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Alcohol Advertising and Adolescent Alcohol Consumption in the United States

Abstract

Although several other factors such as alcohol price, income, age, and race exist that possibly affect alcohol consumption, the correlation between advertising spending by the alcohol industry and subsequent adolescent alcohol consumption is not as crystal clear. Consequently, this issue generates much debate, especially in recent times.

Alcohol Advertising and Adolescent Alcohol Consumption in the U.S.

Iftekhhar Ahmed

I. INTRODUCTION

Over the years various social organizations and public health advocates have raised concerns over the apparent use of advertising by the alcohol industry as a tool to target the adolescent market. Their concerns are material; *Advertising Age* lists five alcohol companies in the top 100 advertisers worldwide. Also, according to *Competitive Media Reporting (CMR)*, alcohol advertising in the U.S. exceeded US\$1.5 billion in 2002, an increase of 25% from 1998. The bulk of these ads target the youth population. A study done by the *Center on Alcohol Marketing and Youth (CAMY)* suggests that adolescents are 45% more likely than adults to see beer ads (CAMY, 2003).

A survey conducted by *Monitoring The Future Study (MTF)* in 2002 shows that the proportions of 8th, 10th, and 12th graders who admitted drinking an alcoholic beverage in the 30-day period prior to the survey were 20% (up from 7.7% in 2001), 35% (up from 21.9% in 2001), and 49%, respectively. Concerns have also been expressed over the growing number of alcohol firms that feature online games in their product websites. Interestingly, underage drinkers are responsible for almost 20% of all alcohol consumed in the United States, with \$22.5 billion spent on alcohol in 1999 – more than the

amount spent on all other beverages and books combined (Foster, 2003).

Although several other factors such as alcohol price, income, age, and race exist that possibly affect alcohol consumption, the correlation between advertising spending by the alcohol industry and subsequent adolescent alcohol consumption is not as crystal clear. Consequently, this issue generates much debate, especially in recent times.

Before we delve further into this topic, it is important to address several detrimental outcomes associated with underage drinking. It includes reduced educational attainment, increased fatal motor vehicle crashes,

increased suicide attempts, increased criminal offences and greater occurrences of sexually transmitted diseases. Alcohol is responsible for 6.5 times more deaths of young people than all other illicit drugs combined (BrandWeek, 2003). The total cost attributable to the consequences of underage drinking reaches more than \$100 billion each year (U.S. Department of Health and Human Services, 2003). It is evident that underage drinking creates social problems that bear both human and economic costs with the potential of carrying on to adult life. Hence, it is pertinent that empirical research address this issue in an attempt to determine the likely causes of underage drinking, including the impact advertising

“Underage drinkers are responsible for almost 20% of all alcohol consumed in the United States. . . more than the amount spent on all other beverages and books combined!”

has on consumption.

Unfortunately, little empirical evidence exists to support the notion that alcohol advertising has any effect on actual alcohol consumption. Researchers believe that the aggregate level of advertising has not fluctuated much in the past, which renders it impossible to establish a clear link between alcohol consumption and advertising. Hence, even though both these phenomena prove to be substantial, a clear association between the two is yet to be established. Having said that, the issue continues to remain contentious in U.S. society. Therefore, the purpose of this paper is to establish the affect of alcohol advertising in the common media on underage drinking in the U.S. over the past 20 years by incorporating certain variables in addition to advertising, which past studies do not take into consideration.

This paper extends past research on two fronts. First, the study incorporates marketing expenditures by the alcohol industry as a variable in its model. It is hoped that its inclusion will capture strategic developments that the alcohol industry has undergone in recent years. Second, this paper formulates a comparative analysis in order to test whether alcohol advertising in the common media has differential effects on consumption among underage drinkers and those of legal age.

Section II discusses past studies that address similar research problems. Section III lays out the theory behind alcohol advertising and consumption. Section IV transforms the theoretical framework into empirical models and discusses the data set. Section V analyzes the results and explains them in light of the research problem. Section VI recommends future avenues of research and highlights policy implications.

II. LITERATURE REVIEW

Econometric studies on alcohol advertising have undergone a progressive transition in conceptual thought from purely theoretical concerns initially to more pragmatic, policy oriented concerns later. For instance, the early studies focused more on purely economic issues, such as return to advertising, rates of depreciation of advertising, and its effect on industry structure. Recent studies focus more on the esti-

mation of elasticities and whether or not advertising affects alcohol consumption (Fisher, 1993).

The most direct test of advertising was done by Ackoff and Emshoff (1975), where they conducted a market research for Anheuser-Busch. This study was different from other studies for several reasons. First, unlike most econometric work, the research was an actual experiment where advertising expenditures were systematically varied in an effort to optimize advertising expenditures and maximize sales revenue. The study was also important in the sense that it provided a rare opportunity to actually observe corporate decisions regarding advertising in a firm. The results achieved by Ackoff and Emshoff were rather surprising. Contrary to theoretical belief, sales volume actually increased at a higher rate in markets where advertising was reduced compared to markets where aggressive advertising campaigns were undertaken. The authors reason that a push towards market saturation of advertising creates detrimental effects on consumption by decreasing it, while reducing that saturation removes such detrimental influences and thereby enhances sales.

On the contrary, Saffer and Dave (2002) found a significant correlation between alcohol consumption and advertising expenditure. They find that partial alcohol advertising bans reduce alcohol consumption. Alcohol price was found to have a negative and significant correlation, while, on the other hand, income was found to have a positive and significant influence. Results also showed that total bans are more likely to be enacted where the alcohol culture is more social and also where the government has a broad role in controlling health related matters. The most striking finding of the research was that a marginal increase in advertising ban would reduce the consumption of alcohol by approximately 5% and a similar ban on all alcohol advertising in a media would reduce consumption by about 8%.

Fisher (1993) outlines some of the key findings of studies undertaken in this field. Econometric research conducted in the U.S. indicate that there is no evidence that consumer preferences change towards alcohol as a direct consequence of alcohol

advertising in the media. It is rather the relative decline in taxes and corresponding prices that have driven the growth in alcohol demand in recent years. A number of studies conclude that advertising levels are set in a budgetary context and are therefore more likely to be affected by preceding sales than to affect future consumption.

III. THEORETICAL FRAMEWORK

A. Advertising Expenditures

The alcohol industry in the U.S. is oligopolistic in nature. In such a market structure, competition through advertising, rather than price, is often preferred (Saffer, 2002). Economic theory suggests that oligopolistic firms are likely to advertise more than firms in monopolistic situations. Firms in an oligopolistic market will be hesitant to use price as a tool to influence market share since their competitors are certainly likely to follow suit. A pricing war ensues, which causes each firm to move down an inelastic demand function similar to the industry function. Market share will remain unchanged while firm level revenues will decline. Advertising research usually finds that the firm with the greatest exposure in the common media generally controls the largest market share. Each firm attempts to advertise more than their rivals, which results in a high level of advertising in the market (Fisher, 1993). This is evident in the alcohol industry where the advertising-to-sales ratio is about 9%, while the average in other industries is about 3% (CAMY, 2001).

Becker and Murphy (1993) argue that advertising can be viewed as a compliment to the advertised product. In essence, advertising portrays a favorable image about the advertised good. This increases the marginal utility to consumers and, in turn, increases demand. Saffer and Dave extend this theory to apply to the alcohol industry. They suggest that advertising has a cumulative effect and thereby creates what, in advertising theory, is defined as brand capital. Brand capital is defined as the collective positive associations that individuals relate to a brand. Saffer and Dave believe that advertising is one of the ways of adding to or changing

brand capital. Brand capital is, however, a depreciable item and therefore requires additional creation of brand capital by continued advertising. Hence, if advertising is reduced or banned, there would only be limited possibilities to offset brand capital depreciation. Therefore, in theory, this would reduce marginal utility of consumption and reduce sales.

Empirical studies in the past have used the normal demand function to illustrate alcohol consumption. The demand function is derived by assuming that a consumer maximizes a utility function, which includes alcohol as one of its arguments, subject to a budget constraint (Fisher, 1993). Enhancement in brand capital through advertising increases marginal utility and therefore demand. Optimization in overall utility creates a demand function for alcohol that relates alcohol price, advertising, income, age, availability of alcohol, alcohol sentiment, and other taste variables. Horizontal summation of individual consumer demands result in the market demand function.

According to Saffer and Dave, economic theory also suggests that advertising and consumption is subject to diminishing marginal product. This concept is the basis the of the advertising response function.

The advertising response function relates consumption, or sales revenue, to advertising expenditures. According to the researchers, advertising response functions are generally studied at the firm level since almost all advertising is done at the firm level (Fisher, 1993). It is a general consensus that advertising increases sales and that these increases are subject to diminishing marginal product owing to consumers' diminishing marginal utility. Firm level advertising response functions hold constant all other determinants of firm level sales including advertising by rivals and product price. For the firm, new sales induced by advertising come from two sources. First, new sales come from consumers who would have purchased from rival firms, leading to an increased market share. Secondly, new sales come from consumers who would not have purchased the product at all or who would have purchased less of the product, thereby increasing the market size. Similarly, an

industry level response function is derived by aggregating the firm level response functions.

Hence, an advertising response function isolates all other determinants of alcohol demand and presents the correlation between advertising and consumption. Therefore, *ceteris paribus*, an increase in advertising expenditure will increase alcohol consumption, with diminishing marginal returns in consumption. As a result, the alcohol industry feels the need to diversify their advertising exposure by utilizing several forms of media to avoid diminishing marginal effects in a particular form of media. Hence, it is expected that any exogenous variable that affects the level of advertising would shift the advertising response function downwards and thereby decreasing alcohol consumption.

One such exogenous variable is advertising bans. An advertising ban may not reduce the total level of advertising but will reduce the effectiveness of the remaining non-banned media, as a result of its diminishing marginal product. Firms might respond to this ban by increasing their advertising expenditure to attain a higher position on the lower advertising function. They might also use other marketing strategies to compensate for lost media.

Unfortunately, a study involving advertising bans usually involves many countries with similar alcohol consumption patterns. Therefore, an examination of alcohol consumption and alcohol advertising bans is not relevant for this study. While advertising bans are expected to show a strong correlation to consumption, advertising expenditure is theoretically still expected to effect alcohol consumption.

B. Marketing Expenditures

While general research in the field concentrates on advertising's effect on alcohol consumption, it fails to take note of a broader criterion of possible causation in the shape of marketing expenditures. Marketing expenditures encompass advertising, researching consumer preferences, research and development of new products, and promoting brand recognition. The theory involved in this instance is more of social realm rather than pure economics. Recent years have seen a growth in the value that youth

culture attaches to brand labels and symbols and move away from the healthy-living ethos. The alcohol industry's response to these trends has been to design alcoholic beverages that appeal to young people, using well-informed and precisely targeted marketing strategies.

Three key changes were observed in the article titled *Marketing Alcohol to Young People* (Jackson, 2004). They include the development of new designer drinks such as ice lagers, alcopops, white ciders, and alcoholic energy drinks. In addition, the alcohol industry has also been aggressive in increasing the use of sophisticated advertising and branding techniques to establish alcohol products that relate to the emerging youth culture. The opening of new drinking outlets, such as café bars, theme pubs, and club bars, have also been promoted in an attempt to lure the younger generation to consume alcohol. This effectively increases the availability of alcohol products to adolescents. A direct outcome of extravagant marketing expenditure has been the introduction of "designer drinks" (characterized by brightly colored and innovative packaging) and "alcopops," which are regular alcoholic drinks available in a wide variety of sweet and fruity flavors. Such innovative products appeal to the less mature drinkers, mainly adolescents.

Given the aforementioned economic theory and discussion of this research problem I hypothesize that, *ceteris paribus*:

- (i) Advertising and marketing expenditure by the alcohol industry in the U.S. positively affects alcohol consumption. As was argued in the theory section, an increase in alcohol advertising and/or marketing expenditure will cause alcohol consumption to increase along the advertising response function. An increase in consumption is expected to be derived from an absolute increase in consumption and increased preference for alcoholic drinks with respect to other household consumption goods given a certain budget constraint. Hence, this paper expects to find a positive correlation between alco-

hol advertising and marketing expenditure and alcohol consumption.

- (ii) Advertising and marketing expenditure have a greater impact on adolescents compared to people of legal drinking age. As mentioned in the introduction, adolescents are 45% more likely to watch an alcohol ad than adults. In addition, my discussion in the previous section revealed how the alcohol industry targets the youth population by implementing aggressive marketing policies that reflect youth appeal. Therefore, this study expects to find a greater impact of alcohol and marketing expenditure on the younger generation in relation to those of legal drinking age.

IV. EMPIRICAL MODEL AND DATA

In order to illustrate that advertising and marketing expenditure by the alcohol industry has a positive effect on alcohol consumption, I devise an Ordinary Least-Square (OLS) regression model. This paper aims to present the media's impact on alcohol consumption on two levels:

- (i) **Aggregate Model:** This model will correlate aggregate per capita alcohol consumption within the U.S. in relation to several independent variables, such as price, income, and advertising and marketing expenditures.
- (ii) **Comparative Analysis Model:** This model consists of a system of equations which aims to distinguish the differential effects of alcohol advertising on drinking patterns of different age groups below and above the legal drinking age.

A. Aggregate Model

The aggregate model will be tested by using aggregate time series data for the years 1982 to 2002. This model incorporates several control variables, which should help in isolating the subsequent effect of alcohol advertising and marketing expenditure on its consumption. A functional relationship

between the variables follows:

$$\text{Consumption} = f(\text{Price, Income, Advertising, Marketing})$$

The dependent variable, *consumption* (CONS_PERCAPITA), is expressed in terms of per capita alcohol consumption. This aggregate data of alcohol consumption has been collected from the National Institute of Alcohol Abuse and Alcoholism (NIAAA) website for the years spanning 1982 to 2002.

Past studies have established that alcohol is an inelastic normal good (Baltagi, 1995). Hence, demand theory predicts that the *price of alcohol* (PRICE) will have a negative effect on consumption. As a result, it is expected that as the price of alcohol increases, the per-capita consumption of alcohol will decrease. Alcohol price information for the years 1982-2002 is obtained from the ACCRA database. Alcohol price from this database is expressed as price per ounce of alcohol and has also been deflated by the Consumer Price Index (CPI).

Being a normal good, it is also expected that the *income per-capita* (GDP_PERCAP) of households in the U.S. will have a positive effect on alcohol consumption. As the per-capita income increases, the budget constraints of households shift rightwards, enabling them to increase their demand for consumer products, including alcohol. The PRICE and GDP_PERCAP variables capture the effects that the price of alcohol and the per capita income of U.S. households, respectively, have on the alcohol consumption level. GDP per capita information for U.S. households from 1982 to 2002 is taken from the World Development Indicators.

As the theory section elaborated, it is expected that *advertising* (ADV_EXP) and *marketing expenditure* (MKT_EXP) by the alcohol industry will have a positive effect on alcohol consumption. An increase in advertising expenditure will increase consumption along the advertising response function. Since marketing expenditure is a broader category, which includes advertising, an increase in marketing expenditure is expected to have a similar, if not larger, effect on alcohol consumption.

Industry specific advertising data is hard to come by. Although the *Competitive Media Reporting* (CMR) website is a reliable vendor for such datasets, the expensive nature of the product diminished its practicability for use. As a result, the ADV_EXP variable from the above model will be eliminated. This also removes the potential problem of high correlation between ADV_EXP and MKT_EXP. Hence, under the circumstances, the MKT_EXP variable will potentially act a proxy in addition to serving its initial purpose in the model. If anything at all, I expect marketing expenditure – owing to its all-encompassing nature – to have a more pronounced influence on alcohol consumption than advertising expenditure. In addition, it will be interesting to study whether incorporating the marketing variable will achieve significant results compared to studies done in prior years, which only used advertising expenditure as the primary causation. Marketing data will be compiled by going through the annual reports of the ten largest liquor companies in the U.S. for the years 1982-2002. Aggregating the marketing expenditure data of the top 10 companies should be sufficient since the alcohol industry in the U.S. is oligopolistic in nature.

A revised regression equation for the aggregate model follows:

$$\ln(\text{CONS_PERCAPITA}) = \hat{a} + \hat{a}_1 \ln(\text{PRICE}) + \hat{a}_2 \ln(\text{GDP_PERCAP}) + \hat{a}_3 \text{MKT_EXP}_{t-1}$$

Table 1 presents the variables and their definitions.

B. Comparative Analysis Models

Recall that adolescents are 45% more likely to be targeted through alcohol advertising than the adult population. Hence, it is relevant to develop a comparative analysis model, which will reflect on the potential different impacts that marketing strategies have on the underage people in relation to those of legal drinking age. It is further expected that, given we can draw a reasonable distinction between advertising and marketing's effect on youth and adult population, the results of this paper would produce more robust implications.

Comparative analysis will be conducted by developing two models. The models are described as follows:

1. Comparison Model I

A four equation structural model estimates the differential effect that alcohol advertising is expected to have on consumption in teenagers of dif-

TABLE 1
Descriptive Statistics of the Aggregate Model (1982 - 2002)

Variable	Description	Mean	Standard Deviation
Consumption per Capita	Natural log of per capita total consumption of alcohol in gallons (beer and wine)	2.35	.21
Price (-)	Mean real price per gallon of alcohol, deflated by the CPI (beer and wine)	1.24	.07
GDP per Capita (+)	GDP per capita of U.S. households in 2003 dollars	26,761	3,386
Marketing Expense (+)	Marketing expenditure of the leading liquor brands in the U.S. (5 companies), deflated to 1982 dollars (in billions)	2.02	.79

ferent age groups relative to those of legal drinking age. Specifically, this model presents a comparison between the percentage of 8th, 10th, 12th graders and individuals over the age of 21 that report consumption in their lifetime. A functional relationship of the variables in the comparative analysis follows:

$$\% \text{ Reporting Consumption}_n = f(\text{Price, GDP, Marketing})$$

By expanding the system of equations stated above, we get the following:

$$(i) \%RPT_CONS_{8th\ grade} = \hat{a}_1 + \hat{a}_1 PRICE + \hat{a}_2 INC_PERCAP + \hat{a}_3 MKT_EXP_{t-1}$$

$$(ii) \%RPT_CONS_{10th\ grade} = \hat{a}_2 + \hat{a}_4 PRICE + \hat{a}_5 INC_PERCAP + \hat{a}_6 MKT_EXP_{t-1}$$

$$(iii) \%RPT_CONS_{12th\ grade} = \hat{a}_3 + \hat{a}_7 PRICE + \hat{a}_8 INC_PERCAP + \hat{a}_9 MKT_EXP_{t-1}$$

$$(iv) \%RPT_CONS_{Over21} = \hat{a}_4 + \hat{a}_{10} PRICE + \hat{a}_{11} INC_PERCAP + \hat{a}_{12} MKT_EXP_{t-1}$$

Time series data (1982-2002) will be incorporated to test these regression equations. The

dependent variables in this system of equations is *percentage of each age group reporting alcohol consumption (%RPT_CONS)* during their lifetime when the respondent belonged to a specific age group. The data was obtained from the U.S. Department of Health and Human Services website. The model will be tested by using data which was created by a survey conducted by the Monitoring the Future Study (MTF). MTF targeted specific age groups across the United States from 1982 to 2002 to respond to certain alcohol and substance abuse questions. The same time series data set (1982-2002) that was used in the aggregate model for *Price (ACCRA)*, *GDP per capita (World Development Indicators)*, and *Marketing Expenditure (compilation from annual reports)* information is also implemented here. Table 2 presents the variables incorporated in the first comparative model.

2. Comparison Model II

This model presents a comparison between the number of initiates aged 12 to 17 and the number of initiates who are over the age of 21. As was discussed previously, the alcohol industry in the U.S.

TABLE 2
Descriptive Statistics of the Comparative Model I (1982 - 2002)

Variable	Description	Mean	Standard Deviation
	Reported alcohol consumption by:		
% Reporting Consumption	8th Graders	62.69	9.43
	10th Graders	77.01	6.11
	12th Graders	86.21	5.58
	Over 21	87.34	4.24
Price (-)	Mean real price per gallon of alcohol, deflated by the CPI (beer and wine)	1.24	.07
GDP per Capita (+)	GDP per capita of U.S. households in 2003 dollars	26,761	3,386
Marketing Expense (+)	Marketing expenditure of the leading liquor brands in the U.S. (5 companies), deflated to 1982 dollars (in billions)	2.02	.79

has been aggressive in promoting their products to the younger generation through opening up strategic retailing outlets like café bars, theme pubs and club bars. Such a trend essentially “invites” the younger generation to take up alcohol consumption, or in other words, initiates alcohol consumption. Thus, it should be interesting to study whether strategic marketing policies through aggressive marketing expenditure has a greater influence on adolescents to initiate alcohol consumption relative to individuals of legal drinking age. A differential response in this instance will go further in showing that marketing policies implemented by the alcohol industry are weighted more towards the youth of our society. Table 3 presents the variables incorporated in the comparative model II.

The regression equations to test this model are shown below:

$$(i) \text{Ln}(\text{INITIATES}_{\text{Under18}}) = \hat{a}_1 + \hat{a}_1 \text{Ln}(\text{PRICE}) + \hat{a}_2 \text{Ln}(\text{GDP_PERCAP}) + \hat{a}_3 \text{Ln}(\text{MKT_EXP}_{t-1})$$

$$(ii) \text{Ln}(\text{INITIATES}_{\text{Over21}}) = \hat{a}_2 + \hat{a}_4 \text{Ln}(\text{PRICE}) + \hat{a}_5 \text{Ln}(\text{GDP_PERCAP}) + \hat{a}_6 \text{Ln}(\text{MKT_EXP}_{t-1})$$

Time series data will also be integrated into this model. Data for the dependent variable INI-

TIATES is collected from the U.S. Department of Health and Human Services. Monitoring the Future Study (MTF) conducted a survey among age groups of individuals under age 18 and over age 21 from 1982 to 2002, which consists of the number of individuals who responded that they started alcohol consumption during the year. The same time series data set (1982-2002) that was used in the aggregate model for *Price* (ACCRA), *GDP per capita* (World Development Indicators), and *Marketing Expenditure* (compilation from annual reports) information is also implemented here.

V. RESULTS

A. Aggregate Model

The results of the aggregate model are presented in Table 4.

The model was run using time series data (1982-2002) of per capita consumption of alcohol (CONS_PERCAPITA), price (PRICE), GDP per capita (GDP_PERCAP), and marketing expenditure (MKT_EXP) by the alcohol industry. The model returned a R² value of 0.916. The key variable, MKT_EXP, was significant at the 5% level. Results show that there exists a positive re-

TABLE 3
Descriptive Statistics of the Comparative Model II (1982 - 2002)

Variable	Description	Mean	Standard Deviation
Initiates	Number of respondents who began consumption during the year:		
	Under 18 Years	2,759	763
	Over 21 Years	1,223	152
Price (-)	Mean real price per gallon of alcohol, deflated by the CPI (beer and wine)	1.24	.07
GDP per Capita (+)	GDP per capita of U.S. households in 2003 dollars	26,761	3,386
Marketing Expense (+)	Marketing expenditure of the leading liquor brands in the U.S. (5 companies), deflated to 1982 dollars (in billions)	2.02	.79

relationship between marketing expenditure and alcohol consumption, which follows the initial hypothesis of this paper. A unit change (i.e. 1 billion dollar increase) in MKT_EXP will increase alcohol consumption by 0.0496 gallons per capita. Although this amount might seem insignificant in isolation, the importance of this magnitude comes to light when we consider there are almost 10 million underage drinkers in the U.S. today

alcohol will increase per capita consumption by 1.34%. The unexpected nature of this variable, which essentially predicts an upward sloping demand curve for alcohol, may be due to an absence of a particular key variable, which the aggregate model failed to include. It might also be the case that the data reflecting the PRICE variable failed to capture the probable change in quality and composition of a gallon of alcohol through the years.

TABLE 4
Regression Results for Consumption Per Capita

Variable	Coefficient
Constant	3.83 (1.83)
Natural Log of Price	1.34** (3.41)
Natural Log of GDP per Capita	-.331 (-1.65)
Marketing Expense	.049* (2.1)

Adjusted R² = .916

* indicates significance to .05 level
** indicates significance to .01 level

NOTE: t-statistic appears in parentheses

(MADD, 2004). Hence, the results demonstrate that with respect to sign, magnitude, and significance, the key variable, MKT_EXP, correctly predicts per capita alcohol consumption.

The GDP_PERCAP variable was not significant in this model. However, the control variable PRICE was significant at 1% level. Nonetheless, the regression failed to return its hypothesized sign. Results show that, holding other variables constant, a 1% change in mean real price of

B. Comparative Models

1. Comparative Model I

The first of the comparison consumption models change focus from the aggregate statistics to concentrate more on age specific variations. The model predicts the percentage of 8th, 10th, 12th, or individuals who are over age 21 reporting consumption (%RPT_CONS) in relation to price of alcohol (PRICE), GDP per capita (GDP_PERCAP), and marketing expenditure (MKT_EXP) by the alcohol industry. The log-log model used in the previous model was not used here since a linear model proved to be a better predictor of the individuals reporting consumption. I present the results of this model in Table 5

A general pattern is visible in relation to the PRICE variable in the model. All the PRICE coefficients in the system of equations in this model were highly significant at 1% level. As we saw in the previous (aggregate) model, the model predicts an upward sloping demand curve. But the extent of influence that PRICE has on consumption tends to decrease as adolescents gradually approach adult life. Saporito (1991) notes this pattern of behavior. Saporito finds that, between 1985 and 1990, sales of premium priced brands, those costing more than \$10 a bottle, increased by 5%, while sales of cheaper brands fell as much (Saporito, 1991). He also predicts that such a trend is likely to continue as aging baby boomers shift their preference towards premium, "better taste" brands, which are frequently characterized by

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TABLE 5
Regression Results for % Reporting Consumption

Variable	8th Grade	10th Grade	12th Grade	Over 21
Constant	-208.5 (-3.12)	-140.51 (-2.5)	-20.3 (-0.5)	50.95 (3.38)
Price	164.46*** (4.82)	125.65*** (4.36)	73.6*** (3.55)	33.37*** (4.33)
GDP per Capita	.0033** (2.78)	.0029** (2.89)	.0008** (1.16)	.00002 (-0.081)
Marketing Expense	-10.19*** (-3.2)	-7.56** (-2.82)	-3.56* (-1.85)	-2.27*** (-3.16)
Adjusted R ²	.900	.830	.895	.975

* indicates significance to .10 level

** indicates significance to .05 level

*** indicates significance to .01 level

NOTE: t-statistic appears in parentheses

higher prices.

The GDP_PERCAP variable for most parts returned significant coefficients. Here as well, the results predict a decreasing influence of GDP per capita on alcohol consumption as age of the reporting individuals increase. However, the magnitudes of the coefficients are rather small, indicating that GDP_PERCAP essentially has a minimal effect on consumption in this model.

The most surprising aspects of this model were the signs of the key variable MKT_EXP. Although the coefficients were significant at various levels, the results, however, consistently predict that an increase in marketing expenditure will consequently decrease the percentage of people reporting consumption. A possible explanation of such an unexpected result might be that the dependent variable of the model (% Reporting Consumption) does a poor job in capturing the consumption level of the age groups concerned.

2. Comparative Model II

The second consumption comparison model looks at how much influence PRICE, GDP_PERCAP, and MKT_EXP exerts on individuals under and above the age of 18 to initiate consumption during a particular year. The model predicts the number of alcohol initiates (INITIATES) during a particular year in relation to price of alcohol (PRICE), GDP per capita (GDP_PERCAP) and marketing expenditure (MKT_EXP) by the alcohol industry. Table 6 presents these results.

Perhaps the most interesting finding of the research was the strong correlation that was found between marketing expenditure (MKT_EXP) and the number of individuals under age 18 who initiated drinking during a given year. Regression results demonstrate that a 1% increase in MKT_EXP will increase alcohol initiation by

1.61%. The coefficient was also significant at 1% level. This finding adds a new dimension to the study, which in essence reveals that even if aggressive marketing expenditure does not increase the percentage of individuals reporting consumption by a significant degree (as demonstrated by Comparative

Model I previously), it nonetheless encourages adolescents to start alcohol use, as illustrated by the results of this model. This model had an R² value of 0.607. The PRICE variable was found to be highly insignificant and predicted the wrong signs for the coefficients. The GDP_PERCAP variable was significant at 10% level and demonstrated an unexpected sign.

The results for the regression equation, which predicted the number of initiates over the age of 18, did not return such convincing results as the regression for initiates under age 18 did. The model returned a relatively low R² value of 0.263. The prediction of marketing expenditure on consumption was found to be insignificant. In addition, both the PRICE and GDP_PERCAP variable were found to be insignificant in this model.

VI. CONCLUSION

The primary conclusion of this paper is

TABLE 6
Regression Results for Initiates

Variable	Under 18 Years	Over 21 Years
Constant	34.022 (2.55)	31.91 (2.55)
Price	1.79 (0.828)	-2.73 (-1.5)
GDP per Capita	-2.71* (-2.057)	-1.87 (-1.68)
Marketing Expense	1.61** (3.28)	.296 (0.72)
Adjusted R ²	.607	.263

* indicates significance to .10 level
** indicates significance to .01 level

NOTE: t-statistic appears in parentheses

that marketing expenditure influences alcohol consumption, as evidenced by the aggregate model. This is one of the key findings of the paper since previous studies found little or no correlation between alcohol consumption and advertising expenditure. Hence, the all-encompassing nature of the marketing expenditure

variable did indeed prove to be a better predictor of alcohol consumption than advertising expenditure, which most previous researchers incorporated in their studies. This study also features another key conclusion. Aggressive marketing expenditure influences adolescents who are under the age of 18 more into taking up alcohol consumption relative to individuals above the age of 18. This result agrees with many social organizations who accuse the alcohol industry of luring the youth population towards their products.

However, the findings on age group basis remained inconclusive. It might be the case that distinctions between sex, race, and educational background within each age specific group distorted the results pertaining to marketing expenditures. Henceforth, consumption pattern analysis based on other economic and societal influences like unemployment, family religiosity, and relationship, in addition to sex, race, and educational background, can be investigated in future research.

Overall this paper has found some positive correlation between adolescent alcohol initiation and marketing expenditure. It is therefore imperative that policies are undertaken where marketing strategies aimed specifically at adolescents are regulated by concerned authorities. Regulatory bodies solely responsible for researching the content of marketing initiatives undertaken by the alcohol industry in the U.S. can be formed. Widespread social awareness directed towards those most vulnerable to the ploys of the alcohol industry should be initiated. Only then can the ill effects of underage drinking be checked in today's society.

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