Economics Working Paper Series

Faculty of Business, Economics and Law, AUT

The Devil is in the Details: Identifying the Unbiased Link between Access to Alcohol and Criminal Behavior

Kabir Dasgupta, Christopher Erwin, and Alexander Plum

2020/12

The Devil is in the Details: Identifying the Unbiased Link between Access to Alcohol and Criminal Behavior

Kabir Dasgupta[✓✓], Christopher Erwin[✓✓], and Alexander Plum[✓✓]

September 2020

The minimum alcohol purchasing age in New Zealand was lowered from 20 to 18 in December 1999. Focusing on two distinct legislative regimes, we utilize a national-level census of criminal convictions to examine the impact of unrestricted alcohol purchasing rights on alcohol-related crime. Our study reveals that overall trends in alcohol-related crimes are obscured by offences that can only be prosecuted up to a certain age. After removing confounding influences from additional regulations that hold relevance under one legislative regime but not the other, we do not find a statistically meaningful increase in overall measures of alcohol-related crimes at the minimum legal alcohol purchasing age. Our analysis suggests that compared to more commonly analyzed minimum legal drinking age legislation, governmental regulations that allow limited exposure to moderated drinking experiences prior to permitting alcohol purchasing rights might be more effective in mitigating alcohol-induced risky behaviors.

Keywords: minimum legal purchasing age; alcohol-related crime; court charges; youth behavior; regression discontinuity

JEL Classifications: C21; I12; I18; K14; K42

Compliance with Ethical Standards:
We hereby declare that this project did not receive specific grant from funding agencies in the public, commercial, or not-for-profit sectors. We also declare that this study does not involve any financial or personal conflict of interest.

[✓✓] Faculty of Business, Economics & Law, Auckland University of Technology, New Zealand.
Correspondence to: New Zealand Work Research Institute, Auckland University of Technology, Private Bag 92006, Auckland 1142. Email: kabir.dasgupta@aut.ac.nz.

Acknowledgement: We are thankful to the participants of New Zealand Association of Economists Conference 2019, Wellington, Association of Public Policy Analysis & Management International Conference 2020, and New Zealand Work Research Institute Seminar 2020 for providing useful comments and feedback on the analysis. We also thank Andre Diegmann for providing helpful suggestions. We are solely responsible for all errors committed in this study.

1. INTRODUCTION

This study investigates the effect of gaining alcohol purchasing rights on alcohol-induced criminal behavior in New Zealand (NZ). Excessive consumption of alcohol, which is often regarded as the "drug of choice among youth" (Adger & Saha, 2013), bears detrimental health and behavioral implications in both the short- and long-term. Heavy drinking at an early age results in neurologic brain impairment and prompts risk-taking behavior among adolescents, eventually leading to an increased likelihood of poor cognitive outcomes, delinquencies, and adverse health consequences (Hanson et al., 2011; Bouchery et al., 2011; White & Hingson, 2013; Ewing et al., 2014). The substantial social costs imposed by alcohol abuse during late adolescence have prompted policymakers to regulate the availability of alcohol to youth.

One of the first lines of defense in preventing alcohol abuse at an early age are state-administered age restrictions on access to alcohol (Kypri et al., 2006; Miron & Tetelbaum, 2009; Carpenter & Dobkin, 2011). Most economies regulate youth access to alcohol by enforcing a minimum age for alcohol consumption, also commonly known as the minimum legal drinking age (MLDA). Generally, MLDA represents the age at which a person gains legal rights to consume as well as purchase alcohol (examples include the US, Canada, and Australia). Implementation of MLDA regulations presents an intuitive opportunity for empirical researchers to investigate whether state-based interventions are effective in mitigating the social costs associated with excessive drinking among youth.

Internationally, adoption of drinking age regulations has triggered an extensive body of empirical literature that seeks to explore causal mechanisms by leveraging the discontinuous change in the access to alcohol at mandated age thresholds. Apart from youth drinking behavior, most studies focus on health outcomes, such as traffic accidents, alcohol-related injuries and fatalities, criminal behavior, and other substance abuse (e.g. see Carpenter &

Dobkin 2009; 2011; 2015; Yoruk & Yoruk, 2011; Deza 2015). Existing literature indicates that gaining unhindered access to alcohol via MLDA regulations leads to a discrete rise in alcohol consumption, in addition to significant rise in alcohol-related hospitalizations and fatalities; vehicular crashes and traffic violations; violence; drunkenness; and public nuisance and property crimes (Carpenter Dobkin 2009; 2015; Callaghan et al., 2013; 2014; 2016). However, the related literature appears to be disproportionately represented by findings from North America—especially the US. Importantly, empirical evidence obtained from US-based studies may not be generalizable to other regions. For example, recent studies from Australia (Lindo et al., 2016; Stillman & Boes, 2017) and Europe (Kamalow & Siedler 2019) indicate that despite observing a consistent jump in alcohol consumption at the relevant legal age thresholds, unrestricted access to alcohol may not always result in increased adverse social consequences such as traffic-related crashes or injuries. These findings are suggestive of regional heterogeneity in youth's behavioral responses to gaining legal access to alcohol. In particular, the observed differences in alcohol-induced behavioral spillovers across regions may be driven by disparities in the degree of public compliance with legislative guidelines, administrative commitment of law enforcement agencies, and public attitude towards risk. By focusing on how young adults in NZ respond to gaining legal access to purchase alcohol, our study augments the relevant international literature by highlighting the importance of regional heterogeneity in studies of the social implications of age-based alcohol regulations.

Apart from having traditionally low baseline crime rates (Grinshteyn & Hemenway, 2016), NZ's unique age-specific alcohol regulation offers a novel opportunity for analyzing how gaining greater access to alcohol affects youth criminal behavior. As mentioned before, most existing studies in the related literature analyze a legal framework where an individual is not permitted to either drink or purchase alcohol before reaching the minimum legal age threshold or the MLDA. However, the analogous legislation in NZ controls youth access to alcohol

through purchasing rights only. In other words, rather than an MLDA, NZ has a nationally mandated minimum legal purchasing age (MLPA) for alcohol. In NZ, it is not illegal for adolescents younger than the MLPA to consume alcohol in an adequately monitored environment (e.g., under parental or legal guardian supervision). This is in stark contrast to the U.S. and Canada, where MLDAs and MLPAs are one in the same.

There is little evidence on how MLPA regulations affect youth's risk-taking behavior. Our apriori assumption is that gaining alcohol purchasing rights at the MLPA may have a different behavioral impact on youth relative to the effects of legal rights granted in MLDA regulations. This assumption is supported by an absence of noticeable changes in alcohol-induced motor vehicle accidents observed in jurisdictions that allow controlled exposure to experiences of alcohol consumption prior to reaching the minimum alcohol purchasing age (e.g. see Stillman & Boes, 2017 for NZ-specific evidence and Kamalow & Siedler, 2019 for German[1] evidence). These results indicate that prior drinking experiences in an appropriately supervised and safe environment may encourage responsible drinking once the MLPA is surpassed, thereby reducing the future likelihood of alcohol-induced risky behaviors. Overall, we expect both MLPAs and MLDAs to increase aggregate youth alcohol consumption at the relevant age threshold, but hypothesize that behavioral responses vary according to the nature of legislation being evaluated. As such, by focusing on alcohol-induced criminal behavior in NZ, our study aims to provide meaningful insights into the above hypothesis. Given that existing evidence from the US and Canada reveals a significant increase in crime at the relevant MLDA

[1] In Germany, although adolescents aged between 14 and 16 are restricted from buying or consuming alcohol, they can drink certain non-distilled beverages (like wine and beer) when accompanied by a parent or legal guardian. Furthermore, between ages 16 and 18, individuals are allowed to buy and consumer non-distilled fermented beverages without supervision, while adults (aged 18 and above) can buy and publicly consume any type of alcoholic beverages (see Kamalow & Siedler, 2019).

thresholds (Carpenter & Dobkin, 2015; Callaghan et al., 2016; Chalfin et al., 2019), NZ's alternative legislative approach provides a unique case study for comparison.

Our study leverages sharp regression discontinuity to estimate the impact of the MLPA on the criminal behavior of young adults in NZ. Using optimally selected data-driven age bandwidths, we compare crime rates for individuals just below the MLPA to individuals just above. Additionally, NZ lowered their MLPA from 20 to 18 by enacting the Sale of Liquor Amendment Act in 1999, which affords us the opportunity to separately evaluate youth's behavioral responses under two different age restrictions. Although our latest sample (spanning from January 2014 to December 2018) allows us to estimate treatment effects when MLPA is 18, findings are likely confounded by several other legal rights individuals are afforded upon becoming an adult (the "adulthood effect"). To remove potential confounders, we run the analysis for the 20-year MLPA threshold (using a sample spanning from January 1994 to December 1998), a regime for which there are no other concurrent legal changes which would jeopardize the identification strategy.

A major advantage of using NZ data is its thoroughness and ability to link to other administrative data sets. For example, the analysis herein employs a detailed census of all criminal convictions registered in NZ courts during both regimes. We utilize NZ's Integrated Data Infrastructure, an administrative database of microdata that houses a wide range of administrative data sets linked by unique confidentialized individual-level identifiers. The data on court charges include offense dates, offense types, court actions, and unique identifiers allowing researchers to link convicted criminals to demographic and socio-economic characteristics. These data allow us to take a granular approach that avoids reporting bias well-known in U.S. FBI statistics (e.g., see Barnett-Ryan & Nolan, 2005). To the best of our

knowledge, this is the first study to utilize national-level administrative crime records to investigate the effect of youth access to alcohol on alcohol-related crimes.

Another important empirical advantage of our data comes from the comprehensively defined alcohol-induced criminal offenses, which allows us to construct comparable measures of youth crime to support causal analysis. In other words, we demonstrate that broad definitions of alcohol-related crimes may often ignore the effect that unaccounted confounding influences may have on the outcome of interest. For instance, some alcohol-induced offenses in NZ are dependent on additional traffic regulations on permitted blood and breath alcohol concentration limits. Since these traffic regulations vary across different age groups, to ensure comparability of measures of alcohol-related crime across ages, we make sure that our outcomes of interest include only offenses for which an individual can be legally convicted regardless of their age being above or below the MLPA threshold. As will be illustrated later, the detailed offense classification system used to define our outcome variables allows us to minimize confounding influences arising from possible heterogeneities that may be ignored due to the absence sufficient information in the data.

Overall, we do not find any evidence that MLPA has a statistically discernible effect on the rate of alcohol-related crimes in NZ. However, when NZ lowered their MLPA to 18, we find a statistically significant increase in convictions resulting from traffic violations that are only applicable to individuals aged under 20. We also find that gaining legal access to alcohol results in a significant rise in offences against public order, such as disorderly conduct, trespassing, criminal intent, and violations of liquor ban laws. The causal interpretation of findings is supported by multiple robustness checks and sensitivity tests.

The remainder of the study is structured as followed: Section 2 discusses the paper's relationship to existing research on the behavioral responses to gaining legal access to alcohol;

Section 3 presents the institutional framework in New Zealand; Section 4 discusses the administrative data employed in the analysis; Section 5 details the regression discontinuity identification strategy; Section 6 presents results; and Section 7 concludes with policy implications.

2. SOCIAL IMPLICATIONS OF LEGAL ACCESS TO ALCOHOL

Excessive drinking imposes large social and public health costs (Cook & Moore, 2002; Hanson & Li, 2003; Bouchery et al., 2011; Sacks et al., 2015). For instance, in the US, alcohol abuse has been identified as "the leading risk factor for injury" (Gentilello et al. 1999). Furthermore, heavy drinking is a primary driver for injury-related deaths among individuals below 21, mainly caused by motor vehicle crashes, violence, and unintended as well as self-inflicted injuries. In general, the numerous health and behavioral consequences of excessive alcohol consumption, especially among youth, often bear long-term socio-economic ramifications, including persistent decline in physical and mental wellbeing, increase in crime and delinquency, and loss in labor market productivity (see for example Mullahy & Sindelar, 1991; MacDonald & Shields, 2004; Chatterji et al. 2004; French & Maclean, 2006; Carpenter & Dobkin 2009).

As preventive strategies to reduce alcohol abuse and associated social implications, policymakers around the world have adopted various regulatory measures (World Health Organization, 2004; Brand et al. 2007). The most common forms of alcohol control policies are implemented via taxation (Grossman et al.,1993; Cook & Moore, 2002); advertising (Young, 1993; Saffer & Dave, 2006); state monopolies (Nelson, 1990); and regulations on the rights to consume, purchase, and sell alcohol, which generally include location-, time-, and

age-specific mandates (Godfrey & Maynard, 1995).[2] For instance, location-specific state interventions control public access to alcohol by designating areas for liquor stores, pubs, and other permitted spaces for alcohol consumption (Gruenewald et al., 1996; Jones-Webb et al., 1997). Time-specific alcohol regulations usually relate to sale of alcohol during specific hours of the day or days of the week (Popova et al., 2009; Heaton 2012). And age-specific rights on legal access to alcohol typically involve regulations on minimum legal age of drinking or purchasing alcohol (Carpenter & Dobkin, 2015). Our study belongs to the specific strand of literature that focuses on social consequences of governmental regulations on minimum legal age thresholds for consuming and/ or buying alcohol. Closely related outcomes commonly studied in the existing research space can be broadly categorized as measures of substance use; health and risky behavior; and crime and delinquency.[3]

Substance use measures examined in the previous literature include indicators of alcohol consumption as well smoking behavior and use of illicit drugs such as marijuana and cocaine (Carpenter & Dobkin, 2009; Crost & Guerrero, 2012; Yoruk & Yoruk 2011; 2013; Deza, 2015; Carpenter et al., 2016). Analyzing the effect of drinking (or purchasing) age regulations on alcohol consumption provides the underlying mechanism (or the "first-stage" evidence) that motivates the relevance of analyzing the effects of youth access to alcohol on related social outcomes such as health, risky behavior, and delinquency. On the other hand, the primary objective of studies that focus on non-alcoholic substance use such as smoking or marijuana consumption is to test the complementarity (or substitutability) between alcohol and other substances (see Yoruk & Yoruk 2011; 2013; Deza, 2015).

[2] Some other examples of social interventions that are targeted at reducing the negative externalities of excessive alcohol consumption include drunk-driving regulations (as already discussed in the previous section), school-based education, and health promotion programs (WHO, 2004).

[3] Again, the majority of existing evidence comes from U.S.-based studies (Carpenter & Dobkin 2009, 2011, 2015, 2017; Miron & Tetelbaum, 2009; Lovenheim & Slemrod, 2010; Wechsler & Nelson, 2010; Crost & Guerrero, 2012; Yoruk & Yoruk, 2011, 2013, 2015; Chalfin et al, 2019).

Health and risky behavioral outcomes usually examined in the literature include indicators of morbidity and mortality resulting from alcohol-induced injuries and illnesses. Previous empirical evidence from the U.S. and Canada (see Carpenter & Dobkin 2009; 2011; 2017; Callaghan et al., 2013; 2014; Carpenter et al. 2016) suggests that surpassing MLDA prompts significant increases in the incidences of adverse health outcomes such as hospitalizations; emergency room admissions; and alcohol-induced mortality, including traffic crashes and suicides. In contrast, recent studies in Europe (Kamalow & Siedler, 2019) and Australia (Lindo et al., 2016) offer little evidence that surpassing age-based alcohol thresholds results in elevated rates of motor vehicle crashes, despite Lindo et al. (2016) finding evidence of a significant rise in drinking behavior and hospitalizations due to alcohol abuse.

Health-specific evidence found in NZ is varied and mostly focuses on the impact of lowering the MLPA in 1999. Stillman & Boes (2017) find no evidence that the Sale of Liquor Amendment Act, which lowered NZ's MLPA from 20 to 18, had any effect on motor vehicle crashes or alcohol-related injuries. However, this result differs from multiple studies which found that lowering the MLPA resulted in significant increases in traffic-related injuries for individuals aged 15-19 (Kypri et al., 2006, 2017; Huckle & Parker, 2014). Furthermore, using a difference-in-differences framework, Conover & Scrimgeour (2013) find that lowering the minimum alcohol purchasing age in NZ led to a significant increase in alcohol-related hospitalizations among individuals aged 18-19. However, Stillman & Boes (2017) argue that Conover & Scrimgeour's (2013) analysis looks at the short-term impact of the change in the MLPA and focuses on the specific time point of gaining alcohol purchasing rights. In comparison, Stillman & Boes (2017) state that their study estimates a more dynamic specification. However more importantly, using regression discontinuity design during the period when MLPA was 18, Stillman & Boes (2017) observe only a short-term increase in traffic accidents, which appears to gradually dissipate over a longer time horizon. Overall, the

heterogeneity in health-based spillover effects of gaining legal access to alcohol across different countries motivates the importance of testing for regional heterogeneities in other outcomes, such as criminal behavior and delinquency.

The literature most germane to our analysis examines the effect of MLDAs on crime (Carpenter & Dobkin, 2015; Callaghan et al., 2016; Chalfin et al., 2019). Utilizing census of arrest records in California, Carpenter & Dobkin (2015) use sharp regression discontinuity around the U.S. MLDA of 21 to estimate the effect of gaining legal access to alcohol on crime. Like their earlier findings on adverse health outcomes, the authors find that legal access to alcohol also prompts a sharp increase in youth criminal behavior. At the MLDA, the authors observe a significant rise in the incidence of driving under influence, public intoxication, nuisance crimes, and violent crimes. Moreover, in a more recent study, Chalfin et al. (2019) find that surpassing the MLDA results in increased rates of violent and property crime victimization. Using the Uniform Crime Reporting Survey in Canada, Callaghan et al. (2016) report sharp increases in violent crimes, property crimes, and disorderly conduct offenses at the MLDA.

As we discuss below, data granularity—especially with respect to crime classifications—plays a pivotal role in producing unbiased estimates of the causal effect of gaining access to alcohol on crime. Apart from limited quasi-experimental evidence from the U.S. and Canada, the related international literature focusing on youth crime appears to be largely unexplored. By making use of a population-wide census of criminal convictions in NZ over several years and two different policy regimes, our analysis makes a substantial contribution to the literature. Further, as discussed in detail in the next section, an additional novelty of our study lies in the uniqueness of NZ's MLPA (as compared to MLDA restrictions), where the purchase of alcohol is age-restricted but the consumption of alcohol is not.

3. INSTITUTIONAL BACKGROUND IN NEW ZEALAND

The minimum age of purchasing alcohol in NZ was lowered from 21 to 20 in 1969 through the Sale of Liquor Amendment Act (Conover & Scrimgeour, 2013). Almost thirty years later, effective from December 1, 1999, the Sale of Liquor Act was further amended (cited as the Sale of Liquor Amendment Act 1999) to lower the minimum age of purchasing alcohol from 20 to 18 (see Kypri et al, 2006; 2014; 2017; Huckle & Parker, 2014). Apart from tightening the legislative provisions regarding youth's purchasing rights, the 1999 act introduced consolidated guidelines for supplying alcohol to a minor. More specifically, it is a criminal offence under the Sale of Liquor Act to supply alcohol to a minor (aged under 18) unless the individual is accompanied by their parent (or legal guardian) or the person supplying alcohol is the minor's parent (or legal guardian).[4] This also however implies that NZ does not explicitly have a minimum age ceiling for drinking (like in the US). As a matter of fact, non-adult adolescents can consume alcohol as long as they drink 'responsibly' and under parental or a legal guardian's supervision.[5]

As highlighted above, for adolescents aged under the minimum legal purchasing age, NZ's law is not strictly binding on youth's alcohol consumption. Interestingly to a certain degree, Germany's 'stepwise' mandated minimum drinking age thresholds (at age 16 and age 18) represent a regulatory framework that appears to be a revised version of NZ's legislative stance on permitting youth access to alcohol (see Kamalow & Siedler, 2019). Despite the apparent differences in alcohol regulations across countries, the unrestricted access to alcohol gained

[4] This legislative provision has been in place at least since 1989 Sale of Liquor Act (see sections 155 & 157). The financial penalty was subsequently increased in Sale of Liquor Amendment Act of 1999 (sections 83 & 85), which replaced the repealed 1989 Sale of Liquor Act.

[5] See section 241 of Sale and Supply of Alcohol Act 2012. It is important to note that the legislation does not explicitly specify the age when individuals are allowed to drink, but only defines the conditions under which a person aged under 18 can responsibly consume or be supplied with alcohol (also see, Cagney & Palmer 2007).

upon reaching the mandated drinking or purchasing age threshold is likely to prompt a discontinuous increase in youth alcohol consumption on aggregate. However, the change in youth drinking behavior at the mandated age threshold may of course depend on the nature of the legal rights granted by the legislation of interest. Consequently, in jurisdictions where youth may conditionally consume alcohol before reaching the MLPA, the variation in alcohol-induced behavioral risks at the minimum legal age threshold may differ from the changes in behavioral responses in states where underaged people are fully prohibited from buying as well as consuming any amount of alcohol prior to reaching the MLDA. In this context, our novel analysis adds to the widely documented evidence on minimum legal drinking age regulations by looking at a relatively much lesser explored research space that documents social implications of age-specific mandate on youth's alcohol purchasing rights only. Focusing on NZ, our study specifically examines youth's alcohol-induced criminal behavior. However, for an unbiased estimation of the causal impact of MLPA on alcohol-related crime, it is important to have a comprehensive understanding of other relevant regulations that can also influence our outcomes of interest.

As will be evident later, the major share of alcohol-related crimes in NZ is comprised of traffic offences such as drunk driving and alcohol-induced violations of traffic guidelines.[6] Consequently, the overall trends of alcohol-related offenses might be driven by other relevant traffic guidelines, in addition to the MLPA regulation. In this context, a detailed review of NZ's legislative history on relevant traffic regulations reveals that the country has maintained a strong stance against driving under influence of alcohol. In response to a growing number of road traffic fatalities, in 1969, a legal blood alcohol limit of 100 mg/100 ml (while driving) was enforced for the first time (Ross, 1981). The permitted blood alcohol limit was further lowered

[6] The minimum age eligibility for a full (unrestricted) drivers' license in NZ has traditionally been at least 16 years (see Land Transport Driver Licensing Rule 1999). We have been mindful of the driver licensing legislation while considering our youth population for analysis.

to 80mg/100ml in 1978.[7] However, more relevant to our study are the related traffic regulations on breath and blood alcohol limits that were implemented between the years 1992 and 2014.

We provide a list of these legislations and relevant details in Table 1 below. The information provided in Table 1 highlights the existing age-specific differences in legal breath and blood alcohol content (BBAC) limit. Apparently, the BBAC regulations are more stringent for those aged below 20, which is further evident from the adoption of a zero-alcohol limit for that specific age group in August 2011. For instance, as of December 2014, while an individual aged 20 (or above) can drive a vehicle with a blood alcohol level of 45mg/100ml, the same would be a criminal offense if the person is aged below 20. However, it would be a criminal offense for both the age groups if the blood alcohol level of a person exceeds 50mg/100ml (see Table 1; bottom panel). In other words, while classifying the observed blood alcohol content level in the first example as a criminal offense would be conditional on perpetrator's age, the second example demonstrates a case where an individual can be convicted independent of their age.

[7] Further information on NZ's transport regulations are provided in NZ Ministry of Transport's report on road crash statistics. See https://www.transport.govt.nz/assets/Uploads/Research/Documents/ce869ff7de/alcohol-drugs-crashfacts-2013.pdf; Accessed on February 12, 2020.

Table 1

Timeline of Legislative Regulations on Blood and Breath Alcohol Limit

			Legal breath and blood alcohol limit	
Regulation	Time of enforcement	Relevant general provisions	20 years & above	Under 20 years
Transport Amendment Act (No. 3) 1992	April 1993	Introduction of compulsory breath testing and legal blood and breath alcohol limits introduced for those under 20 years	- Breath limit: 400 µg/litre - Blood alcohol level limit: 80mg/100ml	- Breath limit: 150 µg/litre - Blood alcohol level limit: 30mg/100ml
Land Transport (Road Safety and Other Matters) Amendment Act 2011	August 2011	The legal blood alcohol limit and the breath limit for those under 20 years is lowered to zero.	- Breath limit: 400 µg/litre - Blood alcohol level limit: 80mg/100ml	- Both breath and blood alcohol limits set to zero
Land Transport (Road Safety and Other Matters) Amendment Act 2011	September 2012	The concept of interlock license and zero alcohol licenses are introduced to allow a previously convicted person (regardless of his/her age) to drive but with a zero-blood alcohol and breath limit.	- Breath limit: 400 µg/litre - Blood alcohol level limit: 80mg/100ml	- Both breath and blood alcohol limits continue to be zero
The Land Transport Amendment Act (no 2) 2014	December 2014	New breath alcohol and blood alcohol limit for drivers aged 20 years and over.	- Breath limit: 250 µg/litre - Blood alcohol level limit: 50mg/100ml	- Both breath and blood alcohol limits continue to be zero

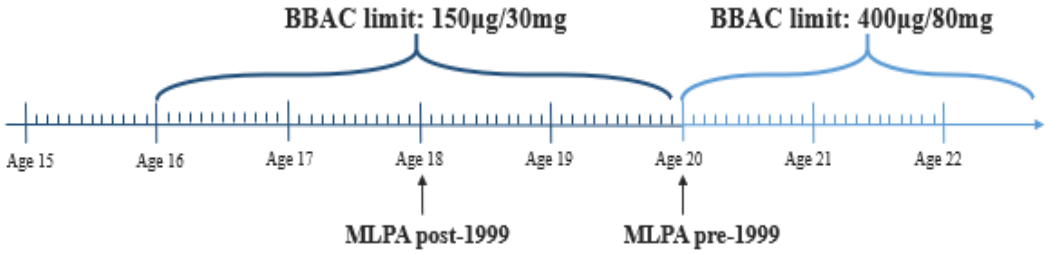
Notes: The above legislative information has been obtained from New Zealand Legislation database of Parliamentary Counsel Office.
- µg/litre- micrograms per litre of breath.
- mg/100ml- milligrams per 100 millilitres of blood.

The differences in the permitted BBAC limits by age-groups indicates that broad measures of alcohol-induced crimes can also be age-dependent. As such, to motivate causal interpretation of our regression estimates, construction of dependent variables needs to account for possible confounding influences of other relevant regulations that could also affect alcohol-related crimes (such as the BBAC regulations in Table 1). To be specific, we classify the overall measures of alcohol-related convictions into age-dependent and age-independent categories. As will be evident later, such classification is more relevant for the sample pertaining to the period when MLPA was 20. As highlighted above, violations of BBAC limits that are applicable to ages below 20 are included in age-dependent categories, since the same alcohol

content limits do not apply to individuals aged 20 or above. However, violations of BBAC limit for individuals aged 20 and above would be age-independent as those traffic offenses can legally be considered as crimes regardless of the perpetrators' age. Additionally, there are other (non-traffic) alcohol offenses which can only be legally convicted conditional on an individual's age (such as minor consuming alcohol in a public place or minor purchasing alcohol). To estimate the true effect of MLPA on crime, especially at the 20-year age threshold, our analysis shows that age-independent alcohol-related convictions are more well-suited outcome measures than overall measures of alcohol-related convictions. This is because age-independent offenses are comparable across individuals whose ages are on the either side of the MLPA cutoff. However, for the sample period when MLPA is 18, violations of applicable BBAC limits for individuals aged below 20 can be treated as comparable measures for offenders of ages below and above the 18-year MLPA, provided the optimally selected age bandwidth lies below 20. This is highlighted in Figure 1 below.

Figure 1

Age-specific traffic guidelines when MLPA was 20 (1994-1998)



Notes: The above figure is based on the information presented in the first row of Table 1. It is important to note that the minimum age eligibility for a full drivers' license in NZ is 16.

Finally, the Oranga Tamariki Act of 1989 (also known as the Children's and Young People's Well-being Act; hereinafter "the OT Act") introduced substantial reforms in NZ's youth justice system. In general, the act introduced a "new paradigm" by establishing family group

conferences and separate youth court systems for juvenile offenders (aged below 17) to hold them accountable for their criminal actions and determine necessary remedial consequences thereof (Zegers & Price 1992; Watt 2003). The remedial intervention (via family group conferences) recommended by the 1989 Act for juvenile offenders aged below 17 implies that young perpetrators are not to be tried in adult court unless the crime committed is a serious offence.[8] Since our outcomes of interest are created based on criminal convictions tried in NZ courts, the legislative requirements of the OT Act of 1989 may trigger a discrete jump in the relevant crime measures at the 17th year. Reassuringly, the optimal age bandwidths in all our regression discontinuity-based specifications are selected to be above the 17-year cutoff, so the OT Act does not jeopardize the identification strategy.

4. DATA

We utilize a large-scale database known as the Integrated Data Infrastructure (IDI). Administered by Statistics NZ, the IDI houses a wide range of linked administrative and survey data collected from various government and non-government agencies. We focus on two five-year periods representing two distinct policy regimes—1994-1998 and 2014-2018. The 1994-1998 sample (hereafter the "MLPA-20 sample") allows us to evaluate the causal link between legal access to alcohol and youth crime when MLPA was 20. The 2014-2018 sample (hereafter the "MLPA-18 sample") enables us to provide more recent evidence on the relationship of interest when MLPA is 18. Analyzing the two policy regimes has three distinct advantages. First, it allows us to assess whether the effect of the MLPA on criminal behavior varies when set at different ages. Second, as the two samples are 20 years apart, it allows us to examine the time consistency of the behavioral response. Third, using the MLPA-20 sample allows a cleaner identification of treatment effects compared to the MLPA-18 sample since the

[8] Listed in Schedule 1A of the Oranga Tamariki Act 1989 as 'Specified Offences'.

adulthood effect likely confounds the relationship between legal access to purchasing alcohol and criminal behavior when the MLPA is set at age 18.

Turning 18 in NZ is often marked by several life-changing experiences that result from gaining additional legal rights. For example, upon reaching adulthood, a person becomes eligible to smoke (Smoke-free Environments Act, 1990), gamble (The Gambling Act, 2003), vote (Electoral Amendment Act, 1974), be legally independent of parental guardianship (Oranga Tamariki Act, 1989), marry (Marriage Amendment Act, 2005), and possess certain types of firearms (Arms Act, 1983).

We construct monthly age cohorts using data from the Department of Internal Affairs' (DIA) birth register and death register. These monthly population counts of living individuals between the ages of 16 and 22 serve as the denominator in offense rate calculations.[9] We then link our monthly age cohorts to a national census of all criminal convictions (hereafter the "court charges data") in NZ provided by the Ministry of Justice (MoJ). These data include individual-level information on offence date, offence type, outcome type (e.g. convicted or acquitted) and various court proceeding details including court identifiers, plea type, hearing and outcome dates, sentence type, and so on.[10] By linking monthly age cohorts with court charges data, we create crime indicators by offence dates. Rather than using absolute number of criminal convictions (as used by Carpenter & Dobkin, 2015; Chalfin et al. 2019), we compute age- and time-specific crime rates (number of convictions per 100,000 population). This is to avoid confounding influences that may arise from age-based discontinuities in population size, which

[9] Unfortunately, due to confidentiality reasons, Statistics NZ does not provide the exact birth date in the IDI database. Therefore, instead of being able to estimate discontinuous change in outcomes at the relevant birthday, we could only focus on discontinuity at the birthday month. However, given our primary research objective and further supported by findings based on additional specifications and robustness checks, we believe that the data structure does not affect our main findings.

[10] For more details on the court charges data, see IDI data dictionary: Ministry of Justice data (July 2019 edition). Retrieved from www.stats.govt.nz on July 15, 2020.

can affect the number of criminal offences in a specific age cohort. We only count offences that were eventually convicted.

The offence type in the court charges data is identified through a detailed crime coding system developed (over 7000 classifications) by the MoJ. We identified 211 offence types that can be broadly categorized as alcohol-induced offences or alcohol-related crimes (including liquor law violations). As an alternative to the MoJ offence classification, there is broader crime coding scheme called the Australian and New Zealand Standard Offence Classification (ANZSOC). While our main objective is to analyze the effects of MLPA on alcohol-related crimes, we further use the ANZSOC definitions to study other broad categories of crime classified as sexual offences and violence; burglary and theft; offences against justice; drug-related offences; fraud and deception; property damage; offences against public order; other traffic offences; and weapon-related offences.[11]

As discussed earlier, we classify all alcohol-related offences into those that are age-dependent and those that are age-independent. We provide details on this categorization in Appendix Table A.5. For each alcohol-related crime, we also provide the corresponding offence categories under ANZOC system. Finally, in the last two columns of Appendix Table A.5, we give details on the specific convictions that were observed in the court charges data in the two samples (MLPA-20 and MLPA-18). Age-dependent traffic crimes include offences that can be prosecuted up to a certain age such as driving under influence where an individual was found to have exceeded their permitted age-specific BBAC limit. As indicated in Table 1, the age-specific permitted BBAC limits have been modified over time. Therefore, while classifying alcohol-related offences into age-dependent and age-independent categories, we have

[11] For details on ANZSOC classification, see: http://archive.stats.govt.nz/methods/classifications-and-standards/classification-related-stats-standards/offence/classification-and-coding-process.aspx#gsc.tab=0; Retrieved on August 5, 2020.

accounted for such temporal changes in the relevant traffic-based alcohol regulations. The age-dependent other alcohol offences include criminal convictions that are perceived as liquor law violations when only committed by an underaged minor and otherwise not (e.g. minor purchasing alcohol, minor drinking in public without parental supervision). Age-independent traffic or other alcohol-offences include convictions that can be legally prosecuted irrespective of an individuals' age.[12]

We present descriptive statistics of the MLPA-18 and MLPA-20 samples in Table 2.[13] In addition to the relevant sample proportions of demographic and crime-based characteristics for the whole youth sample, we also provide similar summary statistics for the sample aged below the respective MLPA. Focusing on columns (1)-(4) of Table 2, we find that aggregate measures of criminal convictions were much higher in earlier period's sample. To our understanding, the substantial decline in overall criminal convictions during the recent years can be attributed to a large-scale policing initiative, known as the Policing Excellence. The nationwide policing strategy was undertaken by the NZ Police in 2010 (see NZ Police, 2014). Over the subsequent five-year period (ending in 2014) following the implementation of Policing Excellence, the number of court charges and criminal convictions fell by approximately 37 percent and 33 percent, respectively. Despite this change in policing, we believe our main analysis is not affected since the intervention was not targeted towards any specific age group. Nonetheless, we do additionally test the consistency of our key findings (obtained from the MLPA-18

[12] We also classify traffic offences committed by zero alcohol or interlock licensees as age-independent traffic crimes since these convictions pertain to repeat offenders who could practically be of any age (see Table 1).

[13] To roughly assess how alcohol-related convictions in NZ compare to that in the US, the number of all traffic-related alcohol convictions per 100,000 individuals per month (including both age-dependent and age-independent offences) aged below the MLPA (20 years) during the period 1994-1998 appears to be approximately 131.9 (see column 2). On a yearly basis, the rate would be equivalent to approximately 1583 convictions per 100,000 individuals or 158.3 convictions per 10,000 individuals. In comparison in the US, as reported by Carpenter & Dobkin (2015) with respect to incidence of driving under influence, the number of arrests per 10,000 person years for individuals aged just below the MLDA is approximately 194. However, the crime measures used in our respective analyses (i.e. criminal convictions versus arrest rates) may not be perfectly comparable.

sample) by repeating our analysis using an alternative 5-year period data (2002-2006) that represents a post-1999 legislative but a pre-Policing Excellence regime.

The descriptive information in Table 2 suggests that the majority of alcohol-related crimes involve traffic offences. While traffic age-independent offences account for around 69 to 70 percent of all alcohol-related crimes in total samples for the two periods, traffic age-dependent crimes constitute over a quarter (25-28 percent) of all alcohol-related convictions. In comparison, the prevalence of non-traffic (other) alcohol offences is substantially lower in both the samples. In fact, we do not observe any age-dependent other alcohol-related convictions in the 2014-2018 sample. As such, the four crime-based measures, we consider in our key empirical analysis includes- *all alcohol-related convictions*, *alcohol age-independent convictions* (sum of traffic and other alcohol age-independent offences), *traffic age-independent convictions* and *traffic age-dependent convictions*. Our analysis demonstrates the period-specific relevance of using these four measures as alcohol-induced crimes to estimate the causal relationship of our interest.

Since our dependent variables are measures of convictions, they may not capture the true extent of youth criminal behavior. Minor offenses are often discharged by the police with an informal or pre-charge warning (O'Reilly, 2010) and are therefore not tried in court. Moreover, it is likely that pre-charge warnings are issued more often to younger offenders. Thus, the estimated impact of MLPA on youth crime may be understated when relying on convictions data. To account for this, we provide further evidence using criminal investigations data from the NZ Police. These data record all criminal investigations in NZ, including incidents where an informal warning was issued. Since NZ Police data in the IDI begins in 2009, we are unable to provide evidence for the MLPA-20 sample. The relevant descriptive information of the crime-based measures in the NZ Police data are provided in columns (5)-(6) of Table 2. Because only

a fraction of criminal offenses is eventually tried in courts, corresponding sample means for each crime type are larger in NZ Police data relative to the court charges data.

5. IDENTIFICATION STRATEGY

The primary objective of our analysis is to see if allowing alcohol purchasing rights triggers criminal behavior among youth. To explore causal mechanisms, we evaluate treatment effects using separate samples that represent two distinct MLPA restrictions.[14]

We employ sharp regression discontinuity (RD) to identify the effect of the MLPA on alcohol-related crime in NZ (Thistlewaite & Campbell, 1960; Imbens & Lemieux, 2008; Lee & Lemieux, 2010). As pointed out earlier, since our restricted data does not provide individuals' exact date of birth, our estimation relies on age expressed in months (similar to Crost & Guerrero, 2012; Carpenter et al., 2016; Carpenter & Dobkin, 2017). Using age, a, as the running variable, the deterministic treatment status D_a can be represented as:

$$D_a = \begin{cases} 1 \; if \; age \; in \; months, a \geq MLPA \\ 0 \; if \; age \; in \; months, a < MLPA \end{cases} \quad (1)$$

For each of our outcomes, the baseline linear specification is given by

$$Y_{at} = \alpha + \rho D_a + \beta(a - MLPA) + \delta.(a - MLPA) * D_a + \boldsymbol{X_{at}}\boldsymbol{\Gamma} + \lambda_t + \epsilon_{at} \quad (2)$$

where Y_{at} represents a measure of alcohol-related criminal conviction rate (per 100,000 people) aggregated for each age-time pair (indexed by at). The parameter ρ represents the local average treatment effect of interest. A vector of covariates, $\boldsymbol{X_{at}}$, includes age- and time-specific

[14] A natural follow-up research question is to investigate the effect of lowering MLPA (from 20 to 18) in the 1999 Sale of Liquor Amendment Act on youth crime. Applying a differences-in-discontinuity strategy (for an application of this approach, see Grembi et al., 2016) using periods before and after the 1999 legislation, we do not find any significant variation in the two measures of alcohol-related crimes that can be compared across the two periods (age-independent all alcohol convictions and age-independent traffic convictions). This additional analysis is excluded as the same is a part of a separate research we are performing. For our analysis, we use a user-written Stata package developed by Ribas (2016) that is designed to estimate multi-dimensional regression discontinuity analysis.

ethnicity and gender composition of the age cohort.[15] The model includes time fixed effects, λ_t, where ϵ_{at} is the idiosyncratic error term. Following Lee and Card (2008), standard errors are clustered on the running variable. Point estimates are bias-corrected and are calculated using a cluster-robust method. Data-driven bandwidths are optimally chosen to minimize the mean squared error at the age threshold. The bandwidth selection procedure is based on methodologies recommended by Imbens and Kalyanaraman (IK, 2012) and Calonico, Cattaneo, and Titiunik (CCT, 2014; 2017). However, we also estimate RD models using alternative bandwidth selection procedures proposed by CCT (2017).[16] Additionally, while our preferred specifications employ nonparametric local linear regression in the neighborhood of the MLPA threshold (see Gelman & Imbens, 2019), we also report results using quadratic specifications.

One of the important assumptions for causal interpretation of RD estimates is that the conditional expectation of the outcome variable of interest is continuous in the running variable. In our case, this condition can be violated if individuals are able to manipulate their age (McCrary, 2008). However, since individuals' birthdays (as observed in administrative birth records used in our study) cannot be manipulated, our analysis does not address the empirical concern arising from an endogenously determined running variable. Nonetheless, prior to aggregating our sample by age and time, we statistically test for manipulation in our

[15] Although our limited access to the selected IDI datasets restricts us from estimating more saturated RD models that control for a wider set of covariates such as socio-economic characteristics (in addition to demographic attributes), we do test the consistency of our key findings by further using the Census 2013 data. Basically, we link our constructed population with Census 2013 data (that includes all respondents who were observed to be residing in NZ on March 5, 2013). The respective Census-linked samples allow us to control for time-variant indicators of fathers' and mothers' qualification. However, since the link rate largely varies across the sample periods (i.e. the link rate for the 2014-2018 sample is much higher than the link rate for 1994-1998 sample), we do not wish to include the Census-linked population-based RD regressions in our main analysis, due to possible selection issues.

[16] For all our RD estimations, we use the 'rdrobust' package developed by CCT (2017) in Stata version 16. We additionally test the consistency of our findings using non-aggregated individual-level samples by manually estimating RD models, similar to equation (2). For all our dependent variables, the effect sizes (i.e. estimated coefficients relative to sample means) are largely similar in the individual-level samples and the corresponding aggregate samples used in our main analyses. Results are available upon request.

age-based variable using empirical verification recommended by McCrary (2008; also see Cattaneo, Jansson, & Ma, 2018). In both the individual-level data that were used to create aggregated MLPA-20 and MLPA-18 samples, we do not find any statistical evidence of a systematic manipulation of our running variables within chosen bandwidth.[17]

6. RESULTS

6.1 Legal Access to Alcohol and Youth Drinking Behavior

Prior to investigating the effect of MLPA on the incidence of alcohol-induced crime in NZ, we begin by analyzing whether legal access to purchase alcohol affects youth drinking behavior. To provide this direct evidence, we examine self-reported drinking behavior from the New Zealand Health Survey (NZHS).

Administered by NZ's Ministry of Health (MoH), the NZHS is a nationally representative cross-section of individuals conducted annually since 1992. The NZHS samples New Zealanders aged 15 years and older and focuses on six domains of health: long-term conditions; health status; health behaviors; health service use and experience; sociodemographic attributes; and anthropometry.[18] Within the health behaviors domain, there are several questions regarding alcohol use. To investigate the relationship between MLPA and youth's drinking behavior, we focus on three survey-based measures of alcohol consumption: any drinking within the

[17] The p-values of the manipulation test statistic with respect to samples used in our main MLPA-20 and MLPA-18 analyses are found to be 0.81 and 0.90, respectively. In addition, using the MLPA-20 sample, we also perform a 'donut RD' (see Barreca et al. 2011) by dropping observations from two months pre- and post-MLPA. The donut RD estimates with regard to the two broadest measures of alcohol-related offences (i.e. all alcohol-related convictions and age-independent alcohol-related offences) are qualitatively similar to our corresponding key findings. We do not run the donut RD test using the MLPA-18 sample since the structural rise in the number of convictions at the 17th birthday (as induced by the Oranga Tamariki Act of 1989) substantially limits the optimal bandwidth size after dropping observations around the MLPA.

[18] Access to the confidentialized NZHS microdata needs to be approved by the MoH based on a detailed assessment of a confidentialized unit record file (CURF) application form, Researchers, intending to use the data, are required to fill up a CURF with relevant details about their research at the time of application. For further information on the application process, see http://archive.stats.govt.nz/tools_and_services/microdata-access/confidentialised-unit-record-files.aspx#assessment&gsc.tab=0; Retrieved February 15, 2020.

previous year, the number drinks consumed per month (monthly consumption), and any binge-drinking (six or more drinks per sitting) within the previous year. The continuous measure of monthly alcohol consumption was constructed based on two questions that asked respondents about their frequency of drinking and number of drinks usually consumed on a typical day when alcohol is consumed (see Boes & Stillman, 2017 for details).

Utilizing five NZHS waves represented by 2011/2012 through 2015/2016 supplements, we employ RD strategy to estimate the impact of MLPA on adolescent drinking behavior using age in months as our running variable. Our analysis is restricted to only five survey waves as all other NZHS waves report respondents' age in years, so are too coarsened for regression discontinuity design based on age. We report our key findings in Table 3 and subsequent RD plots in Figure 2. All our RD specifications control for individual-level indicators of gender, ethnicity, annual household income, education, and time fixed effects. The descriptive information of the covariates is provided in Appendix Table A.4.[19]

Point estimates in Table 3 indicate that gaining right to purchase alcohol is positively associated with alcohol consumption in NZ. These findings are in line with the existing international evidence (Carpenter & Dobkin, 2009; Yoruk & Yoruk 2011;2013; Carpenter et al., 2016). Upon reaching the MLPA, we find a 22-percentage point increase in the likelihood of consuming alcohol within the past 12 months (column 1) and a 12-percentage point rise in the probability of binge-drinking (see column 3). Focusing on much larger youth samples from the U.S. and Canada, Carpenter and his co-authors (Carpenter & Dobkin, 2009; Carpenter et al., 2016) observe that legal access to alcohol is associated with a statistically significant 5-

[19] As will be revealed later, that trends in conviction-based alcohol-related crime measures vary sharply at the 17th birthday month due to the Oranga Tamariki Act of 1989. Therefore, to remove biases from confounding influences of the regulation in our key analysis (see section 6.2), we use RD specifications that rely on MSE-optimal bandwidths chosen using procedures recommended by CCT (2014). However, since the 1989 Act is unlikely to have any impact on other non-conviction youth outcomes, for analysis in Table 3, we use an age bandwidth spanning 12 months (below and above the MLPA) to maximize our comparable sample for estimation. Nonetheless our findings are largely similar to RD estimates obtained using MSE-optimal bandwidths.

percentage point rise in the probability that an individual have had 5 or more drinks (defined as 'heavy drinking') in one sitting at least once in the previous year. [20]

Our point estimates suggest that gaining alcohol purchasing rights increases monthly consumption of alcohol by almost 14 drinks per month. Visual inspection of Figure 2 further confirms our results. Findings are robust to an alternative specification that includes a quadratic polynomial in our age-based running variable and an RD model that accounts for individuals' birth month effect. Results from additional specifications are not provided for the sake of brevity but are available upon request.

Our findings provide supportive evidence to the assumption that New Zealanders drink significantly more when they gain the right to purchase alcohol. However, causal interpretation of our survey-based findings comes with a cautionary note. First, similar to surveys used by Carpenter & Dobkin (2009) and by Carpenter et al. (2016), the NZHS information on any drinking refers to the 12-month period prior to the survey. Hence, for some individuals who are of MLPA in our analysis, the variable may capture their drinking behavior when they are younger than the minimum purchasing age threshold. Moreover, in the survey used by Carpenter & Dobkin (2009), for a large share of their surveyed sample, it was possible to roughly identify the time a person reported to have consumed alcohol. The NZHS design does not allow such identification. However, compared to Carpenter & Dobkin's (2009) study, our analysis is less likely to suffer from a "desirability bias," which refers to the possibility of underreporting alcohol consumption by individuals aged below the federally mandated drinking age. This is because, as opposed to the US, it is not illegal for New Zealanders who

[20] The US-based sample in Carpenter & Dobkin's (2009) analysis was drawn from the National Health Interview Survey and incorporates approximately 16,000 individuals. The Canadian sample in Carpenter et al.'s (2016) study included approximately 36,000 individuals combined from the National Population Health Surveys and the Canadian Community Health Surveys.

are younger than MLPA to consume alcohol as long as the relevant legislative guidelines are met. Finally, due to data availability issues, the NZHS design restricts us from studying the effect of legal access to alcohol on drinking behavior during early years, when the MLPA was 20.

The validity of the identification strategy also relies on the assumption that there are no other discontinuities in the neighborhood of the MLPA cutoff. Traditionally, this is tested by estimating models with the MLPA artificially set at different age values close to the actual MLPA. The absence of statistically significant effects assures one that results are driven by the policy of interest. We report tests setting 'fake' cutoffs of 17.5 and 18.5 years in Table 3. This falsification exercise does not produce any statistically significant results (Appendix Table A.1, Panel A).

6.2 Legal Access to Alcohol and Youth Criminal Behavior in NZ

We motivate our RD-based analysis first by graphically presenting age trends of overall measure of alcohol-related convictions and alcohol-induced traffic convictions for 1994-1998 (MLPA-20) in Figure 3, and comparable trends for the period 2014-2018 (MLPA-18) in Figure 4.

6.2.1 Age Trends in Alcohol-Related Convictions

There are several important takeaways from the conviction-based trends presented in Figures 3 and 4. Focusing on all alcohol-related convictions in Figure 3, we observe sharp changes at the 17th and 20th birthday month. We believe that the changes at the 17-year birthday month are mainly due to legislative provisions of the OT Act of 1989. Furthermore, it can be surmised that the substantial drop in the overall alcohol-related convictions observed at the 20th birthday month is mainly due to the age-specific aspect of mandated BBAC regulations (see Table 1).

This is supported by observed trends for age-dependent, alcohol-related traffic convictions which drop to (nearly) zero after the 20th birthday. In addition, after the 20th birthday, the trends for overall alcohol-related convictions and age-independent traffic convictions are almost identical. Figure 3 further indicates that most of the alcohol-induced crimes in NZ are comprised of traffic-related incidents.

Panel A of Figure 4 provides age trends for the MLPA-18 sample. On average, the prevalence of all alcohol-related convictions is much lower compared to the MLPA-20 sample. However, like Figure 3, we observe similar changes in the corresponding crime trends at the 17th and at the 20th birthday months. In Panel B of Figure 4, we present trends of NZ Police investigations of alcohol-related offences for the MLPA-18 sample. The alcohol-related conviction trends in the two panels of Figure 4 appear to be almost identical.[21]

6.2.2 Regression Discontinuity Analysis of Alcohol-Related Convictions

We present estimate of discontinuous variation in alcohol-related crime measures at the relevant MLPA in Table 4. Using four measures of alcohol-induced convictions as dependent variables, in Table 4, we present RD estimates obtained from specifications that incorporate both linear (Panel A.1 & B.1) and quadratic (Panel A.2 & B.2) polynomials of age in months.

In Panel A, we present regression results for the MLPA-20 sample. We find a statistically significant (at the 1 percent level) decline in all alcohol-related crimes at age 20, which was the mandated MLPA during the pre-1999 legislation period. In the linear specification (column 1 of Panel A.1), the seemingly counterintuitive drop in all alcohol-related crimes is quantified by a decrease of 39.4 convictions per 100,000 individuals. Moreover, the estimated impact on

[21] However, upon a closer look at Figure 4, the variation in the trends in NZ Police offences (panel B) around the 17-year mark does not seem to be as sharp as the change in conviction-based trends observed in panel A. Because legislative provisions in the OT Act (1989) apply only to court-based trials of criminal offenses, the law is likely to prompt a sharper jump in the conviction-based measures of crime at the 17th year age threshold.

the broadest measure of alcohol-related convictions is marginally amplified in the quadratic specification (see column 1 of A.2). This is indicated by a statistically significant drop of 43.4 convictions per 100,000 individuals. However, upon excluding age-dependent convictions (that are mostly comprised of BBAC limit violations), when we estimate RD specifications using age-independent measures of alcohol-induced crimes, we do not find any statistically significant change at the relevant MLPA. This is evident in columns (2) and (3) of Panel A, where we present our RD estimates for all alcohol-age independent crime and traffic age-independent crime. As highlighted in Figure 2, we expect that the RD-based findings for broadest measure of alcohol-related convictions are primarily driven by age-specific BBAC regulations that differ between age groups on the either side of 20-year threshold. Corroborating our assumption, we find a statistically significant (at the 1 percent level) drop in age-dependent alcohol-induced traffic conviction rate at the 20th birthday month, which also happens to be the MLPA in the 1994-1998 sample (see column 4 of Panel A). In our linear specification (A.1), we find a decline of 35.2 convictions per 100,000 population (accounting for 89 percent of the decline in all alcohol-related convictions). The corresponding estimate in the quadratic specification reveals a statistically significant decrease of 36.7 age-dependent traffic convictions per 100,000 population at MLPA of 20.

Like Kamalow & Siedler's (2019) study, our MLPA-20 analysis presented in Panel A of Table 4 contributes to the relevant literature by demonstrating the importance of accounting for confounding influences of relevant regulations at the mandated drinking (or alcohol purchasing) age thresholds that can bias estimation of the true impact of legal access to alcohol on related social outcomes.[22] The detailed crime classification of our data allows us to isolate

[22] Kamalow & Siedler (2019) present one of the very few empirical evidences in the literature on drinking age regulations that highlight the importance of accounting for confounding influences of other regulations on outcomes of interest. Using German administrative data on mortalities and road accidents, the authors find that the statistically significant discontinuous jumps in total number of deaths due to motor vehicle accidents observed at the country's two legal drinking age thresholds (at ages 16 and 18) can be attributed to certain types of driving

age-specific convictions that are likely to be driven by additional traffic-based regulations to obtain more comparable crime measures for individuals aged below and above the relevant MLPA threshold. As such, in the 1994-1998 sample, the two age-independent measures of alcohol-induced crimes (see columns 2 and 3) motivate causal interpretation of the estimated link between MLPA and youth crime. To conclude, in the pre-1999 legislation era, we do not find any significant impact of legal access to alcohol on alcohol-related crime among youth. This is in contrast to the empirical evidence presented by Carpenter & Dobkin (2015) with respect to alcohol-induced crime measures.

Unlike the MLPA-20 sample, for the MLPA-18 sample (2014-2018), the measures of all alcohol-related convictions and alcohol-induced age-dependent traffic conviction are less likely to be influenced by the age-specific BBAC regulations. This is because, the mandated BBAC limits are similar for all individuals aged below 20 and only differ when a person reaches 20. Therefore, as long as the optimally selected age bandwidth lies between the age of 17 (the OT Act threshold) and 20 (BBAC age cutoff), all of the four measures of alcohol-induced convictions can be considered as comparable outcomes for individuals aged just below and above the MLPA of 18. Looking at Panel B of Table 4, the data-driven (MSE-optimal) monthly age bandwidths chosen for RD estimation using the MLPA-18 sample do ensure comparability of all four dependent variables. Using the two broadest measures of alcohol-related convictions, we also test the robustness of our findings using additional bandwidth selection procedures (see CCT, 2017) and provide the corresponding estimates in Appendix Table A.2. The results are largely similar to the findings presented in Table 4.

license eligibility requirements, which coincide with the two mandated drinking age cutoffs. Kamalow & Siedler (2019) believe that the increase in overall motor vehicle accidents is a likely consequence of a *'novice driver'* effect, rather than being an outcome of gaining greater access to alcohol.

Given this context, looking at the RD estimates presented in Panel B of Table 4, we find substantive support to the empirical evidence obtained from the MLPA-20 analysis in Panel A. In our linear specification, we do not observe any statistically significant change in overall measure of alcohol-related crimes at the MLPA of 18 (see column 1 of Panel B.1). Given the optimally selected bandwidth (of approximately 6 months below and above the MLPA), since the measure of all alcohol-related crime rate in the 2014-2018 sample is unlikely to be influenced by additional regulations, the RD estimate in column (1) of Panel B.1 confirms the absence of a statistically significant causal link between MLPA and alcohol-induced crimes in NZ. Additionally, the statistically insignificant relationship between MLPA and alcohol-induced crime persists for the two age-independent measures of alcohol-related crimes and alcohol-induced traffic crimes (see columns 2 and 3). However, we do see a statistically significant (at the 1 percent level) jump in age-dependent alcohol-induced traffic convictions at the 18-year age threshold. The increase of approximately 7.5 convictions per 100,000 population (see column 4 of B.1) indicates that gaining alcohol purchasing rights triggers a small increase in the incidence of violations of mandated BBAC regulations that apply to youth aged under 20. Compared to the sample mean just under the relevant MLPA, the RD coefficient of 7.5 (convictions per 100,000 population) represents a 27-percent increase in alcohol-induced age-dependent traffic convictions. Our findings from the linear specifications are additionally supported by RD estimates obtained from quadratic specifications (see Panel B.2).

Furthermore, Figure 5 and Figure 6 provide visual representation of data-driven RD plots obtained from the linear specifications estimated in Table 4. Confirming our RD findings in Table 4, Figure 5 presents RD plots for the two broadest measures of (all and age-independent) alcohol-induced conviction rates. Figure 6 presents RD plots for age-dependent and age-independent categories of alcohol-induced traffic convictions. In addition, estimation of RD

specifications that fit third-order polynomial in age does not alter our key findings. Results from cubic RD specifications are available upon request.

6.2.3 Analysis of Alternative Samples & Additional Specifications

Our analysis in Table 4 indicates that permitting NZ youth to greater access to alcohol via purchasing rights does not prompt an increase in overall alcohol-induced convictions. However, in the MLPA-18 sample, we find a discontinuous jump in violations of permitted BBAC limits for drivers aged under 20 at the mandated age ceiling. To empirically test the validity of causal interpretation of our findings in Table 4, we perform several sensitivity tests.

First, as described earlier, to construct our alcohol-induced crime indicators in Table 4, we only considered offences that were eventually charged with a conviction in NZ courts. Although the conviction-based outcomes can be argued to be valid indicators of crime, those measures may suffer from certain empirical concerns. This is because the court charges data does not incorporate offenses that are not tried in court and are often discharged with a police warning- an outcome more likely to be prevalent among juvenile perpetrators and for non-severe offences. Unlike the court charges data, the NZ Police data documents criminal offences that were discharged with informal warnings too. We additionally test the robustness of our Table 4 findings using analogously created alcohol-induced crime measures constructed using the police offence data. However, since the NZ Police data in the IDI begins in 2009, we could only perform the additional analysis based on the MLPA-18 sample.

The linear RD estimates utilizing the NZ Police data are presented in Panel A of Table 5. The findings are closely similar to the MLPA-18 analysis performed using the court charges data. To be specific, like our Table 4 findings, we only observe a statistically significant increase in age-dependent traffic offence rates at the MLPA of 18. This increase is represented by rise of

7.5 offences per 100,000 population, which is almost identical to the corresponding linear RD estimate obtained using the court charges data (see Panel B.1 of Table 4 for comparison).

Secondly, a potential empirical critique of the 2014-2018 sample is that the crime-based outcomes are likely to be driven by the nationwide Policing Excellence initiative (implemented in the year 2010) that was eventually followed by a substantial decline in overall criminal convictions. However, the nationwide police excellence strategy was not aimed at any specific demographic groups. As such, the large-scale initiative is unlikely to induce any age-specific unobserved heterogeneities that could challenge empirical estimation of the link between MLPA and alcohol-related crimes. Nonetheless, using the court charges data, we test consistency in our MLPA-18 findings in Table 4 by re-applying our RD analysis on an alternative pre-Policing Excellence sample. The main purpose of this additional exercise is to test the effect of the MLPA of 18 on alcohol-related crime, during a period when the prevalence of criminal convictions was relatively more comparable to that of the pre-1999 sample (MLPA-20 sample). Like our two main samples, we create an age-time aggregate data based on the monthly period spanning from January 2002 to December 2006 (the 2002-2006 sample).[23]

Utilizing the 2002-2006 sample, we report our linear RD estimate of the impact of legal access to alcohol gained at the age of 18 on alcohol-related crime in Panel B of Table 5. Similar to our Table 4 findings, we observe only a statistically significant discrete jump in age-dependent alcohol-induced traffic conviction rates at the MLPA of 18 (Table 5; column 4 of Panel B). Quantified by an increase of approximately 12 convictions per 100,000 individuals, the estimated coefficient for alcohol-induced traffic conviction rates is found to be statistically significant at the 5 percent level.

[23] To select our alternative MLPA-18 sample, we allow for a two-year adjustment period following the implementation of the 1999 legislation of the Sale of Liquor Amendment act.

Furthermore, we supplement our falsification tests performed for the indicators of alcohol consumption by exploiting discontinuity in the two broadest measures of alcohol-related conviction rates (all alcohol and age-independent alcohol) at ages that are 6 months below and above the MLPA. Utilizing the MLPA-20 and MLPA-18 samples, the findings from our falsification analyses are provided in Appendix Table A.1. In Panel B (MLPA-20 sample), we do not find any empirical evidence of significant variation in either of the two conviction-based measures at the 19.5-year or at the 20.5-year age cutoffs. Finally, in Panel C using the MLPA-18 sample, although there seems to be a statistically significant decline in all alcohol-related conviction rates at the 17.5-year age cutoff (see column 1), we do not find any significant change at the 18.5-year (column 5) cutoff. However, for age-independent alcohol conviction rates, there is no variation on either of the two age cutoffs (columns 2 and 6). It is important to note, that in the MLPA-18 sample, while evaluating the variation in the dependent variables for the lower fake cutoff point, i.e. at 17.5-year age threshold, the data-driven selection of (MSE) optimal age bandwidth is likely to be constrained by the OT Act's age limit (of 17). As such, given the narrow range of MSE-optimal bandwidth (of 3.53; see Panel C of Table A.1) chosen for estimation of RD coefficient at 17.5-year age threshold, the statistically significant decline in the overall measure of alcohol conviction rate (in column 1 of Panel C) may be a data artifact. Nonetheless, in general, our sensitivity analyses empirically support the causal interpretation of the key findings presented in Table 4. [24]

[24] Additionally, while the covariate-adjusted RD specifications presented in Table 4 control for age-time proportions of ethnicity, sex and, time indicators, we further estimate two different specifications to check whether our RD coefficients are sensitive to the inclusion of covariates in our model. In other words, we verify whether the treatment status (assigned by the MLPA regulation) can be considered to be orthogonal to covariates included in our main model (Calonico et al., 2019). In the first specification, we estimate RD models using both MLPA-20 and MLPA-18 samples without any covariates (see Panel A of Table A.3). The findings are very similar to Table 4 analysis. Secondly, we link the two population cohorts (used to prepare MLPA-20 and MLPA-18 samples) to Census 2013 such that we could control for age-time proportions of parental education (of both parents) as additional socio-economic indicators. The Census 2013 data is based on the resident population who were physically present in NZ on March 5 of 2013. The link rate of the MLPA-18 sample to Census 2013 was 74.4% and the link rate of the MLPA-20 sample was 59.6%. Despite the potential sample selection issues, our results from the age-time aggregated sample using the Census-linked individuals are qualitatively similar to the Table 4 estimates (see Panel B of Table A.3). The increase in the traffic age-dependent alcohol in MLPA-18 sample is

6.2.4 Analysis of Broad Measures of Crime

Next, using ANZSOC's broad classification of crimes, we estimate variations in the other crimes at the MLPA using the two samples (Carpenter & Dobkin 2015; Callaghan et al., 2016). While constructing the indicators of the additional crime categories, we exclude all alcohol-related convictions used in our main analysis such that the results are not likely to be influenced by the trends in our key dependent variables. An important caveat that could challenge causal interpretation of our analysis of additional measures of crime is that it is not clear whether the offences were committed under the influence of alcohol.[25] Additionally, following our earlier discussion on adulthood effects, some of our empirical findings with respect to other crimes can be accompanied by major lifestyle changes that individuals may experience upon turning 18. The potential confounding influences of the adulthood effects might be of a lesser concern in our earlier empirical analysis that focuses on measures of alcohol-induced crimes. This is because unlike other broad crime categories (such as violence, public disorder, etc.), the measures of alcohol-induced convictions can be more directly linked to drinking regulations that control youth access to alcohol.

Therefore, prior to our analysis on additional crime classifications, we empirically test whether variation in measures of other crime categories at the age of 18 (the MLPA of the post-1999 legislative era) is likely to be affected by adulthood effects. We use the individual-level Census 2013 data to create dichotomous indicators of whether a person has a partner (intimate or de facto or marital); whether a person is currently studying (in a full-time or a part-time basis);

however smaller in size than the corresponding Table 4 estimate. This may be potentially due to low response rates among vulnerable groups with lower socio-economic background and higher prevalence of crime (see Wilson et al., 2017).

[25] For example, domestic abuse or sexual assaults are often associated with alcohol consumption (see Markowitz & Grossman, 1998; Markowitz, 2000). However, since consumption of alcohol may not be illegal, the granular definitions of other ANZSOC-based broad crime types do not indicate whether those crimes were committed under the influence of alcohol.

whether a person is currently employed in a job; and whether a person stays separately from their family ('moving out' indicator; equals 1 if a person reported to be in a single-person household or in a household shared with unrelated persons). Results from estimation of RD specifications that control for demographic and socio-economic characteristics (see list in Table A.4) are presented in Table 6. We observe that upon turning 18, people are significantly less likely to be studying (either on a full-time or a part-time basis). The 4-percentage point decline in the likelihood of studying might be representative of a transitional phase an individual likely experiences after leaving school (see column 2 of Panel A). Additionally, upon reaching adulthood, people appear to be more likely to be employed in a job and stay separately from their family. However, we do not find statistically significant variation in any of the four socio-economic indicators at the age of 20 (the pre-1999 legislative MLPA). Our Table 6 results indicate that individuals are likely to experience changes in important socio-economic conditions upon turning 18. Our findings are in contrast to Lindo et al.'s (2016) 'coming-of-age' analysis, who do not find any discontinuities in socio-economic indicators at the 18th year age threshold that could be suggestive of changes in major life events. However, one of the limitations of our Census-based findings is that our analysis relies on survey information that was collected at a particular point in time only (March 2013). Therefore, the results may not provide generalizable evidence on the hypothesized adulthood effect in NZ.

We present RD estimates for other crime categories (as defined under ANZSOC) in Table 7. Focusing on 1994-1998 sample, which is plausibly less likely to be confounded by adulthood effects, we find statistically significant increases at the 20th birthday month for convictions related to violation of 'public order' and 'other traffic' violations (see Panel A, columns 8 and 9). To be specific, there is an increase of 17.5 public order convictions per 100,000 individuals (which include disorderly conducts, offensive behavior, public nuisance, etc.) and a rise of 9.8 convictions related to other traffic violations per 100,000 individuals (e.g. driving without

license, parking and speeding limit violations, etc.). Both the effects are statistically significant at the 5 percent level.

In Panel B of Table 7, we report RD estimates for broad crime categories using the 2014-2018 sample. At the 18-year age threshold, we find decline in convictions related to 'burglary & theft' (significant at the 10 percent level) and statistically significant increases in convictions related to 'dangerous acts', 'property damage', and 'public order' crimes.

Keeping the Census 2013 results (in Table 6) in mind, the evidence of the impact of MLPA on additional categories of youth crime as presented in the two panels of Table 7, provides qualitatively consistent findings for public order offences only. To be specific, the absence of discontinuous variation in the Census 2013 indicators at the 20th birthday month provides further empirical support to the finding that gaining alcohol purchasing rights in NZ prompts a significant increase in incidence of public order offences among youth. However, the lack of information on identifying individuals' prior circumstances (e.g. whether the perpetrator was drunk) leading to the broadly defined ANZOC offences may still challenge the causal interpretation of the RD estimates in Table 7. Such empirical concerns might also apply to the previous studies that provide estimates of the impact of drinking age regulations on (non-specific) broad measures of youth crime (e.g. Carpenter & Dobkin, 2015; Callaghan et al. 2016).

7. CONCLUSION

Allowing easier access to alcohol has the potential to encourage risky behavior among youth, eventually resulting in a higher incidence of substance abuse, adverse health outcomes, and crime. While there already exists an extensive body of literature that investigates how gaining unconstrained rights to drink and purchase alcohol affects youth's alcohol consumption and ensuing behavioral response, there is substantial heterogeneity in empirical findings across

geographical regions and the nature of legal rights permitted by the state-administered regulations. NZ's MLPA regulation presents a unique opportunity for providing policy-relevant insights into the current understanding of youth's behavioral response to gaining unrestricted access to alcohol. Our analysis is the first to use national-level administrative information to analyze the impact of MLPA on youth's criminal conduct.

Using a census of criminal convictions over two distinct time periods with varying MLPAs, regression discontinuity offers little evidence that late adolescents commit more alcohol-related crimes upon crossing over the legal purchasing age in NZ. Results hold up to alternative empirical specifications and sensitivity tests. Our analysis indicates that alcohol-induced criminal behavior in NZ does not vary by the mandated age at which an individual is allowed to buy alcohol. We do however find evidence that the gaining alcohol purchasing rights in NZ is followed by a significant increase in public order offenses.

Our results contrast with previous studies that find significant increases in youth crime rates at the U.S. and Canada's MLDA, respectively. These contrasting findings might be explained by important institutional differences as well differences in public attitude across regions. Furthermore, our analysis adds policy-relevant insights into the ongoing debate on social justification of maintaining the MLPA of 18 in NZ.[26] Finally, this study motivates a substantial scope for future research to identify potential mechanisms that could explain whether exposure to moderated drinking experiences prior to having unrestricted access to alcohol mitigates the likelihood of the alcohol-related health and behavioral risks.

[26] For more insights see article in the following link: http://www.stuff.co.nz/the-press/7582393/Alcohol-purchase-age-remains-18; Retrieved on March 3, 2020.

REFERENCES

Adger Jr, H., & Saha, S. (2013). Alcohol use disorders in adolescents. *Pediatrics in Review*, *34*(3), 103.

Barnett-Ryan, C., & Nolan, J. J. (2005). Impact of state UCR policy and procedures on bias crime reporting. *Criminal Justice Studies, 18(4)*, 305-319.

Barreca, A. I., Guldi, M., Lindo, J. M., & Waddell, G. R. (2011). Saving babies? Revisiting the effect of very low birth weight classification. *The Quarterly Journal of Economics*, *126*(4), 2117-2123.

Boes, S., & Stillman, S. (2017). You Drink, You Drive, You Die? The Dynamics of Youth Risk Taking in Response to a Change in the Legal Drinking Age. *IZA Discussion Paper No. 10543.*

Bouchery, E. E., Harwood, H. J., Sacks, J. J., Simon, C. J., & Brewer, R. D. (2011). Economic costs of excessive alcohol consumption in the US, 2006. *American Journal of Preventive Medicine*, *41*(5), 516-524.

Brand, D. A., Saisana, M., Rynn, L. A., Pennoni, F., & Lowenfels, A. B. (2007). Comparative analysis of alcohol control policies in 30 countries. *PLoS Medicine*, *4*(4).

Cagney P & Palmer S. (2007) The Sale and Supply of Alcohol to Under 18 Year Olds in New Zealand: A Systematic Overview of International and New Zealand Literature. *Wellington: Alcohol Advisory Council of New Zealand*.

Callaghan, R. C., Sanches, M., Gatley, J. M., & Cunningham, J. K. (2013). Effects of the minimum legal drinking age on alcohol-related health service use in hospital settings in Ontario: a regression–discontinuity approach. *American Journal of Public Health*, *103*(12), 2284-2291.

Callaghan, R. C., Sanches, M., Gatley, J. M., & Stockwell, T. (2014). Impacts of drinking-age laws on mortality in Canada, 1980–2009. *Drug and Alcohol Dependence*, *138*, 137-145.

Callaghan, R. C., Gatley, J. M., Sanches, M., & Benny, C. (2016). Do drinking-age laws have an impact on crime? Evidence from Canada, 2009–2013. *Drug and Alcohol Dependence*, *167*, 67-74.

Calonico, S., Cattaneo, M. D., & Titiunik, R. (2014). Robust nonparametric confidence intervals for regression-discontinuity designs. *Econometrica*, *82*(6), 2295-2326.

Calonico, S., Cattaneo, M. D., Farrell, M. H., & Titiunik, R. (2017). rdrobust: Software for regression-discontinuity designs. *The Stata Journal*, *17*(2), 372-404.

Carpenter, C., & Dobkin, C. (2009). The effect of alcohol consumption on mortality: regression discontinuity evidence from the minimum drinking age. *American Economic Journal: Applied Economics*, *1*(1), 164-82.

Carpenter, C., & Dobkin, C. (2011). The minimum legal drinking age and public health. *Journal of Economic Perspectives*, *25*(2), 133-56.

Carpenter, C., & Dobkin, C. (2015). The minimum legal drinking age and crime. *Review of Economics and Statistics*, *97*(2), 521-524.

Carpenter, C. S., Dobkin, C., & Warman, C. (2016). The mechanisms of alcohol control. *Journal of Human Resources*, *51*(2), 328-356.

Carpenter, C., & Dobkin, C. (2017). The minimum legal drinking age and morbidity in the United States. *Review of Economics and Statistics*, *99*(1), 95-104.

Cattaneo, M. D., Jansson, M., & Ma, X. (2018). Manipulation testing based on density discontinuity. *The Stata Journal*, *18*(1), 234-261.

Chalfin, A., Hansen, B., & Ryley, R. (2019). The minimum legal drinking age and crime victimization *(No. w26051). National Bureau of Economic Research.*

Chatterji, P., Dave, D., Kaestner, R., & Markowitz, S. (2004). Alcohol abuse and suicide attempts among youth. *Economics & Human Biology, 2*(2), 159-180.

Conover, E., & Scrimgeour, D. (2013). Health consequences of easier access to alcohol: New Zealand evidence. *Journal of Health Economics*, *32*(3), 570-585.

Cook, P. J., & Moore, M. J. (2002). The economics of alcohol abuse and alcohol-control policies. *Health Affairs*, *21*(2), 120-133.

Crost, B., & Guerrero, S. (2012). The effect of alcohol availability on marijuana use: Evidence from the minimum legal drinking age. *Journal of Health Economics*, *31*(1), 112-121.

Deza, M. (2015). The effects of alcohol on the consumption of hard drugs: regression discontinuity evidence from the National Longitudinal Study of Youth, 1997. *Health Economics*, *24*(4), 419-438.

Ewing, S. W. F., Sakhardande, A., & Blakemore, S. J. (2014). The effect of alcohol consumption on the adolescent brain: A systematic review of MRI and fMRI studies of alcohol-using youth. *NeuroImage: Clinical*, *5*, 420-437.

French, M. T., & Maclean, J. C. (2006). Underage alcohol use, delinquency, and criminal activity. *Health Economics*, *15*(12), 1261-1281.

Gelman, A., & Imbens, G. (2019). Why high-order polynomials should not be used in regression discontinuity designs. *Journal of Business & Economic Statistics*, *37*(3), 447-456.

Gentilello, L. M., Rivara, F. P., Donovan, D. M., Jurkovich, G. J., Daranciang, E., et al. (1999). Alcohol interventions in a trauma center as a means of reducing the risk of injury recurrence. *Annals of Surgery*, *230*(4), 473.

Godfrey, C., & Maynard, A. (1995). The economic evaluation of alcohol policies. *Alcohol and Public Policy: Evidence and Issues*, 238-259.

Grembi, V., Nannicini, T., & Troiano, U. (2016). Do fiscal rules matter? *American Economic Journal: Applied Economics*, (8) 1-30.

Grinshteyn, E., & Hemenway, D. (2016). Violent death rates: the US compared with other high-income OECD countries, 2010. *The American Journal of Medicine*, *129*(3), 266-273.

Grossman, M., Sindelar, J. L., Mullahy, J., & Anderson, R. (1993). Policy watch: alcohol and cigarette taxes. *Journal of Economic Perspectives*, *7*(4), 211-222.

Gruenewald, P. J., Millar, A. B., Treno, R. J., Yang, Z., Ponicki, W. R., & Roeper, P. (1996). The geography of availability and driving after drinking. *Addiction, 91*(7), 967-983.

Hanson, G. R., & Li, T. K. (2003). Public health implications of excessive alcohol consumption. *JAMA*, *289*(8), 1031-1032.

Hanson, K. L., Medina, K. L., Padula, C. B., Tapert, S. F., & Brown, S. A. (2011). Impact of adolescent alcohol and drug use on neuropsychological functioning in young adulthood: 10-year outcomes. *Journal of Child & Adolescent Substance Abuse*, *20*(2), 135-154.

Heaton, P. (2012). Sunday liquor laws and crime. *Journal of Public Economics*, *96*(1-2), 42-52.

Huckle, T., & Parker, K. (2014). Long-term impact on alcohol-involved crashes of lowering the minimum purchase age in New Zealand. *American Journal of Public Health*, *104*(6), 1087-1091.

Imbens, G. W., & Lemieux, T. (2008). Regression discontinuity designs: A guide to practice. *Journal of Econometrics*, *142*(2), 615-635.

Imbens, G., & Kalyanaraman, K. (2012). Optimal bandwidth choice for the regression discontinuity estimator. *The Review of Economic Studies, 79*(3), 933-959.

Jones-Webb, R., Toomey, T. L., Short, B., Murray, D. M., Wagenaar, A., & Wolfson, M. (1997). Relationships among alcohol availability, drinking location, alcohol consumption, and drinking problems in adolescents. *Substance Use & Misuse*, *32*(10), 1261-1285.

Kamalow, R., & Siedler, T. (2019). The Effects of Stepwise Minimum Legal Drinking Age Legislation on Mortality: Evidence from Germany. *IZA Discussion Paper No. 12456.*

Kypri, K., Voas, R. B., Langley, J. D., Stephenson, S. C., Begg, D. J., Tippetts, A. S., & Davie, G. S. (2006). Minimum purchasing age for alcohol and traffic crash injuries among 15-to 19-year-olds in New Zealand. *American Journal of Public Health*, *96*(1), 126-131.

Kypri, K., Davie, G., McElduff, P., Connor, J., & Langley, J. (2014). Effects of lowering the minimum alcohol purchasing age on weekend assaults resulting in hospitalization in New Zealand. *American Journal of Public Health*, *104*(8), 1396-1401.

Kypri, K., Davie, G., McElduff, P., Langley, J., & Connor, J. (2017). Long-term effects of lowering the alcohol minimum purchasing age on traffic crash injury rates in New Zealand. *Drug and Alcohol Review*, *36*(2), 178-185.

Lee, D. S., & Lemieux, T. (2010). Regression discontinuity designs in economics. *Journal of Economic Literature*, *48*(2), 281-355.

Lindo, J. M., Siminski, P., & Yerokhin, O. (2016). Breaking the link between legal access to alcohol and motor vehicle accidents: evidence from New South Wales. *Health Economics*, *25*(7), 908-928.

Lovenheim, M. F., & Slemrod, J. (2010). The fatal toll of driving to drink: The effect of minimum legal drinking age evasion on traffic fatalities. *Journal of Health Economics*, *29*(1), 62-77.

MacDonald, Z., & Shields, M. A. (2004). Does problem drinking affect employment? Evidence from England. *Health Economics*, *13*(2), 139-155.

Markowitz, S., & Grossman, M. (1998). Alcohol regulation and domestic violence towards children. *Contemporary Economic Policy*, *16*(3), 309-320.

Markowitz, S. (2000). The price of alcohol, wife abuse, and husband abuse. *Southern Economic Journal*, 279-303.

McCrary, J. (2008). Manipulation of the running variable in the regression discontinuity design: A density test. *Journal of Econometrics*, *142*(2), 698-714.

Miron, J. A., & Tetelbaum, E. (2009). Does the minimum legal drinking age save lives? *Economic Inquiry*, *47*(2), 317-336.

Mullahy, J., & Sindelar, J. L. (1991). Gender differences in labor market effects of alcoholism. *The American Economic Review*, *81*(2), 161-165.

Nelson, J. P. (1990). State monopolies and alcoholic beverage consumption. *Journal of Regulatory Economics*, *2*(1), 83-98.

New Zealand Police (2014). Policing excellence: the transformation of New Zealand Police 2009-2014. available at: www.police.govt.nz/sites/default/files/publications/policing-excellence-closure.pdf. Retrieved on April 9, 2020.

O'Reilly, J. (2010). New Zealand police pre-charge warnings alternative resolutions: Evaluation report. *Wellington: New Zealand Police.*

Popova, S., Giesbrecht, N., Bekmuradov, D., & Patra, J. (2009). Hours and days of sale and density of alcohol outlets: impacts on alcohol consumption and damage: a systematic review. *Alcohol & Alcoholism*, *44*(5), 500-516.

Ribas, R. P. (2016, August). Multidimensional Regression Discontinuity and Regression Kink Designs with Difference-in-Differences. In *2016 Stata Conference* (No. 19). Stata Users Group.

Ross, L. (1981). Deterrence of the Drinking Driver: An International Survey. Final Report, *U.S. Dept. of Transportation*, Washington, D.C.

Sacks, J. J., Gonzales, K. R., Bouchery, E. E., Tomedi, L. E., & Brewer, R. D. (2015). 2010 national and state costs of excessive alcohol consumption. *American Journal of Preventive Medicine*, *49*(5), e73-e79.

Saffer, H., & Dave, D. (2006). Alcohol advertising and alcohol consumption by adolescents. *Health Economics*, *15*(6), 617-637.

Thistlethwaite, D. L., & Campbell, D. T. (1960). Regression-discontinuity analysis: An alternative to the ex post facto experiment. *Journal of Educational Psychology, 51*(6), 309.

Watt, E. (2003). A history of youth justice in New Zealand. *Wellington, NZ: Department for Courts*.

Wechsler, H., & Nelson, T. F. (2010). Will increasing alcohol availability by lowering the minimum legal drinking age decrease drinking and related consequences among youths? *American Journal of Public Health*, *100*(6), 986-992.

White, A., & Hingson, R. (2013). The burden of alcohol use: excessive alcohol consumption and related consequences among college students. *Alcohol Research: Current Reviews*.

Wilson, R. T., S. H. Hasanali, M. Sheikh, S. Cramer, G. Weinberg, A. Firth, S. H. Weiss, and C. L. Soskolne. "Challenges to the census: international trends and a need to consider public health benefits." *Public Health*, 151 (2017): 87-97.

World Health Organization. Substance Abuse Department, World Health Organization. Department of Mental Health, Substance Abuse, & World Health Organization. (2004). Global Status Report: Alcohol Policy. *Geneva, World Health Organization*.

Yörük, B. K., & Yörük, C. E. (2011). The impact of minimum legal drinking age laws on alcohol consumption, smoking, and marijuana use: Evidence from a regression discontinuity design using exact date of birth. *Journal of Health Economics*, *30*(4), 740-752.

Yörük, B. K., & Yörük, C. E. (2013). The impact of minimum legal drinking age laws on alcohol consumption, smoking, and marijuana use revisited. *Journal of Health Economics*, *32*(2), 477-479.

Yörük, C. E., & Yörük, B. K. (2015). Alcohol consumption and risky sexual behavior among young adults: evidence from minimum legal drinking age laws. *Journal of Population Economics*, *28*(1), 133-157.

Young, D. J. (1993). Alcohol advertising bans and alcohol abuse: Comment. *Journal of Health Economics*, *12*(2), 213-228.

Zegers, J. B., & Price, C. (1992). Youth Justice and the Children, Young Persons, and Their Families Act 1989. *Auckland UL Rev.*, *7*, 803.

Table 2

Descriptive statistics of youth samples

	MLPA-20 (1994-1998)		MLPA-18 (2014-2018)			
	MoJ Court Charges data				NZ Police data	
Variable	Total sample	Below 20 sample	Total sample	Below 18 sample	Total sample	Below 18 sample
	(1)	(2)	(3)	(4)	(5)	(6)
Male	0.511	0.510	0.514	0.513	0.514	0.514
European only	0.597	0.593	0.513	0.499	0.513	0.513
Māori only	0.107	0.108	0.115	0.111	0.115	0.115
Pacific Peoples only	0.034	0.036	0.074	0.077	0.074	0.074
Asian only	0.007	0.008	0.045	0.052	0.045	0.045
MELAA only	0.001	0.001	0.005	0.006	0.005	0.005
Alcohol offences (per 100,000 people)						
All alcohol	143.192	147.222	69.707	25.491	73.104	31.627
Alcohol age-independent	98.929	80.687	49.937	12.577	51.787	15.069
Traffic age-independent	97.609	78.743	49.835	12.559	51.142	14.633
Traffic age-dependent	35.439	53.179	20.144	13.175	21.723	16.947
Other alcohol age-independent	1.320	1.943	0.102	0.017	0.645	0.436
Other alcohol age-dependent	10.058	15.217	0.000	0.000	0.000	0.000
Other broad offence (ANZSOC) categories (per 100,000 people)						
Sexual & Violence	110.790	113.024	71.491	57.487	126.704	116.961
Against justice	166.973	158.911	135.024	44.699	65.959	43.791
Burglary & theft	263.290	306.572	98.414	108.788	151.065	194.966
Dangerous Acts	137.694	146.859	48.274	28.681	77.175	56.458
Drugs	83.826	80.139	18.460	9.138	51.946	38.772
Fraud & Deception	49.168	46.850	10.468	5.760	13.639	9.816
Property Damage	81.026	89.549	36.998	32.538	63.063	67.386
Public Order	126.416	133.166	28.815	26.464	119.212	98.998
Traffic	103.959	96.439	104.934	46.032	112.642	54.118
Weapon	26.116	29.237	14.155	11.048	24.483	22.875
Age-month cells (N)	4380		4380		4380	
Unique individuals (ages 16-22)	567738		588852		588852	

Notes: The above descriptive table is based on the population-based samples constructed using the DIA birth and death registers. The sample includes information for individuals ages 16-22 (192-264 months). MELAA implies people belonging to Middle Eastern, Latin American, and African origin. Since the NZ Police data in the IDI begins from 2009, we are unable to replicate our MLPA20 analysis using NZ Police data.

Table 3

Effect of alcohol purchasing rights on youth's drinking behavior

	Any drinking in the past year	Monthly alcohol consumption	Binge-drinking in the past year
	(1)	(3)	(3)
Sample mean just under MLPA -	0.717	11.095	0.447
Alcohol purchasing right (MLPA)	0.217***	13.915***	0.163***
	(0.043)	(5.091)	(0.0516)
Observations	4563	4159	4180
Effective observations < MLPA	638	594	594
Effective observations >= MLPA	668	590	592

Note: The above table report bias-corrected RD estimates with robust standard errors (reported in parentheses) are clustered on the age (in months). A triangular kernel is used to construct local polynomial estimators. The age bandwidth selected for estimation was 12 months (below and above current MLPA). However, results do not vary in specifications that were estimated using mean squared error-optimal bandwidths chosen following CCT (2014). Local linear regression is used to construct point estimators. Models include controls for gender, ethnicity, education, household income, and cohort fixed effects. *, **, and *** signify statistical significance at the 10, 5, and 1 percent-levels, respectively.

Figure 2

Regression discontinuity plots of measures of alcohol consumption

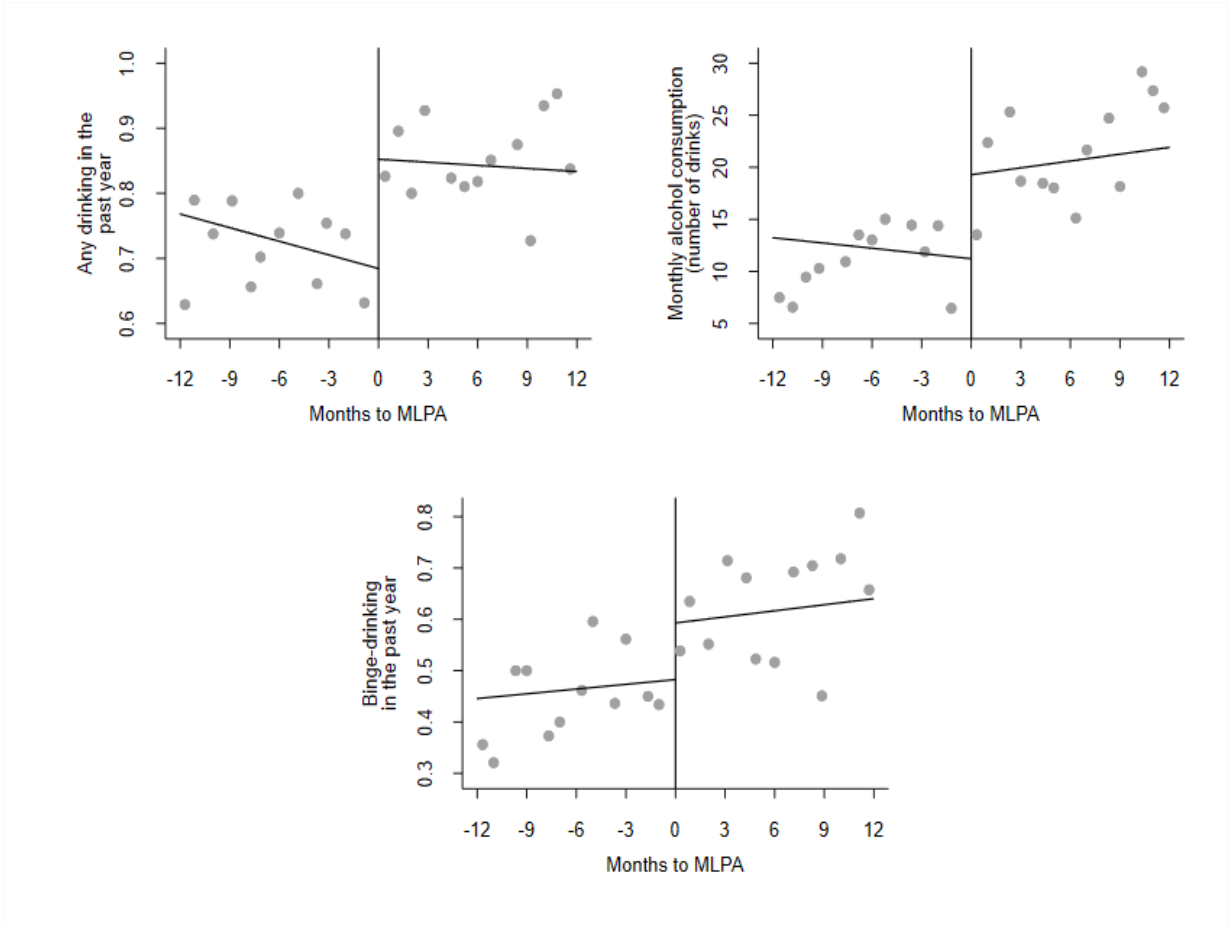


Figure 3

Age-specific trends of alcohol-related convictions – MLPA 20
(MoJ Court Charges 1994-1998 data)

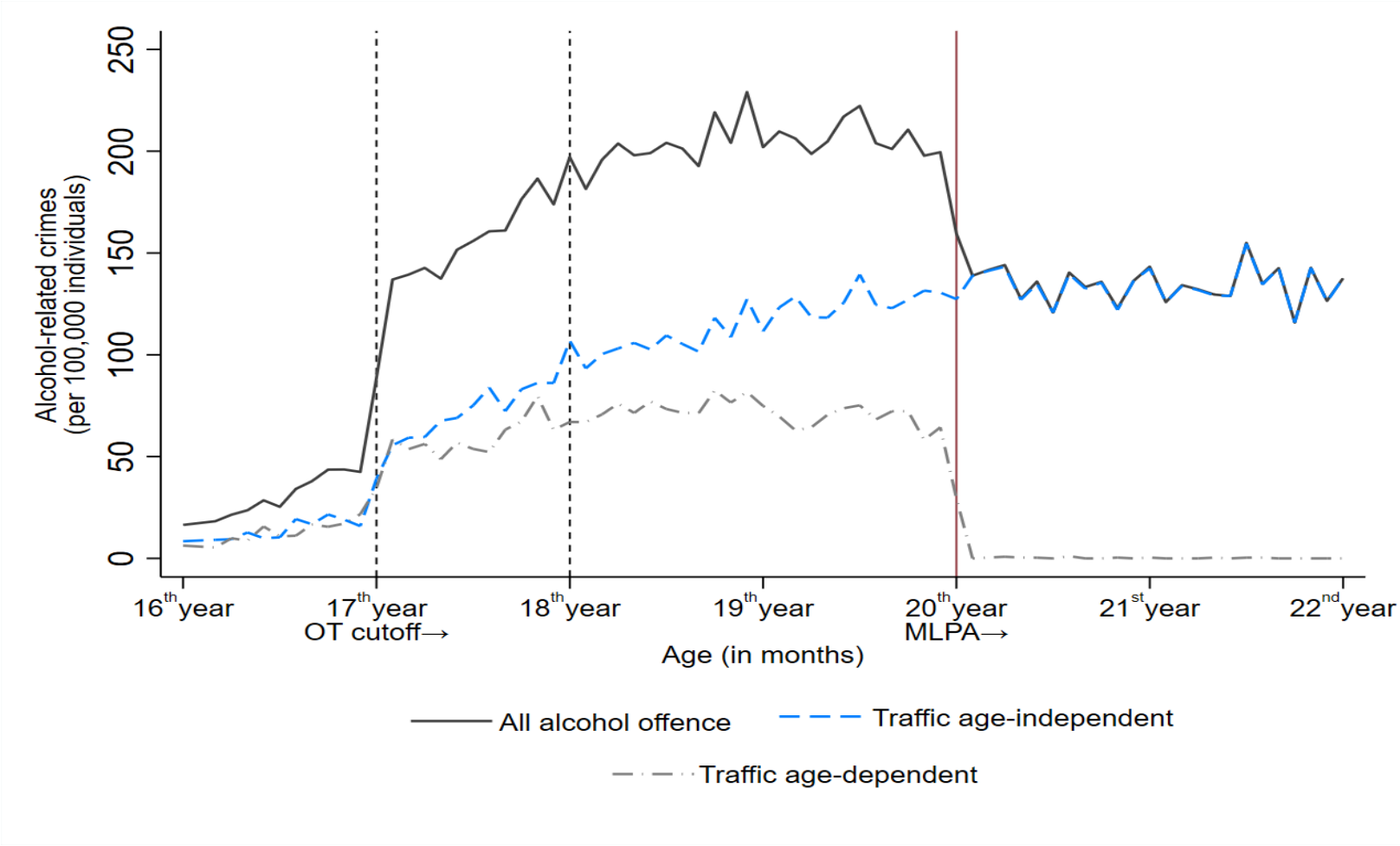
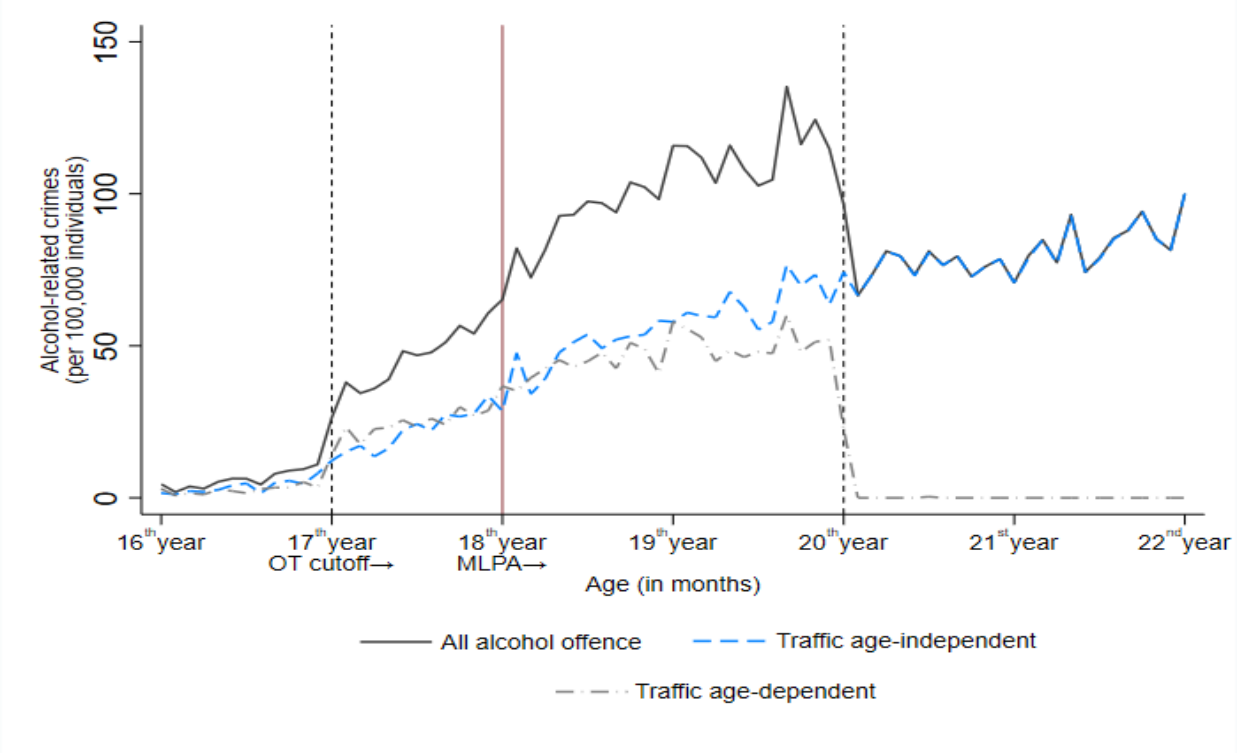


Figure 4

Age-specific trends in alcohol-related crimes– MLPA 18 (2014-2018)

Panel A: MoJ Court Charges data - *Alcohol-related convictions*



Panel B: NZ Police data - *Alcohol-related offences*

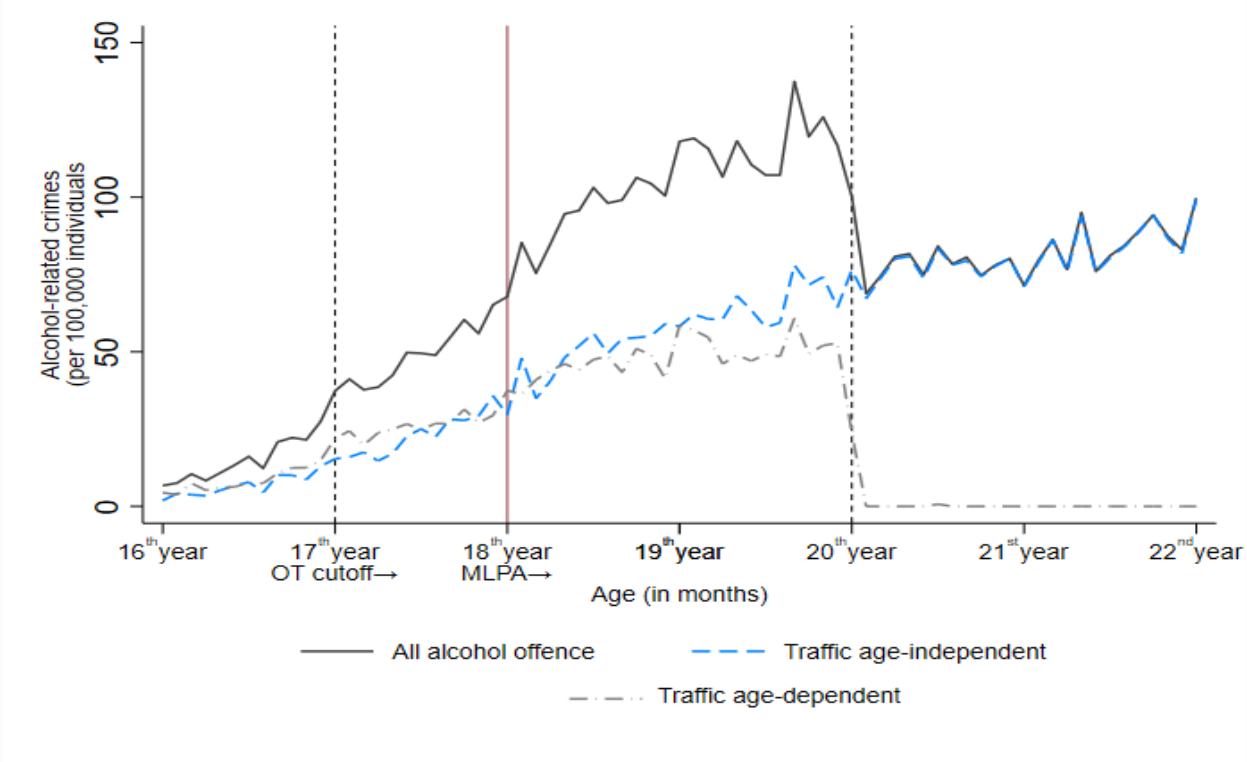


Table 4

Estimates of the impact of MLPA on alcohol-related crimes

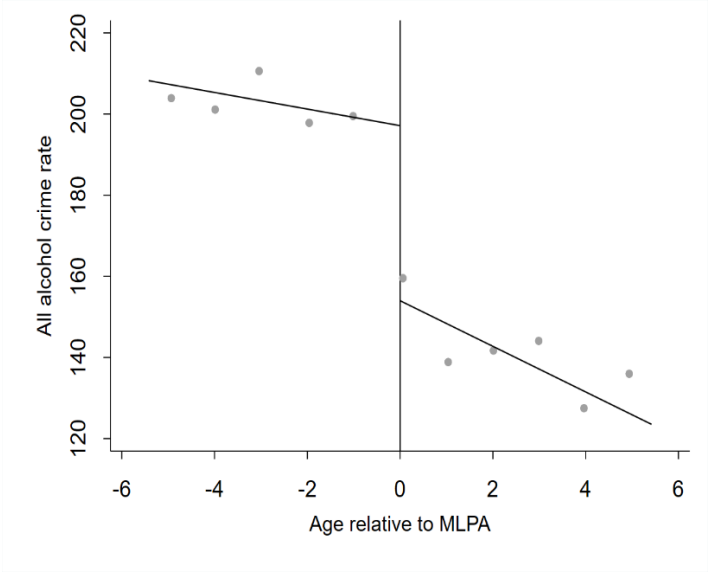
Conviction rate (*per 100,000 population*) -	All alcohol	All alcohol age-independent	Traffic age-independent	Traffic age-dependent
Panel A – MLPA-20	(1)	(2)	(3)	(4)
A.1 Linear specification				
Sample mean just under MLPA	202.584	130.720	129.343	67.080
Alcohol purchasing right (MLPA)	-39.464***	0.706	0.685	-35.222***
	(6.507)	(5.207)	(5.289)	(7.727)
Total age-time cells	4,380	4,380	4,380	4,380
Effective observations < MLPA	300	360	360	300
Effective observations >= MLPA	360	420	420	360
MSE-optimal bandwidth (-|+)	5.42	6.25	6.32	5.30
A.2 Quadratic specification				
Sample mean just under MLPA	207.449	130.477	128.794	69.190
Alcohol purchasing right (MLPA)	-43.361***	-8.687	9.321	-36.766***
	(7.677)	(5.909)	(12.275)	(7.637)
Total age-time cells	4,380	4,380	4,380	4,380
Effective observations < MLPA	420	420	360	300
Effective observations >= MLPA	480	480	420	360
MSE-optimal bandwidth (-|+)	7.42	7.09	6.53	7.21
Panel B – MLPA-18	(1)	(2)	(3)	(4)
B.1 Linear specification				
Sample mean just under MLPA	52.683	23.825	23.779	27.408
Alcohol purchasing right (MLPA)	4.015	-1.238	-1.505	7.513***
	(4.163)	(5.361)	(5.449)	(2.443)
Total age-time cells	4,380	4,380	4,380	4,380
Effective observations < MLPA	360	540	540	240
Effective observations >= MLPA	420	600	600	300
MSE-optimal bandwidth (-|+)	6.16	9.51	9.61	4.07
B.2 Quadratic specification				
Sample mean just under MLPA	52.205	23.153	23.112	27.144
Alcohol purchasing right (MLPA)	2.949	-2.573	-2.770	8.379***
	(4.370)	(5.325)	(5.446)	(3.243)
Total age-time cells	4,380	4,380	4,380	4,380
Effective observations < MLPA	420	600	600	300
Effective observations >= MLPA	480	660	660	360
MSE-optimal bandwidth (-|+)	7.10	10.38	10.59	5.42

Note: The above table report bias-corrected RD estimates with robust standard errors (reported in parentheses), which are clustered on the age (in months). A triangular kernel is used to construct local polynomial estimators. Mean squared error-optimal bandwidths are chosen following CCT (2014). (-|+): Refers to optimal bandwidth below and above the MLPA. Models include controls for gender, ethnicity, and time fixed effects. The sample means of the dependent variables "just under MLPA" were computed based on the selected optimal bandwidth below the drinking age threshold. *, **, and *** signify statistical significance at the 10, 5, and 1 percent-levels, respectively.

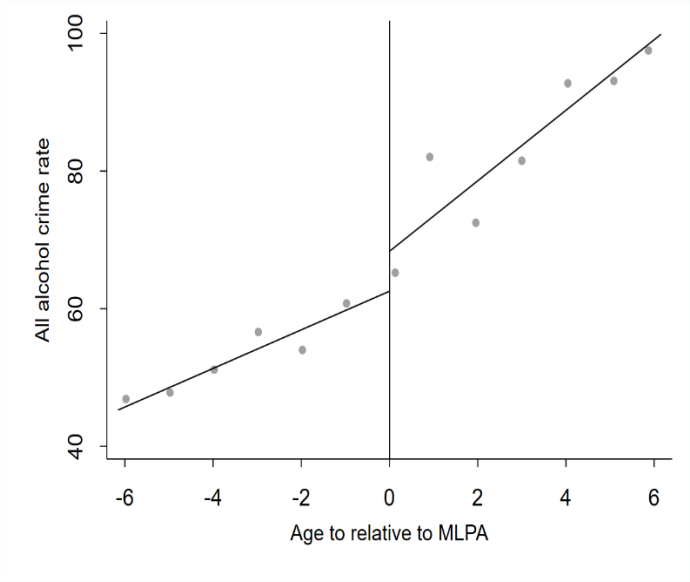
Figure 5

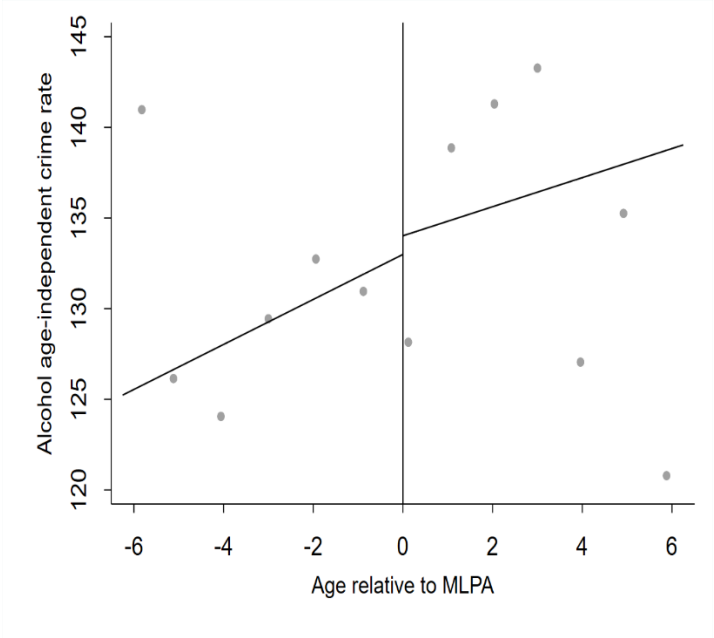
Linear regression discontinuity plots of alcohol-related crimes

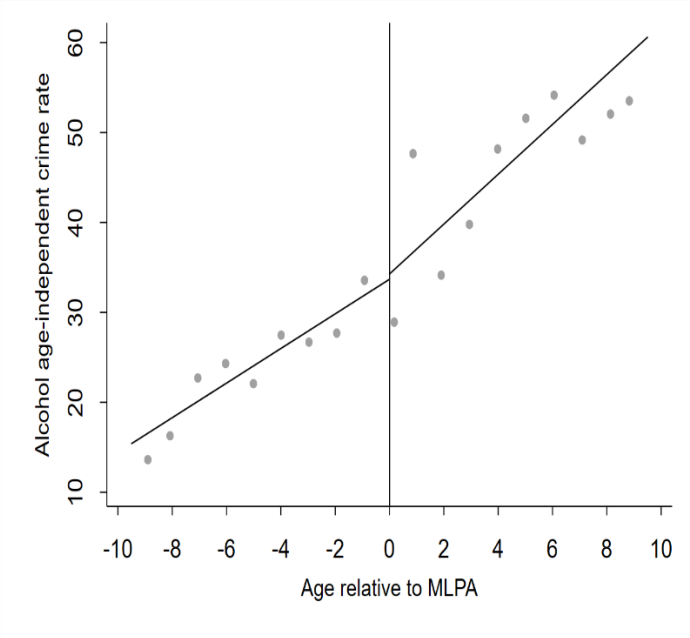
MLPA-20 – (1994-1998 sample)



MLPA-18 – (2014-2018 sample)





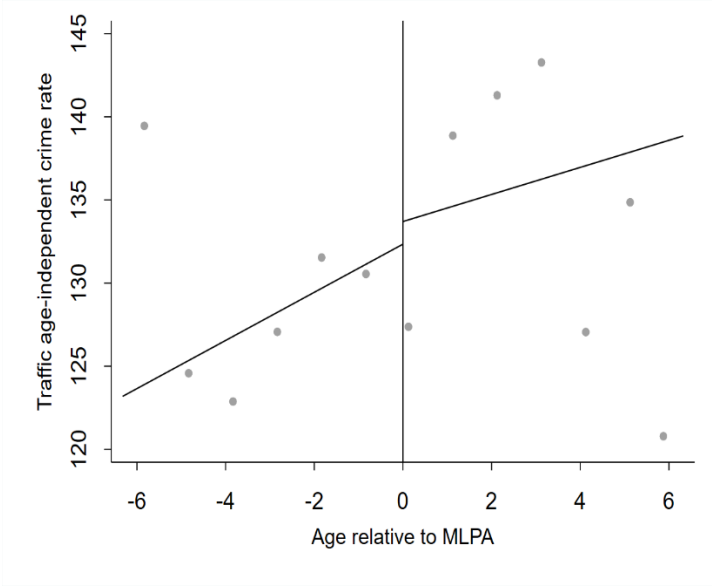


Note: The above RD plots are generated from the linear RD specifications. The corresponding RD estimates are presented in columns (1) & (2) of Panel A.1 and Panel B.1

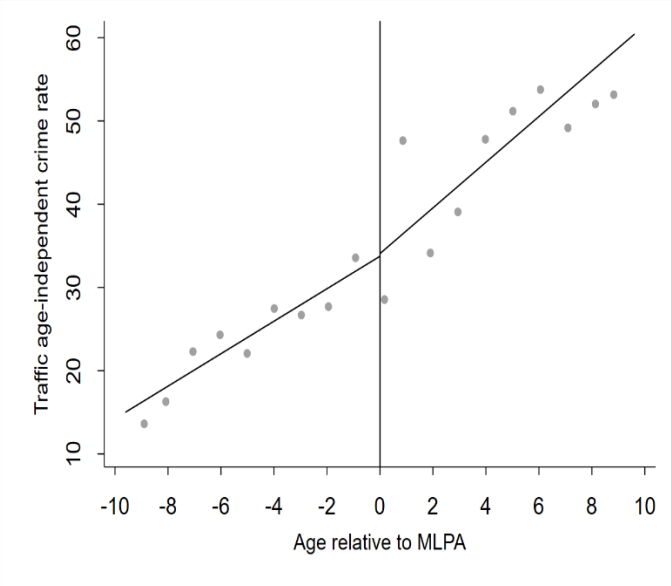
Figure 6

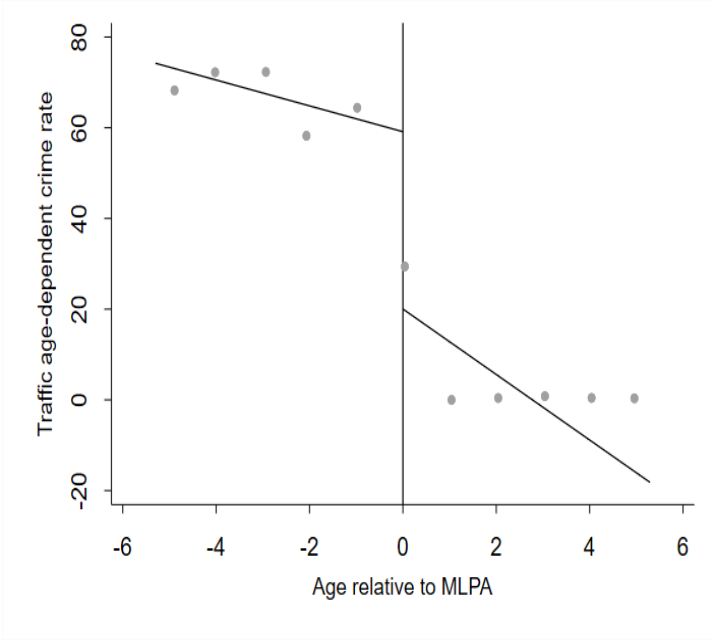
Linear regression discontinuity plots of alcohol-related crimes

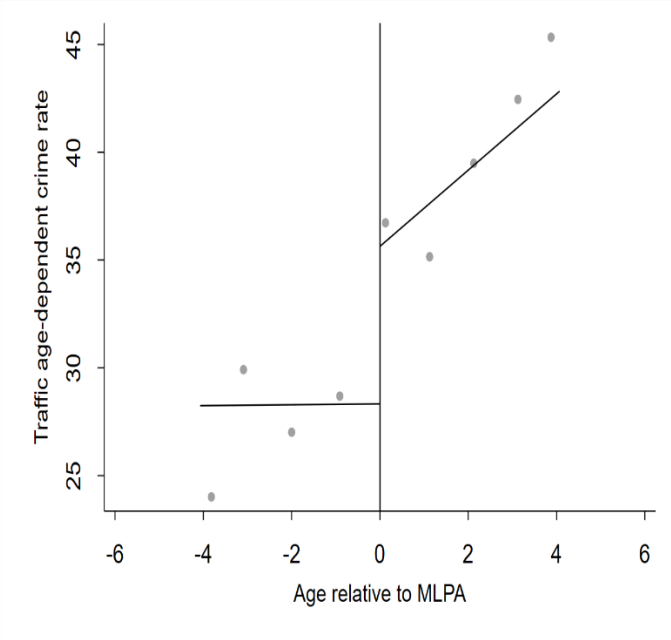
MLPA-20 – (1994-1998 sample)



MLPA-18 – (2014-2018 sample)







Note: The above RD plots are generated from the linear RD specifications. The corresponding RD estimates are presented in columns (3) & (4) of Panel A.1 and Panel B.1

Table 5

MLPA-18 analysis using alternative data and period

Conviction rate (*per 100,000 population*) -	All alcohol	All alcohol age-independent	Traffic age-independent	Traffic age-dependent
Panel A – NZ Police Offence data	(1)	(2)	(3)	(4)
Sample mean just under MLPA	55.737	26.593	26.031	28.634
Alcohol purchasing right (MLPA)	2.343	-3.890	-3.520	7.512***
	(4.831)	(5.795)	(5.372)	(2.238)
Total age-time cells	4380	4380	4380	4380
Effective observations < MLPA	360	480	480	240
Effective observations >= MLPA	420	540	540	300
MSE-optimal bandwidth (-|+)	6.24	8.20	8.47	4.60
Panel B – MoJ data 2002-2006				
Sample mean just under MLPA	241.253	145.186	93.553	98.683
Alcohol purchasing right (MLPA)	14.466	4.097	5.670	12.008**
	(20.563)	(12.745)	(8.440)	(6.013)
Total age-time cells	4380	4380	4380	4380
Effective observations < MLPA	180	180	240	300
Effective observations >= MLPA	240	240	300	360
MSE-optimal bandwidth (-|+)	3.82	3.62	4.05	5.90

Note: The above table report bias-corrected RD estimates with robust standard errors (reported in parentheses), which are clustered on the age (in months). A triangular kernel is used to construct local polynomial estimators. (-|+): Refers to optimal bandwidth below and above the MLPA. Mean squared error-optimal bandwidths are chosen following CCT (2014). Models include controls for gender, ethnicity, and time fixed effects. The sample means of the dependent variables "just under MLPA" were computed based on the selected optimal bandwidth below the drinking age threshold. *, **, and *** signify statistical significance at the 10, 5, and 1 percent-levels, respectively.

Table 6

Testing discontinuity in additional life events at MLPA

	Partnership	Studying	Employment	Moving out
Panel A – Discontinuity at age 18	(1)	(2)	(3)	(4)
Sample mean just under 18	0.027	0.774	0.315	0.013
18th Birthday month	0.001	-0.041**	0.024***	0.008***
	(0.003)	(0.020)	(0.007)	(0.001)
Total sample size (ages 16-22)	276507	276507	276507	276507
Effective observations < MLPA	45045	45045	45045	45045
Effective observations >= MLPA	41118	41118	41118	41118
Panel B – Discontinuity at age 20				
Sample mean just under 20	0.108	0.530	0.513	0.179
20th Birthday month	-0.001	-0.011	0.002	-0.015
	(0.008)	(0.014)	(0.006)	(0.011)
Total sample size (ages 16-22)	276507	276507	276507	276507
Effective observations < MLPA	40434	40434	40434	40434
Effective observations >= MLPA	44511	44511	44511	44511

Note: The above table report bias-corrected RD estimates with robust standard errors (reported in parentheses), which are clustered on the age (in months). A triangular kernel is used to construct local polynomial estimators. The data used for the above analysis is based on Census 2013 that incorporates information on all NZ residents who were residing in the country on March 5, 2013. See http://archive.stats.govt.nz/Census/2013-census.aspx#gsc.tab=0 for further details (Retrieved on January 14, 2020). A triangular kernel is used to construct local polynomial estimators. The age bandwidth selected for estimation was 12 months (below and above current MLPA). However, results do not vary in specifications that were estimated using mean squared error-optimal bandwidths chosen following CCT (2014). All models control for gender, ethnicity, education, and family income (see Appendix Table A.4 for descriptive information). For single-individual household, we use personal income information as measure of family income. *, **, and *** signify statistical significance at the 10, 5, and 1 percent-levels, respectively.

Table 7

Regression Discontinuity- All other crimes

	Sex & Violence	Against justice	Burglary & theft	Dangerous acts	Drug	Fraud & Deception	Property damage	Public order	Traffic (other)	Weapon
Panel A – 1994-1998 sample	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Sample mean just under 20	117.282	208.690	239.747	151.741	99.104	56.459	84.496	153.995	134.754	27.454
MLPA 20	13.952	-9.287	-8.674	0.498	1.462	-0.434	-2.686	17.541**	9.882**	-2.535
	(9.289)	(11.884)	(10.809)	(7.300)	(4.328)	(4.113)	(6.113)	(6.901)	(4.777)	(3.074)
Total age-time cells	4380	4380	4380	4380	4380	4380	4380	4380	4380	4380
Effective observations < MLPA	360	480	360	420	240	480	300	300	420	420
Effective observations >= MLPA	420	540	420	480	300	540	360	360	480	480
MSE-optimal bandwidth (-|+)	6.23	8.78	6.98	7.94	4.37	8.66	5.84	5.40	7.78	7.51
Panel B – 2014-2018 sample	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Sample mean just under 20	68.848	104.638	120.650	46.608	13.419	7.467	39.505	33.109	84.721	13.004
MLPA 18	-4.029	-1.110	-9.676*	12.509**	-2.624	0.357	10.909***	6.261**	5.735	2.588
	(5.943)	(5.379)	(5.051)	(5.820)	(1.869)	(1.187)	(2.400)	(2.503)	(4.521)	(2.233)
Total age-time cells	4380	4380	4380	4380	4380	4380	4380	4380	4380	4380
Effective observations < MLPA	360	480	360	420	240	480	300	300	300	420
Effective observations >= MLPA	420	540	420	480	300	540	360	360	360	480
MSE-optimal bandwidth (-|+)	6.23	8.78	6.98	7.94	4.37	8.66	5.84	5.40	5.40	7.51

Note: The above table report bias-corrected RD estimates with robust standard errors (reported in parentheses), which are clustered on the age (in months). A triangular kernel is used to construct local polynomial estimators. (-|+): Refers to optimal bandwidth below and above the MLPA. Mean squared error-optimal bandwidths are chosen following CCT (2014). Models include controls for gender, ethnicity, and time fixed effects. The crime categories have been constructed based on broad ANZOC and all measures exclude the alcohol-related crimes used in our main analysis so that the estimated impact of MLPA on additional measures of crime are not confounded by the alcohol-related convictions analyzed in Table 4. For example – The "Traffic (other)" category includes traffic violations for which the most detailed offence classification (used to construct our main outcome variable) did not indicate any involvement of alcohol (e.g. speeding or parking violations). For the category 'Sex & Violence', to ensure sufficient sample size, we combine the ANZSOC indicators of "Homicide and related offences"; "Acts to cause injury"; "Sexual assault"; "Abduction and harassment"; and "Robbery and extortion". Similarly, for "Burglary & theft", we combine "Unlawful entry with intent/burglary, break and enter" and "Theft and related offences". *, **, and *** signify statistical significance. We exclude non-identified offences from our analysis which are identified under ANZSOC as "Miscellaneous offences". The sample means of the dependent variables "just under MLPA" were computed based on the selected optimal bandwidth below the drinking age threshold. *,**, and *** signify statistical significance at the 10, 5, and 1 percent-levels, respectively.

APPENDIX

Table A.1

Falsification analysis using alternative age cut-offs

	6 months pre-MLPA			6 months post-MLPA		
Alcohol consumption measure:	Any drinking (past year)	Monthly alcohol consumption	Binge-drinking (past year)	Any drinking (past year)	Monthly alcohol consumption	Binge-drinking (past year)
Panel A – NZHS (2011-2016)	(1)	(2)	(3)	(4)	(5)	(6)
Alcohol purchasing right (MLPA)	-0.000	0.023	-1.436	-0.038	-0.087	-3.626
	(0.041)	(0.058)	(1.138)	(0.044)	(0.072)	(2.993)
Total age-time cells (16-22)	4563	4180	4159	4563	4180	4159
Effective observations < MLPA	604	552	551	630	572	573
Effective observations >= MLPA	699	637	638	706	640	635
MSE-optimal bandwidth (-|+)	12.00	12.00	12.00	12.00	12.00	12.00

Panel B – MLPA 20 (1994-1998)	6 months pre-MLPA		6 months post-MLPA	
Crime rate (per 100,000 population)	All alcohol	All alcohol age-independent	All alcohol	All alcohol age-independent
Alcohol purchasing right (MLPA)	-5.168	9.254	-8.183	1.656
	(8.920)	(7.360)	(9.360)	(8.719)
Total age-time cells (16-22)	4380	4380	4380	4380
Effective observations < MLPA	300	360	240	300
Effective observations >= MLPA	360	420	300	360
MSE-optimal bandwidth (-|+)	5.51	6.93	4.27	5.29

Panel C – MLPA 18 (2014-2018)	6 months pre-MLPA		6 months post-MLPA	
Crime rate (per 100,000 population)	All alcohol	All alcohol age-independent	All alcohol	All alcohol age-independent
Alcohol purchasing right (MLPA)	-11.253***	-0.152	-3.799	-4.062
	(2.757)	(2.799)	(4.257)	(4.124)
Total age-time cells (16-22)	4380	4380	4380	4380
Effective observations < MLPA	180	480	300	300
Effective observations >= MLPA	240	540	360	360
MSE-optimal bandwidth (-|+)	3.53	8.78	5.49	5.61

Note: The above table report bias-corrected RD estimates with robust standard errors (reported in parentheses), which are clustered on the age (in months). A triangular kernel is used to construct local polynomial estimators. Mean squared error-optimal bandwidths are chosen following CCT (2014). Models include controls for gender, ethnicity and time fixed effects. *, **, and *** signify statistical significance at the 10, 5, and 1 percent-levels, respectively. (-|+): Refers to optimal bandwidth below and above the relevant age-cutoff.

Table A.2

Testing RD results using alternative bandwidth selection methods

Panel A – (1994-1998)	Method MSE-2	Method MSE-Sum	Method CER-Optimal	Method CER-2	Method CER-Sum
	(1)	(2)	(3)	(4)	(5)
A.1 Dependent variable: *All alcohol-related crime rate*					
MLPA 20	-38.452***	-36.928***	-38.178***	-41.126***	-39.582***
	(5.7683)	(7.0600)	(6.439)	(5.059)	(6.789)
Total age-time cells (16-22)	4380	4380	4380	4380	4380
Effective observations < MLPA	420	420	240	300	300
Effective observations >= MLPA	420	480	300	360	360
MSE-optimal bandwidth (-)	7.33	7.01	4.38	5.91	5.65
MSE-optimal bandwidth (+)	6.66	7.01	4.38	5.37	5.65
A.2 Dependent variable: *All alcohol-related age- independent crime rate*					
MLPA 20	1.490	-0.081	-1.616	-1.940	-1.603
	(4.530)	(5.203)	(5.268)	(4.322)	(5.325)
Total age-time cells (16-22)	4380	4380	4380	4380	4380
Effective observations < MLPA	360	360	300	300	240
Effective observations >= MLPA	420	420	360	300	300
MSE-optimal bandwidth (-)	6.87	6.08	5.05	5.54	4.91
MSE-optimal bandwidth (+)	6.09	6.08	5.05	4.92	4.91
Panel B – (2014-2018)					
B.1 Dependent variable: *All alcohol-related crime rate*					
MLPA 18	4.891	5.001	4.786	2.281	4.797
	(4.932)	(4.297)	(4.130)	(5.012)	(4.312)
Total age-time cells (16-22)	4380	4380	4380	4380	4380
Effective observations < MLPA	180	420	240	180	360
Effective observations >= MLPA	600	480	300	480	420
MSE-optimal bandwidth (-)	3.93	7.46	4.97	3.17	6.02
MSE-optimal bandwidth (+)	9.73	7.46	4.97	7.85	6.02
B.2 Dependent variable: *All alcohol-related age- independent crime rate*					
MLPA 18	-0.997	-1.497	-1.313	-1.620	-1.297
	(5.014)	(5.362)	(5.462)	(5.211)	(5.458)
Total age-time cells (16-22)	4380	4380	4380	4380	4380
Effective observations < MLPA	300	600	420	240	480
Effective observations >= MLPA	900	660	480	720	540
MSE-optimal bandwidth (-)	5.75	10.05	7.68	4.64	8.11
MSE-optimal bandwidth (+)	14.63	10.05	7.68	11.80	8.11

Note: The above table report bias-corrected RD estimates with robust standard errors (reported in parentheses), which are clustered on the age (in months). A triangular kernel is used to construct local polynomial estimators. To test consistency of our main findings (reported in Table 4), we trial RD specifications with alternative bandwidth selection methods as developed by CCT (2017) based on recommendations by Imbens & Kalyanaraman (2014) and CCT (2014; 2015). While our main analysis relies on mean squared error-optimal bandwidth, the alternative bandwidth selection procedures we trial in the above table include 1) two different MSE-optimal bandwidth selectors above and below the MLPA cutoff (MSE-2); 2) a common MSE-optimal bandwidth selector for the sum of regression estimates (MSE-Sum); 3) CER-optimal bandwidth selector (CER-optimal); 4) two different CER-optimal bandwidth selectors above and below the MLPA cutoff (CER-2); and 5) a common CER-optimal bandwidth selector for the sum of regression estimates (CER-Sum). *, **, and *** signify statistical significance at the 10, 5, and 1 percent-levels, respectively.

Table A.3

Additional RD specifications with alternative sets of covariates

Crime rate (*per 100,000 population*)	All alcohol	All alcohol age-independent	Traffic age-independent	Traffic age-dependent
Panel A – No Covariates	(1)	(2)	(3)	(4)
MLPA20 sample (1994-1998)				
Alcohol purchasing right (MLPA)	-39.805***	0.034	0.623	-35.372***
	(6.547)	(5.138)	(5.196)	(7.736)
Total age-time cells (16-22)	4380	4380	4380	4380
Effective observations < MLPA	300	360	360	300
Effective observations >= MLPA	360	420	420	360
MSE-optimal bandwidth (-|+)	5.46	6.17	6.22	5.30
MLPA18 sample (2014-2018)				
Alcohol purchasing right (MLPA)	4.224	-1.184	-1.457	7.866***
	(4.149)	(5.397)	(5.469)	(2.496)
Total age-time cells	4380	4380	4380	4380
Effective observations < MLPA	360	540	540	240
Effective observations >= MLPA	420	600	600	300
MSE-optimal bandwidth (-|+)	6.17	9.52	9.64	4.02
Panel B – Census-linked sample	(1)	(2)	(3)	(4)
MLPA20 sample (1994-1998)				
Alcohol purchasing right (MLPA)	-38.940***	-6.566	-6.549	-38.570***
	(9.555)	(5.614)	(5.521)	(8.895)
Total age-time cells	4380	4380	4380	4380
Effective observations < MLPA	360	300	300	300
Effective observations >= MLPA	420	360	360	360
MSE-optimal bandwidth (-|+)	6.51	5.41	5.32	5.93
No. of individuals (16-22 years)	**338220** (59.6% of the main analysis sample)			
MLPA18 sample (2014-2018)				
Alcohol purchasing right (MLPA)	2.990	1.323	1.023	3.503*
	(5.150)	(5.429)	(5.511)	(2.174)
Total age-time cells	4380	4380	4380	4380
Effective observations < MLPA	360	660	660	180
Effective observations >= MLPA	420	720	720	240
MSE-optimal bandwidth (-|+)	6.26	11.78	11.99	3.89
No. of individuals (16-22 years)	**438360** (74.4% of the main analysis sample)			

Note: The above table report bias-corrected RD estimates with robust standard errors (reported in parentheses), which are clustered on the age (in months). A triangular kernel is used to construct local polynomial estimators. Mean squared error-optimal bandwidths are chosen following CCT (2014). The Census-linked sample control of (both father and mother) parental academic qualification in addition to gender, ethnicity, and time fixed effects used in our main analysis (in Table 4). *, **, and *** signify statistical significance at the 10, 5, and 1 percent-levels, respectively. (-|+): Refers to optimal bandwidth below and above the MLPA.

Table A.4

Descriptive statistics of NZHS and Census 2013 samples (16-22 years)

	MoH NZHS (2011/12-2015/16)	**Census 2013**
	Mean (SD)	Mean (SD)
Partnership (partnered/married)✓	-	0.098 (0.298)
Employed✓	-	0.438 (0.496)
Moved out✓	-	0.114 (0.318)
Any drinking last year✓	0.789 (0.408)	-
Monthly consumption (number of drinks)	18.529 (31.560)	-
Any binge-drinking last year✓	0.568 (0.495)	-
European	0.494 (0.500)	0.545 (0.498)
Māori	0.304 (0.460)	0.083 (0.275)
Pacific Peoples	0.105 (0.307)	0.071 (0.256)
Asian	0.096 (0.295)	0.128 (0.334)
Female	0.524 (0.499)	0.491 (0.500)
School qualification (NCEA Level 1-4)	0.294 (0.455)	0.708 (0.455)
Post-School (NCEA Level 1-4)		0.100 (0.300)
Tertiary (NCEA Level 5-7, Bachelors, and Post-graduate)	0.094 (0.291)	0.022 (0.145)
Income (>50K & <=100K)	0.090 (0.287)	0.242 (0.428)
Income (>100K)	0.089 (0.284)	0.405 (0.491)
Sample size (ages 16-22)	4563	276507

Note: ✓: 0-1 indicators. The 'partner' indicator equals 1 if individual is reported to currently have a partner or in a marital or de-facto relationship. The above table presents descriptive information of NZHS and Census 2013 (16-22 years) samples utilized for analyses presented in Table 2 and Table 6, respectively. The ethnicity indicators are based in prioritized information. Individuals from Middle Eastern/ African/ Latin American region along with other or mixed ethnicities are considered as the omitted category. The education-based indicators in the two samples differ in the way they are coded in respective surveys. For Census 2013, we consider separate categories for school-level and post-school qualification of National Certificate of Educational Achievement (NCEA) levels 1-4. Tertiary education includes individuals who completed NCEA level 5-7, Bachelors' degree, or Post-graduate degree (Honors, Masters, or Doctorate). In the NZHS survey, we only control for two categories of academic qualification, NCEA level 1-4 and Tertiary. In both the samples, no or incomplete schooling is considered as the omitted category. For income information, in Census 2013, we use annual family income and in NZHS we use annual household income. Annual income less than NZD 50,000 or missing values is treated as the omitted category.

Table A.5

Detailed alcohol-related crime classification in the Ministry of Justice data

		Traffic-related		Other categories		Convictions observed in data	
Alcohol offence classifications (Detailed)	**ANZSOC classification**	Age independent	Age dependent	Age independent	Age dependent	1994-1998 (MLPA: 20)	2014-2018 (MLPA: 18)
Driving Under Influence	Dangerous acts	✓					
Driving Causing Injury Through Drink	Dangerous acts	✓					
Driving Causing Injury Through Drink And Drug	Dangerous acts	✓					
Causing Injury Through Excess Breath/Alcohol	Dangerous acts	✓					
Driving Under Influence	Dangerous acts	✓					
Causing Injury Through Excess Blood/Alcohol	Dangerous acts	✓					
Careless Use Causing Injury Through Drink	Dangerous acts	✓					
Driving Under Influence	Dangerous acts	✓					
Driving Under The Influence Of Drink	Dangerous acts	✓					
Driving Under The Influence Of Drink And Drug	Dangerous acts	✓					
In Charge Motor Vehicle Under Influence Drink	Dangerous acts	✓					
In Charge Motor Vehicle Under Influence Drink & Drug	Dangerous acts	✓					
Driving Under Influence Drink/Drug	Dangerous acts	✓					
Driving Under Influence	Dangerous acts	✓					
Cause Bodily Injury Through Drink	Dangerous acts	✓					
Drive Under The Influence Of Drink	Dangerous acts	✓					
Other Drive Under Influence	Dangerous acts	✓					
Attempts To Drive Under Influence	Dangerous acts	✓					
Attempts To Drive Und Infl. drink	Dangerous acts	✓					
Other Attempts To Drive Und Influence	Dangerous acts	✓					
In Charge Under Influence	Dangerous acts	✓					
In Charge Under Influence Drink	Dangerous acts	✓					
Other In Charge Under Influence	Dangerous acts	✓					
Driving Under The Influence Of Drink Or Drug	Dangerous acts	✓					
Driving Under The Influence Of Drink	Dangerous acts	✓				✓	✓
Cause Injury While Under Influence Of Drink	Dangerous acts	✓				✓	✓
Excess Breath Alcohol Causing Injury	Dangerous acts	✓				✓	✓
Driving Under The Influence Of Drink/Drug Or Both	Dangerous acts	✓				✓	✓
Cause Injury While Under Influence Of Drink/Drug	Dangerous acts	✓				✓	✓
Aggravated Careless (Under Influenced) Causing Death/Injury	Dangerous acts	✓					
Aggravated careless (under influence) causing injury	Dangerous acts	✓					✓
Drove Under Influence Drink Or Drugs - 3Rd Or Subsequent	Dangerous acts	✓					✓
Cause Injury Driving Excess Blood Alcohol	Dangerous acts	✓				✓	✓
Excess Blood Alcohol Causing Injury - 3Rd Or Subsequent	Dangerous acts	✓					✓
Aids/Permits To Drive While Under Influence Drink	Dangerous acts			✓		✓	
Excess Breath Alcohol Causing Injury	Dangerous acts	✓				✓	✓

Table A.5 (continued): Detailed alcohol-related crime classification in the Ministry of Justice data

		Traffic-related		Other categories		Convictions observed in data	
Alcohol offence classifications (Detailed)	**ANZSOC classification**	Age independent	Age dependent	Age independent	Age dependent	1994-1998 (MLPA: 20)	2014-2018 (MLPA: 18)
Aid/Permit To Drive While Und Influence Drink/Drug	Dangerous acts			✓		✓	
Excess Breath Alcohol Causing Injury - 3Rd Or Subsequent	Dangerous acts	✓					✓
Transport Service Driver Under The Influence Of Drink	Dangerous acts	✓					
In Charge Transport Service Vehicle Under Influence Of Drink Causing Injury	Dangerous acts	✓					
Excess Breath Alcohol Causing Injury - In Charge Transport Service Vehicle	Dangerous acts	✓					
Drove In Transport Service Under The Influence Of Drink/Drug Or Both	Dangerous acts	✓					
In Charge Transport Service Vehicle Under Influence Drink/Drug Causing Injury	Dangerous acts	✓					
Aggravated Careless (Under Influence) Causing Death/Injury- Transport Service	Dangerous acts	✓					
Drove In Transport Service Under Influence Drink Or Drug - 3Rd Or Subsequent	Dangerous acts	✓					
Excess Blood Alcohol Causing Injury - In Charge Transport Service Vehicle	Dangerous acts	✓					
Aid/Permit Transport Service Driver To Drive While Under Influence Of Drink	Dangerous acts			✓			
Aid/Permit To Drive In Transport Service While Under Influence Of Drink/Drug	Dangerous acts			✓			
Transport Service Driver Excess Breath Alcohol Causing Injury - 3Rd Or Subs	Dangerous acts	✓					
Transport Service Driver Excess Blood Alcohol Causing Injury - 3Rd Or Sub	Dangerous acts	✓					
Aided Transport Driver Under 20 To Drive - Blood Alcohol Over 30 mcg	Dangerous acts			✓			
Aided Transport Driver Under 20 To Drive - Blood Alcohol 30mgm Or Less	Dangerous acts			✓			
Aided Transport Driver Under 20 To Drive - Breath Alcohol Over 150mcg	Dangerous acts			✓			
Aided Transport Driver Under 20 To Drive - Breath Alcohol 150mcg Or Less	Dangerous acts			✓			
Aggravated Careless Under Influence Caused Injury - Transport Service	Dangerous acts	✓					
Careless Driving Alcohol Involved Causing Injury	Dangerous acts	✓					
Careless Driving Alcohol Involved Cause Injury	Dangerous acts	✓				✓	
Careless Driving Drink/Drug Involved Cause Injury	Dangerous acts	✓				✓	
Causing Injury Driving With Excess Blood Alcohol Level	Dangerous acts	✓					
Driving Causing Death Through Drink	Homicide	✓				✓	
Driving Causing Death Through Drink And Drug	Homicide	✓					
Causing Death Through Excess Breath/Alcohol	Homicide	✓					
Causing Death Through Excess Blood/Alcohol	Homicide	✓					
Careless Use Causing Death Through Drink	Homicide	✓					
Cause Death Through Drink	Homicide	✓					
Cause Death While Under Influence Of Drink	Homicide	✓				✓	✓
Excess Breath Alcohol Causing Death	Homicide	✓				✓	✓
Cause Death While Under Influence Of Drink/Drug	Homicide	✓				✓	✓
Aggravated careless (under influence) causing death	Homicide	✓					✓
Causing Death Driving Excess Blood Alcohol	Homicide	✓				✓	✓
Excess Blood Alcohol Causing Death - 3Rd Or Subsequent	Homicide	✓					
Excess Breath Alcohol Causing Death - 3Rd Or Subsequent	Homicide	✓					

Table A.5 (continued): Detailed alcohol-related crime classification in the Ministry of Justice data

		Traffic-related		Other categories		Convictions observed in data	
Alcohol offence classifications (Detailed)	**ANZSOC classification**	Age independent	Age dependent	Age independent	Age dependent	1994-1998 (MLPA: 20)	2014-2018 (MLPA: 18)
In Charge Transport Service Vehicle Under Influence Of Drink Causing Death	Homicide	✓					
Excess Breath Alcohol Causing Death - In Charge Transport Service Vehicle	Homicide	✓					
In Charge Transport Service Vehicle Under Influence Drink/Drug Causing Death	Homicide	✓					
Excess Blood Alcohol Causing Death - In Charge Transport Service Vehicle	Homicide	✓					✓
Transport Service Driver Excess Breath Alcohol Causing Death - 3Rd Or Subs	Homicide	✓					
Transport Service Driver Excess Blood Alcohol Causing Death - 3Rd Or Sub	Homicide	✓					
Aggravated Careless Under Influence Caused Death - Transport Service	Homicide	✓					
Careless Driving Alcohol Involved Causing Death	Homicide	✓					
Careless Driving Alcohol Involved Cause Death	Homicide	✓				✓	
Careless Driving Drink/Drug Involved Cause Death	Homicide	✓				✓	
Other Offences Alcoholism & Drug Addiction Act	Miscellaneous			✓			
Liquor Offences	Public order			✓			
Minors Re Liquor	Public order			✓			
Minor Purchasing Liquor	Public order				✓		
Minor Found In Bar	Public order				✓		
Minor Possess Liquor In Public For Consumption	Public order				✓		
Minor Consumes Liquor In Public Place	Public order				✓		
Illegal Use Of Premises For Liquor	Public order			✓			
Found Unlawfully Possess Liquor On Unlicensed Premises	Public order			✓			
Liquor In Vicinity Of Dance Hall	Public order			✓			
Purchase/Consume Liquor On Premises After Hours	Public order			✓			
Behave Violent/Disorderly Manner In Bar	Public order			✓			
Miscellaneous Liquor Offences	Public order			✓			
Consume/Possess Liquor For Consumption Public Convey.	Public order			✓			
Other Miscellaneous Liquor Offences	Public order			✓			
Employees Liquor Offences	Public order			✓			
Other Employees Liquor Offences	Public order			✓			
Other Liquor Offences	Public order			✓			
Drunkenness	Public order			✓			
Drunk And Disorderly	Public order			✓			
Found Drunk In Public Place	Public order			✓			
Other Drunkenness Offences	Public order			✓			
Alcohol Offences	Public order			✓			
Offences Re Minor - Liquor	Public order			✓			
Minor Purchases Liquor	Public order				✓	✓	
Minor Drink/Consume Liquor In Public Place	Public order				✓	✓	

Table A.5 (continued): Detailed alcohol-related crime classification in the Ministry of Justice data

		Traffic-related		Other categories		Convictions observed in data	
Alcohol offence classifications (Detailed)	**ANZSOC classification**	Age independent	Age dependent	Age independent	Age dependent	1994-1998 (MLPA: 20)	2014-2018 (MLPA: 18)
Supply Alcohol To Minor	Public order			✓			✓
Other Minor Liquor Offences	Public order			✓		✓	
Unlicensed Premises Liquor Offences	Public order			✓			
Other Unlicensed Premises Liquor Offences	Public order			✓		✓	
Miscellaneous Liquor Offences	Public order			✓			
Breach Of Liquor Ban Local Government	Public order			✓			✓
Drinking In A Public Place	Public order			✓			
Drinking In A Vehicle Carrying Passengers For Reward	Public order			✓			
Other Miscellaneous Liquor Offences	Public order			✓		✓	✓
Trespass Alcoholism And Drug Addiction Act	Public order			✓			
Person Under 18 Purchases Liquor	Public order				✓		
Person Under 18 Drank Liquor Public Place	Public order				✓		
Person Under 18 Had Liquor Public Place	Public order				✓		
Person Under 18 Purchased Liquor	Public order				✓		
Under 18 Without Parent/Guardian In A Public Place Drinking Alcohol	Public order				✓		
Under 18 Without Parent/Guardian Has Alcohol To Consume In Public Place	Public order				✓		
Person Under Purchase Age Bought Alcohol	Public order				✓		
Consumed Alcohol In An Alcohol Banned Area	Public order			✓			
Brought Alcohol Into An Alcohol Banned Area	Public order			✓			
Possessed Alcohol In An Alcohol Banned Area	Public order			✓			
Drove With Excess Breath/Alcohol	Traffic	✓					
Drove With Excess Blood Alcohol	Traffic	✓					
Licensed Person Driving Excess Blood Alcohol Level	Traffic	✓					
Unlicensed Person Driving Excess Blood Alcohol Level	Traffic	✓					
Licensed Person Driving Excess Breath Alcohol Level	Traffic	✓					
Unlicensed Person Drive Excess Breath Alcohol Level	Traffic	✓					
Drive With Excess Blood Alcohol	Traffic	✓					
Drive With Excess Breath Alcohol	Traffic	✓					
Attempts To Drive With Ex Bl Alcohol	Traffic	✓					
Attempt Drive Excess Breath Alcohol	Traffic	✓					
Alcohol Interlock Licence Holder Offended In Relation To Interlock Device	Traffic	✓					✓
Other Person Offended In Relation To An Alcohol Interlock Device	Traffic	✓					
Alcohol Interlock Licensee's Breath Contained Alcohol - Not Over 400 mcgs	Traffic	✓					
Zero Alcohol Licensee's Breath Contained Alcohol - Not Over 400 mcgs	Traffic	✓					✓
Alcohol Interlock Licensee's Blood Contained Alcohol - Not Over 80 mcgs	Traffic	✓					✓
Zero Alcohol Licensee's Blood Contained Alcohol - Not Over 80 mcgs	Traffic	✓					✓

Table A.5 (continued): Detailed alcohol-related crime classification in the Ministry of Justice data

		Traffic-related		Other categories		Convictions observed in data	
Alcohol offence classifications (Detailed)	**ANZSOC classification**	Age independent	Age dependent	Age independent	Age dependent	1994-1998 (MLPA: 20)	2014-2018 (MLPA: 18)
Alcohol Interlock Licensee's Breath Contained Alcohol - Over 400 mcgs	Traffic	✓					✓
Zero Alcohol Licensee's Breath Contained Alcohol - Over 400 mcgs	Traffic	✓					✓
Alcohol Interlock Licensee's Blood Contained Alcohol - Over 80 mcgs	Traffic	✓					✓
Zero Alcohol Licensee's Blood Contained Alcohol - Over 80 mgms	Traffic	✓					✓
Alcohol Interlock Licensee's Breath Contained Alcohol - not over 250mcgs	Traffic	✓					✓
Zero Alcohol Licensee's Breath Contained Alcohol - not over 250mcgs	Traffic	✓					✓
Alcohol Interlock Licensee's Blood Contained Alcohol - not over 50mgms	Traffic	✓					
Zero Alcohol Licensee's Blood Contained Alcohol - not over 50mgms	Traffic	✓					✓
Alcohol Interlock Licensee's Breath Contained Alcohol - over 250mcgs	Traffic	✓					✓
Zero Alcohol Licensee's Breath Contained Alcohol - over 250mcgs	Traffic	✓					✓
Alcohol Interlock Licensee's Blood Contained Alcohol - over 50mgms	Traffic	✓					
Zero Alcohol Licensee's Blood Contained Alcohol - over 50mgms	Traffic	✓					✓
Blood Alcohol Offences	Traffic	✓					
Driving With Excess Blood Alcohol Level	Traffic	✓				✓	
Driving With Excess Blood Alcohol Concentration	Traffic	✓					
Driving With Excess Blood Alcohol Level Exceeds 200	Traffic	✓					
Aid/Permit Driving With Excess Blood Alcohol	Traffic			✓			
Licensed Person With Excess Blood Alcohol Level	Traffic	✓				✓	
Unlicensed Person Driving Excess Blood Alcohol	Traffic	✓				✓	
Driving With Excess Blood Alcohol Content	Traffic	✓				✓	✓
Person Under 20 Years Exceeded Blood Alcohol Limit	Traffic		✓			✓	
Aided Person Under 20 To Exceed Blood Alcohol Limit	Traffic			✓			
Person Under 20's Blood Contained Alcohol - Over 30 mgm	Traffic		✓				✓
Aided Person Under 20 To Drive - Blood Contained Alcohol - Over 30 mgm	Traffic			✓			
Person Under 20's Blood Contained Alcohol - 30mgm or Less	Traffic		✓				
Aided Person Under 20 To Drive - Blood Contained Alcohol - 30mgm Or Less	Traffic			✓			
Drove With Excess Blood Alcohol 3Rd Or Subsequent	Traffic	✓					✓
Blood Alcohol Level Exceeded 50mgm but not more than 80mgm	Traffic		✓				
Aided Person With Blood Alcohol Level Over 50mgm but not more than 80mgm	Traffic			✓			
Blood Alcohol Level Exceeded 50mgm But No More Than 80mgm - Refused EBT	Traffic		✓				
Aided Person With Alcohol Level Over 50mgm - Not Over 80mgm - Refused EBT	Traffic			✓			
Driving With Excess Breath Alcohol Level	Traffic	✓				✓	
Unlicensed Person Driving Excess Breath Alcohol	Traffic	✓				✓	
Driving With Excess Breath Alcohol Level Exceeds 1000	Traffic	✓					
Licensed Person Driving With Excess Breath Alcohol Level	Traffic	✓				✓	
Aid/Permit Person To Drive Excess Breath	Traffic			✓		✓	✓

Table A.5 (continued): Detailed alcohol-related crime classification in the Ministry of Justice data

		Traffic-related		Other categories		Convictions observed in data	
Alcohol offence classifications (Detailed)	**ANZSOC classification**	Age independent	Age dependent	Age independent	Age dependent	1994-1998 (MLPA: 20)	2014-2018 (MLPA: 18)
Aid/Permit Unlicensed Person Drive Excess Breath	Traffic			✓		✓	
Breath alcohol level over 400 mcgs per litre of breath	Traffic	✓				✓	✓
Person Under 20 Years Exceed Breath Alcohol Limit	Traffic		✓			✓	
Aided Person <20 To Exceed Breath Limit	Traffic			✓			
Person Under 20's Blood Contained Alcohol - Over 150mcg	Traffic		✓				✓
Aided Person Under 20 To Drive - Breath Contained Alcohol - Over 150 mcg	Traffic			✓			
Person Under 20's Blood Contained Alcohol - 150 mcg Or Less	Traffic		✓				
Aided Person Under 20 To Drive - Breath Contained Alcohol - 150 mcg Or Less	Traffic			✓			
Breath Alcohol Level Exceeded 250mcgs But Not More Than 400mcgs	Traffic		✓				
Aided Person With Breath Alcohol Level Over 250mcgs But Not Over 400mcgs	Traffic			✓			
Drove With Excess Breath Alcohol 3Rd Or Subsequent	Traffic	✓				✓	✓
Aid/Permit Person To Drive In Transport Service With Excess Blood Alcohol	Traffic			✓			
Drove In Transport Service With Excess Blood Alcohol Content	Traffic	✓					
Transport Service Driver Under 20 Exceeded Blood Alcohol Limit	Traffic		✓				
Drove In Transport Service With Excess Blood Alcohol - 3Rd Or Subsequent	Traffic	✓					
Aid/Permit Person To Drive In Transport Service With Excess Breath Alcohol	Traffic			✓			
Transport Service Driver Breath Alcohol Level Over 400 Mcgs Per Litre	Traffic	✓					
Transport Service Driver Under 20 Exceeded Breath Alcohol Limit	Traffic		✓				
Aided Transport Service Driver Under 20 To Exceed Breath Alcohol Limit	Traffic			✓			
Drove In Transport Service With Excess Breath Alcohol - 3Rd Or Subsequent	Traffic	✓					
Aided Transport Service Driver Under 20 To Exceed Blood Alcohol Limit	Traffic			✓			
Transport Driver Under 20's Blood Contained Alcohol - Over 30 mcg	Traffic		✓				
Transport Driver Under-20's Blood Contained Alcohol - 30mgm Or Less	Traffic		✓				
Transport Driver Under 20 Breath Contained Alcohol - Over 150 mcg	Traffic		✓				✓
Transport Driver Under 20 Breath Contained Alcohol - 150 mcg Or Less	Traffic		✓				
Drove Contrary To An Alcohol Interlock License	Traffic	✓					✓
Drove Contrary To A Zero Alcohol License	Traffic	✓					✓
Learner Driver With Breath Alcohol Level Exceeding 150	Traffic		✓			✓	
Learner Driver With Blood Alcohol Level Exceeding 30	Traffic		✓				
Restricted Driver With Breath Alcohol Level Exceeding 150	Traffic		✓			✓	
Restricted Driver With Blood Alcohol Level Exceeding 30	Traffic		✓			✓	

Notes: The classification text highlighted in red represent crimes that can be classified as age-dependent until December 2014 but becomes age-independent afterwards. See Table 1 for details.

DISCLAIMER

The results in this paper are not official statistics, they have been created for research purposes from the Integrated Data Infrastructure (IDI), managed by Statistics New Zealand. The opinions, findings, recommendations, and conclusions expressed in this paper are those of the authors, not Statistics NZ.

The results are based in part on tax data supplied by Inland Revenue to Statistics NZ under the Tax Administration Act 1994. This tax data must be used only for statistical purposes, and no individual information may be published or disclosed in any other form or provided to Inland Revenue for administrative or regulatory purposes. Any person who has had access to the unit record data has certified that they have been shown, have read, and have understood section 81 of the Tax Administration Act 1994, which relates to secrecy. Any discussion of data limitations or weaknesses is in the context of using the IDI for statistical purposes and is not related to the data's ability to support Inland Revenue's core operational requirements.

Access to the anonymised data used in this study was provided by Statistics NZ in accordance with security and confidentiality provisions of the Statistics Act 1975. Only people authorised by the Statistics Act 1975 are allowed to see data about a particular person, household, business, or organisation, and the results in this paper have been confidentialised to protect these groups from identification. Careful consideration has been given to the privacy, security, and confidentiality issues associated with using administrative and survey data in the IDI. Further detail can be found in the Privacy impact assessment for the Integrated Data Infrastructure available from www.stats.govt.nz.