Do Alcohol Policies Influence the Level of Road Fatalities in Ireland?

By

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Abstract:

The objective of this study is to examine the effectiveness of alcohol policies as a method to curtail the level of fatalities on Irish roads. The effectiveness of alcohol control laws on road fatalities is assessed using a multiple regression time-series model. The data examined is from the time period 1961-2001. The empirical estimation found that legal limit laws and first offence fines were significant for the full sample period, suggesting that policies aimed at increasing the probability of being caught and increasing the severity of punishment are considered most effective in reducing fatalities. Taxation on cider is also found to be significant for the period whereas beer taxes are not. This is consistent with the campaign in Ireland to curb youth drinking by increasing cider taxes. The results from this study suggest that increasing the probability of being caught and increasing the severity of punishment are Ireland's most successful policies. This suggests that the Irish Government may include Random Breath Testing as part of their policy regime which involves frequent and publicly visible checks along the roadways, during which police stop drivers at random for a breath test thus increasing the probability of being caught.

1.Introduction

The objective of this study is to examine the potential use of alcohol control policies and other policy initiatives as a means to reduce the level of fatalities on Irish roads from 1961-2001. In order to achieve this objective this study will address two questions:

i. Are road fatalities in the ROI (Republic of Ireland) influenced by policies initiated by the Irish Government?
ii. What are the most effective initiatives with respect to decreasing road fatalities?

The economic importance of these questions can be seen as a reflection of the costs incurred in the event of a vehicle fatality, the European Commission (1997)

estimates that each fatality costs at least €1 million. The calculation of the economic costs of road accidents takes account of all the consequences of an accident that leads to a loss of net product. These costs include restoration costs, that is, costs that are incurred for restoration, such as, medical, legal and administrative costs. Costs arising from loss of resources are also included. These costs are incurred in the event of serious injury or death, given that the person is no longer able to take part in the production process. Resources are also lost due to the damage caused by road accidents to vehicles. These vehicles represent real capital, and this capital is now available to the production process for a reduced period or permanently disabled. Lastly accidents have human consequences that can be mirrored to the devastation a road death causes to the victims family and friends. Economically this may result in decreasing the individuals capacity to endure stress and therefore make them unfit for work; this entails a loss in net product. The latter is the hedonic method of pricing a human life i.e. a person is valued according to the amount that they produce. Alternatively one may use the QALY (Quality Adjusted Life Years) method of estimating the costs of a fatality. This method accounts for all the effects of a collision, that is, psychological, physical, emotional etc. Using this method the net loss to society greatly increases as it takes into account all of the human costs associated with a fatality. It is the latter method that is the driving force of this study and therefore the identification and evaluation of the most effective policies will contribute to economics and more importantly quality of life. Road accidents pose enormous burdens on the exchequer and any reductions in the level of fatalities has the promise of generating major benefits in terms of resource saving.

It is an expectation that one policy may be more successful than another in achieving its goals. It is the primary aim of this study to identify the most effective policy initiatives with respect to decreasing road fatalities. It would be in the interest of the Irish Government to devote resources (such as advertising, equipment, gardai time etc.) to the more effective approaches with regard to road safety. This sentiment is expressed by the NRA (National Road Authority) (2001):

> *"There is a need to better understand the effectiveness of different means of enforcement in terms of achieving greater compliance, for example in relation to parameters like excessive speeding, seat belt wearing or alcohol consumption. It is unclear what actions (or a combination of actions) can best achieve responsiveness."*

The identification of the most efficient policies in terms of reducing road fatalities is undertaken empirically by examining time–series data for ROI representing the level of fatalities between the years 1961-2001. A time-series multiple regression model is adopted to estimate the impact of policy on total vehicle fatality rates.

2: Background and Literature

Drinking and driving is considered in Ireland and across the EU as a very serious offence. In recent decades, much has been done already in an attempt to improve road safety, and not without success. Major initiatives have been undertaken in most EU states and because of these most countries have seen their fatality level fall dramatically as can be seen from Table 2.1.

Table 2.1: EU Road Fatalities 1970 versus 2000

Country	**1970**	**2000**	**Change**
Netherlands	3,181	1082	-66%
Germany	21,653	7503	-65%
Austria	2,574	976	-62%
Finland	1,055	396	-62%
Denmark	1,208	498	-59%
Sweden	1,307	591	-55%
United Kingdom	7,771	3580	-54%
Belgium	3,070	1470	-52%
France	16,445	8079	-51%
Italy	11,025	6410	-42%
Ireland	**540**	**415**	**-23%**
Portugal	1,842	1860	1%
Spain	5,456	5776	6%
Greece	1,099	2116	93%

Source ECMT/IRTAD 2001

Most counties have experienced a significant decrease in the number of road fatalities over the past 30 years, despite sustained increases in the number of vehicles and the distance travelled. The highest decrease was in The Netherlands (-66%) and Germany (-65%). In contrast Ireland has shown a more moderate decrease (-23%). The fact that Ireland is performing so moderately indicates that there may be potential for a further reduction.

In recent decades the Irish Government have considered the possibility of utilising alcohol policy measures in an attempt to limit road fatality rates. Reducing the BAC (blood alcohol concentration) limit has been a major element of this

campaign. This trend began with a decrease to 0.1 in 1978 followed by an additional decrease to 0.8 in 1995. The method in which the Irish Government deal with first offence drunk-drivers has also been reviewed. These penalties are in the form of fines and prison terms. The maximum prison term (six months) has not changed since the original Traffic Act (1933), however fines have progressively become more severe. In addition fines have become more severe for licence holders should they breach the terms of their licence, that is, serve beyond the legal opening hours or serve a person not legally entitled to consume alcohol. One policy that has not been utilised heavily by the Irish Government is significant tax increases taxation on alcoholic beverages. By raising taxes, this policy could lower alcohol consumption and thereby the vehicle fatality rate. Even though Ireland has a relatively high level of taxation in comparison to other EU countries, the tax increase has been gradual with approximately two cent being added annually. Cider taxes on the other hand have become subject to a strict taxation regime in the last few years, with the view that youths primarily consume cider and thereby taxation should result in a decrease in consumption.

Ireland also has adopted two original campaigns to tackle the level of fatalities on Irish roads. "SHAME", a 60 second, hard hitting advertising campaign, which shows graphical images of drink-driving victims, has been employed since the NRA came into existence in 1999. It is believed by the NRA that these graphical advertisements aided in decreasing the level of road fatalities in Ireland in recent years.

As previously stated the primary purpose of this paper is to investigate the responsiveness of road fatality rates on Irish roads to the alcohol policy measures described above. There have been no previous economic studies of the effects of alcohol policies on road fatality levels in Ireland. Other studies have considered the effects of more stringent drunk driving on the level of fatalities for the U.S. In particular Ruhm (1996) used the fixed effects model for panel data (for 48 U.S. states for 1982 to 1988) to allow for factors that vary both across state and across time. The independent variables in this model include, MLDA (Minimum Legal Drinking Age) laws, preliminary breath test laws, mandatory jail sentences, suspended licence laws and macro control variables in his study. Each of these variables was found to have a significant effect on reducing the motor-vehicle fatality rate. Chaloupka et al. (1993) used a multiple regression model to estimate the effect of alcohol policies on death

due to alcohol impaired driving in the U.S. The primary findings of this study are that both MLDA laws and pre-arrest breath test laws are both highly significant . Particularly the study finds that by allowing police to conduct a pre-arrest breath test would reduce motor vehicle deaths by 3.9% per year. In addition this study postulates that increasing beer tax to its real 1951 value (i.e. offsetting inflation) would decrease motor vehicle death rates by 11.5% per year.

Other studies have investigated the effects of lowering BAC levels and the fatality rate. In particular Wagenaar et. al (2001) estimated the effects of lower BAC limits for youth on individual drinking and driving behaviour. The authors find in favour of lower BAC laws, specifically they find that lower limits were associated with decreases in self-reported drink-driving incidents. This result is consistent with the findings of Hingson et al (1994) who compared the level of fatality rates for states in the U.S. that lowered their BAC level to .08 to those who did not lower their BAC level in order to establish a link between lower fatality rates and lower BAC rates. The authors find the BAC to have had a significant affect in reducing fatality rates. Carpenter (2004) investigates the potential for a zero tolerance campaign; this campaign suggests that a country should lower their BAC level to zero or indeed a negligible figure. The results obtained find no concrete evidence to suggest the law has effected drunken driving participation for either males or females.

RBT (Random breath testing) laws have been adopted in many U.S. states as well as in some European countries. This laws permits breath tests to be carried out randomly without establishing probable cause of drink driving, therefore, this law shall increase the probability of being caught drunk-driving and thereby acts as a deterrent. Saffer and Chaloupka (1989) estimate the effect of these laws on the level of motor-vehicle fatality rates. The authors used cross-sectional time-series data for forty-eight states to examine the effect of these laws and essentially find this law to significantly reduce motor-vehicle fatality rates. Similarly MLDA laws can potentially reduce the incidence of drunk driving by restricting alcohol availability to young drivers. Wagenaar (1986) examined time-series data for Maine, Michigan, New York and Pennsylvania in the U.S. to estimate the effect of MLDA laws on alcohol-related motor vehicle crashes among drivers aged eighteen to twenty and found increases in the legal drinking ages to produce significant reductions in the level of fatalities. Legge (1991) extended previous analysis by Wagenaar (1986) by analysing different measures of traffic fatalities in order to estimate the effectiveness

of MLDA laws as an alcohol policy. The study finds evidence that the increase in Michigan's MLDA led to a reduced motor-vehicle fatalities rate for young drivers. Ironically the Irish Government has not increased the MLDA over the period 1961-2001, despite its reported success as an alcohol policy variable as reported in the literature.

Taxation on alcohol is often cited as a means in which to curb alcohol consumption and thereby decrease the probability of an alcohol related fatality. However the literature does not provide an unambiguous assessment of this variable. Toomey *et al.*, (1994) found that excise taxes were significant in reducing the level of road fatalities. Cook (1981) supports this idea by postulating that motor vehicle deaths would decrease by 7% for every 10% decrease in tax on spirits. Kenkel (1993) investigated the same idea and calculated that an alcohol tax adjusted for inflation from 1975 to 1988 would save between 3,300 and 3,700 lives per year. This idea is contradicted in studies by Huber (2003), Young and Likens (2000) and Mast *et al.,* (1999). According to Mast *et al*., (1999) the significance of the tax variable in earlier studies is indicative of omitted variable bias i.e. the authors of this study failed to included all relevant alcohol policy variables.

3: Analytical Framework

The model used for analysis in this study is an OLS multiple regression model. Primarily it can be said that a person shall not drink drive if the perceived costs associated with drink driving outweigh the perceived benefits. Initially it is plausible to assume that the level of drunk drivers on the road affects fatalities caused by drunk driving. That is if there were zero drunk drivers than there would naturally be zero fatalities relating to alcohol and as the quantity of drunk drivers on the roads increase than the probability of a drunk driving incidents also increases. Unfortunately data on the level of drunk drivers on Irish roads is unavailable, however, following the argument of Mast *et al.* (1999) the level of drunk drivers may be seen as a function of the probability and severity of punishment a society has for drink drivers. Generally speaking, a person's decision to drink drive may be seen as a reflection of the benefits gained. Therefore, if the costs associated with drink driving outweigh these benefits than a person is less like to drive while over the limit.

The second aspect that one would expect to affect the level of fatalities is the attitude that a society adopts towards alcohol consumption. Specifically a society that

has a negative attitude towards alcohol would have a lower probability of a drink related fatality than a society with a 'drinking culture'. Naturally it is plausible that this attitude may vary across both a cross-section and across time. In the U.S. attitudes vary greatly from state to state; for example, Utah is predominantly Mormon and could be classified as a dry-state[1] (Ruhm, 1996). This reasoning cannot be adopted for Ireland; there is no evidence to suggest that attitudes to drinking vary from county to county. Therefore a cross sectional drinking sentiment variable is not considered. It is possible however that drinking sentiment has changed in Ireland over the last forty years. This change in attitude could have come about for numerous reasons; for example, changes in religious culture, changes in the cost of getting transport home after drink driving, changes in the volume of alcohol consumption etc. In addition the Irish Government has initiated a campaign in order to change individual's perception that it is acceptable to drink drive through graphically illustrating the consequences of a fatality. This campaign essentially aims to alter people's attitude into 'thinking twice' before drinking and driving.

Thirdly, it is necessary to consider the inclusion of a macro-economic control variable to allow for factors that affect the level of drink driving incidents at a macro level. Similarly to Ruhm (1996) this study introduces income as a means to control for macroeconomic effects. These effects include, increase in the ability to afford alcohol, increases in the quality of infrastructure and increases in society's resources (example: number of gardai).

There is also a need to consider, the effects of both taxes[2] and availability laws, following Toomey *et al.,* (1994), who see these variables as a measure of the potential use of fiscal policy to achieve harm minimisation objectives, in this instance the level of road fatalities. Availability laws will ultimately affect the cost associated with drink driving indirectly, through limiting access to alcohol and likewise taxes will indirectly affect drink driving through raising the price of alcohol.

The number of vehicles in an economy has not been considered in previous studies as a determinant of the overall fatality rate. The reasoning behind this is questionable for studies using time-series analysis over several decades. In the Irish context the level of vehicles on the road has increased dramatically between 1961-2001. Naturally, one would expect that in isolation (that is holding changes in

[1] A society free of alcohol
[2] Alternatively one could choose to replace the taxation variable with alcohol consumption as taxation affects fatalities through alcohol consumption. The results of this regression is in table A.1 in the appendix

technology and infrastructure constant) that the increase in the quantity of vehicles on the road shall increase the probability of a collision and thereby a fatality.

Using the above analysis the time series multiple regression model is now:

$X=f(Y, Z)$ (1)

Where X=Fatality Rate

Y=Policy Variables

Z=Control Variables

4: Dataset and Variable Analysis

The dataset employed in this paper is a time-series study and consists of data relevant to the Republic of Ireland for years 1961-2001. Table 4.1 contains definitions, means and standard deviations of the variables in the data set. A detailed description of the variables and their sources appears in an appendix to this paper (available on request).

Table 4.1 Variable Definitions and Summary Statistics

Name	Description	Min	Max	Mean	Std. Deviation
Total Vehicle Fatality Rate (Fatality)	Death within 30 days after an accident.	332.00	640.00	470.17	87.43
Gross National Product (GNP)	GNP per Capita in 1995 prices	-2.76	13.64	3.62	3.27
Blood alcohol Concentration (BAC)	Milligrams of alcohol per 100 millilitres of blood permitted whilst driving	.08	.125	.14	.08
First offence Fine (Availability Laws)	Maximum fine in Euro for first offence DUI	100.00	1000.00	553.66	421.37
Excise Duty on Beer (Beer)	Annual level of duty in euros added to one pint of beer.	.00	.293	.500	.076
Excise Duty on Cider (Cider)	Annual level of duty in euros added to one pint of cider.	.00	12.70	.62	2.23
Advertising (Advert)	0=no advertising campaign; 1=otherwise	0.00	1.00	.073	.26
Level of Vehicles (Vehicles)	Number of mechanically propelled vehicles currently under licence.	57999	415263	131745	91265
Time Trend	Time Trend	1	42	22	12.5565

The dependent variable is the level of road fatalities and is measured as the number of lives lost to vehicle collisions. A road fatality is defined in this research as death within 30 days of a road accident. This is the standard definition recommended by the United Nations Organisation, Geneva.

GNP is used rather than GDP because GDP includes profits, which are repatriated to foreign investors whereas GNP measures the output produced solely by Irish people and is therefore considered as a more appropriate figure for Ireland

(Kennedy 2001). The expected sign on the income coefficient is ambiguous. On the one hand, a higher income leads to more discretionary income, leading to a higher alcohol consumption rate (Ruhm, 1996). If this is accurate, then both the probability of drink driving and hence the fatality rate increases. However a higher income may also lead to the purchase of safer vehicles, making individuals less likely to be involved in a fatal accident. Also Huber (2003) argues that higher income leads to a higher social status. Therefore the embarrassment factor of being caught drink driving may act as a deterrent. These factors in isolation would suggest a negative relationship between GNP and the fatality rate.

Legal limit laws are introduced to reflect the probability of punishment. Under these laws it is illegal to drive a mechanically propelled vehicle while over a certain alcohol level. In Ireland the punishment of first offences comprises the possibility of a prison sentence and/or fine. Interestingly the length of this prison sentence has not varied for over forty years and therefore is not a variable. A variable reflecting the maximum fine receivable is included. It is expected *a priori* that both the probability of punishment and the severity of punishment will have a negative effect on the dependent variable.

Availability of alcohol describes measures evoked to limit the alcohol availability. Restrictions on the availability of alcohol in Ireland are enforced by fines that are employable if licence holders:

a) Serve beyond legal opening times.
b) Serve an individual who is not legally permitted to consume alcohol.

Under such laws people are likely to be served a lesser quantity of alcohol and thereby lessen consumption. Therefore the predicted effect on the endogenous variable is negative.

The real tax rate is included to determine the effects of taxation on alcohol related fatalities. Information on taxes, rather than prices, is used for two reasons. Firstly, tax rates are set directly by policy-makers, whereas prices are not. Second, prices result from interaction of supply and demand, whereas taxes are relatively unaffected by this interaction. Unlike other studies, such as, Chaloupka *et al*., (1993a) and Zhang (1999), which only considered beer taxes this study also estimates the effect of cider taxation on fatality rates. In these studies beer taxes had almost perfect correlation with all other alcohol taxes. This is true, in Ireland, with respect to spirits and wine, however the same cannot be said for cider taxes. This

may be due to the Irish Governments recent policy of taxing cider as a means of curbing alcohol consumption among youths. For this reason cider taxes is added to the model.

A dichotomous dummy, representing the graphical advertising campaign iniatied by the Irish Government is included to allow for a change in individuals attitude prior to viewing the advertising features. It is expected, given the disturbing visuals in these campaigns that this will have a negative effect on the level of fatalities.

The level of vehicles on the Irish roads is included to allow for the increases in the level of vehicles on Irish roads over the last forty years. An increase in the number of vehicles increases the probability of a road fatality; therefore the effect of an increase in vehicles is expected to have a positive effect on the independent variable.

Finally the time trend variable allows for factors that vary across time, these factors include:

- Changes in attitudes towards drunk-driving and drinking sentiment in general
- Changes in technology that result in people driving safer cars and thereby decrease the probability that a collision will be fatal.
- Changes in infrastructure→ the availability of 'safer' roads may decrease the probability of being involved in a fatality.

4: Results

Table 4.1:OLS Estimates for 1961-2001

Ordinary Least Squares Estimation			
Dependent variable is FATALITY			
41 observations used for estimation from 1961 to 2001			
Regressor	**Coefficient**	**Probabilities**	
Constant	432.91	[.000]***	
Advert	-59.283	[.314]	
Bac	-1150.2	[.000]***	
Availability Laws	-.060321	[.417]	
First Offence	-.066545	[.018]**	
Beer	36.9131	[.808]	
Cider	.073083	[.088]*	
GNP	-.0064415	[.343]	
Vehicles	-.0002472	[.998]	
Time Trend	-1.3054	[.054]*	
R^2	.72702	**Adjusted R^2**	.65903

*** Significant at 1% level
** Significant at 5% level
* Significant at 10% level

In this regression both BAC level and first offence punishments are significant at the 1% level of significance indicating that the most effective alcohol control policies were those that affected the probability and increased the severity of punishment. The results suggest that if the Irish Government were to decrease the BAC level by 0.01 over eleven lives would be saved. This is consistent with previous studies (Hingson *et al.,* (1996), and Ruhm (1996)). The effect of first offence punishments is considerable, suggesting for a €100 increase in the first offence fine there would be over six lives saved in society. However, perhaps part of this variables significance may be attributed to the fear of getting caught drunk driving. Cider taxes are also significant at the 10% level of significance and the results indicate that an increase of cider taxes by 1 euro could have the potential to save seven lives. Finally, the time trend variable, as explained has been included to capture the changes in the level of fatalities over time and therefore the results suggest that annually one would expect a decrease of between one and two fatalities. This result maybe due to a change in people's attitude towards drink driving as a reaction to anti-drink driving campaigns enacted by the government, it may also be attributed to increase safety technology in motor vehicles thus reducing the chance of a collision being fatal or perhaps it is due to the existence of better infrastructure in Ireland in recent years.

The level of motor vehicles is insignificant, again this may be the result of improvements in technology, which lead to safer vehicles and therefore decreases the probability that a collision has fatal consequences. It may also be coupled with the increase in the quality of Irish roads over the sample period, which again will reduce the incidence of fatalities having fatal consequences.

The insignificance of the income variable may be attributed to the effect of an increase (or indeed a decrease) having an ambiguous effect on the level of road fatalities. As previously explained, an increase in income will generally increase alcohol consumption and therefore increase the incidence of drink driving. Conversely an increase in income will also result in individuals being able to afford more robust vehicles and at an aggregate level, due to an increase in tax receipts, the government being able to increase investment in infrastructure. The latter outcomes considered in isolation will have a negative effect on the dependent variable. Therefore, given that the effect of an increase in income has both positive and

negative effects on the dependent variable, this may ultimately render its overall effects negligible. The insignificance of the beer tax variable may be linked to the drinking culture in Ireland. Individuals may be slow to respond to a small price change in a pint of beer and therefore the policy has little or no effect on the level of fatalities. This is consistent with the significant coefficient on the cider tax variable, which as stated previously, may be the result of the recent campaign by the Irish Government to curb alcohol consumption among youths[3], which has seen significant increases in cider taxes. It is not unusual for conflicting results to emerge, with respect to the effect of alcohol taxes on the level of fatalities, alcohol taxes are found to be significant by earlier studies such as Saffer and Grossman (1987) and Laixuthai and Chaloupka (1993), however this variable is found to be insignificant by Young and Likens (2000) and Mast *et al (1999)*. This conflict is not unusual:

" The failure to include determinants of alcohol consumption other than drinking age and/or factors that simultaneously determine drinking behaviour and political support for alcohol taxes" (Mast *et al*., 1999).

The insignificance of availability laws may perhaps be due to the fact these laws are not severe enough and rendered insignificant or perhaps maybe they are difficult to enforce. The insignificance of the advertising variable is surprising given the public's reaction to the graphical nature of these advertisements. There are two possibilities for this result

- The fact that this advertising campaign was only initiated in 1999 may cause the sample to be too short to estimate the variables total effects.
- The fact that this variable was modelled as a dichotomous variable may result in the magnitude of its effects being underestimated.

5: Conclusions and Policy Prescriptions

Consistent with studies by Kenkel (1993), Toomey *et al.,* (1994) and Ruhm (1996) this study supports the view that alcohol control policies can significantly reduce road fatalities. Similar to previous studies ((Ruhm, 1996) and (Kenkel 1993)) this study lends support to the idea that when deciding on alcohol control policies the Government should aim to:

[3] In Ireland Cider is considered by the Department of Health and Children as a good primarily consumed by younger drinkers

1. Increase the probability of being caught whilst drinking and driving.
2. Increase the severity of the punishment for first offence drunk-drivers.

With regard to the former the primary method employed in Ireland is the enforcement of legal limit laws, today the legal BAC level is 0.08%. It is recommended, this level is decreased in line with most other EU countries to a level of 0.05% or more ideally follow the zero-tolerance campaign adopted by the Swedish Government and legislate a level of .02%. Another method that is employed in other countries is the employment of a RBT law. This law involves frequent, widespread and publicly visible checks along the roadways, during which police stop drivers at random and require them to provide breath tests[4]. These laws were found to be significant by Saffer and Chalpouka (1989), Evans *et al.,* (1991) and Kenkel (1993). Given that employment of these laws would increase the probability of detection, it is recommended the Irish Government update the traffic laws to include the provision of an RBT law.

With regard the severity of punishment, given that at present (2003) the Traffic Act (1933-2002) outlines a maximum fine level and a maximum prison sentence (both of which may be wavered at the court's discretion), it is recommended this act is updated to include a minimum fine (which can't be wavered). Also considering the limited capacity of Irish prisons, it is recommended the Irish Government adopt a name and shame policy, (i.e. a first offence drink-drivers name is published), which was suggested by Huber (2003) as a means to decrease drink driving among the higher income population. Another possibility is the employment of immediate licence suspension laws, which have been found as highly effective in Room's (2000) review of the literature.

Finally increasing MLDA laws have not been considered by the Irish Government in over forty years. These laws would restrict availability by increasing the legal age of alcohol consumption and have been found highly effective by U.S. researchers such as, Wagenarr (1983), Chaloupka *et al.,* (1993), Legge (1991) and Chaloupka *et al*., (1998). Perhaps future policies should consider increasing Ireland's MLDA.

In summation more research is needed in order to formulate the best range of policies in order to deal with drink driving. Across Ireland, individuals are losing

[4] The difference between this method and the ordinary breath tests is that an officer does not have to adopt probable cause of drunk driving.

their lives unnecessarily in vehicle collisions and the effect of these accidents extends beyond those killed. Economically a fatality results in a loss of resources and therefore is a loss to society. At a human level it may take years for the families involved to recover after the devastating loss, while others may never recover. Therefore this study may be seen as a useful step in identifying the most effective policies to decrease the level of needless road fatalities.

Appendix A:

Table A.1:OLS Estimates for 1961-2001 with Taxation Variables Replaced with Alcohol Consumption

Ordinary Least Squares Estimation			
Dependent variable is FATALITY			
41 observations used for estimation from 1961 to 2001			
Regressor	**Coefficient**	**Probabilities**	
Constant	475.4566	[.000]***	
Advert	-10.3396	[.857]	
Bac	-796.394	[.001]***	
Availability Laws	-.060321	[.417]	
First Offence	-.042557	[.091]*	
Alcohol Consumption	44.2994	[.004]***	
GNP	-.61601	[.854]	
Vehicles	-.00048	[.687]	
Time Trend	-1.5833	[.100]*	
R^2	.70218	**Adjusted**	.62715

*** Significant at 1% level
** Significant at 5% level
* Significant at 10% level

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