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COVID-19 restrictions, pub closures, and crime in Oslo, Norway

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ABSTRACT

Alcohol consumption and crime are closely linked and there is often more crime near pubs and bars. Few studies have considered the impact of restricting access to pubs or bars on crime, and the present study aims to provide more insight into this by using the restrictions to combat the COVID-19 pandemic as a natural experiment. In Oslo, Norway, alcohol serving was banned twice during 2020, and at other times during the year, restrictions were placed on how late it could be served. In the present paper, these restrictions are analysed, alongside more general COVID-19 restrictions, to assess their association with crime. To identify these, we employ negative binomial regression models of daily crime counts for nine types of crime adjusted for the day of the week, the week of the year, and the year itself. This is in addition to the presence, or absence, of alcohol-related restrictions and more general COVID-19 restrictions. The findings suggest that both, general restrictions and bans on serving alcohol, reduced crime, although not universally across all crime types and times of the day. When pubs are ordered not to sell alcohol after midnight there appears to be an unexpected increase in crime.

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Introduction

The fact that crime responds to changes in the social environment is clear (Cohen & Felson, 1979; J.H. Boman & Mowen, 2021; Nivette et al., 2021). Few changes to the social environment have been so quick and dramatic as those brought about by the COVID-19 pandemic which has led to nearly 6300000 deaths across the world since 2020 (Dong et al., 2020).[1] Just two years after the pandemic struck the world, there are already dozens of studies on its impact on crime (some examples covering different parts of the world and crime types include Ashby, 2020a; Buil-Gil et al., 2021a; Campedelli et al., 2020; Ceccato et al., 2022; Estévez-Soto, 2021; J. H. Boman & Gallupe, 2020; Mohler et al., 2020; Nivette et al., 2021; Payne et al., 2021; Piquero et al., 2021). However, there has only been a single study from the country of interest in this paper, Norway (Nesset et al., 2021), and only a few from the other Nordic countries (Ceccato et al., 2022; Gerell, 2021).

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Furthermore, while the previous studies focused on how the pandemic generally affected crime patterns, the main focus of this study is on a more specific aspect of COVID-19 and the associated restrictions imposed; namely, the banning or restricting of alcohol sales at pubs and bars.

There is a vast literature on the association between alcohol venues, such as bars and crime (Gerell, 2018; Groff & Lockwood, 2014; Grubesic & Pridemore, 2011; Gruenewald et al., 2006; Roncek & Bell, 1981). The consensus is a positive association where more bars lead to more crime. Studies of interventions to reduce alcohol-related harm however have not been as conclusive, although enforcement of stricter licencing laws has the potential of reducing violence, while the effect of softer measures is less clear (Holder et al., 2000, Treno et al., 2007; Skardhamar et al., 2016). To date, few studies have explicitly focused on the abrupt policy changes regarding alcohol serving resulting from the restrictions to curb the spread of COVID-19. The few studies that exist suggest that crime dropped in public environments, but possibly shifted to domestic situations (Abrams, 2021; Chalfin et al., 2021). The impact of the pandemic on drinking behaviour is more analysed, both theoretically and empirically, but this literature shows somewhat mixed results (Bade et al., 2021; Colbert et al., 2020; Finlay & Gilmore, 2020; Gibbons et al., 2020; Grossman et al., 2020; Rehm et al., 2020; Silverio-Murillo et al., 2020).

The present study will provide further information on the association between venues selling alcohol and crime using the case of Oslo, Norway, which had multiple changes in how pubs and other types of nightlife venues could operate during 2020. We will consider how crime changed when alcohol venues were completely banned from selling alcohol and when they were restricted in the hours they could serve it. We will also provide more general estimates on how COVID-19 restrictions were associated with crime in Oslo. We will assess this using eight different types of crime, in addition to total crime. This can help shed light on the impact of alcohol venues on crime, and on restrictions more generally in a country with few published studies on the topic (Nesset et al., 2021).

Literature review

It is well established that excessive alcohol consumption increases the risk of becoming aggressive and impulsive and thus can make people more prone to crime and particularly violence (Heinz et al., 2011). Likewise, it is well established that there is more crime around pubs and bars than at other locations (Gerell, 2018; Groff & Lockwood, 2014; Grubesic & Pridemore, 2011; Gruenewald et al., 2006; Roncek & Bell, 1981). In part, the association of pubs and bars with crime is due to those locations simply having more people, and thus more offender-victim interactions (Gerell, 2018, 2021). The presence of alcohol though is also likely to be a contributing factor. Pubs and bars are, in general, locations where many people gather, and a new alcohol venue will draw more people to that location. This will itself generate crime, but this is likely exacerbated through the presence of alcohol. Most studies on the topic of alcohol venues and crime are descriptive rather than causal (Chalfin et al., 2021), but a few have a more rigorous design and attempt at causal explanations.

Causal effects of alcohol serving on crime have been discussed in a few studies that estimate the impact of restricting, or the inverse in terms of extending, alcohol sales on crime. In those most related to the current study, analyses from Norway (Rossow &

Norström, 2012) and Iceland (Ragnarsdóttir et al., 2002), suggest longer opening hours are associated with more crime, while a Swedish study found the opposite (Norström et al., 2018). The Swedish increase in opening hours though co-occurred with other crime-preventative efforts which could explain the results. This general pattern of results is also supported by most studies from elsewhere, such as from Australia (e.g. Jones et al., 2009; Kypri et al., 2014) and England (e.g. Newton et al., 2007; Peirce & Boyle, 2011), which generally conclude longer operating hours are linked to more crime or related incidents. That being said, there are exceptions and potentially other factors that can be important, for example, Bellis et al. (2006) suggested longer serving hours led to a significant decrease in assaults while Gray et al. (2000) found restrictions led to a short-term increase, but a long-term overall decrease.

From more general studies, Klick and MacDonald (2021) used the varying length of baseball matches to estimate the causal impact of alcohol sales closing at baseball matches towards the end of a match. They found that alcohol contributes to more crime. Chang and Jacobson (2017) analysed the closure of marijuana dispensaries and found that it increased crime nearby. More importantly for this study, however, they also considered the effect of temporary closures of restaurants and found that when one closes, property crime nearby goes up, especially in areas without many pedestrians. This is suggestive of a deterrent effect from restaurant visitors such that when a restaurant attracts people to an otherwise empty location, there are 'more eyes on the street' (Jacobs, 1961) and an increased risk for offenders. Pubs and bars can have a similarly positive and negative effect on crime. A bar may attract more people, which as bystanders can deter crime, but as potential victims or offenders can increase crime. On average, more people at a location tends to be associated with more crime, but lower crime risk. In other words, there is more crime at locations with more people, but less crime per person (Ceccato et al., 2013; Gerell, 2018, 2021).

There have also been some studies on the alcohol-crime association during the pandemic. Abrams (2021) considers the issue by showing that as Philadelphia entered a lockdown and bars and other establishments closed, violent crime dropped more near bars than elsewhere, which suggests that bars generate crime. Chalfin et al. (2021) argue that restrictions pushed alcohol use towards the home environment, and that, in turn, will increase the risk for domestic violence. Their analysis shows that there was little association between visits to bars or liquor stores with domestic violence before the pandemic, but when the pandemic hit, an association materialized. No such effect was noted for non-domestic violence, however, and the authors argue that the shift in alcohol use towards liquor stores is one of the reasons for the strengthened association of alcohol and domestic violence during the pandemic. Finally, South Africa banned all alcohol sales, and this led to a reduction in alcohol-related trauma but an increase in domestic violence (Matzopoulos et al., 2020).[2] Taken together, these three studies suggest that restricting access to bars during the pandemic may have contributed to less public violence, but more domestic violence.

While few studies have considered how restricting access to bars or alcohol during the pandemic affected crime, there are studies on the impact of the pandemic on drinking behaviour, which show somewhat mixed results. Rehm et al. (2020) consider two theoretical mechanisms that could affect alcohol use during the pandemic. Due to psychological stress and anxiety for the future, alcohol use could be expected to increase. On the other

hand, the reduced availability of alcohol due to restrictions in combination with the changed affordability of alcohol could reduce its use. Divergent empirical findings seem to indicate that both mechanisms may apply. Silverio-Murillo et al. (2020) discuss how alcohol consumption could increase during the pandemic, and in turn, increase domestic violence. However, their data suggests this was not the case, with no change in alcohol consumption in Mexico, which mirrors findings from Argentina (Gibbons et al., 2020, as cited in Silverio-Murillo et al., 2020). Bade et al. (2021) show a significant reduction in alcohol consumption at the beginning of the pandemic using wastewater measurements in Australia. The reduction was most pronounced on weekends. Wastewater measurements are arguably strong indicators of alcohol use, but whether findings from Australia are generalizable is another matter. Other studies have documented how alcohol consumption moved from on-premise to off-premise (homes) in response to COVID restrictions and bar closures (Colbert et al., 2020), that people stocked up on drinks when pubs closed (Finlay & Gilmore, 2020), and how stress, availability, and boredom were key reasons to drink more during the pandemic (Grossman et al., 2020).

COVID-19 and crime

Studies have shown that COVID-19 affected crime more generally, including across crime types. Notably, that crime went down as COVID-related stay-at-home orders and lockdowns began (Abrams, 2021; Campedelli et al., 2021; Estévez-Soto, 2021; Nivette et al., 2021). There is however heterogeneity in the findings, with other studies noting relatively small effects, or only substantial changes for certain crime types (Ashby, 2020a, 2020b; Gerell et al., 2020). Campedelli et al. (2020) shed further light on how crime changed by showing that only a minority of Chicago neighbourhoods saw decreases in crime when the pandemic struck. About 13% of the city neighbourhoods saw reductions in burglaries or robberies, and 23% saw reductions in assaults. Neighbourhoods that saw reductions tended to have a higher population and were less characterized by poverty, compared to neighbourhoods with no significant reduction. Kirchmaier and Villa-Llera (2020) similarly found that vulnerable areas of England and Wales saw larger increases in anti-social behaviour and bicycle thefts during the first wave of the pandemic, and smaller reductions in other crime types.

Another key finding from the literature is that stricter lockdowns are associated with larger decreases in crime (Nivette et al., 2021; Ceccato et al., 2022). This is likely part of the explanation for the discrepancy across findings, with some studies noting small reductions in crime in places with milder restrictions, such as in Sweden which had much fewer restrictions on public life than most other western countries (Yan et al., 2020; Gerell et al., 2020; Ceccato et al., 2021). The research on crime and COVID-19 in addition notes certain types of crime for which the pandemic appears to have led to more crime. This is true for domestic violence (Ivandic et al., 2020; Nesset et al., 2021; Piquero et al., 2021) and cybercrime (Buil-Gil et al., 2021b, 2021a). Increases in these crimes are expected due to changes in routine activities, as people spend more time at home, which could increase domestic violence, and online activity, which could increase cybercrime (Esiner & Nivette, 2020; Buil-Gil et al., 2021b).

Norway is a very similar country to Sweden but it had much stricter COVID-19 restrictions. Studies from Sweden suggest the COVID-19 pandemic had a significant, but relatively small impact on crime (Gerell et al., 2020; Ceccato et al., 2021). Yet, the

only study published on how crime changed in Norway was on domestic violence which showed an increase (Nesset et al., 2021). The current paper aims to shed more light on how crime changed in Oslo, the capital and largest city in Norway, during the pandemic, but with a particular focus on the impact of alcohol-related restrictions.

Design and method

In the present study, we aim to study the association between crime and banning or restricting alcohol sales at pubs, bars, and restaurants in Oslo, Norway, and how this plays out across different crime types. In Oslo in 2020, there were two bans related to the sale of alcohol at pubs and bars. There were also various time-periods with restrictions only allowing alcohol sales until 8.30 pm (and to be finished by 9 pm) and 11.30 pm (to be finished by midnight) respectively. We will also consider the impact of the more general COVID-19 restrictions on crime.

Operationalizing general COVID-19 restrictions

We consider the impact of banning alcohol sales and restricting the times when sales were allowed by using interrupted time-series models of daily crime. We include fixed effects for the day of the week, the week of the year, and the year itself to deal with any long-term trends, seasonal effects, and weekday differences. Since the decisions to ban or restrict alcohol sales are correlated with the spread of COVID-19 and with the other restrictions, we need to adjust our models for the more general restrictions in place. One solution for this, that we use, is the measure of government restrictions maintained by Oxford University: the COVID-19 government response tracker (Hale et al., 2021). This calculates a stringency index that reflects the overall levels of COVID-19 restrictions implemented in a country. It includes several indicators such as the closure of schools and workplaces and restrictions on public gatherings. Importantly for our analyses, and to avoid any further issues of multicollinearity, the Oxford stringency index does not explicitly cover alcohol sales (Phillips & Tatlow, 2021).

The stringency index is measured at the national level such that the whole of Norway is assigned a single value. This value is however dependent on the strictest restrictions implemented in the country and uses an indicator to denote whether the strictest restrictions are regional or national (Phillips & Tatlow, 2021). In the case of Norway, since Oslo always had the strictest restrictions in the country in 2020, Oslo was always determining the overall value for Norway. This means that we can re-calculate the index but account for this indicator to get an accurate measurement of Oslo COVID-19 restrictions. We do this by simply multiplying the value for each restriction in the index for each day and dividing it by the maximum value for the restriction, which generates a value between 0 and 1 for each of the included measurements. The new stringency index is then simply calculated as the mean (Tatlow & Phillips, 2021). The variables included in the stringency index are C1-C8 (school closing; workplace closing; cancel public events; restrictions on gatherings; close public transport; stay at home requirements; restrictions on internal movement;

international travel controls) and H1 (public information campaigns; Tatlow & Phillips, 2021, 2021). These were included as they have been used globally as general indicators of restrictions (Nivette et al., 2021; Tatlow & Phillips, 2021).

Research design

Since our outcome variable is a count variable that tends to be over-dispersed, we fit our models as negative binomial regressions. As outlined above, our main independent variables are dummy variables for the alcohol-related restrictions (0 or 1) and a continuous variable for the general COVID restrictions (any value between 0 and 1). The crime count is our dependent variable. To consider trends, seasons, and weekday differences, we also include dummies for the year (2016–2020), the week of the year (1–53), and the day of the week (Sunday-Saturday) in our models.

Our model thus takes the form:

$$\log(\mu_t) = \beta_0 + \beta_1 Alc_t + \beta_2 O_t + \beta_3 D_t + \beta_4 W_t + \beta_5 Y_t$$

Where μ_t is the number of crimes at date *t*. *Alc* is an indicator for alcohol restrictions, O_t is the stringency index recorded for day *t* in Oslo,*D* is a day of week dummy, *W* is a week of year dummy, and *Y* is a year dummy with data including 2016–2020.

Alc is measured using the following mutually exclusive categories: a) whether alcohol is banned or not, b) whether alcohol is banned after 9 pm or not, and c) whether alcohol is banned after midnight or not. It should be noted that general restrictions are correlated with alcohol restrictions. The closing of pubs and bars, for instance, coincides with some of the strictest general restrictions. The models are fitted for nine different classifications of crime: total, violent, theft, vandalism, order, other, drugs, traffic and fraud. Our models will thus generate estimates of how each of these types of crime changed in relation to changes in alcohol restrictions, having adjusted for year, week of the year, and day of the week.

As our main interest lies with how restrictions to sell alcohol affect crime, we fit an additional model where we exploit the fact that 2020 saw few such restrictions outside of Oslo. We, therefore, add some nearby municipalities that are sufficiently populated such that they will have some nightlife, yet did not have alcohol sales completely banned. These municipalities are Drammen, Asker, Bærum, Lillestrøm, Sarpsborg and Fredrikstad. We then fit a new model which takes the following form:

$$\log(\mu_{it}) = \beta_0 + \beta_1 Alc_{it} + \beta_2 O_{it} + \beta_3 D_{it} + \beta_4 W_{it} + \beta_5 Y_{it} + \beta_6 I_{it}$$

Each component now denotes time *t* at municipality *i*, and *I* represents municipality dummy variables.

To display the trends, we also generate plots of the raw crime counts, for four different time periods: before the first alcohol ban, during the first alcohol ban (March 21st, 2020, to May 6th, 2020), after the first alcohol ban, and during the second alcohol ban (August 13th, 2020, throughout 2020).

Robustness checks

To assess the robustness of the results, we also specify our models in several alternative ways. We run models on only Oslo and on only the other municipalities. In addition, we evaluate whether placebo tests for alcohol bans have an impact by moving the alcohol restrictions 1 year back in time.

Pre-registration

To facilitate transparency, parts of this project were pre-registered at OSF.[3] The data available at this point, however, only cover 2020, not 2021 as pre-registered, and the present study largely only considers Oslo municipality as there was little variation in alcohol bans outside of Oslo in 2020.

Results

We first plot the raw crime data in relation to the two alcohol bans in Oslo. As shown in Figure 1, there is a marked decrease in crime as alcohol venues were closed (blue and cyan), though crime returned to more normal levels when the restrictions were lifted. Although not shown, this is driven by large decreases in violence and theft, while the other crime types had lower volumes and/or smaller changes. This should however not be interpreted as being solely attributable to the ban of alcohol sales as other restrictions also occurred at the same time. We, therefore, analyse the association of both the general restrictions and the alcohol-specific restrictions in regression models to try to tease out the relative contribution of each to the reduction in crime.

We fit models for each of the eight different crime categories and for total crime and we present our overall findings graphically for each of the four tested restriction types. The results related to each type of restriction are plotted in turn and each graph shows the

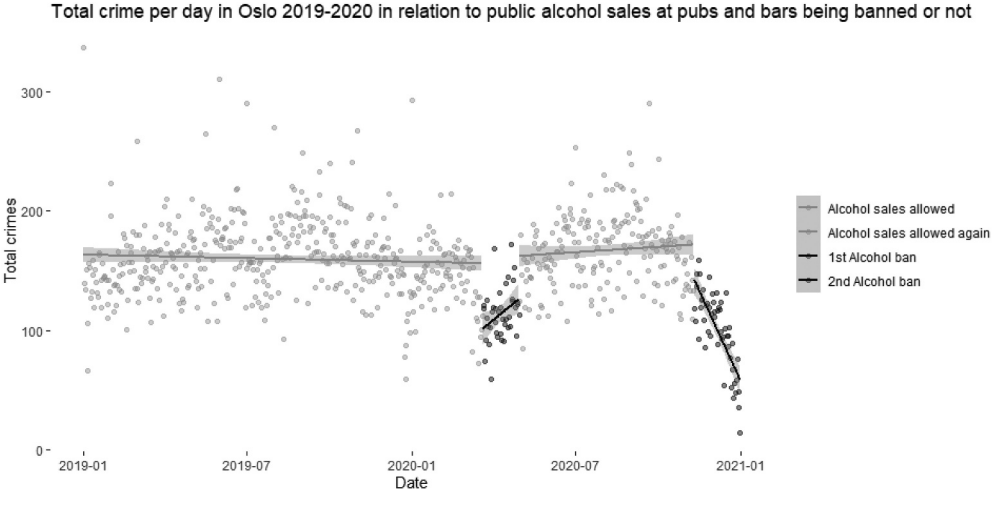

Figure 1. Raw counts of total crime per day in Oslo, 2019–2020 by whether alcohol venues were banned from selling alcohol.

regression coefficients with 95% confidence intervals. These results are net of controls for the other three restriction types, the day of the week, the week of the year, and the year. See Appendix table 1 for a summary of the associated regression coefficients and the following three figures.

Shown in Figure 2 are the regression results regarding the Oxford stringency index. As shown, there are significant negative associations for theft, drug, traffic, order crime and total crime. In effect, for these crime types, there is less crime when there are more restrictions. However, there is a significant increase in vandalism, a non-significant increase in other crime, and violence and fraud have non-significant negative coefficients.

Figure 3 shows the regression coefficients of banning the sale of alcohol from pubs, bars, and restaurants on crime. The results show that the ban, after controlling for any general restrictions, is significantly associated with reductions in theft, violence, vandalism, fraud, and total crime. However, there are significantly more drug crimes when on-premise alcohol sales are banned. One explanation for this is that it could be due to other drugs being used as a substitute for alcohol. Alternatively, it may be because the police have more time when bars are closed and so can spend that time targeting drug offences.

Figure 4 shows that forcing pubs and bars to stop selling alcohol before midnight appears to generally have a positive relationship with crime. When they are open, but close before midnight, theft, drug, traffic and order crime increase. These estimates are adjusted for the Oxford stringency index and so they represent the effect of alcohol restrictions on top of the general restrictions. Here, it seems that the closing of bars at midnight had no preventive effect beyond that of the general restrictions. It should be noted that drug and traffic crimes are largely generated by police activity and so might not reflect actual changes in crime.

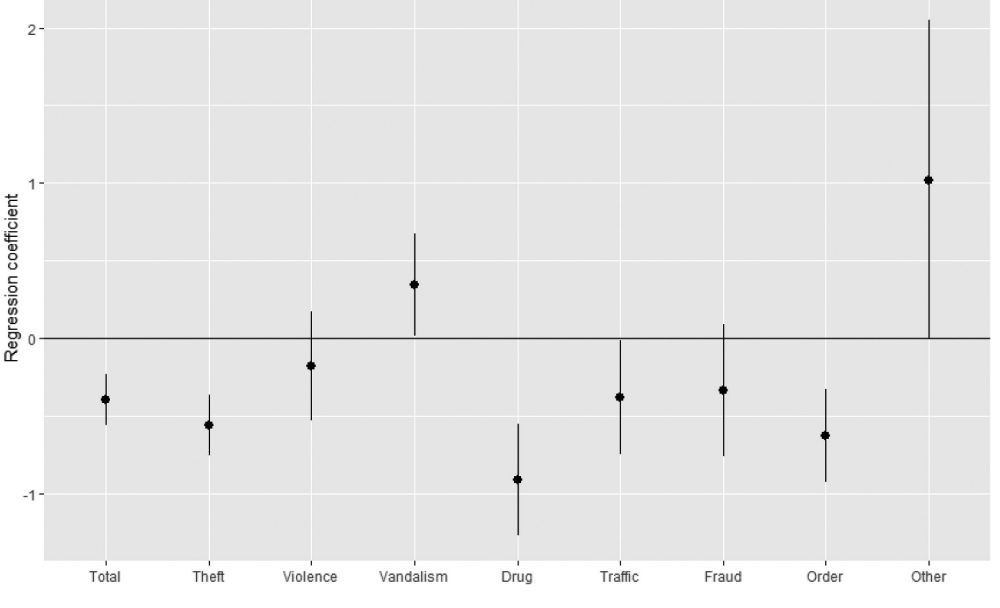

Figure 2. Point estimates and 95% confidence intervals for the association of crime with general restrictions.

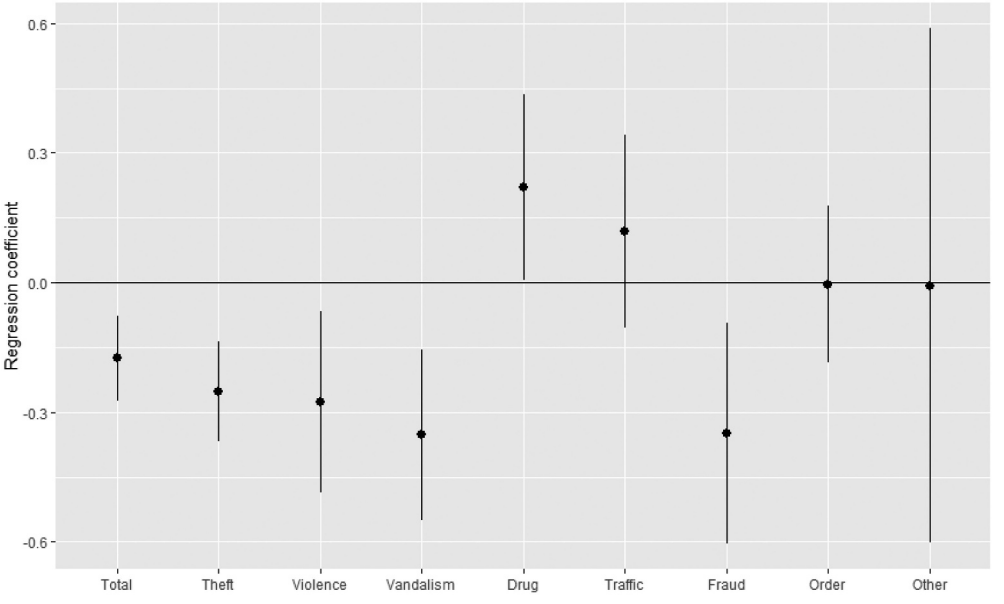

Figure 3. Point estimates and 95% confidence intervals for the association of crime with bars ordered closed.

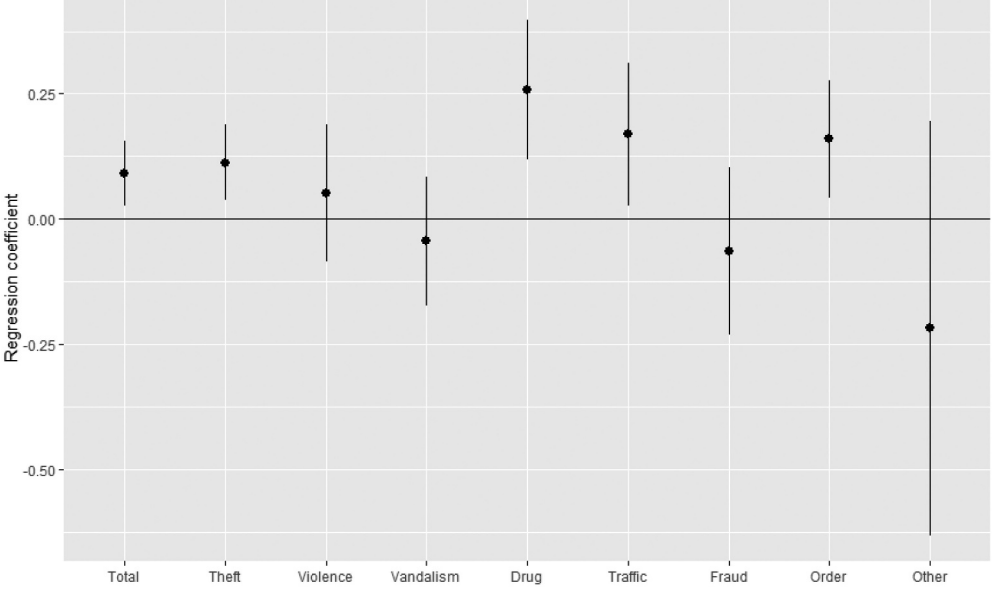

Figure 4. Point estimates and 95% confidence intervals for the association of crime with bars ordered to close by midnight.

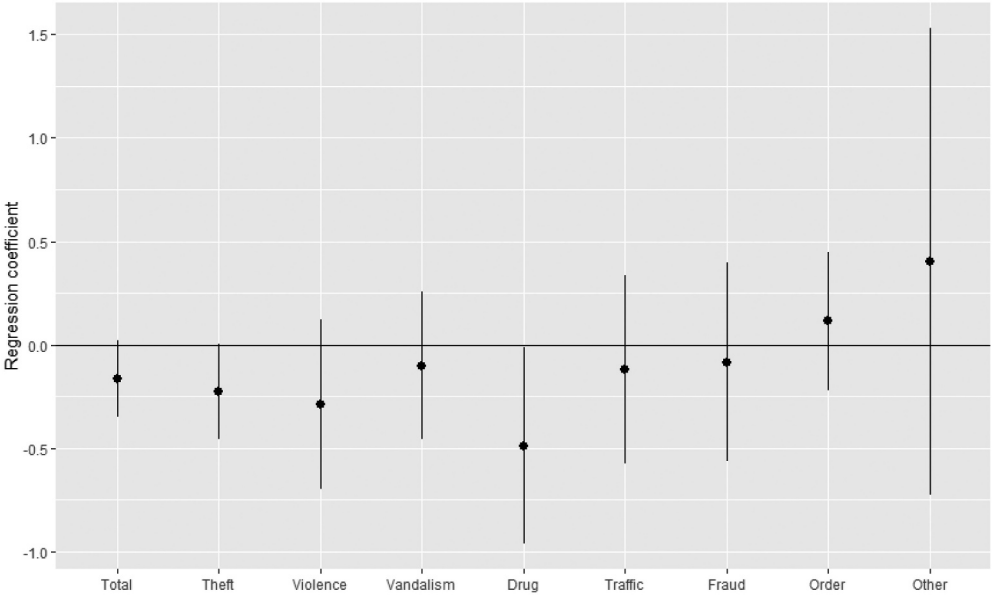

Figure 5. Point estimates and 95% confidence intervals for the association of crime with bars ordered closed by 9 pm.

Lastly, Figure 5 shows the impact of closing pubs and bars before 9 pm. There appears to be little (significant) impact on crime with the only significant (negative) association being with drug crime.

Robustness

To test the robustness of these findings we run several alternative model specifications (the figures are shown in the Appendix and regression coefficients are found in Appendix Table 2). First, we test whether the results hold if we run similar models but include six additional large municipalities near Oslo: Drammen, Asker, Bærum, Lillestrøm, Sarpsborg and Fredrikstad. As outlined in the methods section, this changes our model to look at crime at time *t* in municipality *i*, with a dummy variable for each municipality. These municipalities all had some restrictions on alcohol sales towards the end of the year, but not at the beginning. This means they can serve as controls for the first alcohol ban in Oslo. They can also add more data on the bans and restrictions for the time-period when the second alcohol ban took place. We first fit models on all seven municipalities using just the first six months of 2020. This means that we only have alcohol restrictions in Oslo and the other municipalities serve as controls. The trend of the added municipalities is parallel to that of Oslo before the pandemic, and our model thus takes the form of a difference-in-difference model. We find that theft, drug crime, and total crime decreased significantly with the alcohol ban.

We then fit the models with the full data to take advantage that some restrictions occurred at the end of 2020 in the other six municipalities. These results are similar to those from the model just including Oslo. There is no change to the direction or

significance for general restrictions. For the alcohol ban, the coefficients for fraud and order crime become significant and negative. The midnight ban now only shows a significant relationship with theft which increased, and the 9 pm ban registers a significant negative relationship with theft. In this dataset there is also a 10 pm closing for two municipalities, which appears to be associated with significant decreases in violence, theft, vandalism, fraud and total crime, making it very similar to the effects of the alcohol ban. Results are also relatively similar when running the models without Oslo and so including just the other six municipalities, with significant negative coefficients between total crime and general restrictions, alcohol bans, and closing at 10 pm, but no significant association with the midnight ban.

We next run placebo tests and fit models with our full data (i.e. including all municipalities) but with the starting date for the alcohol restrictions moved back one year to 2019. We use 2019 for the placebos as there are few dates earlier in 2020 where there are no alcohol restrictions, making it difficult to generate a true placebo. The Oxford stringency index is not changed. Our models find some significant placebos for violence (−.094, p = .049) and theft (.064, p = .020) the alcohol ban placebo is significant. For traffic, the midnight closing has a positive association (.088, p = .029), while it has a negative association with order crime (-,093, p = .013). For fraud, the 10 pm closing of alcohol sales (−.495, p = 0.007 is significant. With four intervention variables and nine crime types we would expect to see 1.8 significant associations, so the five significant placebos here are noteworthy. The placebo effect on violence and fraud is substantially similar to our main findings, the placebo for theft offences though is in the opposite direction, and those for traffic and order crimes change from non-significant in our main findings to significant. The theft placebo in particular appears to be random noise, but the violence and fraud placebos do temper our findings somewhat. The fraud placebo remains significant in an Oslo-only model (−.172, p = .010) while the violence placebo disappears (−.003, p = .96). The findings for fraud do appear to potentially be random noise, while the findings for violence appear to hold up at least for Oslo, but with more uncertainty for the full sample.

Discussion

The present study has shown that restricting pubs and bars from selling alcohol has a noticeable effect on crime in Oslo. In addition, there is also a more general effect from other COVID-19 restrictions, such as stay-at-home recommendations and restrictions on public gatherings. Both these findings are expected, particularly the latter result which has been shown in prior studies and so appears to be a global phenomenon (Nivette et al., 2021). As COVID-19 restrictions increased to combat the spread of the disease, crime decreased in light of the general restrictions, but also due to the specific order to have pubs and bars closed. There are crime types that are affected by both, by one of the two, and by neither. This highlights the different causes of, and explanations for, different types of crime.

When pubs and bars are closed, a likely result is there are fewer people drawn to the city centre or other nightlife areas. This could explain the reduction in theft and violence as there are fewer offender-victim interactions. The fact that vandalism is also significantly

reduced may be from fewer potential offenders to a large extent, as vandalism does not require a person as a victim, and there are potential targets almost everywhere (Gerell, 2021). This finding is however the opposite of what Chang and Jacobson (2017) found, where an increase in theft was found when restaurants closed. They attributed this finding to a reduced deterrent effect from restaurant visitors on crime. A potential reason for this discrepancy could be the difference in closing restaurants as opposed to banning the sale of alcohol, which affects pubs, bars, and nightclubs even more so than restaurants. There are likely differences in the type of visitors to restaurants compared to pubs, bars, and nightclubs, and such differences may well generate different effects on crime.

The fact that crime appears to increase somewhat as pubs and bars were allowed to serve alcohol up to midnight, as opposed to when they were allowed to open until later, is somewhat surprising. The fact that drug and traffic crime increase when pubs close can perhaps be attributed to changes in policing, for example, when bars close earlier it may free up time for the police to focus proactively on other crimes. Theft also significantly increased with this type of alcohol restriction. One reason for this might be that when pubs and bars close at midnight, people can drink in a social setting; but some will do this more enthusiastically to 'beat the clock'. Then, to continue their evening after the bars are closed, they must do this in a less regulated environment, which could result in more crime. Another possibility, as suggested in some evaluations of bar closing times in the UK (e.g. Graham et al., 2002), is that the restricted closing times mean that assuming all bars maximize their operating hours, all customers across bars are ejected onto busy streets at the same time. This has the potential to cause many more offender-victim interactions, and people might struggle for the same services such as transport or food. Such explanations however would be more fitting for violence than for theft, and the point estimate for violence was not significant. Furthermore, it is important to underline that the estimates are adjusted for general restrictions, so theft was driven down by restrictions, but it also increased slightly when alcohol sales stopped at midnight.

When alcohol venues are stopped from serving alcohol after 10 pm, there appears to be a reduction in crime which is similar to that when bars are closed altogether. These results are however drawn from two quite small municipalities which had these restrictions for only about a month and should therefore be interpreted with caution.

For the restriction that only allowed the serving of alcohol to 9 pm, only drug crime appears to be affected, but this impact was fairly substantial. As drug crimes are largely detected and reported by the police themselves, they are to some extent a measure of police activity and priorities, rather than actual crime. It is possible that pubs and bars closing this early led to both less drug use, due to fewer opportunities to party, and to fewer situations where the police were in a situation where it was possible to detect drug use. The same can be said for changes to traffic crime, and in general, these two crime categories largely comprise of crimes generated by the police and their patrols and so should be interpreted with caution.

Finally, it is worth noting that while not significant, the point estimates are positive for the other crimes category. This is likely due to COVID-related regulation infractions which are included here and nationwide they increased from a total of 290 crimes in 2019 to 811 in 2020 (Statistisk sentralbyrå, 2021).

The present study is not without limitations. One major limitation is that violence is not separated into its different subtypes, for example, domestic violence and nightlife violence. Prior studies have shown that domestic violence tends to increase with restrictions, while violence more generally decreases (Campedelli et al., 2020; Nivette et al., 2021). This means our findings may mask a much larger negative effect in relation to public violence, while domestic violence may have increased. In addition, our placebo tests yielded some significant associations. For violence, the placebo test was significant in our model with all municipalities, but in the Oslo sample, it was not. Although this means the findings for violence will need to be treated with some caution, there appears to be some impact on violence from closing pubs and bars. For fraud, however, our placebos were significant in both models, suggesting that something else than the alcohol ban is driving those findings.

Notes

1. The cited figure is by June 2022, taken from the dashboard created by Don, Du & Gardner here: https://www.arcgis.com/apps/dashboards/bda7594740fd40299423467b48e9ecf6.
2. The references for these changes in crime are to media reports however and should be treated with caution.
3. See the pre-registration here: https://osf.io/zt4rv.

Disclosure statement

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Appendix

Appendix Figures, summary graphs for Oslo, Drammen, Asker, Sarpsborg, Fredriksstad, Lillestrøm and Bærum municipalities

Table A1. Coefficients and standard errors for negative binomial regressions on eight types of crime plus violent crime and the four independent variables of interest in the study: The Oxford stringency index (general COVID restrictions), the ban to sell alcohol, the restriction to not sell alcohol after 11.30 pm and the restriction to not sell alcohol after 8.30 pm. All models are adjusted for day of week, week of year and year and are fit on crime data from 2016–2020.

Type	Oxcoeff	Oxerr	Bancoeff	Banerr	Midcoeff	Miderr	Eighcoeff	Eighterr
Violence	−0,178	0,179	−0,276	0,107	0,052	0,07	−0,286	0,209
Theft	−0,561	0,098	−0,253	0,059	0,113	0,038	−0,225	0,118
Vandalism	0,347	0,168	−0,353	0,101	−0,044	0,066	−0,1	0,181
Other	1,02	0,525	−0,007	0,304	−0,218	0,211	0,403	0,575
Drug	−0,914	0,182	0,22	0,11	0,258	0,071	−0,487	0,241
Traffic	−0,383	0,188	0,118	0,114	0,169	0,073	−0,118	0,231
Order	−0,629	0,153	−0,004	0,092	0,16	0,06	0,115	0,17
Fraud	−0,336	0,217	−0,349	0,13	−0,065	0,085	−0,083	0,245
Total	−0,396	0,084	−0,175	0,05	0,091	0,033	−0,163	0,095

Table A2. Regression coefficients and standard errors for models with seven municipalities.

Type	Oxcoeff	Oxerr	Bancoeff	Banerr	Midcoeff	Miderr	Tencoeff	Tenerr	Eighcoeff	Eighterr
Violence	−0,186	0,09	−0,316	0,057	0,012	0,039	−0,737	0,162	−0,241	0,223
Theft	−0,532	0,054	−0,302	0,034	0,077	0,022	−0,335	0,105	−0,267	0,127
Vandalism	0,033	0,098	−0,156	0,058	−0,017	0,04	−0,934	0,257	0,145	0,181
Other	0,456	0,294	0,375	0,155	0,158	0,115	−0,34	0,473	0,709	0,541
Drug	−0,239	0,1	−0,14	0,066	−0,086	0,046	−0,133	0,138	−0,837	0,325
Traffic	−0,186	0,089	0,029	0,058	0,049	0,039	−0,065	0,139	−0,191	0,254
Order	−0,545	0,09	−0,14	0,056	−0,004	0,038	−0,192	0,145	0,138	0,201
Fraud	−0,29	0,107	−0,406	0,068	−0,077	0,046	−0,857	0,22	0,021	0,241
Total	−0,335	0,042	−0,238	0,028	−0,001	0,019	−0,364	0,063	−0,153	0,132

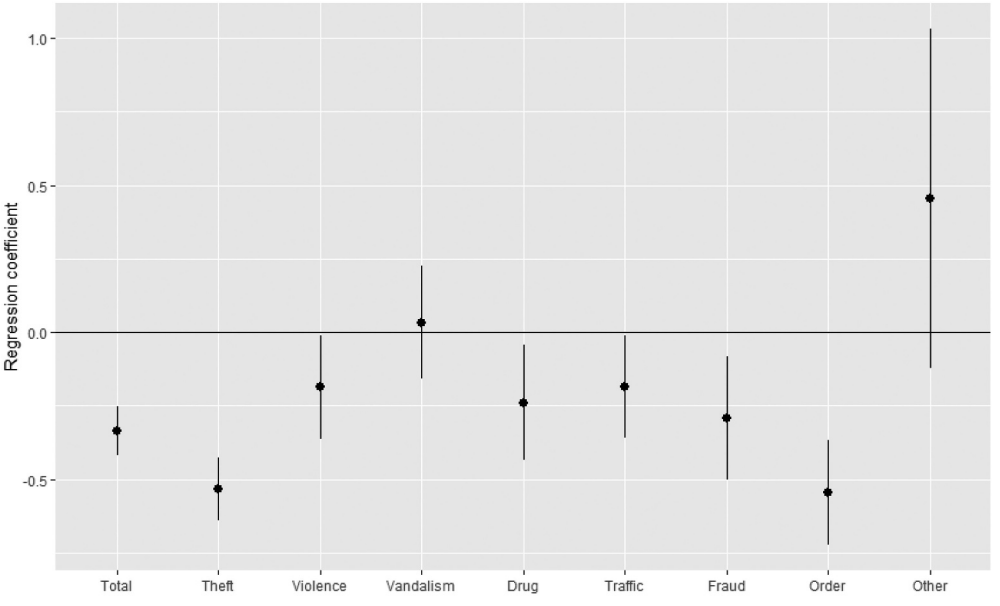

Figure A1. Point estimates and 95% confidence intervals for the association of crime with general restrictions.

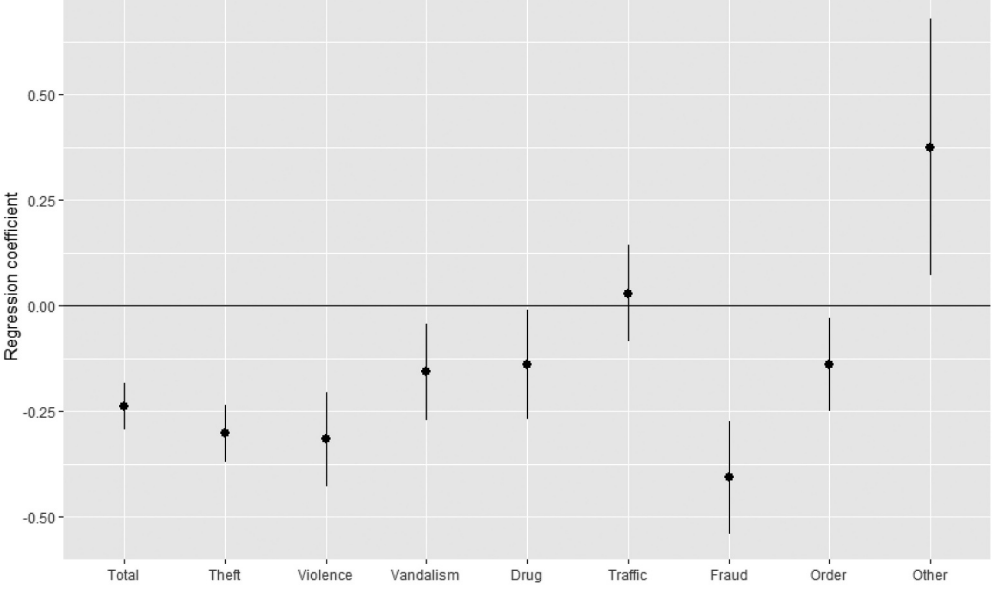

Figure A2. Point estimates and 95% confidence intervals for the association of crime with alcohol serving banned.

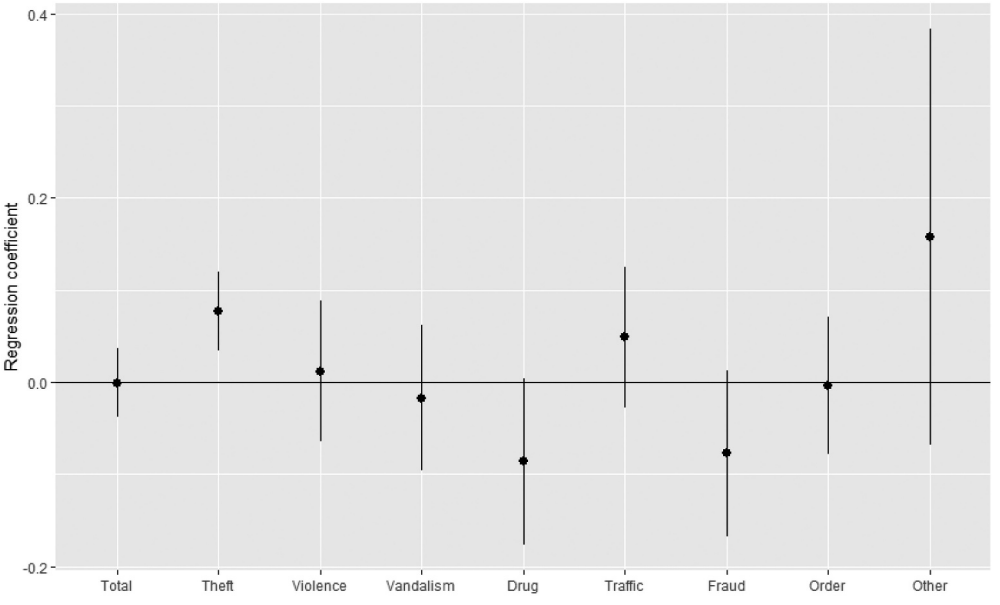

Figure A3. Point estimates and 95% confidence intervals for the association of crime with alcohol serving banned after midnight.

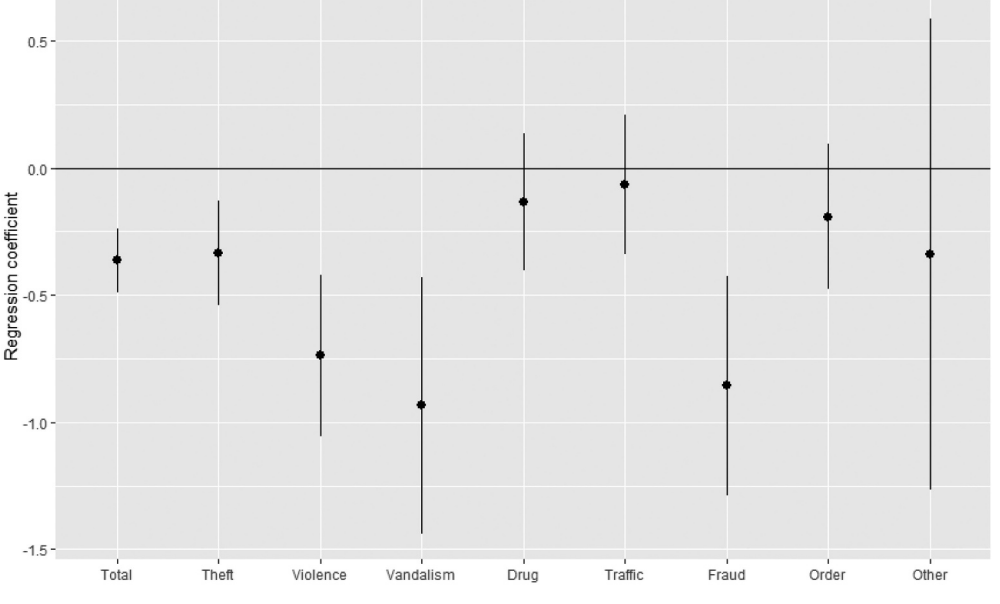

Figure A4. Point estimates and 95% confidence intervals for the association of crime with alcohol serving banned after 10pm.

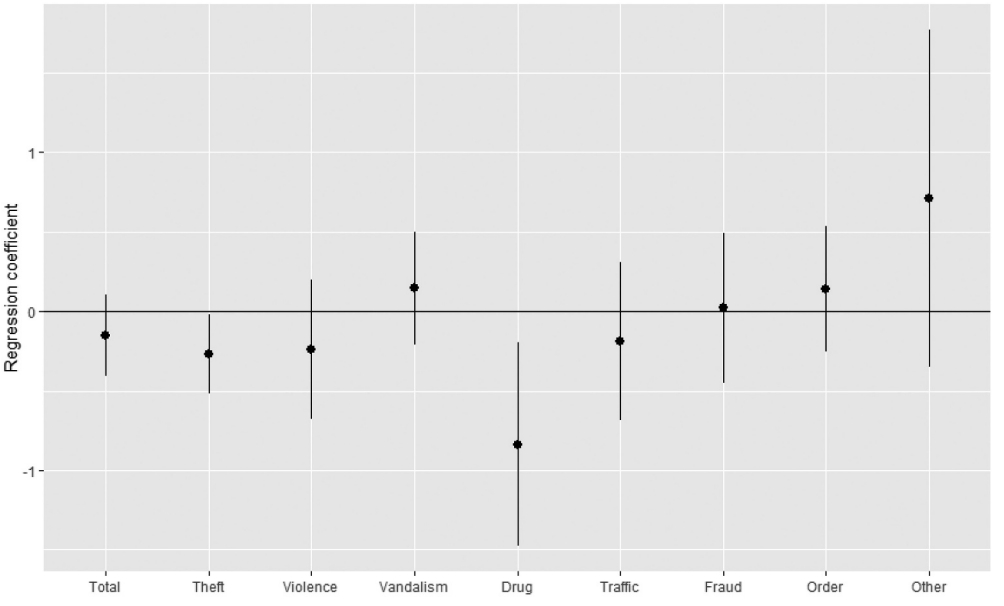

Figure A5. Point estimates and 95% confidence intervals for the association of crime with alcohol serving banned after 9pm.