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Abstract
We analyze the impact of Election Day alcohol bans on road traffic accidents, traffic-related injuries, and alcohol-related hospitalizations. Our analysis focuses on the 2012 Municipal Elections in Brazil, during which 11 out of 27 states imposed on its 2,733 municipalities the decision to implement alcohol bans. Using daily-level data on municipalities, we find that alcohol bans caused substantial reductions in road crashes (15%), traffic-related injuries (30-70%), and traffic-related hospital admissions (18%). An analysis of the hospitalization costs associated with traffic accidents reveals that banning the sale of alcohol saved Brazil's healthcare system $150,000 per day, which is likely to be a lower bound of the total societal cost savings. Using this figure as a benchmark, we estimate the total cost savings to be up to $1 million for a one-day ban on alcohol.

Keywords
Alcohol, ban, election, drunk driving, traffic accident, road crash, hospitalization, hospital admission, cost analysis.

JEL Classification Codes
I12, I18

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I. Introduction

Road traffic injuries are a major public health problem. Every year, about 1.24 million people die from injuries sustained in road traffic accidents and between 20 and 50 million suffer from non-fatal injuries. Remarkably, 92% of traffic-related deaths occur in low and middle income countries, despite the fact that these countries account for only 53% of the world's registered vehicles (World Health Organization, 2013). Among the countries that are afflicted with road traffic safety problems, Brazil ranks among the worst. Compared with the U.S., for example, fatalities from road traffic crashes as a fraction of all causes of death are nearly twice as high in Brazil (Sivak and Schoettle, 2014). The economic cost associated with these road crashes is substantial. A recent study estimated that, in 1997, they were valued at about $15.6 billion or about 2% of Brazil's gross national product (Jacobs *et al.*, 2000).

The consumption of alcohol significantly impairs the driving ability of most individuals (Breitmeier *et al.*, 2007; Phillips and Brewer, 2011), and one of the most important causes of traffic accidents is driving under the influence of alcohol (Levitt and Porter, 2001).[1] For example, a recent study of traffic accidents in four state capitals in Brazil found that 27% of the individuals involved in road crashes had blood alcohol content (BAC) levels that were above the BAC limit set by the federal government (Galduróz and Caetano, 2006). However, while there is a consensus regarding the existence of a strong relationship between alcohol consumption on the one hand, and road crashes and traffic-related injuries on the other, much less is known about policies

[1] According to data from the National Highway Traffic Safety Administration (NHTSA), in 2011 about 31% of all traffic fatalities in the U.S. involved at least one driver or non-occupant (such as a pedestrian or cyclist) with a blood alcohol concentration (BAC) of 0.01 g/dL or higher. Similar patterns have been documented in several other countries (Christophersen *et al.*, 1995; Akgür *et al.*, 2011). According to Smith (1990), studies typically find that between 40 to 50% of all road traffic fatalities are associated with elevated blood alcohol concentrations.

that are effective in reducing the negative externalities associated with excessive alcohol consumption.

This paper contributes to the literature by evaluating a policy that eleven Brazilian states imposed on its 2,733 municipalities during the 2012 Municipal Elections, namely, a ban on the sale and purchase of alcoholic beverages. In particular, we analyze the effects of short-term alcohol bans on (1) road crashes and traffic-related injuries and (2) alcohol-related hospital admissions and the costs associated with them. We exploit the fact that Brazilian federal states are allowed to independently decide whether to impose alcohol bans on election days. Importantly, the electoral "dry laws", as these resolutions are often referred to, are intended to be a cautionary measure aimed at preserving public order during elections and are unrelated to any public health objective in Brazil.

The analysis uses daily-level data on Brazilian municipalities from two sources. The first source of data is the *Sistema de Informações Hospitalares* (SIH-SUS), which is provided by Brazil's Ministry of Health and contains detailed information on about 80% of all hospitalizations that occur each year in Brazil. A prominent feature of this data set is that we observe the costs of hospital admissions, which allows us to quantify the extent to which bans on alcohol sales reduce the negative externalities due to excessive alcohol consumption, as measured by the financial burden placed on the healthcare system in Brazil. The second source of data comes from Brazil's Federal Road Police Department, which provides information on all traffic accidents that occurred on federal roads.

Our analysis reveals that, Election Day alcohol bans, which occurred over a weekend, substantially reduced road crashes, injuries resulting from road traffic accidents, and traffic-related hospitalizations. In particular, we estimate that, on

average, weekend bans on alcohol sales reduced road crashes by 15%, non-fatal traffic-related injuries by 30-35%, and traffic fatalities by almost 70%. Consistent with the analysis of data on road crashes, we find that weekend alcohol bans caused a reduction of 18% in hospital admissions due to road traffic accidents.

An analysis of hospitalization cost data reveals that, even for a short-term restriction on access to alcoholic beverages, the negative externality associated with excessive alcohol consumption is substantial. In particular, using the cost data in the hospitalization files, we estimate that, on average, weekend alcohol bans reduced the costs associated with traffic-related hospitalizations by about $50, which represents a 40% reduction from the sample mean. Summing this value across the 2,733 municipalities that banned alcohol during the municipal elections, our analysis indicates that the alcohol bans saved Brazil's public healthcare system approximately $150,000 on Election Day. Given that driving and traffic congestion tends to intensify during special events and holidays, our analysis has important policy implications, especially in areas where excessive alcohol consumption and risky behavior are rampant.

The rest of the paper is organized as follows. First, we review the literature on the link between alcohol availability and public health. Second, we provide a historical account of Election Day alcohol bans in Brazil. Third, we describe the data used in the analysis. Fourth, we outline the empirical strategy and discuss the main results. Fifth, we explore heterogeneity in the impact of alcohol bans and the timing of its effects on traffic-related outcomes. Sixth, we conduct a cost analysis to quantify the magnitude of our estimates. Finally, we conclude.

II. Literature Review

The present paper is related to studies that have analyzed the impact of policies that either restrict or increase the availability of alcohol on public health outcomes.

According to conventional wisdom, policies that restrict the sale and purchase of alcohol during certain hours and days of the week should lead to a reduction in risky behavior, accompanied by an improvement in health-related outcomes, such as a decrease in road traffic accidents and alcohol-related injuries.

However, the public health impact of policies that reduce the availability of alcohol hinges on how sensitive individuals are to the full price of alcohol which, in addition to the dollar cost of the beverage itself, involves an increase in the time and travel costs associated with obtaining alcohol (Jewell and Brown, 1995). And, indeed, existing evidence on the link between access to alcohol and risky health behavior is mixed. For example, Heaton (2012) found no evidence that the legalization of Sunday packaged liquor sales in Virginia had an impact on arrests for drunk driving. Similarly, Norström and Skog (2005) found only weak evidence that Saturday openings of alcohol retail shops in Sweden increased drunk driving. Lovenheim and Steefel (2010), analyzing a panel of U.S. states between 1990 and 2009, showed that state-level Sunday alcohol law repeals had, at most, a small effect on fatal road traffic accidents.[2] Biderman *et al.* (2010) found that the effect of the adoption of "dry laws" in the São Paulo Metropolitan Area in Brazil, such as mandatory night closing times for bars and restaurants, had a small and statistically insignificant effect on deaths associated with road crashes. In contrast, Green *et al.* (2014) found that road crashes actually fell after the liberalization of bar hours in England and Wales, by reducing the incentive for individuals to drink to "beat the clock" before closing times.

Evidence from these studies, on balance, indicates that policies that constrain the availability of alcohol are either ineffective or have, at best, a small impact on road

[2] While McMillan and Lapham (2006) found that repealing the ban on Sunday packaged alcohol sales increased alcohol-related road crashes in New Mexico, Stehr (2010) analyzed data from several states and did not find that the repeal had a similar effect in other states.

traffic accidents. Conceptually, it is not clear whether temporary alcohol bans will have a favorable impact on public health outcomes. First, individuals who would like to consume alcohol during the time of the ban may simply purchase their beverages in advance and drink at home or at other private places.[3] Moreover, as discussed by Vingilis (2007) and Green *et al.* (2014), the adoption of dry laws and other restrictions on closing times may lead to binge drinking shortly before licensed establishments close, which could perversely increase the number of intentional and unintentional injuries associated with excessive alcohol consumption. Also important, particularly in the context of a large developing country like Brazil, is the fact that some commercial establishments (*e.g.* small bars in the outskirts of towns), may have an incentive to keep operating despite alcohol sale restrictions, given the limited resources available for the police authorities to enforce the law and, consequently, the relatively small probability of being caught and fined.

The evidence cited above is mixed, but a consistent result in the literature is that alcohol-related policies tend to be more effective among the youth. For example, while Lovenheim and Steefel (2010) found that, overall, Sunday alcohol law repeals had a small impact on fatal road crashes, they found evidence of much larger effects on the fatal accident rates of underage male drivers. Marcus and Siedler (2013) found that the introduction of a ban on alcohol sales between 10pm and 5am at off-premises outlets in the German state of Baden-Württemberg reduced alcohol-related hospitalizations among adolescents and young adults by about 9%. Dee (1999) found that, in the U.S., a higher minimum legal drinking age reduces fatal traffic accidents by at least 9%. Similarly, Carpenter and Dobkin (2009) found a 14% increase in deaths due to motor vehicle accidents in the discontinuity around the minimum drinking age in the U.S.,

[3] Interestingly, there is evidence that restrictions on smoking in public places have perverse effects on children. For example, Adda and Cornaglia (2010) found that, in the U.S., smoking bans displace smokers to private places where they expose nonsmokers to second-hand smoke.

while Conover and Scrimgeour (2013), using a difference-in-differences approach, also found a significant increase in alcohol-related hospitalizations for the group of individuals above the minimum age to purchase alcohol in New Zealand.

Evidence in the literature also indicates that the day of the week that alcohol availability is restricted is important for policy effectiveness. For example, Ragnarsdóttir *et al.* (2002) showed that the adoption of unrestricted alcohol serving hours in Iceland increased admissions to emergency rooms by 20% during weekends, but *decreased* them by 2% during weekdays. And Vingilis *et. al.* (2005) found evidence that, in Ontario, people who go out to drink on weekdays are likely "problem drinkers" who drink until closing hours, while those that go out on weekdays are "social drinkers". This has clear implications for policy effectiveness if, for example, alcohol-related harm to society is caused mostly by the subset of the population that is most responsive to alcohol-related policies.

Taken together, the evidence suggests that the public health effects of policies that restrict access to alcohol may vary by the type of policy and the age group of the individuals who are affected by it. While the literature reveals a mixed bag of evidence, it does highlight the importance of heterogeneity in the effects of policies that restrict access to alcohol on health outcomes. As we discuss in greater detail below, we use previous evidence in the literature to guide our analysis, and we explore heterogeneity in the impact of alcohol bans by age, sex, and the timing of the policy's implementation.

It is important to discuss how our paper differs from other studies in the literature. First, it is important to note that government authorities tend to implement a *set* of alcohol-related policies, which makes it difficult to measure the causal impact of any one of these policies (*e.g.* see Ruhm, 1996).[4] A noteworthy difference between our

[4] For instance, the World Health Organization's recommended policy to reduce road traffic mortality is based on the adoption of comprehensive legislation aimed at: (i) reducing driving speed, (ii) reducing

study and many of the studies in the literature is the fact that the potential for policy endogeniety to be a concern is extremely limited. As we discuss in greater detail below, we focus on a 35-day time interval, and no other alcohol-related policies were implemented over this period.

Second, the policies that are evaluated in previous studies are often much less restrictive than the one we study here. For example, some of the policies discussed above apply to a subset of beverage types (liquor but not beer and wine), a subset of the population (young but not old), or a subset of establishments (on-premises but not off-premises). The policy we evaluate in this study applies to all alcoholic beverages (beer, wine, and spirits), all consumers, all establishments (bars, restaurants, and supermarkets) and, in addition, the law prohibits the public consumption of alcoholic beverages legally purchased at other times. This distinction is important because previous work has shown that the effects of alcohol-related policies on traffic-related outcomes are varied, depending on whether the policy change involves a restriction on the place where the alcohol is to be consumed or the type of alcohol whose sale is restricted (*e.g.* Baughman *et al.*, 2001).

Third, we do not have to rely solely on back-of-the envelope calculations to quantify the negative externalities associated with excessive alcohol consumption. We exploit the richness of our hospitalization data to analyze the effect of alcohol bans on hospitalization costs which, as we describe in greater detail below, are likely to be close to the lower bound of the total costs that excessive alcohol consumption imposes on society. However, before moving to the analysis, we provide a background to Election Day alcohol bans in Brazil.

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drunk driving, (iii) increasing motorcycle helmet use, (iv) increasing seat-belt use and (v) increasing the use of child restraints (World Health Organization, 2013).

III. Institutional Background

A unique feature of Brazil's electoral system is that states are allowed to independently decide whether to impose alcohol bans on election days. Formally, there is no federal law regulating this issue but, in practice, state police departments and judges have autonomy to decide whether or not to impose alcohol bans. The electoral "dry laws", as these resolutions are often referred to, prohibit the sale and purchase of any type of alcoholic beverage in all commercial establishments, including bars, restaurants, and supermarkets. As a result, these bans are much more restrictive than similar measures adopted in other countries, such as the Sunday liquor laws in the US.

The rationale for the existence of electoral dry laws in Brazil is that they help the police to maintain public order during Election Day, by reducing the likelihood of violent confrontations between supporters of different local political factions as well as other smaller occurrences, such as decreasing the probability that individuals come to the polling stations under the influence of alcohol. Indeed, electoral violence is an important and long-unresolved issue in Brazil, especially in the poorer and less developed regions of the North and Northeast. For instance, during the municipal elections of 2012, there are reports that at least 22 politicians were murdered in the months preceding Election Day.[5]

Furthermore, according to many electoral courts, cases of violence involving campaigners of rival candidates are frequent. As a result, in the 2012 elections, more than 400 municipalities requested additional police forces from the federal government to preserve the public order during Election Day. For the purpose of our analysis, it is, therefore, important to bear in mind that electoral dry laws are primarily a police issue, and are not at all related to any public health objective in Brazil.

[5] Barbassa, J. 2012. "Brazil: 22 Murders Connected to Local Elections." Associated Press, September 3. http://bigstory.ap.org/article/brazil-22-murders-connected-local-elections.

Historically, alcohol bans were adopted uniformly across the country in elections after the re-democratization in the mid-1980s until the mid-2000s. During this period, however, there was a gradual increase in the opposition to such restrictions, led especially by associations of bar and restaurant owners. These groups questioned the constitutional validity and effectiveness of dry laws on two main grounds. First, from a legal point of view, it was argued that state authorities, such as local judges and police, are not allowed to impose constraints on civil liberties without congressional approval. Second, it was claimed that, although the bans caused a significant loss in revenue for businesses, their impact on public safety was, at best, marginal, given that the police have other more effective ways to maintain order.

In a lawsuit filed by the Brazilian Association of Bars and Restaurants (Abrasel) in the state of São Paulo, the association estimated the loss in revenue due to the adoption of a one-day ban in the city of São Paulo alone to be at around $15 million (or 35 million Reais) in 2006. This sum corresponds to approximately 30% of the total revenue of bars and restaurants on a typical Sunday. After a long and protracted judicial battle, the lawsuit was eventually settled in favor of Abrasel and, as a result, the state of São Paulo has not adopted dry laws since 2008. Indeed, between 2005 and 2010, there were a number of similar lawsuits in different parts of the country. The final rulings in these cases were varied, reflecting both differences in the individual views of judges, as well as the specific socioeconomic and political characteristics of each state. Importantly, these lawsuits had the effect of sparking a public debate on electoral dry laws, which many people viewed as arbitrary, particularly in the more urban centers. As a consequence, several states were either obliged or voluntarily decided to restrain from imposing Election Day bans, while a few others decided to transfer the authority to restrict alcohol or not to municipalities.

IV. Data

The present paper uses information on the adoption of dry laws in the mayoral elections of 2012, which we have compiled from official reports provided by regional electoral courts, as well as various media sources.[6] One part of the analysis uses data on 4,728 municipalities—which amounts to more than 85% of the country's total population—located in the 17 states that imposed statewide decisions on their municipalities over the banning of alcohol on Election Day.[7] Table 1a provides summary statistics for the municipalities in our full sample, as well as being conditional on whether or not they adopted a ban on alcohol. Note that, on average, municipalities that implemented dry laws tend to be poorer and less developed. Furthermore, they are more likely to request federal police reinforcement for Election Day, suggesting that these places tend to be more prone to electoral violence. The duration of the bans varied slightly across states, but they typically lasted from 12am to 6pm on Election Day.[8]

There are several reasons that make the 2012 elections particularly suitable for our study. First, in 2012, there was a fair amount of cross-sectional variation in the adoption of dry laws, which is crucial for our identification strategy. Second, and equally important, after a period of judicial uncertainty, the 2012 elections were the first in several years where there was sufficient clarity about which states would and would not implement alcohol bans. Indeed, in previous years, there were cases, such as in

[6] The main source of the information can be obtained here: http://www.ebc.com.br/noticias/eleicoes-2012/2012/10/quais-estados-adotaram-a-lei-seca-nas-eleicoes-2012, accessed on June 3, 2014.

[7] In 2012, elections were held on Sunday, October 7th. Overall, 11 states adopted alcohol bans (Amazonas, Ceará, Maranhão, Minas Gerais, Mato Grosso do Sul, Pará, Paraíba, Pernambuco, Piauí, Paraná and Rio Grande do Norte), while 6 states did not impose any restriction on alcohol consumption and sales (Bahia, Rio de Janeiro, Rondônia, Rio Grande do Sul, Santa Catarina and São Paulo). Additionally, there were 9 states that decentralized the decision to ban alcohol to its municipalities. We do not include these states in our analysis because we are unable to recover information on exactly which municipalities implemented bans in these states. See Appendix Tables 1a and 1b for details.

[8] The main exception was the state of Maranhão, where partial-time bans started taking place almost five days before the election.

Pernambuco and Espirito Santo in 2010, where the final decision about the ban was confirmed by the state's electoral court on the day before the elections took place. We choose not to use data from previous years given that the lack of certainty could affect the results of analyses of the previous year's data to the extent that some individuals, for the fear of being fined, could have refrained from consuming or selling alcohol even in states that ended up not imposing any restriction on these activities.[9]

In order to analyze the impact of alcohol bans on public health, we exploit a unique data set from the *Sistema de Informações Hospitalares* (SIH-SUS) of Brazil's Ministry of Health, which contains detailed information on about 80% of all hospitalizations that occur every year in Brazil. Crucial to our study, the SIH-SUS reports information on the calendar day and location of each hospitalization. This feature allows us to pin down all hospitalizations that occurred on Election Day, as well as to compare the number of admissions across municipalities. The data set also contains information on the primary and secondary causes of each hospitalization (coded according to the ICD-10 code classification), which allows us to concentrate our analysis on the more pertinent occurrences, such as "acute" alcohol-related hospitalizations, which include road traffic accidents, unintentional injuries, and intentional injuries such as assaults.[10] We also observe several other relevant variables, such as the gender and age of the patient, as well as the cost and duration of hospital stays.

Our sample is constructed by aggregating the number of hospitalizations by calendar day and municipality for the 35-day period between September, 23rd and

[9] Also, we focus our analysis on the main Election Day, and not on the runoff elections that occurred on October 28th in a small number of municipalities. In fact, only 23 municipalities banned alcohol during the runoff elections, and given that they are distantly distributed across the country, the potential for avoidance behavior was very high.

[10] Please see Appendix Table 2 for a list of the ICD-10 codes that were used for the main analysis, which was obtained from the Centers for Disease Control and Prevention.

October, 27th.[11] This results in a balanced panel with 165,480 municipality-day observations. Table 1a shows summary statistics including average hospitalization rates for municipality-days for several causes. Municipalities that adopted alcohol bans over the sample period tend to have fewer "acute" and "chronic" alcohol-related hospitalizations, but have a slightly greater number of hospitalizations due to road traffic accidents per 100,000 persons in the municipality.

In order to further investigate whether alcohol bans have an impact on the number of traffic accidents and injuries resulting from these accidents, we use a data set provided by Brazil's Federal Road Police Department, which contains information on all road traffic accidents that were reported to have occurred on federal roads during the sample period. Importantly, we observe accidents occurring in a given municipality if there is a federal road passing through it, and if the accident is reported to the authorities.[12] Thus, we are likely underestimating the total number of accidents occurring in each municipality. However, so long as reporting differences across municipalities, if any, are constant across time, our empirical model will account for this type of heterogeneity across municipalities.

A major advantage of this data set is that it contains detailed information on the day, time, and location of the accident, as well as the number of injuries involved in each crash. We have a total number of 49,945 municipality-day observations for 1,427 municipalities, 696 of which adopted a ban on alcohol over the sample period. Table 1b reports summary statistics for accidents and injuries for several degrees of severity per municipality-day. Municipalities that adopted alcohol bans over the study period, on

[11] The results are not sensitive to using narrower or wider time intervals.

[12] In Brazil, most of the more serious road traffic accidents, especially those involving victims, are reported to the federal road police, since police reports are required for insurance claims and may serve as important evidence in civil and criminal lawsuits related to the accidents.

average, have a lower number of accidents and a lower number injuries resulting from accidents per 100,000 persons over the sample period.

V. Empirical Strategy and Results

a. Main Results

As shown in Tables 1a and 1b, for many of the outcomes, we observe only a small number of accidents and hospitalizations. Given the nature of the underlying data, we estimate models for hospital admission and accident counts using a conditional fixed-effects count data model. In particular, we used the Poisson quasi-maximum likelihood estimator (Woolridge, 1999) to estimate the following model:

$$E(Y_{mt}|A_{mt}) = exp(\beta_1 A_{mt} \times I^{WKDAY} + \beta_2 A_{mt} \times I^{WKEND} + \mu_m + \tau_t),$$

where Y_{mt} is the number of hospitalizations or accidents occurring in municipality m at time t; A_{mt} is the alcohol ban dummy variable, which takes a value of one if an alcohol ban is effective for a municipality m at time t (and zero otherwise); I^{WKDAY} and I^{WKDAY} are indicator variables for a weekday and weekend day, respectively; and μ_m and τ_t are municipality and calendar day fixed effects, respectively. In our preferred specification, we also include linear time trends that are allowed to vary by state, which account for state-specific trends in the dependent variable that may, for example, affect a state's decision to impose an alcohol ban on its municipalities. When estimating the conditional fixed-effects Poisson regressions, standard errors are clustered at the municipality level to allow for arbitrary correlation of observations within municipalities over time. We present Poisson regression estimates throughout the paper, but incidence rate ratios can be obtained by exponentiating regression estimates.

In Table 2, we show the first set of our main results.[13] Our analysis indicates that, on average, bans on alcohol sales during weekend days reduce acute alcohol-

[13] Regression sample sizes are different from the sample sizes shown in the summary statistics because municipalities with all-zero outcomes are dropped from the fixed-effect Poisson regression analyses.

related hospital admissions by about 10% (Column 1). When we add state-specific linear time trends (Column 2), the estimate increases (in absolute magnitude) only slightly, revealing that weekend alcohol bans decrease acute alcohol-related hospitalizations by about the same amount, as shown in Column 1.

In contrast, we do not find any evidence indicating that bans on alcohol sales during weekdays reduce acute alcohol-related hospitalizations. This is a finding that persists throughout the analysis. (To save space, we do not show the estimates of the weekday ban dummies, but they are controlled for in regressions throughout the analysis.) Weekday bans may have a much smaller effect than weekend bans because alcohol consumption is much lower during weekdays, or, because weekday drinkers may be very different from weekend drinkers. For instance, it may be the case that weekday drinkers are more likely to systematically avoid weekday alcohol bans via anticipatory purchases before the ban is effective due to problem drinking habits (Vingilis *et. al.*, 2005).

When we analyze alcohol-related hospitalizations due to several acute causes, we find evidence indicating that the estimated reduction in all acute alcohol-related hospitalizations is mostly driven by the reduction in hospital admissions associated with road traffic accidents. In particular, we find that, on average, weekend alcohol bans reduced such hospitalizations by about 18%. Furthermore, while the estimated impact of weekend alcohol bans on hospital admissions associated with unintentional injuries is economically significant (a reduction of about 8%), the estimates are not statistically significant at conventional levels. We also find that weekend alcohol bans have a small negative effect on hospitalizations associated with assaults (a reduction of about 1%), but the coefficients in these regressions are very imprecisely estimated.

The results in Table 2 suggest that weekend alcohol bans reduced hospital admissions associated with road traffic accidents by reducing excessive alcohol consumption. To shed more light on this finding, we now turn to an analysis of the impact of alcohol bans on road traffic accidents to further investigate the relationship between alcohol bans and drunk driving. Table 3 contains our second set of main results. Similar to the results shown in Table 2, we find strong evidence indicating that bans on the sale of alcohol during weekends reduce both road crashes and the injuries resulting from them. In particular, focusing on specifications that include state-specific linear time trends (Column 2), we estimate that, on average, weekend alcohol bans reduce road crashes by about 15%, reduce light injuries by about 31%, reduce serious injuries by about 35%, and reduce fatal injuries by about 68%. When we do not differentiate between the injuries, we estimate that, on average, weekend alcohol bans reduce all traffic-related injuries by about 36%.

These results provide an extra source of validation to the results shown in Table 2. We, therefore, find strong evidence suggesting that the reductions in hospital admissions due to road traffic accidents are driven by the fact that such alcohol bans reduce excessive alcohol consumption which, in turn, decreases drunk driving, road crashes, and traffic-related injuries.

Overall, we find that the effects of dry laws on public health outcomes are both statistically and economically significant. One week before the elections, in the period between September 23rd and September 29th 2012, there were, on average, a total of 206 hospitalizations due to road crashes per day in the 2,733 municipalities that implemented Election Day alcohol bans. Our results imply that about 37 hospitalizations due to road traffic accidents were prevented as a result of the adoption of a single-day ban on alcohol sales. Over the same time period there were, on average,

a total of 77 light, 35 serious, and 12 fatal traffic-related injuries. Thus, we further estimate that around 24 light injuries, 12 serious injuries, and 8 fatalities resulting from traffic accidents on federal roads were averted as a result of a one-day ban on alcohol sales. In the cost analysis below, we provide a more detailed analysis of the magnitudes of the policy's effects on public health outcomes.

In Table 4, we subject our analysis to further scrutiny through several robustness and sensitivity checks. As shown in Table 1a, municipalities that banned alcohol during the elections were more likely than other municipalities to be given federal troops for the elections. This raises the concern that the presence of extra police in a municipality—and not a short-term restriction on the availability of alcohol—accounts for the decline in both hospitalizations and injuries resulting from road traffic accidents. As we show in Row 1, controlling for the presence of extra troops on Election Day barely changes the regression coefficients (compare Row 1 of Table 4 to Column 2 of Tables 2 and 3). Thus, the fact that there was more policing in municipalities that banned alcohol—which was likely concentrated in select areas with election polls—does not explain our results.

Because municipalities that banned alcohol differ from those that did not, in terms of income, population size, and literacy, we investigated whether our estimates are sensitive to changes in the composition of the control group. We re-run our main specification excluding from the sample all control municipalities that have above median income per capita (Row 2), below median percentage of rural population (Row 3), above median literacy rates (Row 4) and above median population size (Row 5). Observe that our results are very robust to changes in the estimation sample, so non-comparability between treatment and control groups does not seem to be an issue here.

Throughout our analysis, we distinguished between weekday and weekend bans. In Row 6, we, instead, use a single policy variable that is weighted by the fraction of hours that the alcohol ban was in effect on a particular day. The estimates indicate that a full-day ban reduces traffic-related hospitalizations by about 18% and reduces all traffic-related injuries by about 40%. The former estimate is of the same magnitude as the one shown in Table 2, and the latter estimate is only slightly larger than the one we presented in Table 3.

We have been estimating Poisson regression models throughout the analysis but, as shown in Row 7, our results are not sensitive to changing the estimation method. The estimates delivered from Ordinary Least Squares (OLS) also indicate a substantial reduction in traffic-related hospitalizations and injuries, relative to the estimation sample means.[14] The OLS estimates are, however, larger than the incidence rate ratios that we obtained from the Poisson regression. We do not place too much weight on this difference given that Poisson regression models are more appropriate for count data than are OLS models.

Lastly, we perform a placebo test. Given the short-term nature of the alcohol bans, we would expect that the impact on alcohol-related hospitalizations due to chronic causes (*e.g.* cirrhosis of the liver) is much smaller than the impact on acute causes, if not zero. Indeed, in Row 8, we find no evidence indicating that alcohol bans had an effect on chronic alcohol-related hospitalizations. This adds credibility to the estimates of the effect of alcohol bans on hospitalizations due to acute causes that we find in our main analysis.

b. Heterogeneity

Our results indicate that excessive alcohol consumption imposes substantial

[14] The estimation sample mean for the counts of traffic-related hospitalizations is 0.182 and the corresponding mean for all traffic-related injuries is 0.256.

negative externalities on society, based on strong evidence that bans on alcohol sales during weekends result in large reductions in traffic-related hospital admissions, road crashes, and traffic-related injuries. It is important to know who contributes most to alcohol-attributable negative externalities in order to help shape well-designed policies aimed at reducing them. There is evidence in the literature indicating that, in Brazil, excessive alcohol consumption is a problem of males and, in particular, young males (*e.g.* Bacchieri and Barros, 2011). In the hospitalization files, we find evidence that is suggestive of this as well. In particular, in Figures 1a and 1b, we plot the total daily count of hospital admissions associated with road traffic accidents across all of the Brazilian states in our sample, by age, for males and females. Most hospitalizations due to road traffic accidents involve individuals aged 18-44. While we find a similar pattern for both males and females, the count for the former is generally much higher across the age distribution.

In order to examine the distribution of the morbidity impact of alcohol bans, we exploit the richness of the hospitalization data by analyzing the impact of alcohol bans on traffic-related hospitalizations, by age group and sex. The results from this analysis are contained in Table 5. We find that the impact of weekend alcohol bans is concentrated among males. The estimates for females are generally smaller than the corresponding ones for males, and are always statistically insignificant. We estimate that, on average, bans on the sale of alcohol during weekends reduce traffic-related hospitalizations among males by about 21%, which is almost four times the size of the estimated impact we find for females (compare Panel A to Panel B in column 1).

In an analysis of the impact by gender and age groups (17 and under, 18-44, and 45+), we further find evidence indicating that the impact is concentrated among young males. In particular, we estimate that, on average, weekend alcohol bans reduce traffic-

related hospitalizations among males in these age groups by 40%, 19%, and 8%, respectively. However, only the first two estimates are statistically significant at conventional levels. We can never reject the null hypothesis that alcohol bans have a zero effect on the hospitalizations of females, irrespective of the age group.

In sum, the heterogeneity analysis indicates that the morbidity impact of alcohol bans is concentrated among young males. This finding is consistent with the alcohol consumption patterns in Brazil, *i.e.* that young males are the most likely to engage in excessive drinking. It is also consistent with the wealth of evidence in the literature discussed above, which is based on data from many countries, that alcohol-related policies have much larger effects on males than on females.

c. Dynamics

We also examine the dynamics involved in the policy's implementation and the resulting improvements in traffic-related outcomes. In particular, we examine whether there is evidence of anticipatory and lagged effects of alcohol bans. Given the short-term nature of the policy individuals may, for example, increase their consumption of alcohol before an alcohol ban takes effect, and immediately after the ban is lifted.

In the analysis of the hospitalization data, we focus on estimating three-day leaded and lagged effects of the bans that occurred over the weekend. Figure 2 summarizes the results of our analysis. We find that the reduction in hospital admissions associated with road traffic accidents is concentrated in the period when the ban was effective, which in all cases, include Election Day. In particular, we estimate that, on average, bans on alcohol sales contemporaneously reduce traffic-related hospitalizations by about 19%, which is very close to the estimate in our preferred specification in column 2 of Table 2. In contrast, the estimated effects of the leads are much smaller and are all statistically insignificant. A test of joint significance indicates that we cannot

reject the null hypothesis that the leads are jointly equal to zero (p-value 0.762). Interestingly, the figure also shows that there is a small *increase* in traffic-related hospital admissions on the day after the ban is lifted. However, the lagged estimated effects are all smaller in absolute value than the contemporaneous effect, are all statistically insignificant, and we fail to reject the null hypothesis that the lags are jointly equal to zero (p-value 0.530).

We conducted an analogous analysis with the road traffic accident data but, in this case, we estimate three separate four-hour-time-blocks before and after the time block of the weekend ban. Note that we focus here on a narrower time period than we did previously, namely, the day before and after Election Day. Similar to the evidence shown in Figure 2, the evidence summarized in Figure 3 indicates that the improvement in traffic outcomes caused by weekend bans is concentrated during the time of the ban. We estimate that, on average, the ban reduces traffic accidents by about 7% during the time block when it is effective. Tests of joints significance of the leads (p-value 0.968) and lags (p-value 0.204) indicate that we cannot reject the null hypothesis that the policy had zero anticipatory and lagged effects on road crashes.

In sum, the evidence in Figures 2 and 3 is consistent with the analysis shown previously, which focused on the contemporaneous effects of alcohol bans on road crashes and traffic-related hospital admissions. Bans on the sale of alcohol on Election Day were effective in reducing the negative externalities caused by excessive alcohol consumption, as measured by a lower number of road crashes and traffic-related hospitalizations. However, there is also some weak suggestive evidence of a perverse effect of the policy: traffic-related outcomes seem to worsen in municipalities that had an alcohol ban relative to other municipalities after the ban is lifted. This may be due to the fact that individuals engage in over-consumption of alcohol once it is available for

purchase. This seems to be a plausible explanation, especially considering that the bans were lifted, in most cases, on Sunday evening, around 6pm, which is a period where individuals typically go out to socialize and drink. A staggered ban-lifting process may help to alleviate this perverse effect of the policy.

d. Cost Analysis

The richness of the hospitalization files allows us to quantify the negative externality imposed on society caused by excessive alcohol consumption. In particular, we have information on the total cost of each hospitalization, which enables us to analyze the healthcare cost savings associated with the reduction in traffic-related hospitalizations caused by bans on alcohol sales. We also observe the length of hospital stays, which we use as an alternative way to assess the cost savings. Unfortunately, however, we are unable to conduct a comprehensive cost-benefit analysis of Election Day alcohol bans because it is difficult to measure the loss in revenue for all of the establishments that are affected by this policy, *e.g.* bars, restaurants, supermarkets, *etc*.

Because of the nature of the cost and length of hospital stay data and the fact that we observe relatively few hospital admissions due to road traffic accidents across the municipality-days in our sample, we used a Tobit model for this part of the analysis. The results from this analysis are contained in Table 6. We estimate that, on average, weekend bans reduce traffic-related hospitalization costs by about $50 and reduce the length of hospital stays by about one-third of a day.[19] Relative to the estimation sample means, these reductions are substantial: alcohol bans reduce the costs associated with traffic-related hospital admissions by about 40%, and the corresponding reduction for hospital stays is about 26%. To get a better sense of the cost savings for the healthcare system in Brazil, recall that 2,733 municipalities banned alcohol sales on Election Day.

[19] These estimates are based calculating the marginal effects on the expected value of the truncated outcome.

Thus, a one-day ban on alcohol sales saved municipalities approximately $150,000 in terms of healthcare expenditures.

While the magnitude of this estimate may be viewed as small in magnitude, it should be emphasized that the present analysis only takes into account the cost savings associated with hospitalization expenditure. In fact, the economic costs of traffic accidents also include losses in productivity due to temporary or permanent incapacitation, monetary damages to vehicles and other properties, costs of ambulatory care and post-hospitalization medical treatments, *etc*. Indeed, according to the Institute of Applied Economic Research (IPEA)—an important government think-tank in Brazil—hospitalization costs account for between 13% and 32% of the economic costs of road traffic accidents (IPEA 2003, 2006). Using our estimate of $150,000 as a benchmark, this implies that the total cost savings may be on the order of $460,000-$1,150,000 for a single day.

An alternative way to assess the magnitude of the policy's effect on public health is to value the lives saved as a result of the alcohol ban. Above, we indicated that our estimates imply that a one-day alcohol ban prevented a total of 8 fatalities resulting from traffic accidents on federal roads. A recent study using data from São Paulo estimated that the Value of a Statistical Life-Year (VSLY) ranges between $61,392 and $159,456 (Ortiz *et al.*, 2009). Thus, using this VSLY range, the 8 fatalities prevented by the Election Day alcohol ban may be valued at between $491,136 and $1,275,648 for each additional year lived.

The electoral dry laws may also generate other potential social benefits, such as a reduction in crime (Carpenter 2005; Biderman *et al.* 2010; Heaton 2012; Grönqvist and Niknami 2014) and suicide rates (Birckmayer and Hemenway 1999; Ramstedt 2001). It is important to note, however, that alcohol bans reduce consumer surplus by

preventing individuals from drinking in public places, although drinking privately was still allowed. The policy also caused a decrease in alcohol-related revenue of commercial establishments and a reduction in the amount of alcohol-related taxes raised by the federal government. However, these losses in revenue do not necessarily represent a decrease in economic welfare, since money not spent on alcohol may be directed towards other products sold by the establishments affected by the law.

Our analysis shows that the negative externalities associated with alcohol consumption are substantial, implying that government policies that restrict the availability of alcoholic beverages may be justified in some situations. While the present study does not allow us to conclude that this type of policy would lead to similar cost savings if it was implemented for longer periods of time, it is likely that short-term alcohol bans could be successfully adopted during certain special events and holidays, when large numbers of people are expected to be driving from one place to another and traffic congestion is expected to be problematic. Alcohol bans may also be useful to reduce risk of violent outbreaks associated with sporting events. For example, several jurisdictions in Colombia banned the sale of alcohol in response to reports of injuries and killings resulting from World-Cup-related victory celebrations.[20]

From a policy perspective, it is useful to apply our estimates to an important historic event during which the sale of alcohol was expected to be—but was ultimately not—banned in Brazil. To reduce the risk of violence during football games, the Brazilian government has prohibited the sale of alcohol in football stadiums since 2003 and it, initially, decided that the sale of alcohol would be banned in stadiums during the

[20] Medina, O and Jenkins, C. 2014. "World Cup Spurs Booze Ban Across Colombia as Deaths Rise." Bloomberg, June 25. http://www.bloomberg.com/news/2014-06-24/world-cup-spurs-booze-ban-across-colombia-as-deaths-rise.html.

2014 World Cup games.[21] A fiery debate between Brazilian authorities and the Fédération Internationale de Football Association (FIFA) ensued. In the end, the alcohol ban was lifted, in large part because Budweiser's producer, Anheuser-Busch InBev, is one of FIFA's main sponsors and beer is deemed to be an important part of fan culture and World Cup tradition. If the ban on alcohol sales had been in place on each of the 25 days of the World Cup games in every municipality in Brazil, our estimates suggest that the cost savings for the Brazilian healthcare system could have amounted to $7 million ($50*5,570*25), or $280,000 per World Cup game day.

VI. Conclusion

In this paper, we analyzed the impacts on public health of a short-term ban on alcohol sales in a large number of municipalities in Brazil during the 2012 Municipal Elections. Our analysis indicates that Election Day bans substantially reduced road crashes, traffic-related injuries, and traffic-related hospital admissions. The evidence in this study indicates that Election Day alcohol bans which, in most cases, lasted for only a fraction of a day led to economically important unintended cost savings for Brazil's healthcare system, as measured by the reduction in costs associated with traffic-related hospitalizations.

We estimate that, on average, a one-day ban on alcohol caused costs associated with traffic-related hospital admissions to fall by about $50 (or a decrease of about 40% relative to the sample mean), which amounts to $150,000 when the cost is summed over all the municipalities that banned alcohol sales during the elections. Our results indicate that banning alcohol may serve as an important policy tool to reduce the negative externality imposed on a nation's healthcare system. Given the potential for compensatory health-reducing behavior to be a perverse product of many policies, this

[21] CNN. 2012. "World Cup beer battle brewing between Brazil and FIFA." CNN International, January 20. http://edition.cnn.com/2012/01/19/sport/football/football-brazil-alcohol-fifa/index.html.

intervention may be best utilized on days of the year when many individuals are likely to consume alcohol and drive nontrivial distances because they are not at work, such as in the case of special events, holidays, and elections.

While we in no way recommend a prohibition on alcohol, we do believe that our results have important implications for policymakers in areas where excessive alcohol consumption and risky driving behavior are especially problematic. This is certainly applicable to the case of Brazil, where traffic fatalities rank among the top causes of death, particularly among young men. Excessive alcohol consumption also raises the potential for aggression and violence. Bans on the sale and purchase of alcohol were recently implemented by Colombia during its Congressional Elections and World Cup games in order to decrease public drunkenness and violent behavior. Similar policies might be useful in reducing the social cost associated with hosting large sporting events, such as in the case of Rio de Janeiro for the 2016 Summer Olympics.

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Table 1a: Sample Summary Statistics for Baseline Socioeconomic Information and Hospital Admissions

	All Municipalities		Alcohol Ban Implemented Over Sample Period			
			Yes		*No*	
	N = 4,728		N = 2,733		N = 1,995	
Municipality-Level Information	*Mean*	*S.D.*	*Mean*	*S.D.*	*Mean*	*S.D.*
Total Population (2010)	34,278	203,113	28,325	105,056	44,999	306,902
Percent Rural Population (2010)	36.174	22.041	38.595	20.365	33.673	24.703
Percent Male Population (2010)	50.496	1.569	50.374	1.312	50.381	1.801
Literacy Rate (Aged 15 and Over) (2000)	78.230	12.460	73.686	12.264	85.155	9.940
Income per Capita (2000)	170.814	96.425	135.364	75.502	224.569	103.317
1 if Federal Troops Given for the 2012 Municipal Elections	0.071		0.126		0.004	
Sistema de Informações Hospitalares Hospitalization Files						
"Acute" Alcohol-Related Hospitalizations[a]	1.018	4.017	0.903	3.564	1.175	4.561
Hospitalizations due to Road Traffic Accidents[a]	0.242	1.872	0.264	1.949	0.212	1.762
Hospitalizations due to Unintentional Injuries[a]	0.727	3.460	0.603	2.895	0.897	4.104
Hospitalizations due to Assaults[a]	0.042	0.761	0.027	0.607	0.063	0.931
"Chronic" Alcohol-Related Hospitalizations[a]	0.477	2.971	0.396	2.595	0.588	3.416
Total Hospitalizations[a]	17.415	18.831	16.407	17.677	18.797	20.225
Sample Size	165,480		95,655		69,825	

Note: Our sample constists of hospitalizations that occurred in the 17 states that imposed on its municipalities a state-level decision to ban alcohol on election day. We exclude information from the 9 states that decentralized the decision to ban alcohol on election day to its municipalities. The unit of observation is a municipality-calendar day. [a] These are hospitalization rates per 100,000 persons in the municipality.

Table 1b: Sample Summary Statistics for Road Traffic Accidents

	All Municipalities		Alcohol Ban Implemented Over Sample Period			
			Yes		*No*	
	N = 1,427		N = 696		N = 731	
Federal Road Police Department Files						
Accidents[a]	1.209	5.206	1.076	4.047	1.336	6.105
Light Injuries Resulting from Accident[a]	0.560	4.582	0.486	3.768	0.630	5.239
Serious Injuries Resulting from Accident[a]	0.233	2.845	0.216	1.969	0.248	3.479
Fatal Injuries Resulting from Accident[a]	0.085	1.410	0.074	1.257	0.095	1.541
All Injuries Resulting from Accident[a]	0.877	6.460	0.776	5.030	0.973	7.572
Sample Size	49,945		24,360		25,585	

Note: Our sample constists of accidents that occurred on Federal Roads in the municipalities of the 17 states that imposed on its municipalities a state-level decision to ban alcohol on election day. We exclude information from the 9 states that decentralized the decision to ban alcohol on election day to its municipalities. The unit of observation is a munipality-calendar day. However, note that we observe an accident only if it is reported by the authorities. [a] These are rates per 100,000 persons in the municipality.

Table 2: The Effect of Alcohol Bans on Acute Alcohol-Related Hospital Admissions

	(1)	(2)
Dep Var	All Acute Alcohol-Related	
	N = 138,565	
1 if Munic Implemented Weekday Ban on Alcohol	0.095	0.087
	(0.076)	(0.077)
1 if Munic Implemented Weekend Ban on Alcohol	-0.100*	-0.102*
	(0.055)	(0.056)
Dep Var	Road Traffic Accidents	
	N = 79,870	
1 if Munic Implemented Weekday Ban on Alcohol	0.142	0.108
	(0.135)	(0.134)
1 if Munic Implemented Weekend Ban on Alcohol	-0.193**	-0.202**
	(0.083)	(0.083)
Dep Var	Unintentional Injuries	
	N = 122,115	
1 if Munic Implemented Weekday Ban on Alcohol	-0.053	-0.049
	(0.106)	(0.104)
1 if Munic Implemented Weekend Ban on Alcohol	-0.088	-0.088
	(0.072)	(0.073)
Dep Var	Assaults	
	N = 25,830	
1 if Munic Implemented Weekday Ban on Alcohol	0.130	0.028
	(0.737)	(0.755)
1 if Munic Implemented Weekend Ban on Alcohol	-0.019	-0.014
	(0.260)	(0.257)
Municipality and Calendar Day Fixed Effects	x	x
State Dummies × Linear Time Trend		x

Note: Standard errors are clustered at the municipality level, and are in parentheses below poisson regression coefficients. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Table 3: The Effect of Alcohol Bans on Road Crashes and Traffic-Related Injuries

	(1)	(2)
Dep Var	Road Traffic Accidents	
	N = 49,910	
1 if Munic Implemented Weekend Ban on Alcohol	-0.175*	-0.168*
	(0.100)	(0.099)
Dep Var	Light Injuries	
	N = 37,695	
1 if Munic Implemented Weekend Ban on Alcohol	-0.381**	-0.376**
	(0.165)	(0.165)
Dep Var	Serious Injuries	
	N = 28,385	
1 if Munic Implemented Weekend Ban on Alcohol	-0.428*	-0.432*
	(0.249)	(0.251)
Dep Var	Fatal Injuries	
	N = 16,975	
1 if Munic Implemented Weekend Ban on Alcohol	-1.091**	-1.143***
	(0.435)	(0.438)
Dep Var	All Injuries	
	N = 43,155	
1 if Munic Implemented Weekend Ban on Alcohol	-0.438***	-0.439***
	(0.142)	(0.142)
Municipality and Calendar Day Fixed Effects	x	x
State Dummies × Linear Time Trend		x

Note: Standard errors are clustered at the municipality level, and are in parentheses below poisson regression coefficients. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Table 4: Robustness Checks

	(1)	(2)
(1) Addressing the Issue of Extra Policing	Hospitalizations due to Road Traffic Accidents	All Injuries Resulting from Road Traffic Accidents
	N = 79,870	N = 43,155
1 if Munic Had Extra Federal Troops Present	0.110	0.229
	(0.208)	(0.273)
1 if Munic Implemented Weekend Ban on Alcohol	-0.206**	-0.443***
	(0.083)	(0.142)
(2) Drop High Income Control Municipalities	Hospitalizations due to Road Traffic Accidents	All Injuries Resulting from Road Traffic Accidents
	N = 68,110	N = 37,100
1 if Munic Implemented Weekend Ban on Alcohol	-0.258***	-0.393**
	(0.097)	(0.166)
(3) Drop Low Rural Pop Control Municipalities	Hospitalizations due to Road Traffic Accidents	All Injuries Resulting from Road Traffic Accidents
	N = 72,625	N = 39,760
1 if Munic Implemented Weekend Ban on Alcohol	-0.191**	-0.439***
	(0.097)	(0.157)
(4) Drop High Literacy Control Municipalities	Hospitalizations due to Road Traffic Accidents	All Injuries Resulting from Road Traffic Accidents
	N = 69,650	N = 37,170
1 if Munic Implemented Weekend Ban on Alcohol	-0.219**	-0.352**
	(0.102)	(0.163)
(5) Drop High Pop Control Municipalities	Hospitalizations due to Road Traffic Accidents	All Injuries Resulting from Road Traffic Accidents
	N = 56,315	N = 26,775
1 if Munic Implemented Weekend Ban on Alcohol	-0.240*	-0.377
	(0.132)	(0.262)
(6) Alternative Coding of Policy Variable	Hospitalizations due to Road Traffic Accidents	All Injuries Resulting from Road Traffic Accidents
	N = 79,870	N = 43,155
Munic Implemented Ban on Alcohol	-0.197*	-0.513**
(*Weighted by Hours the Ban was in Effect*)	(0.106)	(0.241)

Table 4 (Continued): Robustness Checks

	(1)	(2)
(7) Ordinary Least Squares	Hospitalizations due to Road Traffic Accidents	All Injuries Resulting from Road Traffic Accidents
	N = 79,870	N = 43,155
1 if Munic Implemented Weekend Ban on Alcohol	-0.062***	-0.135***
	(0.023)	(0.041)
(8) Placebo Regression	All Chronic Alcohol-Related Hospitalizations	
	N = 106,085	
1 if Munic Implemented Weekend Ban on Alcohol	-0.059	
	(0.097)	
Municipality and Calendar Day Fixed Effects	x	x
State Dummies × Linear Time Trend	x	x

Note: Standard errors are clustered at the municipality level unless otherwise specified, and are below poisson regression coefficients. *,**, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Table 5: The Heterogenous Effects of Alcohol Bans on Hospitalizations due to Road Traffic Accidents by Age Group and Sex

	(1)	(2)	(3)	(4)
Dep Var	Hospitalizations due to Road Traffic Accidents			
Panel A: Males	All N = 72,520	Aged 17 and Under N = 23,135	Aged 18-44 N = 59,395	Aged 45+ N = 29,155
1 if Munic Implemented Weekend Ban on Alcohol	-0.235*** (0.090)	-0.511** (0.248)	-0.209* (0.119)	-0.086 (0.188)
Panel B: Females	All N = 34,650	Aged 17 and Under N = 11,830	Aged 18-44 N = 22,330	Aged 45+ N = 15,120
1 if Munic Implemented Weekend Ban on Alcohol	-0.067 (0.196)	-0.165 (0.376)	0.071 (0.243)	-0.143 (0.345)
Municipality and Calendar Day Fixed Effects	x	x	x	x
State Dummies × Linear Time Trend	x	x	x	x

Note: Standard errors are clustered at the municipality level, and are in parentheses below poisson coefficients. *, **, and *** denote statistical significance at the 10%, 5% level, and 1% level, respectively.

Table 6: The Effect of Alcohol Bans on Hospitalization Costs and Length of Hospital Stay due to Road Traffic Accidents

Dep Var	Hospitalization Costs *Sample Mean* = 123.974 N = 79,870
1 if Munic Implemented Weekend Ban on Alcohol	-49.479** (21.614)
Dep Var	Length of Hospital Stay *Sample Mean* = 1.164 N = 79,870
1 if Munic Implemented Weekend Ban on Alcohol	-0.305* (0.180)
Municipality and Calendar Day Fixed Effects	x
State Dummies × Calendar Day	x

Note: The Tobit model estimates shown are estimated marginal effects on the expected value of the truncated outcome. Standard errors are clustered at the municipality level, and are in parentheses below the estimated marginal effects. *, **, and *** denote statistical significance at the 10%, 5%, and 1% level, respectively.

Figure 1a: Daily Count of Hospitalizations due to Road Traffic Accidents (Males)

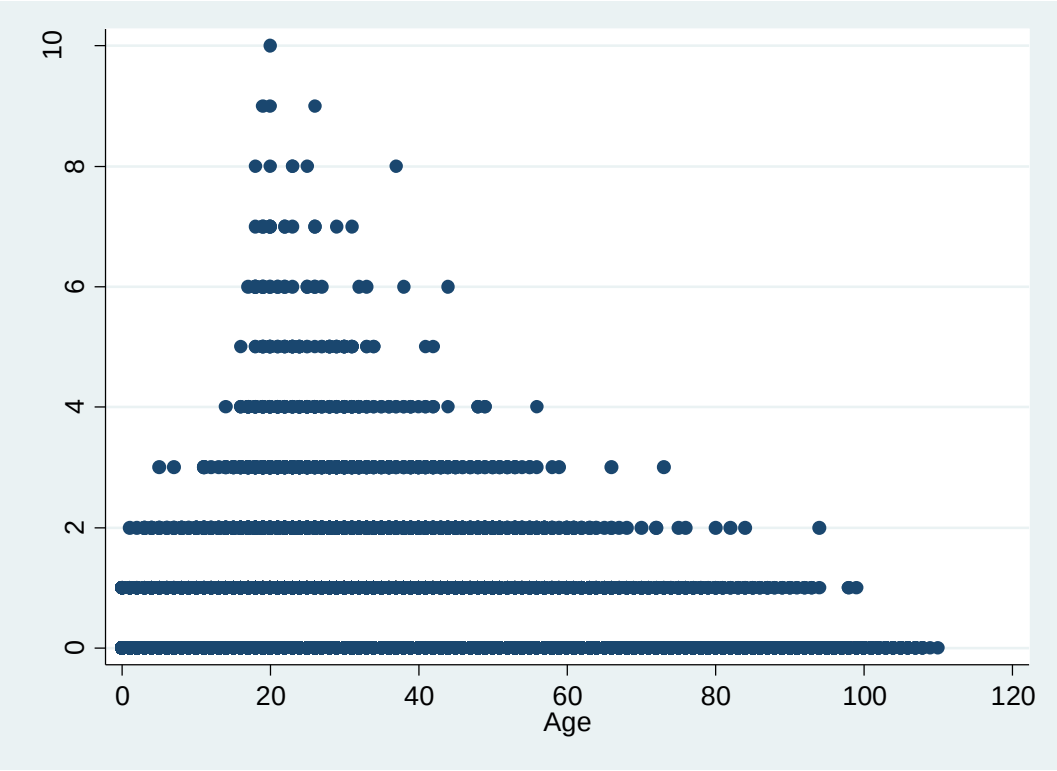
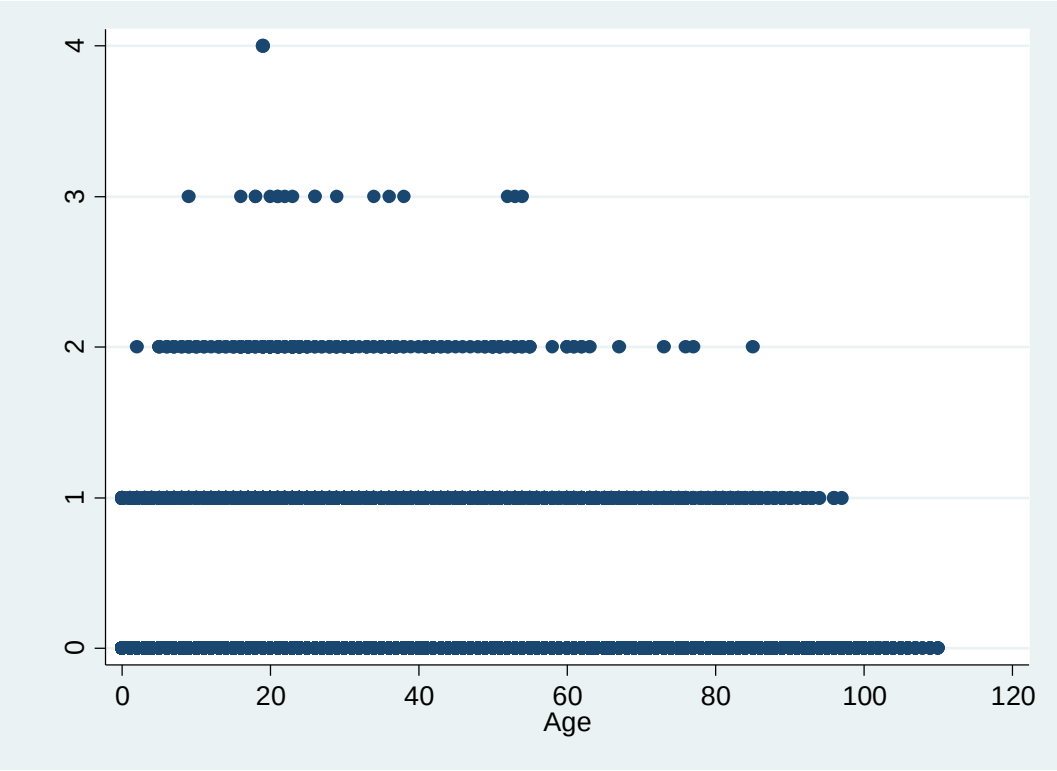
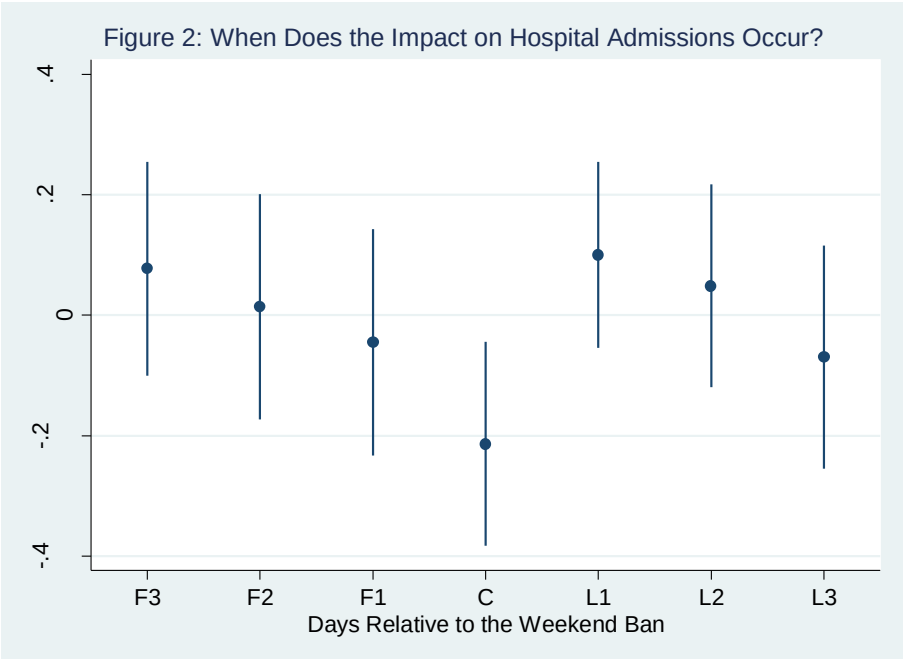
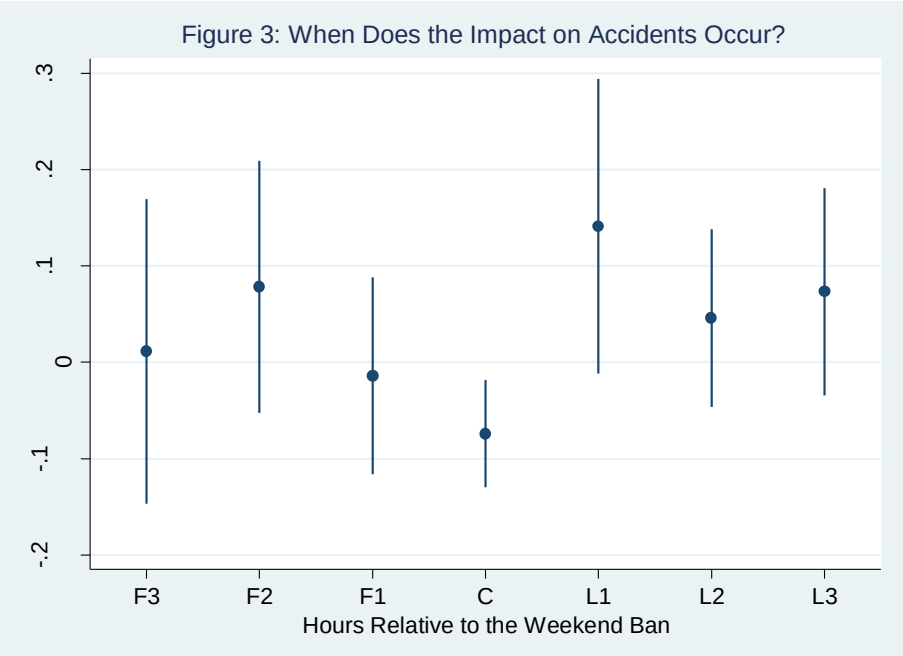


Figure 1b: Daily Count of Hospitalizations due to Road Traffic Accidents (Females)





Note: The dependent variable is the number of hospitalizations due to road traffic accidents. The analysis here uses the full sample of data, as we did in Table 2; the specification is also the same as in Table 2. "C" corresponds to the day of the weekend ban, and "F*i*" and "L*i*" correspond to the ith day before and after the ban, respectively. The dot is the Poisson regression coefficient estimate and the lines correspond to the 95% confidence band.



Note: The dependent variable is the number of road traffic accidents. The analysis here uses data from October 6th to October 8th; the specification is the same as in Table 3, except that here we include calendar day-hour dummies instead of calendar day dummies. "C" corresponds to the full time block of the weekend ban, and "F*i*" and "L*i*" correspond to the ith 4-hour time block before and after the ban, respectively. The dot is the Poisson regression coefficient estimate and the lines correspond to the 95% confidence band.

Appendix Table 1a: List of States by Alcohol Ban Status during the 2012 Municipal Elections

	States
Adopted Alcohol Bans	Amazonas (AM), Ceará (CE), Maranhão (MA), Minas Gerais (MG), Mato Grosso do Sul (MS), Pará (PA), Paraíba (PB), Pernambuco (PE), Piauí (PI), Paraná (PR) and Rio Grande do Norte (RN).
Did Not Adopt Alcohol Bans	Bahia (BA), Rio de Janeiro (RJ), Rondônia (RO), Rio Grande do Sul (RS), Santa Catarina (SC) and São Paulo (SP).
Decentralized the Decision to Municipalities	Acre (AC), Alagoas (AL), Amapa (AP), Espirito Santo (ES), Goias (GO), Mato Grosso (MT), Roraima (RO), Sergipe (SE) and Tocantins (TO).

Appendix 1b: The Timing of Alchol bans across Brazilian States during the 2012 Municipal Elections

State	Alcohol Ban Dummy (Fraction of Day the Ban was in Effect)						
	Oct 2 Tuesday	Oct 3 Wednesday	Oct 4 Thursday	Oct 5 Friday	Oct 6 Saturday	Oct 7 Sunday	Oct 8 Monday
						Election Day	
Amazonas	0	0	0	0	1 (8.3%)	1 (75%)	0
Bahia	0	0	0	0	0	0	0
Ceará	0	0	0	0	0	1 (75%)	0
Maranhão	1 (8.3%)	1 (33.3%)	1 (33.3%)	1 (33.3%)	1 (100%)	1 (100%)	1 (100%)
Minas Gerais	0	0	0	0	0	1 (50%)	0
Mato Grosso do Sul	0	0	0	0	0	1 (75%)	0
Pará	0	0	0	0	0	1 (75%)	0
Paraíba	0	0	0	0	0	1 (75%)	0
Pernambuco	0	0	0	0	0	1 (50%)	0
Piauí	0	0	0	0	1 (8.3%)	1 (75%)	0
Paraná	0	0	0	0	0	1 (50%)	0
Rio de Janeiro	0	0	0	0	0	0	0
Rio Grande do Norte	0	0	0	0	0	1 (50%)	0
Rondônia	0	0	0	0	0	0	0
Rio Grande do Sul	0	0	0	0	0	0	0
Santa Catarina	0	0	0	0	0	0	0
São Paulo	0	0	0	0	0	0	0