the explanation for declining alcohol consumption. Alcohol consumption declined primarily during the 1980s when beverage prices were rapidly falling. The 1991 increases in Federal taxes did boost prices temporarily, but consumption in Montana had already fallen 22 percent between 1981 and 1989, and national consumption had fallen by 13 percent. This pattern is especially strong for beer, where essentially *all* of the decline in consumption occurred before the increases in taxes (Figure 6a).²⁸

Instead of discouraging alcohol consumption, falling prices encouraged higher consumption. For example Wagenaar et al.’s (2009) review of 112 studies and meta-analysis yields price elasticities for beer, wine and spirits of -0.46, -0.69 and -0.80, respectively. Given the declines in “home” prices, consumption of beer, wine and spirits would have been expected to *rise* by 6.9, 16.8 and 20.0 percent, respectively, if nothing else had changed. Similarly, Young and Bielinska-Kwapisz (2003) estimate a price elasticity of demand for total alcohol consumption in the range of -0.53 to -0.75. BLS data indicate that the overall price of alcohol

²⁶ See Padilla and Morrissey (1993) and Gruenewald et al. (1999). Contemporary sources provide much the same picture, e.g. the Institute for Public Strategies (2008).

²⁷ Wagenaar et al. (1996), Harrison et al. (2000).

²⁸ It does appear that the Federal tax increases, which were widely anticipated, shifted some sales from 1991 to 1990: Consumers and distributors apparently “stocked up” in anticipation of higher prices, so sales were exceptionally high in 1990 and exceptionally low in 1991.

declined by 24.7 percent, and so Y and B-K's estimates imply increases in consumption of 13 to 18 percent, if nothing else had changed.²⁹ Of course other things did change, including educational efforts in schools and communities, legal changes such as the Minimum Legal Drinking Age, enforcement and sentencing for alcohol related offenses, and even the demographic composition of the population (Linkenbach and Young, 2010). It is beyond the scope of this paper to discuss the impact of these "other changes." The point here is simply that factors such as these were primarily responsible for the substantial declines in alcohol consumption that occurred in Montana and other states in the last 30 years.

b. Effects of Doubling State Taxes on Consumption

Even though alcohol prices fell over the last 30 years, that trend could be reversed by increasing taxes now and indexing them in some fashion so that they keep up with inflation. A reasonable question is, what would happen to alcohol consumption in Montana if, for example, the state's beer tax were doubled from its current value of \$4.30 per barrel to \$8.60? As discussed in Section 4, a doubling of Montana's beer tax would be expected to increase retail prices by one to three percent. Wagenaar et al.'s (2009) meta-analysis yielded a price elasticity of demand for beer of -0.46.³⁰ Thus, a rise in beer prices of one to three percent would be expected to reduce consumption by 0.5 to 1.5 percent.

More substantial increases in taxes would be expected to have roughly proportional effects on consumption. Thus, if the beer tax were tripled to \$12.90 per barrel, retail beer prices would be expected to increase 2 to 6 percent, and consumption to fall by one to three percent. If

²⁹ The BLS price decline is for off-premise alcohol sales which is similar to the ACCRA data used by Y and B-K. See Young and Bielinska-Kwapisz (2002, 2003).

³⁰ Wagenaar et al.'s estimate is based on studies from many states. Montana's price elasticity may be different from the national average, but we don't know whether it would be higher or lower.

beer prices rose substantially relative to those in neighboring states, however, some sales might be shifted to those states (Beard et al., 1997), without a commensurate reduction in consumption.

Montana state taxes on wine and spirits are higher percentages of retail prices, approximately 6-7 percent for the beverages covered by ACCRA (Table 6). Therefore a doubling of state taxes would have a larger impact on retail prices and consumption. As discussed in Section 4, a doubling of Montana's wine tax would be expected to raise retail prices by 7.7 percent, and a doubling of spirits taxes would raise retail prices by about 11-12 percent. Based on Wagenaar's (2009) estimates of the price elasticities for wine and spirits, consumption of wine would be expected to decline by 5.3 percent and consumption of spirits by 8.8-9.6 percent.

Underage drinking is of particular concern to policy makers, both because teen drinking is a significant factor in traffic fatalities (see below), and because teen drinking is correlated with higher levels of drinking and other problems at older ages (Rachal et al. 1980). There is substantial evidence that higher prices discourage the frequency and intensity of drinking by teenagers, just as they do for adults. However, it is not clear whether underage drinkers are more or less responsive than adults to price hikes. For examples, Grossman et al (1998) estimate that the long run price elasticity of demand for alcohol by young adults, taking account of the "addictive" nature of alcohol consumption is -0.65, a figure about equal to the overall price elasticity of demand in Wagenaar's (2009) meta-analysis. However, Dee (1999) found that teen drinking as reported in the Monitoring the Future surveys of high school students was essentially unresponsive to state excise taxes once researchers controlled for state-specific characteristics. Cook and Moore (2001) found quite the opposite: Controlling for state-specific characteristics *increased* the estimated effect of state taxes. Consequently, the existing research base does not

provide a basis for concluding whether or not tax increases are more or less effective in discouraging underage versus adult drinking.³¹

6. Alcohol Taxes, Beverage Prices and Traffic Fatalities

Traffic fatalities are a leading cause of premature death, particularly among people under thirty-five years of age.³² Alcohol was involved in 37 percent of all U.S. traffic fatalities in 2008, but alcohol involvement in Montana (45 percent) and many of the states in the region is above the national average (Table 7).³³ The majority of alcohol related fatal crashes involve drivers who have been drinking more than a little: A blood alcohol content (BAC) of 0.15 is reached in an 180 pound man by consumption of 8 drinks in two hours, or more drinks over a longer span of time.³⁴ Because alcohol is so frequently involved in traffic fatalities, alcohol taxes and other policies have the potential to significantly reduce fatality rates.

Table 7. Alcohol Related Traffic Fatalities, 2008.

	Number		Percent	
	Total	BAC=.01+	BAC=.01+	BAC=.15+
Montana	229	103	45	28
Idaho	232	93	40	24
North Dakota	104	52	50	35
South Dakota	119	41	34	22
Washington	521	225	43	27
Wyoming	159	75	47	31
U.S. Total	37,261	13,486	37	22

Source: NHTSA (2009a)

³¹ These issues are surveyed in Chaloupka et al. (2002).

³² http://www.cdc.gov/nchs/data/nvsr/nvsr49/nvsr49_08.pdf Table 10

³³ Based on estimates from the National Highway Traffic Safety Administration, <http://www-nrd.nhtsa.dot.gov/Cats/listpublications.aspx?Id=24&ShowBy=Category> Estimates by the National Institute on Alcohol Abuse and Alcoholism are lower: <http://www.niaaa.nih.gov/databases/crash01.txt>.

³⁴ Virginia Tech University <http://www.alcohol.vt.edu/Students/alcoholEffects/estimatingBAC/index.htm> . A 140 pound woman would achieve about the same BAC by consuming 6 drinks in two hours.

Despite the high current costs of drinking and driving, trends over the last 30 years have actually shown substantial improvement. Traffic fatality rates and the rate of alcohol involvement declined markedly after 1982 (NHTSA, 2007).³⁵ Total fatalities per 100 million vehicle miles travelled declined by 49 percent, and the alcohol involved fatality rate declined even more – by 65 percent. Put another way, the percentage of fatalities that involved alcohol declined by about one-third, from 60 percent to 41 percent (Figure 8).³⁶ As with the consumption data, much of the decline occurred well before the 1991 Federal tax increases, and there was an unusually large rate of alcohol involvement in the year before the tax increase (1990).

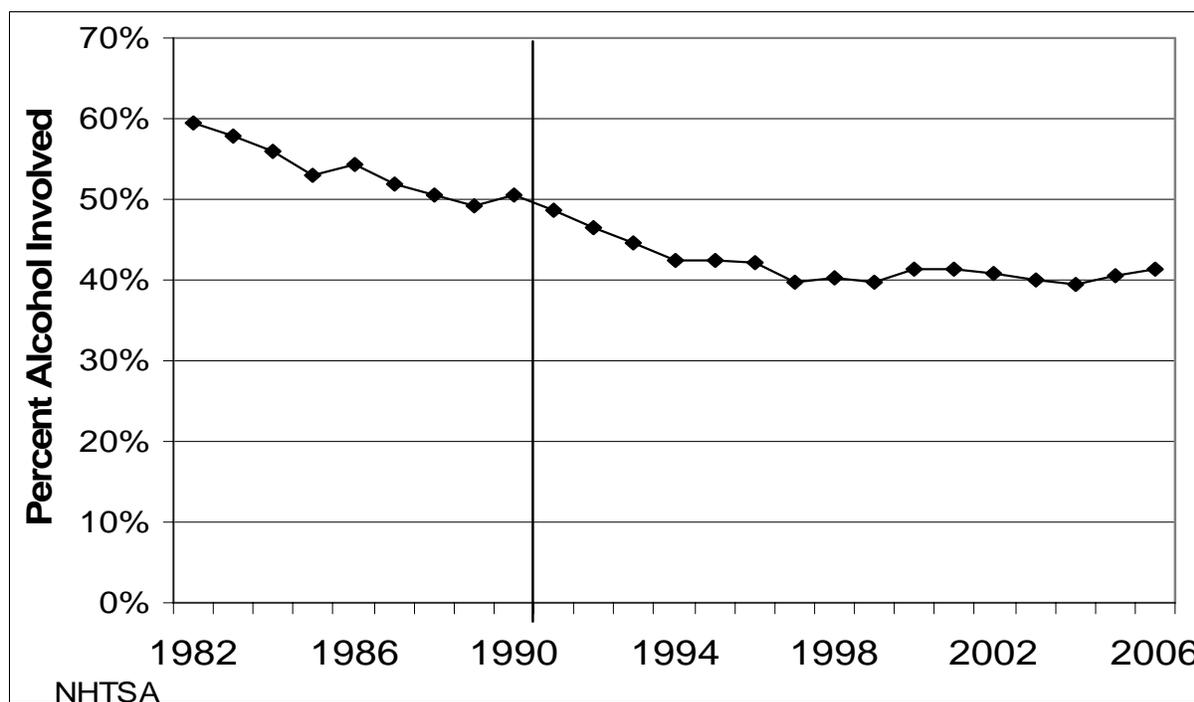


Figure 8. Alcohol Involvement in Traffic Fatalities.

³⁵ Alcohol involvement data are not available before 1982. In recent years, alcohol involvement has been determined largely on the basis of blood tests. However, in early years and in some states, testing was incomplete and alcohol involvement was imputed based on a statistical model. (Klein, 1986). The imputation method has since been updated and improved (Dang, 2008).

³⁶ Dang (2008) uses a slightly different measure: the proportion of drivers in fatal accidents who have a BAC of .08 or greater. This proportion displays a similar time trend, declining by 41 percent between 1982 and 2005.

Not surprisingly, traffic fatalities are linked to both alcohol prices and alcohol consumption, and these relationships have been extensively studied. The results of these studies vary somewhat from study to study, depending on the time period, statistical procedures and whether alcohol taxes are used as a proxy for prices. Nevertheless, the weight of the evidence is that higher alcohol prices reduce consumption and fatalities. For example, Young and Bielinska-Kwapisz (2006) examine data on traffic fatalities across 48 states and the years 1982-2000. They consider fatalities among both the total population and teens aged 16-20, as well as fatalities that occur on weekend nights and during weekdays.³⁷

Young and Bielinska-Kwapisz's (2006) estimates suggest substantial effects of prices on fatalities. A ten percent increase in alcohol prices is predicted to reduce total fatalities by 5.8 percent. The estimated effect is somewhat larger for weekend night fatalities (6.9 percent), and smaller for other times (3.9 percent). The estimated impact on all youth fatalities (9 percent) is larger than for the total population. Less plausibly, the estimated impact on weekend night fatalities among youth (3.5 percent) is smaller than the impact on youth at other times (9.3 percent), although the difference is not significant at the .05 level.

Similar results are obtained when traffic fatalities are related to alcohol consumption instead of price. A 10 percent increase in per capita alcohol consumption is associated with a 10-14 percent increase in fatalities. Somewhat implausibly, however, the estimated effects are smaller on weekend night fatalities than on fatalities at other times, particularly for youth, although the difference is again not statistically significant.

These estimates can be used to project the effects on traffic fatalities from increasing Montana's alcohol taxes. As described in Section 4, a doubling of state taxes on beer, wine and spirits would be expected to increase overall alcohol prices by 5 to 6 percent. The rise in alcohol

³⁷ Weekend night fatalities are much more likely to involve alcohol than weekday fatalities. See NHTSA 2009a.

prices would in turn reduce total fatalities by about 1.45 to 1.75 percent, and fatalities among teens by about half again as much, 2.25 to 2.6 percent. These figures are, of course, only estimates, and numerous qualifications are discussed in the concluding section.

7. Concluding Discussion

Alcohol taxes increase beverage prices and thus influence drinking among teens and adults. Higher taxes and prices have the potential to reduce alcohol abuse and traffic fatalities and injuries.

Beer prices in Montana are in the middle of the range of prices in the region and slightly above the national average. Wine prices in Montana are also typical for the region, although about seven percent below the national average. Montana's price for a 750 ml bottle of J&B Scotch is 13 percent above the national average and the highest in the region, except for Washington State. On an inflation adjusted basis, real alcohol prices in Montana and elsewhere have mostly trended downward over the last 30 years.

Montana's beer tax is about one-half of the national average, and wine and especially spirits taxes, are above national averages. Beer and wine excise taxes are levied as fixed dollar amounts per unit of beverage. Because they are changed quite infrequently, the real (inflation adjusted) value of these taxes has declined over time. Alcohol tax revenues, together with the profits from state liquor operations, amounted to \$37 million dollars in fiscal 2008, or about 2.5 percent of state General Fund revenues.

State taxes account for only about 0.8 to 1.5 percent of the retail price of beer, and 6 to 7 percent of the prices of wine and spirits. A doubling of state alcohol taxes is likely to increase retail beer prices by 1 to 3 percent, wine prices by about 8 percent, and spirits prices by 11 to 12

percent. If all of these taxes were doubled, the overall price of alcohol would rise by 5 to 6 percent.

Higher alcohol prices discourage consumption and alcohol abuse such as drunk driving. A doubling of the state tax on beer would be expected to reduce consumption by 0.5 to 1.5 percent. A doubling of wine and spirits taxes would be expected to reduce consumption of these beverages by 5 and 9 to 10 percent, respectively.

The quantitative impact of increasing alcohol taxes and/or prices on traffic fatalities is subject to more uncertainty, because the literature contains widely varying estimates. A doubling of Montana's alcohol taxes is estimated to reduce overall traffic fatalities by 1.5 to 1.7 percent, but the actual result could be more or less. Most of the estimated impact stems from the increase in spirits taxes: Since they are already a relatively high fraction of retail prices, a doubling of these taxes would amount to a substantial increase in the cost of alcohol. In contrast, state beer taxes are a relatively small fraction of retail prices, and thus doubling these taxes would have a smaller impact on alcohol prices, consumption, and traffic fatalities.

The estimates and even the data reported in this study are subject to numerous qualifications and caveats. As discussed previously, the ACCRA data sample prices for particular beverages in a limited number of locations in Montana and other states, and so may not be representative of average beverage prices. Excise taxes on beer and wine are relatively straightforward, but the estimated "taxes" on spirits include both explicit levies and "profits" earned by the state's Liquor Control Division. Tax shifting from sellers to consumers may be greater or less in Montana than the estimates based on national averages.

Consumers may respond to higher prices in a variety of ways besides simply reducing consumption. One possibility is to shift toward lower quality beverages, which generally have

lower costs per unit. An increase in the tax and price of one type of beverage may lead consumers to substitute one beverage for another. For example, an increase in spirits taxes may cause consumers to shift to beer. Most of the social costs of drinking are associated with heavy consumption, sometimes called binge drinking. Evidence in the literature indicates that heavy consumers do decrease their drinking in response to higher prices, but the decline in consumption may be smaller than for moderate consumers (Wagenaar, 2009). Estimates of the impacts of changes in taxes are imprecise in part because they are based on “small and infrequent changes in state excise taxes” (Cook and Moore, 2001, p. 421). Estimates of price effects are sensitive to what other control variables are included in statistical analyses, with much more modest effects sometimes obtained when some of the insignificant variables are excluded.

Alcohol use and abuse is affected by many factors besides taxes and prices, including the examples set by parents, drinking norms in the community, and educational programs; and laws on drinking and driving and their enforcement. As discussed in Section 4, much of the decline in alcohol use in the last 30 years occurred during a period in which alcohol prices were falling, but awareness of alcohol abuse was rising – in part because of campaigns by Mothers Against Drunk Driving and other groups - and many states legislated stricter and more certain penalties for DUI, and stepped up enforcement and educational efforts (Dang, 2008).

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Appendix: Price, Consumption and Fatality Elasticities

An elasticity is a measure of proportional response. For example, if the price elasticity of alcohol consumption with respect to price is equal to minus 0.5, it means that a 10 increase in price will cause consumption to fall by 5 percent, other factors held constant. The elasticity of fatalities with respect to alcohol taxes depend on several factors, including the extent to which taxes are shifted (marked up) to the retail level, the importance of taxes as a proportion of retail prices, the share of the particular beverage (beer, wine, or spirits) in total consumption, and so forth.

1. The price of i^{th} beverage P_i depends on excise tax t_i and markup λ_i :

$$P_i = a_i + \lambda_i t_i$$

Note: $\lambda > 1$ indicates taxes are over-shifted (markup > 1).

Then the elasticity of the price of the i^{th} beverage with respect to the i^{th} excise tax is equal to the markup times the ratio of the tax to the price.

$$\Rightarrow \frac{d \ln P_i}{d \ln t_i} = \frac{dP_i}{dt_i} \frac{t_i}{P_i} = \lambda_i \mu_i,$$

where: $\mu_i = t_i / P_i =$ tax as proportion of price.

2. Alcohol price index (Stone)

$$\ln P = \sum_i \theta_i \ln P_i, \text{ where } i = \text{beer, wine, spirits}$$

and $\theta_i = \frac{P_i C_i}{\sum_i P_i C_i}$ is the share of beverage i in total expenditure on alcohol.

$$\Rightarrow d \ln P = \sum_i \theta_i \lambda_i \mu_i d \ln t_i$$

In words, the proportional change in the price of alcohol is equal to the sum of the proportional changes in the excise taxes, weighted by the respective products of their markups, tax-price ratios, and shares in alcohol expenditure.

If only one tax changes, the elasticity of the price of alcohol with respect to that tax is:

$$\frac{d \ln P}{d \ln t_i} = \theta_i \lambda_i \mu_i$$

For example, in the year 2000 beer was 63% of alcohol expenditure, the markup is estimated as 1.70, and combined state and Federal excise taxes were approximately 6.5% of retail prices (Young and Bielinska-Kwapisz, 2002, 2006). This implies that a doubling of both state and Federal beer taxes would increase overall alcohol prices by about 7%.

3. Consumption elasticity with respect to price:

$$\varepsilon_{CP} \equiv \frac{d \ln C}{d \ln P}$$

For example, Young and Bielinska-Kwapisz (2003) estimate that the elasticity of aggregate alcohol consumption with respect to price in the range of -1.24 to -0.53. That is, a 10 percent increase in the price of alcohol is expected to reduce consumption by 12.4% to 5.3%.

4. Fatality elasticities:

a. with respect to consumption:

$$\varepsilon_{FC} \equiv \frac{d \ln F}{d \ln C}$$

For example, Young and Bielinska-Kwapisz (2006) estimate that a 10% increase in alcohol consumption is associated with a 10.8% to 11.3% increase in fatalities.

b. with respect to the price of alcohol:

$$\varepsilon_{FP} \equiv \frac{d \ln F}{d \ln P} = \varepsilon_{FC} \varepsilon_{CP}$$

For example, Young and Bielinska-Kwapisz (2003, 2006) estimate that a 10% increase in alcohol price is associated with a 3.1% to 5.8% decrease in fatalities.

c. with respect to tax on beverage i :

$$\varepsilon_{Fi} \equiv \frac{d \ln F}{d \ln t_i} = \varepsilon_{FC} \varepsilon_{CP} \frac{d \ln P}{d \ln t_i} = \varepsilon_{FC} \varepsilon_{CP} \theta_i \lambda_i \mu_i$$

For example, if a doubling of state and Federal excise taxes on beer would increase overall alcohol prices by 7% (see 2. above), and the elasticity of fatalities with respect to the price of alcohol is 0.58 (see 3.b. above), then doubling the beer taxes would reduce fatalities by about 4%, i.e. the elasticity of fatality with respect to state and local beer taxes is about 0.04.