Differential Impacts of Statewide Covid Policies on Urban vs. Rural Communities: Evidence from Liquor Sales in Idaho

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Abstract

This paper analyzes changes in liquor sales that occurred upon entering and during the COVID-19 pandemic era. Our unique data set contains all bar/restaurant and retail liquor sales, by type, month and location, in the state of Idaho. These data facilitate an understanding of the dynamic interactions between retail, wholesale (bar/restaurant) and overall sales in light of COVID-19. Aggregate changes in wholesale and retail sales are estimated separately for both rural and urban areas. Controlling for persistent seasonal fluctuations in liquor consumption, retail liquor sales surged during the peak of the COVID- 19 shutdowns (March, April and May of 2020) at the same time that bar and restaurant sales declined. As bars and restaurants began to reopen in June, July, and August of 2020, bar and restaurant sales recovered to pre-pandemic levels while increased retail sales persisted statewide. However, some substantial differences were seen in the nature of the responses between urban and rural areas, suggesting that statewide pandemic policies were more geared toward conditions in urban areas with limited consideration for externalities imposed on rural areas.

Keywords: Liquor, COVID-19 Running Head: Urban vs. Rural Liquor

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Introduction

The COVID-19 pandemic represents a rarified human tragedy resulting in millions of lives lost around the world, including hundreds of thousands of lives in the United States. The pandemic also had psychological, sociological, and economic effects on countless more people which will likely have impacts for generations (Usher et al. 2020; Banks 2020). One of the striking economic effects of the COVID-19 pandemic was the result of unprecedented lockdowns of businesses that were deemed to be "nonessential".

In most states, including Idaho, the state analyzed here, bars and restaurants were classified as nonessential and were ordered to close during the peak of the pandemic. However, grocery stores and liquor stores in Idaho were allowed to continue operating with only minor restrictions. This created the opportunity for a large-scale shift in how and where food and beverages were purchased and consumed. In the case of liquor sales (the commodity analyzed here), a shift occurred from a mix of sales at both bars/restaurants and retail liquor stores, to almost exclusively the latter. The net impact of these two countervailing effects is one focus of this paper. However, our primary focus is on the timing of shutdowns relative to the incidence of COVID-19 cases in the respective counties throughout the state and how statewide pandemic policies impacted rural versus urban areas. Despite COVID-19 cases varying widely across time and between regions, most policies were enacted at the state level and were initially enforced uniformly, without regard to idiosyncratic differences between counties within the state. While there may be reasons to enact broadly enforced policies, we examine how shut-down and reopening decisions affected urban and rural areas differently and the degree to which those decisions were associated with actual COVID-19 cases in the respective regions.

We use a comprehensive data set that documents all liquor sales in the state of Idaho to analyze how liquor sales changed in terms of volume, liquor types, and how changes differed between rural and urban areas. Due to idiosyncratic state regulations in Idaho, the liquor supply

chain is such that all liquor, whether sold directly to consumers from retail outlets or sold wholesale to bars and restaurants and then served to consumers, must be acquired through state-run liquor stores. Consequently, all liquor sales, whether they are for at-home or away-from-home consumption, are uniquely recorded and accounted for in the data set. (Watson et al. 2020).

Analyzing liquor sales can serve as an informative case study for contemplating other more general changes in retail and wholesale sales. For example, since COVID-19 caused a dramatic downward shift in sales at wholesale (restaurants and bars) due to restricted consumer access, potential mitigation of some of the negative sales effects could occur via demand substitution towards retail sales. We analyze the magnitude of these substitution effects. Furthermore, there may be differences in the characteristics of commodities purchased, such as ethanol level, color, sweetness, bitterness, and aroma in the case of liquor, or other characteristics once shifts in demand occur. Another pertinent issue is the degree of persistence regarding any changes in sales patterns, once sales in the wholesale market channel rebounded.

According to Chetty et al. (2020), the first case of COVID-19 in the United States was reported on January 20th, 2020 (figure 1). The state of Idaho issued a stay-at-home order on March 25th that closed all non-essential businesses, including restaurants for in-person dining, as well as all bars. However, retail liquor sales were largely unaffected by the new regulations, and liquor stores remained open throughout the pandemic. This led to a dramatic change in consumer spending patterns. Idaho began reopening select businesses on May 1st, but on June 24th, the Idaho governor reclosed select businesses (bars) on a regional basis. Chetty et al. (2020) find that retail food sales in Idaho spiked over 60% in late March 2020 and remained over 20% higher through October 2020. Conversely, restaurant and hotel sales declined over 60% in Idaho by the beginning of April 2020 and remained almost 20% lower through October 2020. We provide insights into the impacts of COVID-19 on one of the major components of retail and bar/restaurant sales as a contribution to providing additional perspectives relating to the broader

food consumption impacts of the pandemic.

We focus on a number of specific issues relating to the impacts of COVID-19. First, we estimate the overall effects on liquor sales of COVID-19, and effects attributable to lockdown policies, controlling for year and seasonal effects. Second, we estimate how persistent any changes in sales were over time. Third, we estimate the degree to which changes in sales were motivated by anxiety from the level of COVID-19 cases, and by chances in income and employment in addition to the effects on product availability caused by lockdown policies. Fourth, we identify differences in the effects of COVID-19 on retail versus wholesale market channels. Finally, we identify whether there were any consumer behavioral differences between urban and rural areas.

Literature Review

There is a substantial literature on the demand for liquor across many countries (Selvanathan 2017), and much of it focuses on price elasticities and the degree of substitution between beer and wine (Baltagi and Griffin 1995; Gallet 2007; Fogarty 2010). Other studies investigate the relationship between the economy and demand for alcohol. Some studies find a positive relationship between the state of the economy and alcohol demand (Cotti et al. 2015), while others find a negative relationship for individuals who suffer large economic losses (Mulia et al. 2014).

Research suggests that the use of actual sales transactions data is ideal for studying liquor demand or sales, as opposed to tax revenues or stated behavior which can be inaccurate representations of actual quantities and prices (Young and Bielinska-Kwapisz 2003; Ruhm et al. 2012). The analyses in this paper are based on actual sales data from the State of Idaho, for which any changes in prices and quantities can be accurately depicted. This data set also allows controlling for variables such as the type and other characteristics of liquor as well as regional effects. Differences in sales volume caused by changes in the state of the general economy or in

the prices of beer/wine substitutes can also be analyzed.

COVID-19 and regulations enacted in response to it have influenced the consumption of many types of food. Many commodities, such as potatoes, dairy, eggs, and meat, have seen dramatic swings in demand. COVID-19 has influenced prices for fruits and vegetables (Richards and Rickard 2020), the market for meat (McEwan et al. 2020), and in particular, demand and prices for hogs (Zhang et al. 2020). Some of these changes in prices were influenced by changes in the supply chain (Lusk et al. 2020; Reardon et al. 2020; Gray 2020), and some of the supply chain changes may be long term (Hobbs 2020). Furthermore, there seems to have been a shift towards "comfort foods" (Chaudhuri 2020), which could also apply to liquor consumption.

Research has shown that the effects of COVID, and responses to it , have been different in a number of ways for rural versus urban areas (Peters 2020; Summers-Gabr 2020; Souch and Cossman 2020). On the other hand, regarding effects of changes in economic factors, Maclean et al. (2020) found that the effects of the business cycle on substance abuse did not differ materially between urban and rural areas. It is not currently known whether there were any rural versus urban differences in liquor consumption induced by COVID per se, nor if there were any such differential effects attributable to changes in the economic environment during the pandemic. This work contributes to the literature by filling that gap. Our analysis differentiates economic and pandemic effects with the aid of control variables representing the observed heterogeneous numbers of COVID cases across rural and urban counties over time. Our work also differentiates those effects by market channels, analyzing retail and wholesale liquor sales in addition to sales in the aggregate.

Data

The data for this analysis was obtained from the Idaho State Liquor Division (ISLD). Observations were available on all monthly sales of every unique bottle of liquor at all 186 liquor

stores in Idaho from January 2007 through September 2022. The data include the month, store, liters sold, price, liquor type, and proof (alcohol content) of the liquor. In addition, retail (direct to consumer) and wholesale (to bars and restaurants) sales are tracked and recorded separately. As such, the data set represents all sales of liquor in the state of Idaho during the period. We aggregate the unique bottles of liquor into 58 types of liquor using type codes provided and utilized by the ISLD. These type codes include detailed categories such as single malt Scotch whisky, blended Scotch whisky, domestic gin, imported gin, bonded bourbon, blended bourbon, and so on.

One complicating issue is that no data is reported if a bottle of a given liquor type is not sold at a specific store in a given month. Non-reporting of zero sales for a given liquor type, in a given store for a given month, could be due to no customers buying that type of liquor when it was available for sale, or because that type of liquor was not offered for sale at a given time and place. In either case, the data set supports a conditional analysis of actual liquor sales, which we account for by using a truncated regression methodology, which is discussed further in the empirical section ahead. We also eliminated any sale that was less than a 0.2-liter bottle in our reported estimation results in order to eliminate very small bottles, which we considered to belong to a niche market for liquor (e.g., "airplane bottles")[1]. Other variables of interest include 1) counts of new COVID-19 cases in each county obtained from the U.S. Centers for Disease Control and Prevention (CDC) to test the effect of the changing number of COVID-19 cases on the quantity of liquor purchased, 2) county unemployment rates obtained from the U.S. Bureau of Labor Statistics (BLS) to control for income effects, and 3) consumer price indices for beer and for wine obtained from the U.S. Bureau of Economic Analysis (BEA) to control for the price of substitute goods.

[1] While we believe that small "airplane bottles" represent a distinct niche market for liquor, and for that reason we eliminated those observations from the analysis, we note that the empirical results reported ahead, although not completely identical to those obtained by including such observations, were very similar.

Simply disaggregating the data by month and type of sale (retail or wholesale) provides some general insights. Figure 2 shows that, as expected, in March of 2020 retail sales increased dramatically while restaurant sales began to decrease. While January and February levels were similar to those in 2018 and 2019, it is clear that changes occurred in March. Retail sales remained high throughout the summer. In April, restaurant sales were almost non-existent and began to rebound in May. While sales are heavily dependent upon month and show a general upward trend, sales spiked in March of 2020.

In aggregate, overall liquor sales increased 14.7% in the months of March through August 2020 as compared to the same months in 2019. However, liquor sales increased at an average growth rate of 5.3% annually from 2007 through 2019. After accounting for the average growth rate in annual sales, liquor sales in 2020 still increased by an additional 8.9%. This net total sales increase obscures the fact that while retail sales of liquor increased substantially, wholesale sales of liquor plummeted. Retail sales over the months of March through August 2020 were 26.8% higher than over those same months in 2019. However, wholesale sales (restaurant and bar sales) decreased by 41%. Again, retail and wholesale sales exhibited an average annual growth rate of 6.4% and 2.2%, respectively, over the period 2007 to 2019. Therefore, accounting for these average growth rates in annual sales, the additional increase in retail sales was 19.2% and the net decrease in wholesale sales was 42.3% (tables 1 and 2).

These outcomes are affected by a multitude of additional factors, such as differences in liquor type (e.g., bourbon versus vodka), other idiosyncratic yearly differences, county differences, and most germane to this analysis, differences between urban and rural areas. To explore these effects, we next present a more formal empirical analysis.

Empirical Model

At a fundamental level, we are analyzing empirically the effects of COVID-19 on the quantity of

liquor sold. However, the analysis is complicated by the fact that fear, perceptions, and future expectations may play a large a role in addition to the actual number of COVID-19 cases in a given place. Furthermore, the economic shutdowns associated with COVID-19 policies themselves caused a shift in sales because of the constraints placed on consumer access to markets apart from any shift in demand from COVID-19 per se. Therefore, in addition to including COVID-19 cases by county, we also include county unemployment numbers, and month-year indicator variables for February 2021 through September 2022[2] to reflect impacts of factors associated with the pandemic over time that are not captured by actual COVID-19 cases or the associated unemployment effects during the period.

We estimate separate liquor sales models for retail, wholesale, and total sales. Given our interest in analyzing differences in COVID-19 impacts between urban and rural areas, we also implement separate statewide, urban, and rural sales models. We define urban as the three most populous counties in the state of Idaho: Ada, Canyon, and Kootenai counties. These three counties represent approximately half of the population and half of the total liquor sales in Idaho, and all three are classified as "Metro" counties by the Economic Research Service of the USDA. The remaining counties constitute rural areas for the purposes of this study. All data observations represent transactions for a specific type of liquor, at a specific store, in a specific month from January 2007 through September 2022.

Our empirical sales model can be expressed in general terms as:

$$Q_{slt}^{rj} = f^{rj}(P_{slt}, A_{lt}, B_t, W_t, I_{st}, U_{st}, C_{st}, K_t, L_l, M_t, Y_t, S_s) \quad (1)$$

[2] The year 2007, and the month of January are the base year and month representing the excluded categories for the purposes of representing the indicator variable design while avoiding the well-known perfect collinearity issue.

where r and j identify separate regressions by region r ($r \in$ urban, rural, statewide) and market channel j ($j \in$ retail, wholesale, total) respectively. Q represents liters sold, and the subscripts in (1) refer to store s, of liquor type l, in time period t. P represents the own price of a liquor type, A is the percent alcohol (ethanol) of the specific liquor type, B is the consumer price index for beer, W is the consumer price index for wine, I and U are the percapita income and the unemployment rate in the county where a respective store is located, C is the number of new COVID-19 cases in the county where a respective store is located, K represents indicator variables for months in 2020 (February 2020,...,September 2022), L are indicator variables for the type of liquor, M are indicator variables for months of the year, Y are indicators for years, and S are indicators for specific stores where the transaction took place. Summary statistics are presented in table 3.

In order to readily express estimation results in terms of elasticities, the quantity, price, income, ethanol, unemployment, and population variables are all represented in natural logarithmic form. Because C is zero for the majority of the months in the analysis, taking the logarithm of this variable is clearly not possible. We transform this variable using an inverse hyperbolic sine function, which still allows an interpretation of the coefficient as an elasticity, but also allows for zeros in the data (Burbidge et al. 1988; Layton 2001).

As stated earlier, to account for the data being truncated to observations on only positive quantities sold, the sales model is estimated using the truncated maximum likelihood function approach with robust standard errors as presented in Greene (2018), and as implemented in STATA (Truncreg). In particular, the conceptual lower bound on a positive sale for any liquor type, at a given store in a given month, is one liter in the data set that was utilized, so that $Q_{slt}^{rj} \geq 1,\ \forall r, j, s, l, t$. Given that the dependent variable in the sales models is represented in natural logarithmic form, the actual dependent variable truncation bounds used in implementing the truncated regression estimation method was $\ln\left(Q_{slt}^{rj}\right) \geq 0,\ \forall r, j, s, l, t$.

Results

Results for the nine regressions differentiated by market segments and regions are presented in tables 4 through 6. We present results for the aggregated state model for general interest purposes, although we focus our reporting and interpretation of results on the wholesale and retail market channels for the rural and urban areas. Real prices and percapita income are defined using the GDP deflator.

The estimated associations between price and quantity sold are consistently negative, inelastic, and are statistically significant across all models. Comparing urban to rural responses, magnitudes of the elasticities are roughly similar in nominal terms, although there is a statistically significant difference between the relatively more inelastic urban response and the relatively more elastic rural response. Regarding marketing channel comparisons, the magnitudes of the elasticities are considerably smaller for wholesale than for retail sales, and these differences are also statistically significant. In summary, the price elasticities for sales at retail range from -0.87 to -0.92, while for wholesale sales the elasticities range from only -0.46 to -0.49.

The association between the level of ethanol and liquor sales is statistically significant across all models. The directions of the associations are positive and uniform, although the magnitudes of the associations are somewhat more dissimilar than in the case of the price elasticities. Higher levels of ethanol are estimated to be associated with higher liquor sales in all retail market segments, although the positive association in urban areas is estimated to be over twice as large as in rural areas, with the difference in magnitudes being statistically significant. In the wholesale market segment, the positive relationships between ethanol and liquor sales persists, and relationships are estimated to be modestly larger in magnitude in comparison to retail markets, although the differences are not statistically significant at conventional levels within either the urban or rural areas.

Regarding substitute commodities, wine is estimated to be a statistically significant

substitute for liquor in both the wholesale and retail urban market segments. However, wine is not a statistically significant substitute for liquor in either the retail or wholesale rural markets, and in fact is not estimated to have a significant effect on liquor sales in rural areas. Beer is estimated to not be in a statistically significant substitute relationship with liquor sales at conventional levels of type I error in either market channel or in either rural or urban areas. However, beer is estimated to be in a complementary relationship with liquor sales in the urban retail market at the cusp of conventional statistical significance (at the .051 level).

Increases in the unemployment rate are estimated to be associated with statistically significant decreases in liquor sales in both urban and rural areas, and in both the retail and wholesale market channels. In terms of estimated elasticities, the magnitudes are very substantially larger in rural areas than in urban areas, and the differences in magnitudes are statistically significant. Regarding policies relating to addressing the COVID-19 pandemic, this result suggests that unemployment-inducing lockdowns are associated with overall net negative movements in both the retail and wholesale market segments. The estimated elasticities associated with the income variable are consistent with liquor being a normal good, albeit the income effect in the wholesale urban market was not statistically significant. The magnitudes of the income effects were estimated to be substantially larger in urban areas than in rural areas, and the differences were statistically significant.

Regarding any *direct* association between liquor sales and the number of new COVID-19 cases in a county, as apart from the indirect effects of shutdown policies induced by case numbers, the relationships are estimated to be mixed in direction between market channels, and notably difference in magnitude between urban and rural areas. The direct effect of new COVID-19 cases in a county are associated with a decrease in liquor sales at retail in both urban and rural markets, with the magnitude of the decrease in urban areas being notably large than in rural areas. The difference in magnitudes is statistically significant, albeit it should be noted that the rural

effect itself is only statistically significant at the .10 level. The direct effect of new COVID-19 cases is estimated to be negative in rural wholesale markets as well, although only at the cusp of statistical significance at the .11 level. On the other hand, the direct COVID-19 effect is estimated to be positive and statistically significant in urban wholesale markets. We emphasize that in interpreting these direct effects, the interrelationship with the implementation and consequences of government policies (shutdowns, capacity restrictions) needs to be considered. Given that the monthly indicator variables discussed ahead account for such policies to some degree, the direct effect of COVID-19 case numbers may be more closely attuned to representing behaviors induced by the fear and anxiety consumers face in the face of rising infections. Viewed in that light, the negative effects at retail may be reflecting a hesitancy to frequent retail outlets despite a shift towards retail sales induced by restrictions in access to wholesale outlets, which will be underscored further in the results presented ahead. By the same token, the positive effect in urban wholesale markets may be reflective of a countervailing behavior relating to an increasing preference to frequent bars and restaurants despite the decreased access to such outlets caused by policy restrictions, which will also be underscored by results presented ahead.

Differences in Urban and Rural Impacts of Covid Policies During the Pandemic Period

Focusing attention on urban versus rural behaviors impacted by policies instituted during the pandemic period, there were some notable differences in responses to the COVID-19 pandemic apart from those presented heretofore. Estimated effects over time depicted by the month indicator variables vary both in magnitude and in statistical significance between urban versus rural areas, and retail versus wholesale market segments. In interpreting these indicator effects, we remind the reader that the model contains yearly indicator variables in addition to monthly indicator variables for each year, with the "omitted category" being year 2007 and the month of January. Thus, the estimated effects of the year indicator variables shown in the table are

effectively depicting the change in the January level in a given year from the base year January effect. Moreover, because there is a set of recurring (every year) monthly indicator variables (whose estimated effects are not shown), the *additional* monthly indicator variable effects depicted in the table are interpreted as *changes* to the underlying recurring monthly indicator variable effects that are estimated to have occurred during the period 2020-2022.

The first result of note is that the February 2020 indicator variable is not statistically significant in any of the regressions, likely because while this is the first month of the pandemic period, consumer awareness and behaviors likely had not yet been substantially altered. However, the statistical insignificance remains noteworthy in that it is consistent with a lack of sales-shifting that might be attributable to omitted factors influencing liquor sales at the time and confounded with the month indicator variable.

Regarding the month indicators beyond February 2020, the pattern in the signs and magnitudes of the effects for the retail market denotes a notable increase in liquor sales throughout the remainder of the calendar year following the onset of the pandemic. All of the estimated monthly increases are statistically significant in both urban and rural areas. However, the evolution of the magnitudes differs over time between rural and urban areas. The rural areas experience a larger initial increased sales effect in the first few months of the period (recall the interpretation of the yearly indicator variables), but then the increases, while still positive, dissipate to some degree while the effects in the urban areas generally increase and then roughly stabilize at notably higher levels in the latter part of the period. Note that the March-May period is the time frame associated with the most pervasive restrictions/lockdowns policies in response to the pandemic. It is notable that the largest positive impacts on liquor sales occurred during that three-month period in the rural retail markets, but such was not the case in the urban markets, where the positive impacts were roughly similar, and in some cases greater, during other months of the year. In the following calendar year, one year into the pandemic, the increased retail sales effect in

the urban market exhibits a pattern of decline, and that declination continues into the following year. In the rural market, the increased retail sales effect exhibits a pattern of decline as well, but to a lesser extent, and most notably, the level of increase exhibits more persistence in the year 2021 and through 2022, with somewhat less variability in 2022.

The pattern of effects in the wholesale market, and their statistical significance, is starkly different from the effects at retail both in rural and urban areas. In the first year of the pandemic the estimated monthly effects are substantially negative in urban areas, generally persist in magnitude throughout the year, and all are statistically significant. In that first year, the negative effects on wholesale liquor sales are largest in the last two months of the March-May period, which is the time frame that is associated with the most pervasive restrictions/lockdowns policies in response to the pandemic. In the year following the onset of the pandemic, the negative effect largely stabilizes in magnitude throughout the year with some moderate variability, and then that pattern continues throughout the 2022 period. The large majority of the month effects are statistically significant. Similar to the urban market, the rural market exhibits the most substantial and relatively large negative effects on wholesale liquor sales during the March-May restriction/lockdown period, and those effects are statistically significant. However, unlike the urban market, the negative effects dissipate quickly thereafter, with monthly effects being relatively small in magnitude and many monthly effects were insignificantly different from zero throughout 2021-2022.

As a general summary of the main results exhibited by the estimated effects of the temporal indicator variables, after the initial restrictions/shutdowns, rural areas were less sensitive and more resilient to the impacts of pandemic policies. The negative impact on liquor sales in rural wholesale markets dissipated quickly, while the negative impacts in urban wholesale markets largely persisted. On the other hand, the positive sales effect in rural retail markets increased during the first year of the pandemic, and that higher level of sales remained generally persistent

throughout the remainder of 2021-2022 with only modest variability. The positive sales effect in urban retail markets also exhibited increases during the first year of the pandemic, but those positive effects gradually waned over the 2021-2022 to notably lower levels, albeit still positive by the end of the period.

Conclusions

Retail liquor sales increased significantly during the pandemic months of March 2020 through August 2020. However, the increase in retail sales was partially offset by a large decrease in wholesale (restaurant and bar) sales. Taken together, total liquor sales still increased by almost 10%. While this number is somewhat smaller than presented in some other reports, probably due to the fact that our analysis includes alcohol consumption both inside and outside the home, it still represents a substantial increase in overall liquor sales during the pandemic. Also, the initial increase in liquor purchases was initially higher in March 2020, but the increase dissipated over time.

Regarding factors related to the pandemic, we find that both COVID-19 cases and corresponding increases in unemployment, were both associated with changes in liquor sales, but were not the only factors associated with sales changes. Changes in sales volumes exhibited substantial and statistically significant associations with month fixed effects during the pandemic period. There is evidence that both retail and wholesale sales were less impacted by the number of COVID-19 cases in rural counties than were urban counties. But liquor sales in rural and urban counties were both substantially associated with other factors proxied by the month fixed effects, which in the context of the pandemic, is suggestive of short run and longer run impacts of lockdowns, capacity restrictions, and other policy regulations rather than effects of the incidence of COVID-19 infections, per se. In that regard, negative sales impacts on liquor sales were relatively short-lived in rural wholesale markets, while positive sales impacts in rural retail markets

were relatively persistent, suggestive of longer run behavioral changes. The negative sales impacts in urban wholesale markets were effectively the opposite of the outcomes in rural markets, where the effects largely persisted throughout the 2020-2022 period. On the other hand, the positive sales effects in urban retail markets, while positive throughout the 2020-2022 period as in rural retail markets, exhibited a gradual decline over the period, suggesting that behavioral changes in urban areas were possibly more transient.

An implication of these findings is that shutdown and capacity restriction mandates that were implemented in Idaho beginning in March of 2020, largely in response to pandemic conditions in urban areas, had substantial and differential economic impacts in rural versus urban areas. While these may have been important policies that also reduced the spread of COVID-19 in rural areas, which were not experiencing high levels of cases at the time, the disparate effects on at-home and away-from-home liquor sales between urban and rural areas was notable. This is not to say that shutdown orders were right or wrong. However, one way to mitigate such differential impacts is to allow for more spatially specific restrictions that better reflect local conditions.

Another notable finding is that changes in retail liquor sales appear more persistent in rural areas than in urban areas. While retail sales in urban areas began returning to their pre-pandemic levels during the period of study, retail sales in rural areas were still significantly above their pre-pandemic levels. The differential behaviors in urban versus rural areas underscore the issue of considering more targeted policies that are designed to address the differing characteristics of populations in rural versus urban areas.

The differing results in the wholesale market segment between urban and rural areas could be due to a number of factors. Urban areas experienced more COVID-19 cases in the first wave of the pandemic than rural areas. Also, while COVID-19 cases, both in the urban and rural areas, are surely correlated with restaurant and bar closures and capacity restrictions, there are many other reasons why fluctuating COVID-19 cases could affect sales differently, including that

proportional effects of policy restrictions may differ between the areas, there may be differing degrees of social pressure to be socially distant, enforcement may not be uniform across the regions, and inherent fear and anxiety of the population may be different between more dense urban environments compared to rural living. Whatever the reasons, it is apparent that wholesale sales during the pandemic period are differentially affected across urban and rural areas, both by the actual incidence of COVID-19, and also by other factors associated with the pandemic situation.

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Table 1: Changes in Liquor Sales in Idaho During the Initial Wave of COVID and COVID Shutdowns

	Total Liquor	**Retail Liquor**	**Wholesale Liquor**
Liters Sold Mar-Aug 2020	6,527,005	5,920,816	571,513
Liters Sold Mar-Aug 2019	5,689,822	4,668,127	969,126
Percent Change 2019 to 2020	14.71%	26.83%	-41.03%
Expected Percent Change Based on Trend	5.31%	6.37%	2.17%
Expected Mar-Aug 2020 Sales	5,991,952	4,965,486	990,156
Percent Deviation from Trend	8.93%	19.24%	-42.28%

Table 2: Monthly Changes in Liquor Sales in Idaho During the Initial Wave of COVID and COVID Shutdowns

	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**
Total liters sold in 2019	802,982	780,485	884,502	837,001	953,689	935,316	1,041,428	1,037,888
Total liters sold in 2020	849,967	854,772	1,122,311	947,945	1,089,483	1,085,436	1,179,391	1,102,439
% change 2019 to 2020	5.85%	9.52%	26.89%	13.25%	14.24%	16.05%	13.25%	6.22%
Average annual change 2007 to 2019	5.54%	5.32%	5.31%	5.70%	5.54%	4.56%	5.62%	5.21%

Table 3: Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
total liters sold	1,184,779	128.86	385.82	0.20	18,501.25
real price per liter	1,184,642	19.28	13.83	1.02	3,558.79
percent ethanol	1,184,642	0.33	0.11	0.10	1.59
cpi for beer	1,184,779	216.35	18.01	179.71	255.60
cpi for wine	1,184,779	169.92	3.21	160.59	179.82
percapita personal income	1,165,819	41,119.95	13,494.65	17,981.63	141,809.10
unemployment rate	1,165,819	4.91	1.77	2.10	9.90
population	1,165,819	128,137	160,746.8	1,029	526,268.60
covid cases per 1000 people	1,165,819	1.45	4.77	0.00	55.66

Fixed Effects	Dimension
Month	12 months
Year	16 years
Store	186 stores
Liquor type	58 types

Table 4: Total Sales of Liquor in Idaho

Dep Var: ln(Q milliliters)	STATEWIDE			URBAN			RURAL		
	Coef.	Robust Std. Err.	P>z	Coef.	Robust Std. Err.	P>z	Coef.	Robust Std. Err.	P>z
ln(real price per liter)	-0.8431	0.0037	0.0000	-0.7291	0.0073	0.0000	-0.8584	0.0042	0.0000
ln(percent ethanol)	0.1300	0.0098	0.0000	0.4542	0.0209	0.0000	0.1261	0.0111	0.0000
ln(real percapita income)	0.1222	0.0198	0.0000	2.3960	0.1870	0.0000	0.0940	0.0205	0.0000
ln(population)	0.9376	0.0302	0.0000	-5.0808	0.3997	0.0000	0.7579	0.0351	0.0000
ln(unemployment)	-4.3016	0.0483	0.0000	-6.3356	0.5015	0.0000	-103.474	1.2487	0.0000
cpi for beer	0.0018	0.0011	0.0960	0.0037	0.0021	0.0860	0.0009	0.0012	0.4710
cpi for wine	-0.0012	0.0009	0.1690	-0.0087	0.0018	0.0000	0.0007	0.0010	0.5160
$\sinh^{-1}$(new covid cases/1000)	-0.0033	0.0036	0.3500	-0.0389	0.0255	0.1270	-0.0054	0.0039	0.1580
Year-20	0.2869	0.0567	0.000	-0.1285	0.1693	0.4480	0.3796	0.0640	0.000
Feb-20	0.0112	0.0157	0.4730	0.0189	0.0292	0.5180	0.0080	0.0180	0.6550
Mar-20	0.1368	0.0158	0.0000	0.1822	0.0308	0.0000	0.1273	0.0182	0.0000
Apr-20	0.0853	0.0169	0.0000	0.1890	0.0387	0.0000	0.0692	0.0193	0.0000
May-20	0.1257	0.0167	0.0000	0.0522	0.0321	0.1040	0.1547	0.0191	0.0000
Jun-20	0.1465	0.0165	0.0000	0.2159	0.0530	0.0000	0.1508	0.0187	0.0000
Jul-20	0.1164	0.0179	0.0000	0.2426	0.0870	0.0050	0.1263	0.0199	0.0000
Aug-20	0.0649	0.0177	0.0000	0.1767	0.0748	0.0180	0.0728	0.0199	0.0000
Sep-20	0.1575	0.0175	0.0000	0.1873	0.0610	0.0020	0.1838	0.0200	0.0000
Oct-20	0.1584	0.0191	0.0000	0.2485	0.0782	0.0010	0.1733	0.0216	0.0000
Nov-20	0.0971	0.0206	0.0000	0.1729	0.0958	0.0710	0.1237	0.0232	0.0000
Dec-20	0.0763	0.0205	0.0000	0.1818	0.1037	0.0790	0.0943	0.0228	0.0000
Year-21	0.4952	0.0629	0.0000	0.0284	0.2306	0.9020	0.6184	0.0708	0.0000
Feb-21	-0.0441	0.0158	0.0050	-0.0935	0.0390	0.0170	-0.0443	0.0182	0.0150
Mar-21	-0.0304	0.0160	0.0570	-0.0711	0.0379	0.0610	-0.0330	0.0184	0.0730
Apr-21	0.0357	0.0160	0.0260	0.0227	0.0382	0.5520	0.0234	0.0184	0.2050
May-21	-0.0485	0.0163	0.0030	-0.0623	0.0495	0.2080	-0.0651	0.0187	0.0000
Jun-21	-0.0499	0.0172	0.0040	-0.0754	0.0575	0.1900	-0.0616	0.0195	0.0020
Jul-21	-0.0855	0.0166	0.0000	-0.0548	0.0443	0.2160	-0.1030	0.0189	0.0000
Aug-21	-0.1354	0.0159	0.0000	-0.0280	0.0297	0.3460	-0.1612	0.0183	0.0000

Sep-21	-0.0552	0.0162	0.0010	0.0198	0.0324	0.5420	-0.0680	0.0186	0.0000
Oct-21	-0.0383	0.0155	0.0140	0.0570	0.0311	0.0670	-0.0613	0.0179	0.0010
Nov-21	-0.0654	0.0155	0.0000	-0.0474	0.0307	0.1220	-0.0768	0.0178	0.0000
Dec-21	-0.0893	0.0154	0.0000	-0.0379	0.0311	0.2230	-0.1156	0.0177	0.0000
Year-22	0.4774	0.0682	0.0000	-0.1180	0.2684	0.6600	0.6044	0.0767	0.0000
Feb-22	0.0163	0.0161	0.3120	0.0414	0.0308	0.1790	0.0112	0.0186	0.5490
Mar-22	-0.0067	0.0177	0.7040	-0.0333	0.0433	0.4410	-0.0138	0.0203	0.4970
Apr-22	0.0380	0.0203	0.0610	-0.0501	0.0779	0.5200	0.0296	0.0231	0.2000
May-22	-0.0332	0.0194	0.0870	-0.0690	0.0623	0.2690	-0.0463	0.0221	0.0360
Jun-22	-0.0095	0.0193	0.6230	-0.0272	0.0480	0.5710	-0.0140	0.0221	0.5260
Jul-22	-0.0377	0.0196	0.0540	-0.0243	0.0464	0.6010	-0.0429	0.0223	0.0550
Aug-22	-0.0891	0.0204	0.0000	-0.0484	0.0549	0.3780	-0.1095	0.0232	0.0000
Sep-22	-0.0081	0.0206	0.6940	-0.0342	0.0637	0.5910	-0.0164	0.0234	0.4830

Fixed effect results not reported for brevity.

Table 5: Retail Sales of Liquor in Idaho

	STATEWIDE			URBAN			RURAL		
Dep Var: ln(Q milliliters)	**Coef.**	**Robust Std. Err.**	**P>z**	**Coef.**	**Robust Std. Err.**	**P>z**	**Coef.**	**Robust Std. Err.**	**P>z**
ln(real price per liter)	-0.9137	0.0037	0.0000	-0.7711	0.0072	0.0000	-0.9332	0.0042	0.0000
ln(percent ethanol)	0.1497	0.0098	0.0000	0.3888	0.0206	0.0000	0.1816	0.0111	0.0000
ln(real percapita income)	0.1751	0.0197	0.0000	2.1095	0.1815	0.0000	0.1406	0.0205	0.0000
ln(population)	0.5325	0.0300	0.0000	-5.4928	0.3879	0.0000	0.4341	0.0351	0.0000
ln(unemployment)	-3.2792	0.0481	0.0000	-5.0686	0.4867	0.0000	-94.1184	1.2470	0.0000
cpi for beer	0.0025	0.0011	0.0190	0.0040	0.0021	0.0510	0.0017	0.0012	0.1710
cpi for wine	-0.0002	0.0009	0.8270	-0.0072	0.0017	0.0000	0.0016	0.0010	0.1260
$\sinh^{-1}$(new covid cases/1000)	-0.0048	0.0035	0.1710	-0.0865	0.0247	0.0000	-0.0066	0.0038	0.0870
Year-20	0.3580	0.0564	0.0000	0.2101	0.1643	0.2010	0.4528	0.0640	0.0000
Feb-20	0.0104	0.0155	0.5030	0.0224	0.0283	0.4300	0.0063	0.0179	0.7270
Mar-20	0.2181	0.0157	0.0000	0.2999	0.0299	0.0000	0.2023	0.0181	0.0000
Apr-20	0.2512	0.0168	0.0000	0.4080	0.0375	0.0000	0.2320	0.0192	0.0000
May-20	0.2261	0.0166	0.0000	0.1861	0.0311	0.0000	0.2478	0.0191	0.0000
Jun-20	0.1821	0.0163	0.0000	0.3671	0.0514	0.0000	0.1740	0.0186	0.0000
Jul-20	0.1543	0.0178	0.0000	0.4775	0.0844	0.0000	0.1475	0.0198	0.0000
Aug-20	0.1044	0.0176	0.0000	0.3755	0.0725	0.0000	0.0994	0.0198	0.0000
Sep-20	0.1794	0.0174	0.0000	0.3368	0.0592	0.0000	0.1944	0.0199	0.0000
Oct-20	0.1855	0.0189	0.0000	0.4345	0.0759	0.0000	0.1894	0.0215	0.0000
Nov-20	0.1271	0.0204	0.0000	0.3958	0.0930	0.0000	0.1434	0.0231	0.0000
Dec-20	0.0969	0.0203	0.0000	0.4150	0.1006	0.0000	0.1021	0.0227	0.0000
Year-21	0.6072	0.0625	0.0000	0.6206	0.2239	0.0060	0.7232	0.0708	0.0000
Feb-21	-0.0536	0.0157	0.0010	-0.1504	0.0379	0.0000	-0.0534	0.0181	0.0030
Mar-21	-0.0387	0.0158	0.0140	-0.1346	0.0368	0.0000	-0.0370	0.0183	0.0430
Apr-21	0.0172	0.0159	0.2780	-0.0476	0.0371	0.1990	0.0074	0.0184	0.6880
May-21	-0.0666	0.0162	0.0000	-0.1672	0.0480	0.0010	-0.0785	0.0186	0.0000
Jun-21	-0.0807	0.0170	0.0000	-0.2168	0.0558	0.0000	-0.0853	0.0194	0.0000
Jul-21	-0.1226	0.0164	0.0000	-0.1630	0.0431	0.0000	-0.1364	0.0189	0.0000

Aug-21	-0.1720	0.0157	0.0000	-0.0935	0.0289	0.0010	-0.1900	0.0182	0.0000
Sep-21	-0.0836	0.0160	0.0000	-0.0030	0.0315	0.9240	-0.0906	0.0185	0.0000
Oct-21	-0.0586	0.0154	0.0000	0.0391	0.0302	0.1960	-0.0748	0.0178	0.0000
Nov-21	-0.0946	0.0153	0.0000	-0.1126	0.0298	0.0000	-0.1007	0.0177	0.0000
Dec-21	-0.1167	0.0152	0.0000	-0.0987	0.0302	0.0010	-0.1390	0.0176	0.0000
Year-22	0.5875	0.0678	0.0000	0.5366	0.2606	0.0390	0.7157	0.0767	0.0000
Feb-22	0.0044	0.0160	0.7850	0.0585	0.0299	0.0510	-0.0061	0.0185	0.7410
Mar-22	-0.0257	0.0175	0.1430	-0.1119	0.0420	0.0080	-0.0294	0.0202	0.1460
Apr-22	0.0207	0.0201	0.3020	-0.1867	0.0756	0.0140	0.0115	0.0230	0.6180
May-22	-0.0595	0.0192	0.0020	-0.1843	0.0605	0.0020	-0.0738	0.0220	0.0010
Jun-22	-0.0392	0.0191	0.0400	-0.1117	0.0466	0.0160	-0.0448	0.0220	0.0420
Jul-22	-0.0625	0.0194	0.0010	-0.1011	0.0451	0.0250	-0.0679	0.0223	0.0020
Aug-22	-0.1273	0.0202	0.0000	-0.1579	0.0533	0.0030	-0.1481	0.0231	0.0000
Sep-22	-0.0354	0.0204	0.0830	-0.1506	0.0618	0.0150	-0.0450	0.0233	0.0540

Fixed effect results not reported for brevity.

Table 6: Wholesale Sales of Liquor in Idaho

Dep Var: ln(Q milliliters)	STATEWIDE			URBAN			RURAL		
	Coef.	Robust Std. Err.	P>z	Coef.	Robust Std. Err.	P>z	Coef.	Robust Std. Err.	P>z
ln(real price per liter)	-0.4473	0.0044	0.0000	-0.3537	0.0085	0.0000	-0.4596	0.0050	0.0000
ln(percent ethanol)	0.2557	0.0120	0.0000	0.4877	0.0267	0.0000	0.2204	0.0132	0.0000
ln(real percapita income)	-0.0202	0.0273	0.4590	5.8116	0.2920	0.0000	-0.0412	0.0279	0.1400
ln(population)	1.9287	0.0424	0.0000	-6.7646	0.6282	0.0000	1.5017	0.0493	0.0000
ln(unemployment)	-3.8194	0.0648	0.0000	-6.7581	0.7811	0.0000	-114.850	1.7260	0.0000
cpi for beer	-0.0008	0.0015	0.6070	-0.0005	0.0030	0.8720	-0.0013	0.0016	0.4310
cpi for wine	-0.0032	0.0012	0.0100	-0.0099	0.0025	0.0000	-0.0015	0.0014	0.2810
$\sinh^{-1}$(new covid cases/1000)	-0.0223	0.0051	0.0000	0.1024	0.0396	0.0100	-0.0089	0.0055	0.1060
Year-20	-0.0872	0.0772	0.2580	-2.6012	0.2558	0.0000	-0.021	0.0860	0.8060
Feb-20	-0.0017	0.0216	0.9390	-0.0091	0.0411	0.8240	0.0028	0.0248	0.9110
Mar-20	-0.4089	0.0222	0.0000	-0.5481	0.0445	0.0000	-0.3800	0.0255	0.0000
Apr-20	-1.9140	0.0325	0.0000	-2.3511	0.0676	0.0000	-1.8085	0.0380	0.0000
May-20	-0.7213	0.0242	0.0000	-0.9945	0.0473	0.0000	-0.6390	0.0276	0.0000
Jun-20	-0.0622	0.0229	0.0070	-0.3839	0.0804	0.0000	-0.0296	0.0258	0.2510
Jul-20	-0.0930	0.0251	0.0000	-0.7620	0.1336	0.0000	-0.0286	0.0275	0.3000
Aug-20	-0.1065	0.0248	0.0000	-0.6159	0.1141	0.0000	-0.0670	0.0277	0.0150
Sep-20	0.0916	0.0244	0.0000	-0.3038	0.0929	0.0010	0.1111	0.0276	0.0000
Oct-20	0.0910	0.0267	0.0010	-0.3445	0.1199	0.0040	0.0822	0.0301	0.0060
Nov-20	-0.0323	0.0292	0.2690	-0.5838	0.1473	0.0000	-0.0443	0.0327	0.1760
Dec-20	-0.0457	0.0291	0.1160	-0.6904	0.1602	0.0000	-0.0394	0.0322	0.2210
Year-21	0.0245	0.0860	0.7750	-3.5254	0.3522	0.0000	0.1092	0.0954	0.2530
Feb-21	-0.0593	0.0221	0.0070	0.0765	0.0577	0.1850	-0.0552	0.0253	0.0290
Mar-21	-0.0034	0.0223	0.8790	0.1514	0.0556	0.0060	-0.0054	0.0256	0.8340
Apr-21	0.0546	0.0223	0.0140	0.2321	0.0560	0.0000	0.0480	0.0257	0.0610
May-21	-0.0215	0.0229	0.3490	0.2947	0.0750	0.0000	-0.0421	0.0261	0.1070
Jun-21	0.0566	0.0240	0.0180	0.3893	0.0876	0.0000	0.0570	0.0272	0.0360
Jul-21	0.0200	0.0231	0.3870	0.3214	0.0660	0.0000	0.0002	0.0263	0.9930

Aug-21	0.0214	0.0220	0.3310	0.2176	0.0421	0.0000	-0.0348	0.0252	0.1680
Sep-21	0.0696	0.0225	0.0020	0.1127	0.0465	0.0160	0.0308	0.0258	0.2320
Oct-21	0.0465	0.0216	0.0320	0.1044	0.0446	0.0190	-0.0060	0.0249	0.8090
Nov-21	0.0325	0.0217	0.1340	0.2024	0.0439	0.0000	-0.0135	0.0250	0.5890
Dec-21	-0.0161	0.0216	0.4570	0.2004	0.0450	0.0000	-0.0701	0.0248	0.0050
Year-22	0.0205	0.0932	0.8260	-4.1787	0.4110	0.0000	0.0594	0.1035	0.5660
Feb-22	0.0731	0.0225	0.0010	0.0022	0.0437	0.9600	0.0952	0.0259	0.0000
Mar-22	0.0421	0.0246	0.0870	0.2125	0.0625	0.0010	0.0485	0.0282	0.0860
Apr-22	0.0128	0.0285	0.6540	0.3459	0.1179	0.0030	0.0604	0.0325	0.0630
May-22	0.0015	0.0270	0.9560	0.3084	0.0934	0.0010	0.0208	0.0308	0.4990
Jun-22	0.0845	0.0268	0.0020	0.2771	0.0702	0.0000	0.1064	0.0305	0.0000
Jul-22	0.0254	0.0272	0.3500	0.2291	0.0681	0.0010	0.0385	0.0309	0.2120
Aug-22	0.0522	0.0283	0.0650	0.3305	0.0818	0.0000	0.0633	0.0320	0.0480
Sep-22	0.0776	0.0287	0.0070	0.3832	0.0960	0.0000	0.0983	0.0324	0.0020

Fixed effect results not reported for brevity.

Figure 1: New Covid Cases in Idaho

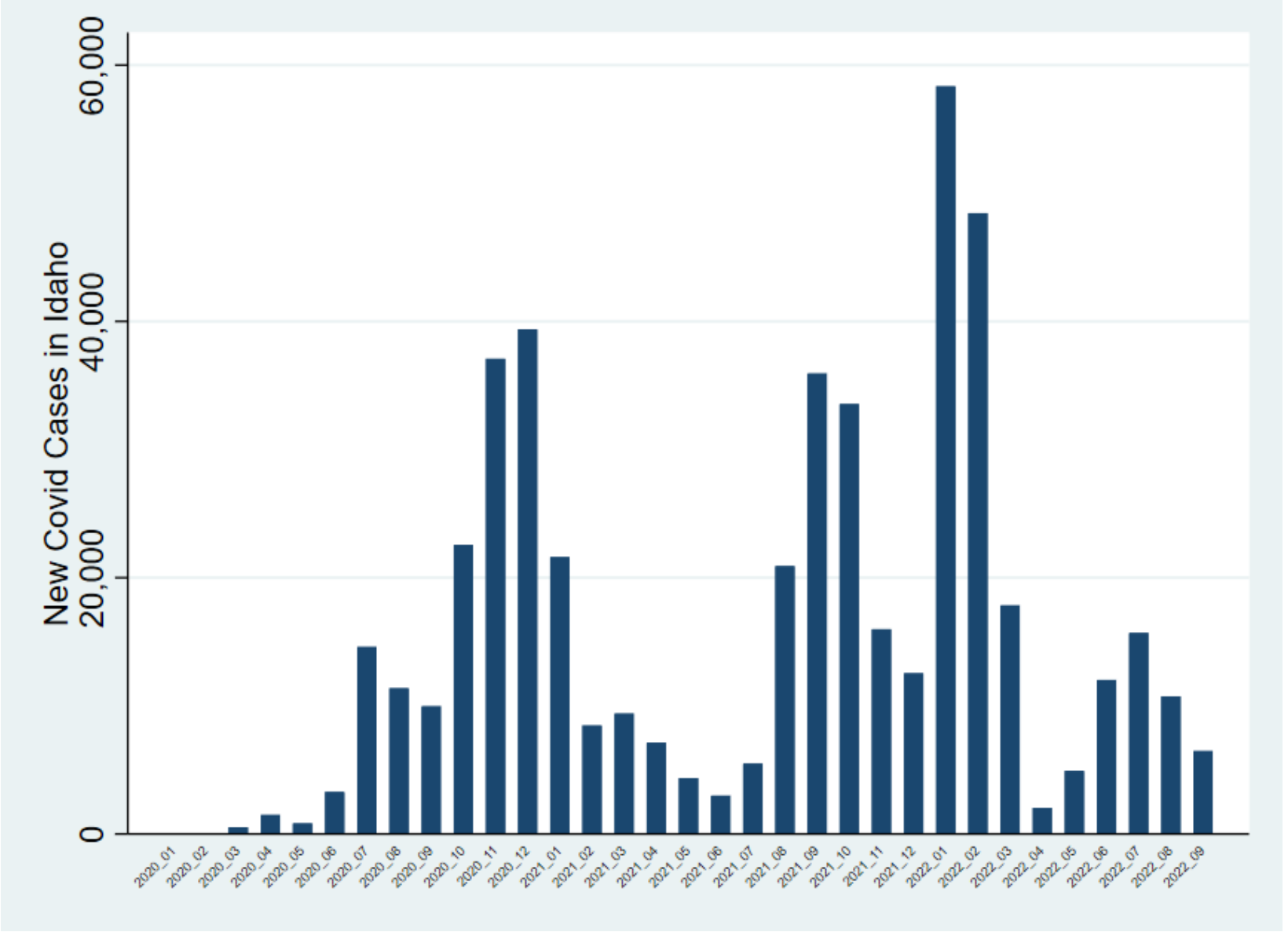

Figure 2: Retail and Wholesale liquor sales in Idaho by month