



The effects of drinking and driving laws on car crashes, injuries, and deaths: Evidence from Chile[☆]



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ARTICLE INFO

Keywords:

Drinking and driving law
Car accidents
Injuries and deaths
Alcohol consumption

ABSTRACT

This paper analyzes the effects of lowering the legal blood alcohol content limit for drivers from 0.05 to 0.03 grams of alcohol per deciliter of blood (g/dL) and increasing license suspension periods for offenders. We take advantage of a rich data set of administrative records that allow us to identify direct measures of accidents involving alcohol including fatalities and injuries. Results show a significant decrease of 32% in alcohol-related car accidents right after the law was approved but the effects moderate over time (15% after three years). There is also a significant reduction in injuries (31% right after the approval and 11% after three years) but no statistically significant effects on deaths. Complementary analysis of blood samples shows that the law had an effect on blood alcohol content (BAC) of male drivers up to the 90th percentile of the BAC distribution.

1. Introduction

Motor vehicle accidents cause over 1.24 million deaths and 20–50 million injuries yearly worldwide. Traffic accident fatalities are the leading cause of death among people between the ages of 15 and 29, and these accidents are expected to rise from the ninth to the fifth leading cause of death among all individuals by 2030 (WHO, 2013). With the aim of reducing car crashes, injuries, and fatalities, many countries have lowered the blood alcohol limit for driving, some even setting it to zero.¹

The empirical evidence on the effects of *per se* blood alcohol limits for driving on car accidents, injuries, and deaths show mixed results (Mann et al., 2001; Beirness and Simpson, 2002; Bernat et al., 2004; Fell and Voas, 2006; Elvik et al., 2009; Assum, 2010). Most of the studies, if not all, focus on the developed world and some lack information on accidents due to alcohol consumption and use proxy measures to circumvent this data issue.

In this paper, we analyze a 2012 Chilean law that reduced the legal blood alcohol limit from 0.05 to 0.03 g/dL for the overall population and increased license suspension periods for offenders. We have access to data on car accidents and their causes, which allows us to analyze the direct effects of the law on alcohol-related crashes. This also includes

data on injuries and deaths associated with each accident. We implement regression discontinuity, generalized Poisson, and linear logit regressions to assess the effects of the law on three main outcome variables: accidents, injuries, and deaths.

The related literature is extensive, and there have been some efforts to summarize the empirical evidence. For example, Mann et al. (2001) examine the evidence for five developed countries that introduced or lowered the legal *per se* blood alcohol limit for driving (the United Kingdom, Canada, Japan, the Netherlands, and the United States) concluding that “some beneficial effect on traffic safety measures has been reported.” However, the effects are in some cases small and temporary. In an extensive review for different jurisdictions of the United States, Canada, Sweden, Australia, and Norway, Beirness and Simpson (2002) conclude that the evidence (even those from methodologically rigorous studies) is inconsistent, showing beneficial effects in some cases, but mixed results, or even no positive effects in others. Other authors conclude that lowering legal BAC limits are associated with lower car crash fatalities and injuries (Wagenaar et al., 2007; Fell and Voas, 2006; Bernat et al., 2004). This evidence focuses on laws that reduced the limits from BAC 0.1 to 0.08 or from 0.08 to 0.05 g/dL.

This paper contributes to the literature on blood alcohol limits in four ways. First, it provides new evidence on lowering legal blood

[☆] We would like to thank Francisco Gallego, Jeff Harris, Jeanne Lafortune, Matías Tapia, and Luis Rizzi for helpful discussions and seminar participants at the PUC-Notre Dame Conference in Economic Analysis (Santiago), SECHI (Viña del mar), LACEA-LAMES (São Paulo), FGV – (São Paulo), PUC-Chile, NEUDC (Boston University), and the 11th World Congress of the Econometric Society (Montreal). Tomás Rau thanks the funding granted by Fondecyt, Project No. 1141093. The usual disclaimers apply.

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¹ Medical literature has found “strong evidence that impairment of some driving-related skills begins with any departure from zero blood alcohol content” (Moskowitz and Fiorentino, 2000).

alcohol limits to a small amount: from 0.05 to 0.03 g/dL. This type of intervention has been less studied because few countries have implemented it.² Second, we can analyze alcohol-related crashes directly. Thus, we do not have to rely on proxy measures such as single-vehicle nighttime accidents as many articles do. Third, we analyze various outcome variables such as accidents, injuries by degree of severity, and fatalities. We also have access to blood tests from the period examined that allows us to assess the effects of the law on drinking and driving. Lastly, this is one of the first papers analyzing this type of intervention for a less developed country.

Two similar experiences to that of Chile have been studied. (Assum, 2010) analyzed the experience in Norway of reducing the legal BAC limit from 0.05 to 0.02 g/dL in 2001. However, he does not have access to data on alcohol-related crashes. Instead, he uses single-vehicle nighttime accidents, weekend personal-injury, and fatal crashes as proxy measures. He does not find any reduction in these proxies when comparing six years before with six years after the decrease of the legal limit. Ross and Klette (1995) studied the Swedish law that lowered the BAC legal limit from 0.05 to 0.02 g/dL in 1990. They perform an interrupted time series analysis finding a 15% reduction in overall traffic fatalities (they cannot distinguish if alcohol was involved in these accidents) but when accidents were split in daytime and nighttime incidents, the overall result is lead by daytime accidents. There were not any reductions in nighttime accidents, those most likely to be related to alcohol consumption. Lastly, Nörstrom and Laurell (1997) also analyze the Swedish case, finding that there was a 9.7% decrease in overall fatal crashes and an 11% decrease in single-vehicle crashes, i.e. those more likely to be related to alcohol. Our paper complements the limited international literature.

2. Institutional background

Traffic accidents are an important matter in Chile. They are currently the second leading cause of death of young people between 15 and 25 years old and first among children under 15 years old. For the period 2000–2012, nearly 1600 people died yearly in road traffic accidents, and more than 20% were related to driver or pedestrian alcohol use (INE, 2010).³

In this context, on January 31st, 2012 the Chilean Senate approved Law 20,580, which increased license revocation time for driving under the influence (DUI) and drunk driving, and lowered the legal driving BAC level. Permitted BAC was reduced from 0.05 to 0.03 g/dL, and driving under the influence (DUI) was set between 0.03 and 0.079 BAC (instead of 0.05–0.099 BAC range). The starting threshold for drunk driving was reduced from 0.1 to 0.08 BAC. The law was announced on the day it was approved but started being enforced on March 15, 2012.

Two important features of the penalty structure in Chile are the distinction between DUI and drunk driving, and that license suspension time depends on the type of injuries caused by the car crash. Thus, DUI drivers would have their license suspended for three months to five years depending on the injuries involved. Meanwhile drunk drivers (above a 0.08 BAC level) would have a license suspension for two years if no injuries were caused and permanent revocation if deaths or serious injuries were involved. In the case of recidivism, the second and third times would have suspension periods of four and five years for DUI offenders, and five years and lifetime cancelation for drunk drivers respectively.⁴

² For example, Russia, Sweden, and Norway decreased from 0.05 to 0.02 g/dL, Poland, and Japan from 0.05 to 0.03 g/dL (Beirness and Simpson, 2002; Desapriya et al., 2007).

³ The primary cause of death in road traffic accidents comes from pedestrian actions, such as pedestrians in driveways and careless crossing, among others, representing 23% of deaths from car accidents for the last decade. Accidents related to alcohol are the second leading cause (INE, 2010).

⁴ In Chile, drivers must be 18 years or older to drive alone. There is a special permit for teens at 17 that allows them to drive when accompanied by an adult driver. Additionally,

Lastly, two key background elements may affect the effectiveness of the law: enforcement and information. Regarding the first, even though Chile classifies as a high-income economy (World Bank, 2016), the enforcement of drinking and driving regulations is lower than that of developed countries, and it is similar to that of other Latin American countries (WHO, 2013).⁵ Also, enforcement, as measured by police stops, did not change with the law (see Section 3.2 for a description of the data). Regarding the announcement of the law, an awareness campaign was deployed in late February 2012 to decrease traffic fatalities by educating the public about the fatal risks of drunk driving and the main legal changes (Table 1).

3. Data and descriptive statistics

3.1. Data

The primary data used in this paper are administrative records from the Chilean national police force, the *Carabineros de Chile*. We have data on all registered traffic accidents in the country with their causes (listed in Appendix A) by date including the number of injuries and deaths for the 2009–2014 period. This information comes from the Highway Traffic Agency of the Carabineros de Chile (OS2). The total sample includes 377,531 accidents, 26,979 of them involving DUI and drunk driving. The total number of drivers in all accidents is 604,801 and 40,813 in those related to alcohol.⁶

It is important to mention that the OS2 uses only one cause to classify an accident such as distracted driving, DUI, or drunk driving (see Appendix A). Certainly, a car crash may have more than one cause, but they are classified according to the “root cause,” as determined by a police officer at the accident scene.⁷ An implicit assumption in our analysis is that the law did not change the way police labeled the root causes of accidents. We discuss this in Section 5.1 and provide evidence against the hypothesis of a change in police officers reporting.

We merge these data with the number of cars stopped by police patrols and the number of alcohol-related driving offenses (DUI and drunk driving). This information was provided by the Criminal Analysis Office (CAO), also part of the Carabineros de Chile, and allows us to control for enforcement in our regressions. To control for variables affecting the number of rides in a given month, we include gasoline sales, obtained from the Transportation Ministry.

Lastly, we have access to all blood alcohol tests in the Metropolitan Region for the period 2009–2014 collected by the Chilean Legal Medical Service (SML).⁸ We use this data to study the channels through which the law works. Although the data might include tests requested

(footnote continued)

buying alcohol is legal for those 18 years old or older.

⁵ WHO (2013) performed surveys in more than 100 countries about the effectiveness of enforcement of several aspects of road safety legislation, the enforcement of drink-driving laws being one of them. The responses are on a scale from 0 to 10 where 0 is “not effective,” and 10 is “highly effective.” Chile gets a score of 5.0. Latin American countries get a 4.8 and high income countries a 6.6.

⁶ All drivers involved in a car accident are not necessarily tested for alcohol. If there are injuries or deaths all drivers are blood tested. If there are neither injuries nor deaths, the police officer may or may not perform a breath test. In these cases, if the breath test exceeds the 0.03 g/dL, a blood test is given as well.

⁷ According to Rizzi and Fariña (2013), this may be due to the need to establish legal responsibilities of drivers involved in a car crash. They also argue that alcohol-related accidents may be underreported since those with drivers in legal BAC limits (between 0 and 0.03) are not classified as alcohol-related.

⁸ The Metropolitan Region is one of the 15 regions of the country and the most populated one. While the total population is 17.8 million, the Metropolitan Region has 7.3 million, 41% of Chile's population (INE, 2014b). Regarding the comparability of the samples, the Metropolitan Region has a 19% higher per capita income than the national average (INE, 2012) but it is a representative sample of the country regarding motorized vehicles and car accidents. The share of motorized vehicles is 41%, and the proportion of accidents in respect to the total is 36%, which are similar to the share of its population (INE, 2014a). Blood alcohol content tests for other regions were not available for the period analyzed.

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