Malleability of Alcohol Consumption: Evidence from Migrants*†

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Abstract

How malleable is alcohol consumption? Specifically, how much is alcohol consumption driven by the current environment versus individual characteristics? To answer this question, we analyze changes in alcohol purchases when consumers move from one state to another in the United States. We find that if a household moves to a state with a higher (lower) average alcohol purchases than the origin state, the household is likely to increase (decrease) its alcohol purchases right after the move. The current environment explains about two-thirds of the differences in alcohol purchases. The adjustment takes place both on the extensive and intensive margins.

JEL: I12, L66, D12, I18

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1 Introduction

Alcohol is one of the leading killers among substances. In 2016, alcohol was responsible for 5.3% of all deaths and 7.2% of all premature deaths (among persons 69 years of age and younger) worldwide (World Health Organization, 2018). Beyond direct health consequences, excessive alcohol consumption generates a social and economic burden on other people (Cook and Moore, 2000; Cawley and Ruhm, 2011).

Various factors affect alcohol consumption, such as taxes and other regulations, peers, and social norms. To identify each factor's direct impact, studies have used changes in regulation (e.g. Carpenter, 2004; Marcus and Siedler, 2015) and random assignment of peers (e.g. Eisenberg et al., 2014). These studies give us a well-identified local average treatment effect in the short term. But over the long term, institutions and cultural norms are known to interact (Guiso et al., 2016), either magnifying or decreasing each factor's direct effect.[1] For example, peers who do not consume alcohol could vote for stricter alcohol regulation; strict alcohol regulation could lead to norms of consuming less alcohol and affect how children grow up viewing alcohol, which again changes the norm and leads to a different local environment. Quantifying the overall impact of the environment is important, as it tells us how malleable alcohol consumption is and informs us how much room there is for any alcohol policy. But measuring the combined effect is challenging because it typically requires looking at a long time horizon. However, over the long term, economic conditions change in other ways that also affect alcohol consumption. Therefore, less is known about the magnitude of the combined effect.

In this paper, we study how much the current environment drives alcohol purchases. To answer the question, we analyze changes in alcohol purchases when consumers move from one state to another in the United States. The magnitude of the change in movers' alcohol purchases allows us to measure the relative importance of the current environment. Understanding how alcohol consumption responds to the current environment is crucial for designing effective policies.

Our empirical strategy relies on the fact that the environment, including supply conditions, alcohol regulation, taxes, and movers' peers, changes discretely when consumers move. If the current environment mainly drives alcohol consumption, we would expect a jump in the mover's alcohol purchases in the same direction as the gap between the destination and origin state. On the other hand, if alcohol consumption is only driven by individual charac-

[1] For an overview of interactions of institutions and cultural norms, see Alesina and Giuliano (2015).

teristics, such as personal preferences and past experiences, we would not expect a change in the mover's alcohol purchases.

We study the question using a panel of movers in the NielsenIQ scanner data of alcohol purchases. We observe their alcohol purchases years before and after the move. Our primary outcome variable is the logarithm of quarterly off-premise alcohol purchases measured in pure ethanol. We also measure alcohol purchases separately in beer, wine, and liquor categories and analyze the extensive margin—whether consumers buy any alcohol at all.

We estimate event study and difference-in-differences regressions with consumer and time period fixed effects. A possible concern with our identification strategy is that moves occur due to a shock that changes alcohol purchases. To alleviate the concern, we provide two pieces of evidence. First, we restrict the sample to movers whose observable characteristics, like household size, employment, and marital status, don't change, and our results remain similar. Second, we compare trends in pre-move purchases of movers to higher versus lower alcohol-purchasing states. This shows that the movers who chose to go to different states before the move had similar trends in their purchases.

We find that if a household moves to a state with a higher (lower) average alcohol purchases than the origin state, the household is likely to increase (decrease) its alcohol purchases right after the move. About two-thirds of the gap in alcohol purchases between the origin and destination state closes immediately when a consumer moves. No sizable further change is seen after the immediate jump. This finding implies that the current environment explains a large share of the differences in alcohol purchases and that government policies and regulations targeting the drinking environment (e.g. alcohol availability) could have a significant impact on the amount of alcohol consumed.

There is some heterogeneity across product types. Consumers adjust their wine purchases more and their liquor purchases less. The adjustment takes place both on the extensive and intensive margins. On the extensive margin, movers are more (less) likely to buy alcohol when moving to a state with a larger (smaller) share of consumers buying alcohol. On the intensive margin, movers who bought alcohol before the move adjust the quantity in the direction of the average purchases in the destination state. There is evidence of asymmetries in adjustment, but mainly on the extensive margin. Consumers are more likely to adjust upward (start to purchase alcohol) than downward (stop buying alcohol). Our results are robust to a number of robustness checks using alternative samples, functional forms, controls, and geographic aggregation levels.

An important concern about the analysis is underreporting of alcohol purchases. In particular, whether the magnitude of underreporting changes at the move. This could happen if reporting depends on retail conditions, such as alcohol availability in grocery stores, which vary by state. We provide evidence that our results are not driven by the changes in reporting related to the retail conditions. When we restrict the sample to moves between states with similar retail conditions, movers still adjust their purchases. Another concern is that we only measure off-premise alcohol purchases, and we provide suggestive evidence that this is predictive of overall heavy drinking.

Our results based on movers and alcohol purchases might not generalize to the general population and other products. If movers are more likely to adjust to the new environment, our results provide an upper bound of how malleable alcohol purchases are in the general population. However, movers are also interesting in their own right because they are a large share of the population—more than 30% of the U.S. population has moved across the state lines in their lifetime (Molloy et al., 2011). Furthermore, our findings of the extent of the adjustment are specific to alcohol and don't necessarily generalize to other products. For example, we show that movers don't significantly adjust their food purchases. We also show that our estimation method replicates the results from the literature of a large adjustment for brands as in Bronnenberg et al. (2012) and no adjustment for healthy eating choices as in Allcott et al. (2019).

Our work contributes to the ongoing debate about how malleable alcohol consumption is and how much it is driven by the environment.[2] We provide new causal evidence that the current environment explains about two-thirds of the variation in alcohol purchases. The current environment consists of many factors (including local regulation, norms, and peers), which in the long-term affect each other, making it difficult to measure the combined effect. Therefore, the literature mostly estimates the short-term direct effect of either taxes and regulations or peer effects. A notable exception is Yakovlev (2018), who uses a structural model and data on alcohol consumption and peers to estimate the impact of an increase in the price of vodka in Russia. He finds that peer effects play a large role in magnifying the impact of the price increase. We contribute to the literature by using an alternative method based on movers to overcome the difficulties in measuring the combined effect.

Our work also adds a new finding to the literature on how changes in the environment

[2]The literature has studied the impact of environmental factors such as alcohol taxes and regulations (Carpenter, 2004; Marcus and Siedler, 2015; Aguirregabiria et al., 2016; Bernheim et al., 2016; Hinnosaar, 2016; Miller and Weinberg, 2017; Illanes and Moshary, 2018; Griffith et al., 2019; Miravete et al., 2019; Seo, 2019; Kueng and Yakovlev, 2021; Gehrsitz et al., 2020), peer effects (Lundborg, 2006; Clark and Lohéac, 2007; Eisenberg et al., 2014), and individual characteristics such as family background, cognitive ability, discount rate, and self-control (Cutler and Lleras-Muney, 2010; Schilbach, 2019).

affect consumer behavior. In the case of food and drinks, the question was studied using movers in the same dataset, the NielsenIQ scanner data, by Bronnenberg et al. (2012); Allcott et al. (2019); Hut (2020).[3] Bronnenberg et al. (2012) study the evolution of brand preferences and find that 60% of the gap between the destination and the origin average purchases of grocery products is bridged immediately after the move. Allcott et al. (2019) and Hut (2020) study how much the healthiness of food purchases changes with a move and find that the change is very small. Our results align with the evidence of large changes in brand choices while standing in contrast to little changes in the healthiness of food purchases. We hypothesize that large regional differences in alcohol regulation (availability and taxes) are the main reason for the large adjustment in alcohol purchases. So large regional differences in supply conditions are absent in food healthiness while existing for brands.

More generally, the literature on the convergence of behaviors of migrants has often found evidence of persistence, for example, for food preferences (Atkin, 2016), living arrangements (Giuliano, 2007), and fertility and female labor force participation (Fernández and Fogli, 2009). Our finding of sizable changes in alcohol purchases is not surprising, considering that alcohol consumption is a social activity. It is plausible that alcohol consumption is more influenced by social forces and the environment than other behaviors examined in the literature.

To quantify the importance of the environment in affecting population health, Finkelstein et al. (2016, 2018, 2021) develop and employ the same empirical strategy of examining migrants' behaviors. Our results on the role of the environment in alcohol purchases add an important dimension not previously examined in this literature. More generally, our paper relates to the recent work of Chetty et al. (2016) and Chetty and Hendren (2018b), which find that where one grows up is an important factor in affecting long-term outcomes such as intergenerational mobility and earning. Our paper provides an additional mechanism of why the environment matters. According to our findings, the current environment largely determines individuals' alcohol purchases. Using a simple back-of-envelope calculation would suggest that if a household of two adults and one child moves from Utah to New Hampshire,

[3] Other papers using data of movers have estimated the impact of urban sprawl on obesity (Eid et al., 2008), the impact of location on healthcare utilization (Finkelstein et al., 2016), food consumption in India (Atkin, 2016), intergenerational mobility (Chetty and Hendren, 2018b,a), opioid abuse (Finkelstein et al., 2018), relative obesity (Liu and Zuppann, 2018), physicians practice styles (Molitor, 2018), mortality (Finkelstein et al., 2021), and consumer financial distress (Keys et al., 2020). More generally, the same idea of using movers is used to measure worker and firm effects (Abowd et al., 1999; Card et al., 2013) and teacher effects (Jackson, 2013; Chetty et al., 2014). The impact of other large changes in the environment on food consumption has been studied, for example, by Dragone and Ziebarth (2017) in German reunification.

the family's alcohol purchases would increase by $27 per quarter. This shift in alcohol purchases could affect wealth, earnings, alcohol abuse, and the overall well-being.

Section 2 describes the data. Section 3 describes the empirical strategy. Section 4 presents our main analysis. Section 5 concludes.

2 Data

NielsenIQ Consumer Panel. We use NielsenIQ Consumer Panel from 2004–2017 to measure household-level alcohol purchases (quantity and expenditures). The panel is representative of the U.S. population. The households in the panel are asked to scan all their grocery purchases, including alcohol. The reliability of the data has been extensively analyzed (Einav et al., 2010; Zhen et al., 2019).

Each year, the households report demographic characteristics, including income, household composition, marital status, employment status, and geographic location. Within household variation in demographic characteristics in the NielsenIQ Consumer Panel has been used widely in the literature, including changes in location (Allcott et al., 2019; Hut, 2020), employment status (Dubé et al., 2018; Hinnosaar, 2018), household composition (Hinnosaar, 2019; Janssen and Parslow, 2021), and income (Dubé et al., 2018; Argente and Lee, 2021).

All the purchases data is at the household level, which makes the person-level analysis impossible. Therefore, with a slight abuse of terminology, when talking about individual characteristics, we mean individual household characteristics.

Sample construction. Our main sample consists of movers. We define a household to be a mover if its state of residence changes once.[4] We exclude from the sample households whose state of residence changes more than once. Robustness analysis shows that further restricting the sample to the movers with constant demographic characteristics (employment status, marital status, household size, and the number of members aged 21 and above) does not substantially change the estimates.

The dataset has information of the year on the move but not the exact time of moving. The geographic location of the stores where movers shop confirms that indeed they change

[4]We analyze robustness to alternative geographic levels, such as county and 3-digit zip code. We focus on across states moves because a lot of the variation in the alcohol regulation is at the state level, and at more disaggregate levels, data is noisier.

the shopping location during the year of the move (figure A.1 in online appendix). Unsurprisingly, timing is heterogeneous: some movers start shopping in their destination at the beginning of the move year, while others switch later. We drop the year of the move from our main sample to avoid mismeasurement associated with not knowing the exact timing of the move. Dropping the year of the move is not critical for our results. In the robustness analysis, we assume that households move in the quarter with the first shopping trip in the destination during the move year. However, this definition of the move's timing is imprecise because the store location is known for about half of the shopping trips.

Outcome measures. Our main outcome measures are household-level quarterly alcohol purchases per adult: quantity of beer, wine, liquor, the total quantity of pure alcohol, and the total expenditure on alcohol. We calculate the total quantity of pure alcohol from all types of alcohol using the following formula: Q(pure alcohol) = 0.4Q(liquor) + 0.12Q(wine) + 0.045Q(beer). We deflate alcohol expenditures to 2015 dollars using the consumer price index for urban consumers.[5] We calculate alcohol purchases per adult by dividing household purchases by the number of persons aged 21 and above.[6] To analyze alcohol purchases on the extensive margin, we calculate a rolling average measure of whether the household has bought any alcohol during the current and past three quarters.

In our main specification, the outcome variable is the logarithm of quarterly alcohol quantity or expenditures plus one. The results do not depend on the functional form. Robustness analysis shows that three alternative functional forms (inverse hyperbolic sine transformation, percentile ranks, and actual values) give similar results.

We compute state-level average outcomes using data on non-movers, that is, households whose state of residence does not change. When calculating state-level averages, we first average across households in each time period (calendar quarter) and in each state using sample weights (and information on the number of adults) and then take averages across time periods.[7]

Summary statistics. Online appendix A presents summary statistics. Movers compared to non-movers are more likely to have higher income, be college-educated, and women are less likely to be employed (table A.1). Movers are also likely to consume more alcohol. Moves are rather symmetric—moves to states with larger average alcohol purchases are about as

[5] In the same way, we also deflate all measures of income, prices, and taxes.

[6] We drop households from the sample that do not have any members aged 21 or above.

[7] State-level alcohol purchases have been rather stable over time (figure A.3 in online appendix).

likely as moves to states with smaller average alcohol purchases (figure A.2). Moves take place between all regions (table A.2). Movers who move to states with larger average alcohol purchases have relatively larger pre-move alcohol purchases than those who move to states with smaller average purchases (table A.3). In our analysis, these differences among movers will be absorbed by household fixed effects.

3 Empirical strategy

Our empirical strategy decomposes the variation in alcohol purchases to the current environment versus individual factors. In the main specification, we restrict the sample to movers and regress mover's alcohol purchases on the *size of the move* defined as the difference between the average outcome variable (measuring alcohol purchases) in the mover's destination and origin states, and on household and time fixed effects.[8] Specifically, we estimate the following event study regression for mover i in period t:

$$y_{it} = \alpha_i + \tau_t + \sum_{r(i,t)} \theta_{r(i,t)} \cdot \Delta_i + \varepsilon_{it} \tag{1}$$

where the outcome variable y_{it} is a measure of alcohol purchases. All regressions include household fixed effects α_i and time period fixed effects τ_t. Index $r(i,t)$ indicates quarters relative to the move for household i in period t. The first quarter in the new state is indexed by 0. The coefficient θ_{-1} on the last quarter in the state of origin is normalized to zero.[9]

The size of the move $\Delta_i = \bar{y}_{D,i} - \bar{y}_{O,i}$ measures the difference between the average alcohol purchases in the mover's destination and origin state. We calculate the difference $\bar{y}_{D,i} - \bar{y}_{O,i}$ based on non-movers in the destination and origin as described in section 2.

The coefficients of interest $\theta_{r(i,t)}$ measure how much individual alcohol purchases change relative to the gap in average purchases between two areas, Δ_i. If, after the move, the mover's alcohol purchases change by the same amount as the gap Δ_i, the coefficient $\theta_{r(i,t)}$ equals one. However, if there is no change in alcohol purchases after the move, the coefficient $\theta_{r(i,t)}$ equals zero. The value of the coefficient measures the fraction of the difference between destination and origin that has been covered. In this way, the size of the jump at the

[8] An alternative strategy (in online appendix B) that instead of the size of the move uses household and state fixed effects and data on both movers and non-movers gives similar estimates.

[9] We exclude the calendar year of the move to avoid mismeasurement due to not observing the exact quarter of the move. By the first quarter in the new state, we mean the first quarter after the year of the move; and by the last quarter in the origin state, we mean the last quarter before the year of the move.

time of move measures the share of the average difference between areas attributable to the current environment (as opposed to individual characteristics).[10] We calculate standard errors clustered at the household level.[11]

In addition to the event-study, we also estimate difference-in-differences regressions. The specification is the same as equation (1), except that all the coefficients post-move $\{\theta_{r(i,t)} : r \geq 0\}$ are collapsed into one and the coefficients pre-move are normalized to zero.

Identification. The identifying assumption is that the trends in movers' purchases are not correlated with the size of the move. Due to household fixed effects, the specification allows that movers' levels of alcohol purchases are correlated with the movers' origin or destination or the size of the move. It also allows that movers' alcohol purchases (levels and trends) systematically differ from those of non-movers.

A possible concern is that movers to higher (lower) alcohol purchasing states would have increased (decreased) their purchases anyway. For example, that moves and changes in alcohol purchases happen due to divorce, unemployment, or retirement. We provide evidence that we get similar results when we exclude households whose marital status, employment, household size, or the number of members aged 21 and above changes.

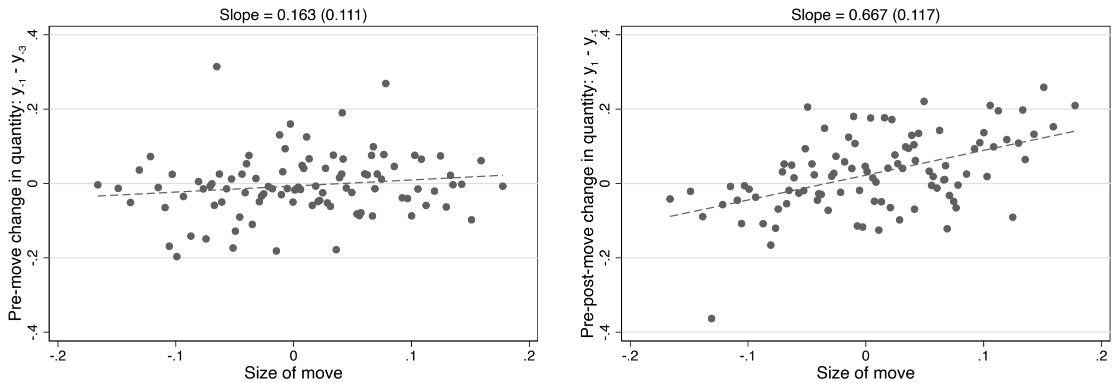
To provide additional support for the identifying assumption, we analyze whether the pre-move trends in alcohol purchases are correlated with the size of the move. Figure 1a presents binned scatter plots of changes in alcohol purchases over three years before the move by the size of the move. While on the figures by eye-balling, one could detect a slight pre-trend, this is not statistically significant at the 10 percent level. In any case, the small magnitude of the statistically insignificant pre-trend is in contrast with the large positive correlation of the size of the move and changes in the three years over the move (figure 1b).

4 Results: Measuring the extent of movers' adjustment

Event study results. Figure 2 presents event study estimates. It shows a sizable jump at the time of the move in the quantity of ethanol purchased. This indicates that the current environment plays a sizable role in affecting alcohol purchases. Figure A.4 in online appendix presents similar results for alcohol expenditures and separately for the quantity of

[10]Finkelstein et al. (2016) show formally how the coefficient measures the share of variation explained by the location as opposed to individual characteristics.

[11]The estimates retain their level of statistical significance when clustering at the level of origin-destination states pair.



(a) Pre-move change: $y_{-1} - y_{-3}$ (b) Pre-post-move change: $y_1 - y_{-1}$

Figure 1: Changes in alcohol purchases by the size of move: pre-move (1a) and from pre- to post-move (1b)

Notes: Each figure presents a binned scatter plot of the change in the logarithm of alcohol purchases (y-axes) on the size of the move $\hat{\Delta}_i$ (x-axes). For each mover we calculate the size of the move Δ_i and group these into percentiles. The x-axes displays the mean Δ_i for movers in each percentile. On figure 1a, the y-axes shows for movers in each percentile the average log purchases in the last calendar year pre-move minus average log purchases in the third calendar year pre-move. On figure 1b, the y-axes shows for movers in each percentile the average log purchases in the first calendar year post-move minus the average log purchases in the last calendar year pre-move. The line of best fit is obtained from OLS regression using the 100 data points (percentiles). Its slope coefficient and standard error (in parentheses) are reported on the graph. Figures 1a–1b use the same sample, which includes all movers that move across state lines, limiting the sample to those that move only once and who are observed continuously from three calendar years before the move to one calendar year after the move (1339 households).

beer, liquor, and wine.

Difference-in-differences results. Panel A of table 1 summarizes the above event-study estimates, re-estimating regression (1) pooling all time periods before the move and all time periods after the move.[12] The change in alcohol purchases after the move equals about 70% of the destination minus origin difference. There is some heterogeneity across the types of alcohol—the adjustment (importance of the current environment) is slightly larger for wine and smaller for liquor.

Is the change in alcohol purchases coming from the intensive or extensive margin? According to the 2017 National Survey on Drug Use and Health, 34% of U.S. adults did not drink alcohol in the past year.[13] Does the move change whether consumers purchase any

[12]When restricting time periods to 2 years before and after the move, results remain similar.

[13]Source: Substance Abuse and Mental Health Services Administration, National Survey on Drug Use and Health, 2017, `https://datafiles.samhsa.gov/`.

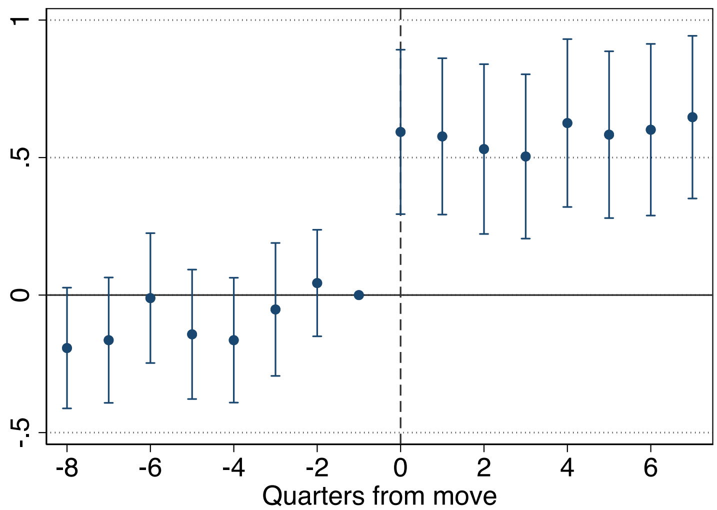


Figure 2: Event study of alcohol purchases (quantity)

Notes: Each figure presents the coefficients $\theta_{r(i,t)}$ (point estimates and 95% confidence intervals) estimated from equation (1). The coefficient for the last time period before the move is normalized to 0. The dependent variable is the logarithm of the quantity of total pure alcohol purchased. The regression includes quarter-year dummies and household fixed effects. Sample includes all movers that move across state lines, limiting the sample to those that move only once and who are observed continuously 2 years before and after the move; the year of the move itself is excluded from the sample; quarters more than 2 years before or after the move are included in the estimation but not shown on the figure (1,379 households and 50,964 observations). Standard errors are clustered at the household level.

alcohol (extensive margin)? Or is all the adjustment coming from those who purchased alcohol before the move and now change the quantity? To examine the intensive margin (table 1, panel B, columns 1–4), we restrict our sample to those who have purchased alcohol before the move. To analyze the extensive margin (panel B, column 5), the dependent variable indicates whether a household purchased alcohol in the previous 12 months and Δ the difference between the destination and origin in the share of households purchasing alcohol.[14] The results show that movers make large changes in their alcohol purchases both on the intensive and extensive margins.

Is the effect asymmetric? It might be easier to adjust alcohol consumption upwards than cut it down. In the extreme, is all the adjustment only upwards? Panel C of table 1 shows that adjustment takes place in both directions. On the intensive margin (columns 1-4), the magnitude of adjusting alcohol quantity upwards versus downwards is not different from each other at 10 percent significance level. On the extensive margin (column 5), the effect is indeed

[14] Nearly one-third of the sample do not purchase any alcohol, which matches the national average from the National Survey on Drug Use and Health.

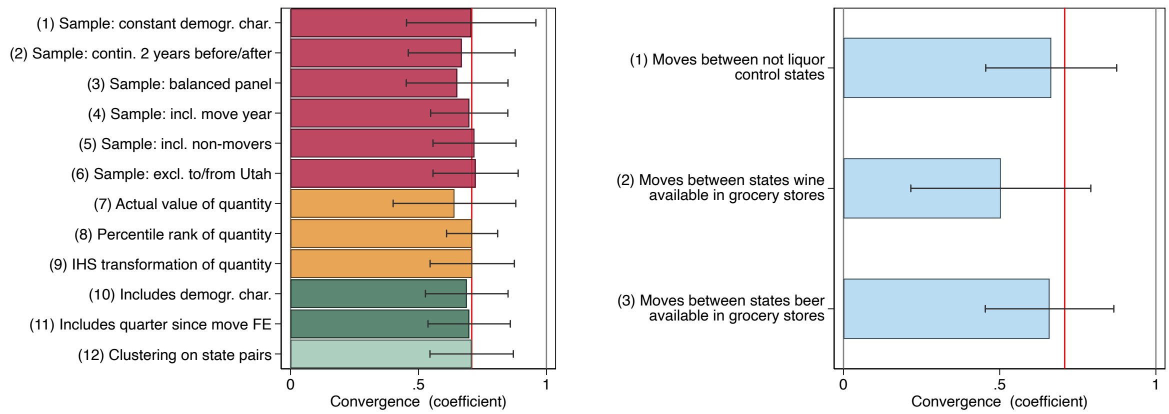
Table 1: Change in alcohol purchases after move. Difference-in-differences estimates.

	(1)	(2)	(3)	(4)	(5)
	Quantity				Expend.
	Total	Beer	Liquor	Wine	Total
Panel A: Average effects					
$\Delta \cdot$ After move	0.708***	0.689***	0.608***	0.821***	0.695***
	(0.082)	(0.087)	(0.097)	(0.093)	(0.058)
Households	3267	3267	3267	3267	3267
Observations	97860	97860	97860	97860	97860
	Intensive margin Quantity conditional on purchasing alcohol before move				Extensive margin Purchasing alcohol
	Total	Beer	Liquor	Wine	
Panel B: Intensive and extensive margins, average effects					
$\Delta \cdot$ After move	0.775***	0.771***	0.670***	0.889***	0.500***
	(0.095)	(0.101)	(0.112)	(0.107)	(0.055)
Panel C: Intensive and extensive margins, asymmetric effects					
$\Delta \cdot 1[\Delta > 0] \cdot$ After move	0.868***	0.919***	0.855***	1.044***	0.705***
	(0.145)	(0.146)	(0.191)	(0.162)	(0.087)
$\Delta \cdot 1[\Delta < 0] \cdot$ After move	0.664***	0.571***	0.486***	0.719***	0.291***
	(0.152)	(0.161)	(0.157)	(0.176)	(0.085)
Wald test, coef. equality, p-value	0.373	0.133	0.170	0.215	0.002
Households	2722	2722	2722	2722	3267
Observations	83596	83596	83596	83596	86112

Notes: Each column-panel combination presents estimates from a separate regression. Dependent variable is logarithm of alcohol purchases or indicator for purchasing alcohol (column 5 in panels B–C). $\Delta_i = \bar{y}_{D,i} - \bar{y}_{O,i}$ is the difference in average logarithm of alcohol purchases between the destination and origin state of the mover; or in column 5 in panels B–C, the difference in the share of households purchasing any alcohol between the destination and origin state. $1[\Delta_i > 0]$ is an indicator for Δ_i being strictly positive, that is, a move to a state with larger average alcohol purchases, and $1[\Delta_i < 0]$ indicates a move to a state with smaller average alcohol purchases. Each regression includes quarter-year fixed effects and household fixed effects. Sample includes all movers that move across state lines, limiting the sample to those that move only once, the year of move is excluded from the sample (3267 households and 97860 observations). In panels B–C columns 1–4, to analyze changes on the intensive margin, the sample is further restricted to households who bought alcohol before the move (2722 households and 83596 observations). In panels B–C column 5, to analyze changes on the extensive margin, the outcome variable indicator for purchasing any alcohol is calculated as a rolling average over four quarters, therefore the number of household-quarters is smaller than in panel A (3267 households and 86112 observations). In panel C, to test whether the effect is asymmetric, p-value of the Wald test for the equality of the two coefficients is included. Standard errors (in parentheses) are clustered at the household level. *** Indicates significance at 1 percent level.

asymmetric. When moving to a state with a larger share of consumers purchasing alcohol ($\Delta > 0$), movers are more likely to adjust upward (start to purchase alcohol), compared to adjusting downward (stopping purchasing alcohol), when moving to a state with a smaller share of consumers purchasing alcohol ($\Delta < 0$). The average Δ in column 5 is about 10%, implying that on average a non-drinker moving from a low alcohol consumption state to a high alcohol consumption state is seven percentage points more likely to purchase alcohol after the move.

Robustness. Below, we summarize the analysis meant to explore the sensitivity of our results to alternative samples, functional forms, controls, clustering, and geographic levels.



(a) Changing samples, dependent variables and regression specifications

(b) Moves between states with similar alcohol retail conditions

Figure 3: Robustness checks of difference-in-differences estimations

Notes: Each bar presents a point estimate from a separate regression analogous to that in column 1 panel A in table 1. The x-axes measures the estimated extent of changes in alcohol purchases after move ($\Delta\cdot$ After move in table 1). The red vertical line at 0.708 describes the comparison which is the value of the point estimate in the regression in column 1 in table 1. The dependent variable is the logarithm of the quantity of total ethanol purchases, except regressions 7-9 on figure 3a where it is either the actual value of the quantity, percentile rank, or IHS transformation. For percentile ranks, in each time period, all households are ranked by alcohol purchases; each period, household's percentile rank is its position in the national distribution; the area-level change is measured as a change in the area-level average percentile rank. Each regression includes quarter-year fixed effects and household fixed effects. Demographic characteristics (logarithm of income, household size, number of adults aged 21+, marital status, employment status, an indicator for children aged 0-5, and dummies for time period relative to move) are included in regression 10 on figure 3a, and quarter since move fixed effects are also included in 11 on figure 3a. Sample includes all movers that move across the state lines, limiting the sample to those that move only once. The sample excludes the move year, except in regression 4 on figure 3a. On figure 3a, the sample is further restricted to households whose demographic characteristics remain constant (regression 1); or who are observed continuously two years before and after the move (2); or to the balanced panel two years around the move (3). In regression 5 and 11, the sample includes non-movers; in 6, it excludes movers to and from Utah. On figure 3b, the sample is further restricted to moves between states that are not liquor control states (regression 1), moves between states where in the majority of grocery stores wine (regression 2) or beer (regression 3) is available. Capped spikes present the 95% confidence intervals with standard errors clustered at the household level, except for regression 12 where the standard errors are clustered on the origin-destination state pair. Details about the estimates are in tables A.4–A.8 and A.12–A.14 in online appendix A.

Our results are robust to using alternative samples (figure 3a, regressions 1–6). Importantly, results remain the same when restricting the sample to movers whose demographic characteristics remain constant. This helps to alleviate the concern that a move and a change in alcohol purchases are due to the same shock in personal circumstances. The results are not driven by the specific functional form of the outcome variable (figure 3a, regressions 7–9). Instead, the results are similar with three alternatives: when we measure alcohol purchases using the actual value of quantity (instead of the logarithm), inverse hyperbolic sine transformation, or percentile rank (as used by Chetty and Hendren (2018a)). Including event time fixed effects or demographic characteristics as controls also does not change the results (figure 3a regressions 10–11). When including event time fixed effects we use the sample of both movers and non-movers, because if we use only movers, time period fixed effects and event time fixed effects would be perfectly collinear. While in the main analysis, we cluster standard errors at the household level, the calculated standard errors remain similar if clustered at the level of origin-destination states pair (figure 3a regression 12).

We explore robustness to the geographic area, comparing zip codes, counties, states, and census regions (tables A.9–A.11 in online appendix). Our results remain similar as long as movers cross state lines. For moves inside the state, there is much less convergence towards the destination zip code or county level. Although county- and town-level differences in alcohol regulation exist, we hypothesize that most variation in alcohol purchases are driven by state-level regulation. For within-state moves, there is little, possibly noisily measured, variation between destination and origin.

Heterogeneity by alcohol retail conditions and initial alcohol purchases. A potential concern is whether our estimates are driven by changes in scanning behavior due to the move. If households are more likely to report purchases made in grocery stores than liquor stores, moving to or from a state which sells alcohol in grocery stores could lead to a large change in reported purchases. To check the validity of this concern, we restrict samples to moves between states with similar retail conditions (figure 3b). The estimates are less precise but not considerably different from those obtained from the full sample (table 1 column 1).

We also explore heterogeneity by before-move alcohol purchases (table A.15 in online appendix). The point estimates for moderate and heavy drinkers are similar (about 0.7), but the estimates for heavy drinkers are imprecise (possibly because of the smaller sample size).

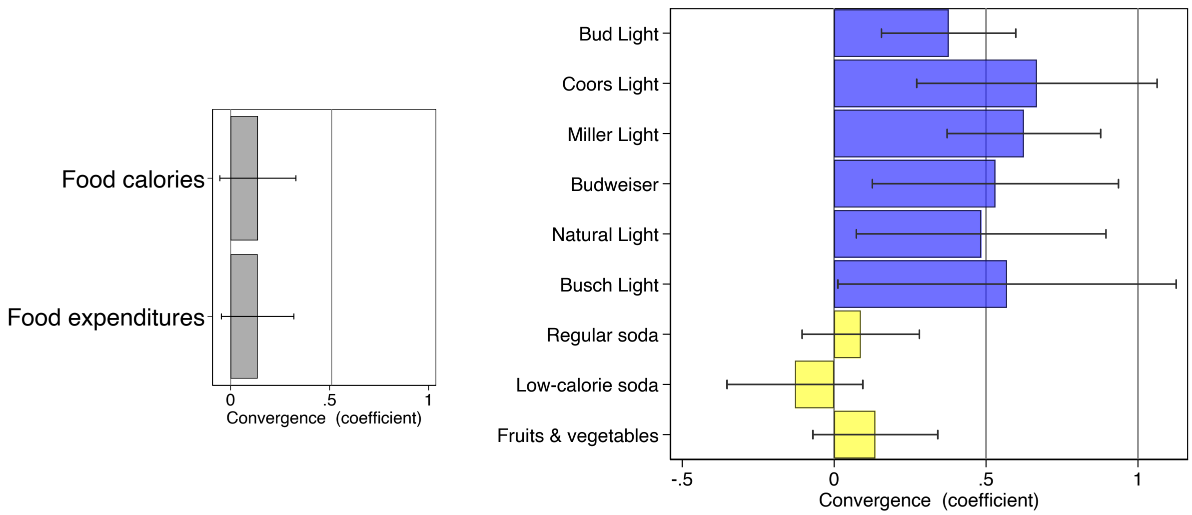
Off-premise versus on-premise alcohol purchases. We might be worried that we measure only changes in off-premise purchases, and households are substituting to on-premise (bar) purchases. First, the adjustment in off-premise alcohol purchases is interesting in its own right. Alcohol consumption in bars is a social activity that is likely to adjust to the level of new peers when moving. An adjustment in off-premise purchases is more surprising.

Second, we explore changes in at-home food purchases. Assuming that on-premise alcohol purchases are related to food consumption outside the home, we expect changes in on-premise alcohol consumption to be reflected in grocery purchases. We estimate the same regression as for alcohol also for grocery purchases (figure 4a). We exclude from the food purchases typical breakfast food products because alcohol is mostly consumed at lunch or dinner times. The adjustment in food purchases is considerably lower than in alcohol. While the estimates are imprecise, they rule out adjustment about half the size of that for alcohol.

Lastly, we compare alcohol purchases from the NielsenIQ dataset to heavy drinking measures from the Behavioral Risk Factor Surveillance System (BRFSS). We find that localities with higher off-premise alcohol purchase in NielsenIQ dataset have higher shares of heavy drinkers in BRFSS (figure A.5).

Comparison with previous literature. To compare with the literature, we use our estimation method to estimate the importance of the current environment in brand choice as in Bronnenberg et al. (2012) and healthy eating choices as in Allcott et al. (2019). Figure 4b presents the estimates. We focus on the most popular beer brands to compare the results with Bronnenberg et al. (2012). We estimate the average change in alcohol purchases to equal 0.54 for the most popular beer brands, similar to 0.6 across all grocery brands (not only beer) in Bronnenberg et al. (2012). To compare with Allcott et al. (2019), we focus on soda and fruits and vegetables, which over- or under-consumption plays a role in the healthiness of diet. Similar to the findings by Allcott et al. (2019), for none of these categories is the estimated convergence statistically significantly different from zero, the average point estimate is 0.03.

Which characteristics are common to high-alcohol-consumption environments? We explore the question in online appendix C. First, using data on both movers and non-movers, we regress alcohol purchases on household, state, and time fixed effects in order to quantify the role of environment in explaining the variation in alcohol purchases. Then, we measure which state-level characteristics are correlated with the estimated state-level location effects. We find that high-alcohol-consumption environments are more likely to have alcohol available in grocery stores and have lower alcohol prices. The correlation does



(a) Food purchases

(b) Beer brands, soda, fruits and vegetables

Figure 4: Change in purchases after the move. Difference-in-differences estimates

Notes: Each bar presents a point estimate from a separate regression, where dependent variable is the logarithm of quantity of purchases. The x-axes measures the estimated extent of changes in alcohol purchases after move ($\Delta\cdot$ After move in table 1). Each regression includes quarter-year dummies and household fixed effects. The sample of 3267 households, includes all movers that move across state lines, limiting the sample to those that move only once, the year of the move is excluded from the sample. In figure 4a, the dependent variable is the logarithm of either calories or expenditures of food, excluding typical breakfast foods. In figure 4b, the dependent variable is either the logarithm of quantity of one of the six most sold brands of beer; or the logarithm of quantity of regular soda, low-calorie soda, or fruits and vegetables. Capped spikes present the 95% confidence intervals with standard errors clustered at the household level. Details about the estimates are in tables A.16–A.17 in online appendix A.

not necessarily describe causal effects and instead could capture endogeneous responses to voters' and consumers' preferences. This could happen both across states and time. For example, during economic downturns, governments tend to increase alcohol taxes (because other revenue sources have decreased), and alcohol consumption also tends to increase during economic downturns. This positive correlation between taxes and consumption does not mean that higher taxes lead to more drinking. In cross-section, in states with high demand, voters may support lower taxes and fewer restrictions on alcohol availability.

Limitations. While the length of our panel and the identification strategy provide advantages in answering the question in the paper, the analysis also has limitations. Below we address the concerns about underreporting, on-premise purchases, purchases versus consumption, and external validity.

As with any consumption survey data, underreporting is a concern with our dataset. Cook (2007) describes that other survey-based measures of alcohol consumption capture about half the consumption in the alcohol tax data. In our analysis, underreporting is not necessarily a problem, as long as the magnitude of underreporting is not correlated with the direction of the move. We might be worried that underreporting depends on retail conditions, which vary by state. But when we restrict the sample to moves between states with similar retail conditions, movers still adjust their purchases. Furthermore, in the main analysis, we drop the year of the move, which should alleviate the concern that consumers are too busy to report purchases during the move.

Our dataset includes only off-premise alcohol purchases, excluding alcohol consumed in bars and restaurants. First, we argue that any adjustment in off-premise alcohol purchases is surprising and interesting in its own right because compared to on-premise purchases, it is less social. Nevertheless, one might worry that we capture only substitution between off- and on-premise purchases. To alleviate the concern, we provide three pieces of evidence. First, off-premise alcohol purchases are likely to change when there are other changes in personal circumstances. But our results remain the same when we limit the sample to movers whose main demographic characteristics (employment and marital status, and household size), stay constant. Second, suppose alcohol purchases in bars tends to increase after moving because movers want to get to know new colleagues, or decrease because they don't yet know anyone. In both cases, if that is reflected in off-premise purchases, we would observe a temporary short-term increase/decrease immediately after the move. Instead, we observe a lasting impact over two years (in the event study framework), suggesting these temporary effects are not driving our results. Third, changes in off-premise versus on-premise alcohol consumption are likely reflected in food consumption at home. But we find no evidence of large adjustments of food purchases after the move.

Could the alcohol purchases be for someone else (as gifts or for a party) instead of own consumption? Presumably wine and beer are purchased as gifts more often than liquor. While changes in liquor purchases are smaller than in beer and wine (tables 1 and A.18), the difference is small and borderline statistically insignificant. Furthermore, the change for liquor is almost as large as the change for total ethanol (column 1), and it is statistically significant at 1%. Therefore, we conclude that this concern does not alter our main findings.

Finally, do our findings based on movers extend to the general population? First, we argue that movers are interesting in their own right because their share in the population is large. Each year about 2% of the U.S. population moves across the state lines,[15] and more than 30% of the U.S. population has moved across the state lines in their lifetime (Molloy et al., 2011). Second, if movers are more likely to adjust to a new environment, then our estimates give an upper bound of how malleable alcohol consumption is. Furthermore, our results show that movers are not particularly open-minded regarding all products. Using the same identification strategy, we find no evidence of large adjustment in purchases of fruits and vegetables, regular soda and diet soda, and total food purchases. Similarly, Allcott et al. (2019) and Hut (2020) find little change in movers' healthiness of food purchases. This suggests that alcohol is a particular type of product (like brands studied by Bronnenberg et al. (2012)) for which the current environment makes a large difference.

5 Conclusion

Analyzing the purchases of households that move across states, we find robust evidence that alcohol purchases are strongly affected by the current environment. About two-thirds of geographic variation in alcohol purchases is due to the current environment instead of individual characteristics. This finding suggests that government policies and regulations that target the drinking environment (e.g. alcohol availability) could considerably impact the amount of alcohol consumed.

While we quantify the overall importance of the environment, our analysis does not determine the main environmental factors that increase alcohol consumption. We provide reduced form suggestive evidence that high-alcohol-consumption environments have higher alcohol availability in grocery stores and lower prices. To identify the separate impact of various factors, a more fruitful way is to examine the effect of exogeneous changes in regulations and taxes, as is done in recent research (Marcus and Siedler, 2015; Bernheim et al., 2016; Illanes and Moshary, 2018; Miravete et al., 2019; Seo, 2019; Kueng and Yakovlev, 2021).

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[15] In 2010-2019, the average annual interstate migration rate equals 2.3 according to the American Community Survey 1-year estimates: `https://www.census.gov/data/tables/time-series/demo/geographic-mobility/state-to-state-migration.html`.

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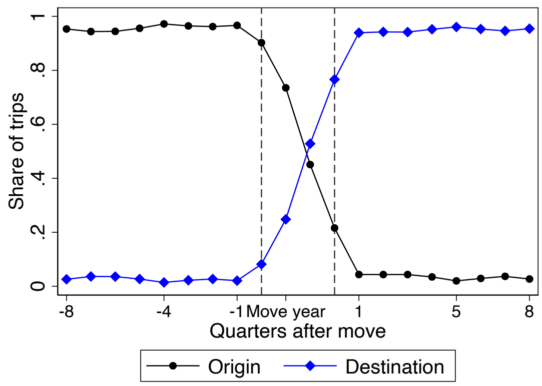
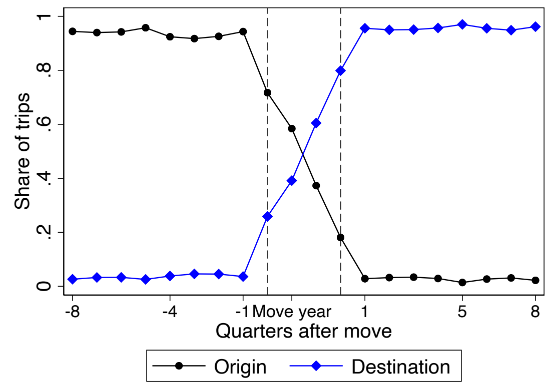
A Online appendix: Additional figures and tables



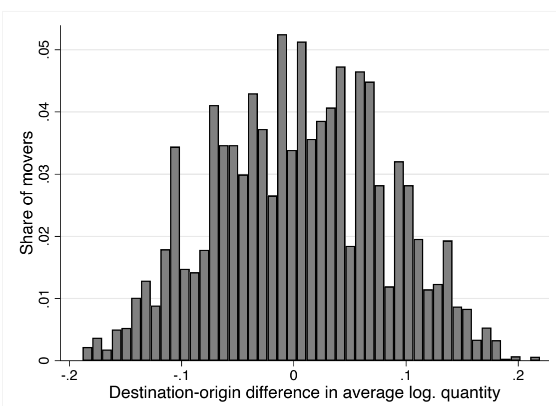
(a) Balanced panel



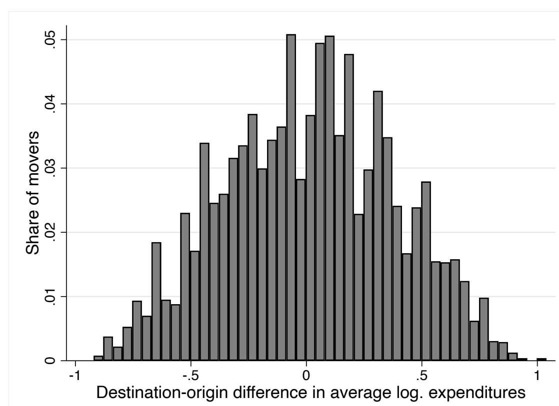
(b) Unbalanced panel

Figure A.1: Share of shopping trips to the destination versus origin state of residence

Notes: The shares are calculated using all trips to stores in NielsenIQ Retail Scanner Data. The shares do not necessarily sum to one because there is a very small share of shopping trips in states other than the origin or destination. The sample includes all movers that move across state lines, limiting the sample to those that move only once. On figure A.1a, the sample is further restricted to those who are observed continuously 2 years before and after the move year, while on figure A.1b, the sample includes the movers who are not observed continuously around the move.

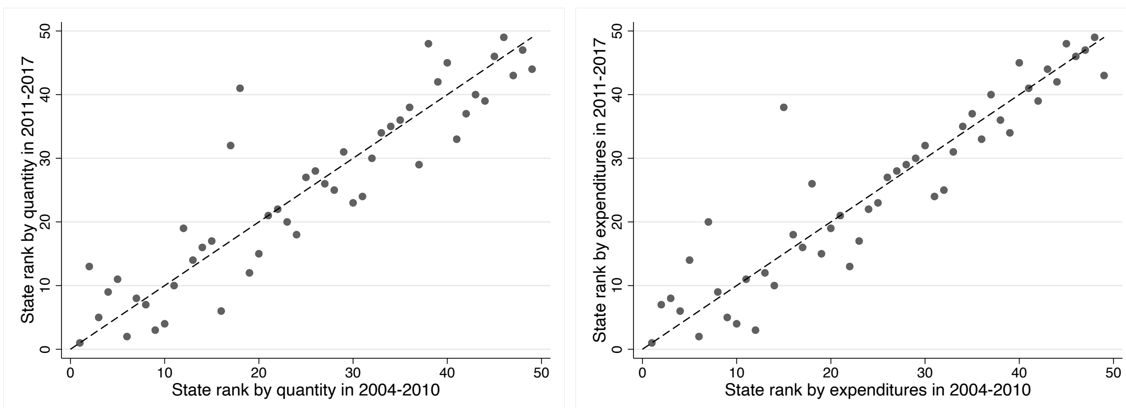


(a) Quantity



(b) Expenditures

Figure A.2: Distribution of destination-origin difference in the logarithm of alcohol purchases

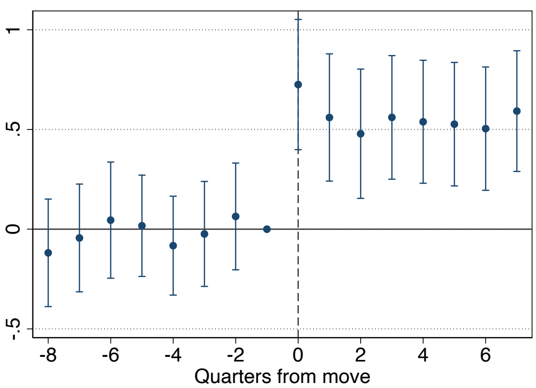


(a) Quantity

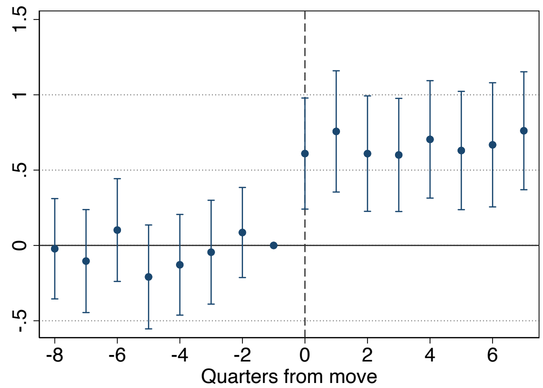
(b) Expenditures

Figure A.3: State ranked by average alcohol purchases before and after 2010

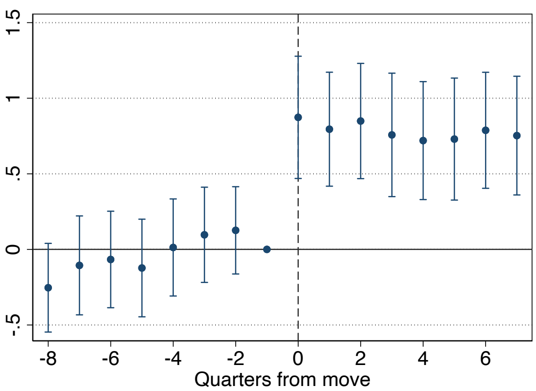
Notes: States ranked by average alcohol purchases of nonmovers in 2004-2010 vs 2011-2017. The dashed line is a 45-degree line.



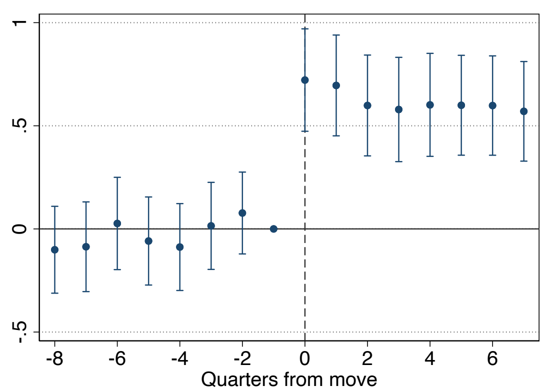
(a) Quantity of beer



(b) Quantity of liquor



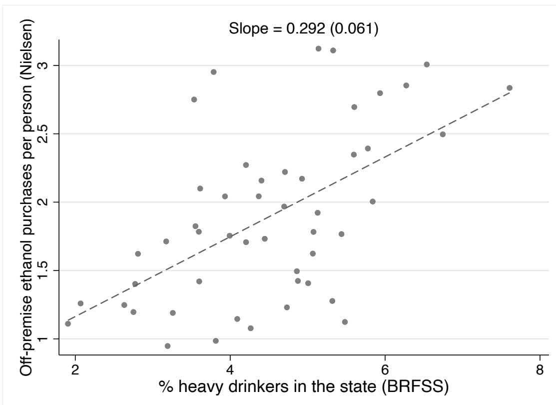
(c) Quantity of wine



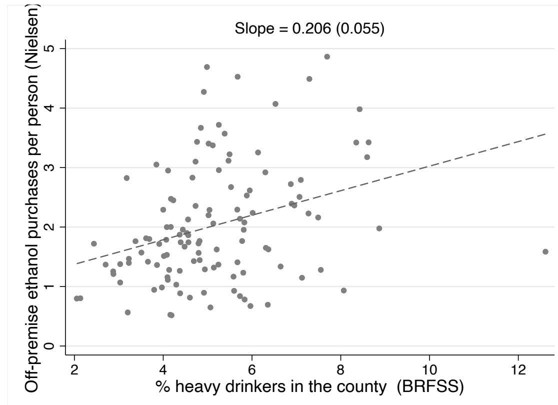
(d) Alcohol expenditures

Figure A.4: Event study of alcohol purchases

Notes: Each figure presents the coefficients $\theta_{r(i,t)}$ (point estimates and 95% confidence intervals) estimated from equation (1). The coefficient for the last time period before the move is normalized to 0. The dependent variable is the logarithm of quantity of beer, liquor, or wine purchased (figures A.4a–A.4c), or alcohol expenditures (figure A.4d). Each regression includes quarter-year dummies and household fixed effects. Sample includes all movers that move across state lines, limiting the sample to those that move only once and who are observed continuously 2 years before and after the move; the year of the move itself is excluded. Standard errors are clustered at the household level.



(a) State level



(b) County level

Figure A.5: Off-premise alcohol purchases (Nielsen) vs the share of heavy drinkers (BRFSS) at state and county level

Notes: Each dot represents either a state (figure A.5a) or a county (figure A.5b). Figure A.5b includes only counties with at least 100 respondents in both BRFSS and Nielsen's dataset. X-axis reflects the share of heavy drinkers (defined by BRFSS as "adult men having more than two drinks per day and adult women having more than one drink per day") in a given locality in 2007 BRFSS dataset. Y-axis displays the yearly off-premise alcohol purchases per adult in a given county or state calculated using Nielsen sample weights (and information on the number of adults) from the NielsenIQ Consumer Panel of 2007. We choose 2007 since that was the first year with a larger number of households (approximately 60,000) in the NielsenIQ Consumer Panel. The line of the best fit is obtained from OLS regressions. Its slope coefficient and standard error (in parentheses) are reported on the graph. The coefficients are significant at 1% level on both figures.

Table A.1: Summary statistics

	Ever-movers (1)	Non-movers (2)
	Demographic characteristics	
Household income	69414.9	63820.3
Household size	2.4	2.7
Average age of household heads	50.8	49.9
College	0.597	0.522
Male household head employed	0.749	0.765
Female household head employed	0.588	0.614
Race: white non-Hispanic	0.810	0.785
Married	0.642	0.646
	First observed residence	
Northeast	18.2	16.9
Midwest	22.8	25.5
South	36.5	38.0
West	22.5	19.6
	Alcohol purchases	
Quantity of total pure alcohol	0.64	0.49
Quantity of beer	3.69	3.37
Quantity of liquor	0.73	0.53
Quantity of wine	1.54	1.05
Alcohol expenditures	27.50	20.45
Purchasing alcohol	0.74	0.66
Number of households	3267	172827

Notes: All characteristics are measured during the first year in the sample. Income and expenditures are deflated to 2015 dollars using the consumer price index for urban consumers. For households with two heads, *College* indicates whether at least one of them has attended college. Alcohol purchases are measured per adult per quarter. Quantity of alcohol is measured in liters and expenditures in dollars. *Purchasing alcohol* is an indicator variable for whether the household has purchased any alcohol during the current and past 3 quarters. Ever-movers include all movers that move across state lines, limiting the sample to those that move only once. Non-movers includes all households that don't ever move across state lines. For all demographic characteristics (except marital status) and alcohol purchases, the differences between movers and non-movers are statistically significantly different from zero at 1 percent significance level according to the Wilcoxon rank-sum test.

Table A.2: Migration patterns (percentages)

Origin region	Destination region			
	Northeast	Midwest	South	West
Northeast	4.4	1.3	10.9	1.7
Midwest	1.0	6.9	10.9	4.0
South	3.1	6.3	22.0	5.0
West	1.3	3.0	7.1	11.1

Notes: The sample of movers.

Table A.3: Comparison of movers to states where alcohol consumption is lower versus higher than in the state of origin

	Movers to states with alcohol purchases		t-test	Wilcoxon test
	lower	higher	p-value	p-value
	(1)	(2)	(3)	(4)
	Demographic characteristics			
Household income	70316.9	68398.3	0.003	0.005
Household size	2.4	2.5	0.007	0.000
Average age of household heads	51.0	50.5	0.053	0.006
College	0.610	0.582	0.001	0.001
Male household head employed	0.740	0.760	0.016	0.016
Female household head employed	0.588	0.589	0.943	0.943
Race: white non-Hispanic	0.815	0.805	0.180	0.180
Married	0.639	0.646	0.412	0.412
	First observed residence			
Northeast	25.2	10.4		
Midwest	21.8	23.8		
South	36.8	36.1		
West	16.1	29.8		
	Alcohol purchases			
Quantity of total pure alcohol	0.58	0.71	0.000	0.000
Quantity of beer	3.24	4.20	0.000	0.000
Quantity of liquor	0.69	0.77	0.106	0.000
Quantity of wine	1.37	1.74	0.001	0.004
Alcohol expenditures	26.18	28.99	0.026	0.000
Purchasing alcohol	0.72	0.75	0.092	0.092
Number of households	1731	1536		

Notes: All demographic characteristics and alcohol purchases are measured during the first year in the sample. Income and expenditures are deflated to 2015 dollars using the consumer price index for urban consumers. For households with two heads, *College* indicates whether at least one of them has attended college. Alcohol purchases are measured per adult per quarter. Quantity of alcohol is measured in liters and expenditures in dollars. Column 3 presents the p-value of the t-test and column 4 of the Wilcoxon rank-sum test for whether the difference between the movers to states with higher versus lower alcohol consumption is significantly different from zero. The sample includes all movers that move across state lines, limiting the sample to those that move only once.

Table A.4: Robustness: Change in alcohol purchases after move, alternative samples

	Quantity				Expend.
	Total	Beer	Liquor	Wine	Total
	(1)	(2)	(3)	(4)	(5)
Panel A: Sample: continuously 2 years before and after					
$\Delta \cdot$ After move	0.669***	0.616***	0.650***	0.886***	0.687***
	(0.106)	(0.114)	(0.129)	(0.130)	(0.077)
Households	1379	1379	1379	1379	1379
Observations	50964	50964	50964	50964	50964
Panel B: Sample: balanced panel 2 years around the move					
$\Delta \cdot$ After move	0.651***	0.553***	0.708***	0.811***	0.632***
	(0.101)	(0.104)	(0.116)	(0.134)	(0.075)
Households	1379	1379	1379	1379	1379
Observations	22064	22064	22064	22064	22064
Panel C: Sample: constant demographics 2 years around the move					
$\Delta \cdot$ After move	0.706***	0.585***	0.522***	0.911***	0.730***
	(0.129)	(0.131)	(0.164)	(0.144)	(0.093)
Households	1190	1190	1190	1190	1190
Observations	14764	14764	14764	14764	14764

Notes: Dependent variable is the logarithm of alcohol purchases. $\Delta_i = \bar{y}_{D,i} - \bar{y}_{O,i}$ is the difference in average logarithm of alcohol purchases between the destination and origin state of the mover. The sample includes all movers that move across state lines, limiting the sample to those that move only once, the year of the move is excluded from the sample. In panel A, the sample is further restricted to those who are observed continuously from 2 years before the move to 2 years after the move; quarters more than 2 years before or after the move are also included in the estimation. In panel B, the sample is restricted to the balanced panel of households observed 2 years before and after the move. In panel C, the sample is restricted to those whose employment status, marital status, household size, and the number of members aged 21 and above stay constant. Each regression includes quarter-year dummies and household fixed effects. Standard errors are clustered at the household level. *** Indicates significance at the 1 percent level, ** at a 5 percent level, * at a 10 percent level.

Table A.5: Robustness: Change in alcohol purchases after move, alternative samples

	Quantity				Expend.
	Total	Beer	Liquor	Wine	Total
	(1)	(2)	(3)	(4)	(5)
	Panel A: Sample: includes the year of move				
$\Delta\cdot$ After move	0.698***	0.678***	0.608***	0.798***	0.671***
	(0.077)	(0.081)	(0.088)	(0.085)	(0.053)
Households	3267	3267	3267	3267	3267
Observations	110928	110928	110928	110928	110928
	Panel B: Sample: includes non-movers				
$\Delta\cdot$ After move	0.719***	0.707***	0.610***	0.830***	0.704***
	(0.083)	(0.087)	(0.097)	(0.094)	(0.058)
Households	176094	176094	176094	176094	176094
Observations	3110488	3110488	3110488	3110488	3110488
	Panel C: Sample: Excludes Utah				
$\Delta\cdot$ After move	0.723***	0.703***	0.621***	0.844***	0.716***
	(0.085)	(0.089)	(0.099)	(0.097)	(0.060)
Households	3206	3206	3206	3206	3206
Observations	96348	96348	96348	96348	96348

Notes: Dependent variable is the logarithm of alcohol purchases. $\Delta_i = \bar{y}_{D,i} - \bar{y}_{O,i}$ is the difference in average logarithm of alcohol purchases between the destination and origin state of the mover. In panel A, the sample includes all movers that move across state lines, limiting the sample to those that move only once. In panel B, the sample adds non-movers. In panel C, the sample excludes movers to and from Utah. Each regression includes quarter-year dummies and household fixed effects. Standard errors are clustered at the household level. *** Indicates significance at the 1 percent level, ** at a 5 percent level, * at a 10 percent level.

Table A.6: Robustness: Change in alcohol purchases after move, functional form

	Quantity				Expend.
	Total	Beer	Liquor	Wine	Total
	(1)	(2)	(3)	(4)	(5)
Panel A: Inverse Hyperbolic Sine transformation of purchases					
Δ· After move	0.710***	0.695***	0.612***	0.819***	0.697***
	(0.084)	(0.085)	(0.097)	(0.091)	(0.056)
Households	3267	3267	3267	3267	3267
Observations	97860	97860	97860	97860	97860
Panel B: Percentile rank of purchases					
Δ· After move	0.710***	0.699***	0.627***	0.775***	0.704***
	(0.051)	(0.070)	(0.078)	(0.059)	(0.051)
Households	3267	3267	3267	3267	3267
Observations	97860	97860	97860	97860	97860
Panel C: Actual value of purchases					
Δ· After move	0.641***	0.527***	0.519***	0.743***	0.540***
	(0.122)	(0.154)	(0.157)	(0.197)	(0.127)
Households	3267	3267	3267	3267	3267
Observations	97860	97860	97860	97860	97860

Notes: In panel A, the outcome variable is the Inverse Hyperbolic Sine transformation of alcohol purchases that equals $\ln\left[x + \sqrt{x^2 + 1}\right]$, where x is the quantity or expenditures of alcohol purchases. In panel B, the outcome variable is the percentile rank of alcohol purchases that equals $(Rank_{it} - 1)/(N_t - 1)$, where $Rank_{it}$ is household i's rank in the national distribution of alcohol purchases calculated for a given time period t, and N_t is the number of households in that time period. In panel C, the outcome variable is the quantity or expenditure of alcohol purchases. In each panel, Δ_i is the difference in average outcome variable between the destination and origin state of the mover. Each regression includes quarter-year dummies and household fixed effects. The sample includes all movers that move across state lines, limiting the sample to those that move only once; the year of the move is excluded from the sample. Standard errors are clustered at the household level. *** Indicates significance at the 1 percent level, ** at a 5 percent level, * at a 10 percent level.

Table A.7: Robustness: Change in alcohol purchases after move, including additional variables

	Quantity				Expend.
	Total	Beer	Liquor	Wine	Total
	(1)	(2)	(3)	(4)	(5)
Panel A: Sample of movers, includes demographic char.					
$\Delta\cdot$ After move	0.689***	0.679***	0.595***	0.806***	0.686***
	(0.082)	(0.087)	(0.097)	(0.093)	(0.058)
Demogr. Char.	Yes	Yes	Yes	Yes	Yes
Households	3267	3267	3267	3267	3267
Observations	97860	97860	97860	97860	97860
Panel B: Sample of movers and nonmovers, includes quarter since move FE					
$\Delta\cdot$ After move	0.698***	0.673***	0.610***	0.805***	0.687***
	(0.082)	(0.087)	(0.096)	(0.093)	(0.058)
Quarter since move FE	Yes	Yes	Yes	Yes	Yes
Households	176094	176094	176094	176094	176094
Observations	3110488	3110488	3110488	3110488	3110488

Notes: Dependent variable is the logarithm of alcohol purchases. $\Delta_i = \bar{y}_{D,i} - \bar{y}_{O,i}$ is the difference in average logarithm of alcohol purchases between the destination and origin state of the mover. The sample includes all movers that move across state lines, limiting the sample to those that move only once; the year of the move is excluded from the sample. In panel B, the sample also includes non-movers. Each regression includes quarter-year dummies and household fixed effects. In panel A, regressions also include the logarithm of income, household size, number of adults aged 21+, marital status, employment status, and an indicator for children aged 0-5. In panel B, regressions include event time fixed effects. In the panel B, we include non-movers, because if we only use movers, event time fixed effects and time period fixed effects would be perfectly collinear. Standard errors are clustered at the household level. *** Indicates significance at the 1 percent level, ** at a 5 percent level, * at a 10 percent level.

Table A.8: Robustness: Change in alcohol purchases after move; clustering at origin-destination states pair

	Quantity				Expend.
	Total	Beer	Liquor	Wine	Total
	(1)	(2)	(3)	(4)	(5)
	Clustering at origin-destination states pair				
$\Delta\cdot$ After move	0.708***	0.689***	0.608***	0.821***	0.695***
	(0.083)	(0.091)	(0.101)	(0.105)	(0.064)
Households	3267	3267	3267	3267	3267
Observations	97860	97860	97860	97860	97860

Notes: Dependent variable is the logarithm of alcohol purchases. $\Delta_i = \bar{y}_{D,i} - \bar{y}_{O,i}$ is the difference in average logarithm of alcohol purchases between the destination and origin state of the mover. Each regression includes quarter-year dummies and household fixed effects. The sample includes all movers that move across state lines, limiting the sample to those that move only once; the year of the move is excluded from the sample. Standard errors are clustered at the origin-destination states pair (1,012 clusters). *** Indicates significance at the 1 percent level, ** at a 5 percent level, * at a 10 percent level.

Table A.9: Robustness: Change in alcohol purchases after move; geographic area is defined as state; move inside versus across census regions

	Quantity				Expend.
	Total	Beer	Liquor	Wine	Total
	(1)	(2)	(3)	(4)	(5)
	Panel A: move across census regions				
$\Delta\cdot$ After move	0.766***	0.806***	0.613***	0.900***	0.754***
	(0.105)	(0.107)	(0.121)	(0.127)	(0.076)
Households	1815	1815	1815	1815	1815
Observations	54292	54292	54292	54292	54292
	Panel B: move inside census region				
$\Delta\cdot$ After move	0.622***	0.500***	0.598***	0.714***	0.616***
	(0.134)	(0.148)	(0.159)	(0.138)	(0.089)
Households	1452	1452	1452	1452	1452
Observations	43568	43568	43568	43568	43568

Notes: Dependent variable is the logarithm of alcohol purchases. $\Delta_i = \bar{y}_{D,i} - \bar{y}_{O,i}$ is the difference in average logarithm of alcohol purchases between the destination and origin state of the mover. Each regression includes quarter-year dummies and household fixed effects. The sample includes all movers that move across state lines, limiting the sample to those that move only once; the year of the move is excluded from the sample. Standard errors are clustered at the household level. *** Indicates significance at the 1 percent level, ** at a 5 percent level, * at a 10 percent level.

Table A.10: Robustness: Change in alcohol purchases after move; geographic area is defined as county; move inside versus across states

	Quantity				Expend.
	Total	Beer	Liquor	Wine	Total
	(1)	(2)	(3)	(4)	(5)
	Panel A: move across states				
$\Delta \cdot$ After move	0.646***	0.461***	0.625***	0.995***	0.746***
	(0.177)	(0.173)	(0.183)	(0.187)	(0.131)
Households	543	543	543	543	543
Observations	16336	16336	16336	16336	16336
	Panel B: move inside state				
$\Delta \cdot$ After move	0.275	0.055	0.308	0.103	0.298*
	(0.168)	(0.167)	(0.208)	(0.220)	(0.159)
Households	947	947	947	947	947
Observations	29900	29900	29900	29900	29900

Notes: Dependent variable is the logarithm of alcohol purchases. $\Delta_i = \bar{y}_{D,i} - \bar{y}_{O,i}$ is the difference in average logarithm of alcohol purchases between the destination and origin county of the mover. Each regression includes quarter-year dummies and household fixed effects. The sample includes movers that move across county borders, limiting the sample to those that move only once, and move between counties where at any time period there are at least 50 households in the dataset; the year of the move is excluded from the sample. Standard errors are clustered at the household level. *** Indicates significance at the 1 percent level, ** at a 5 percent level, * at a 10 percent level.

Table A.11: Robustness: Change in alcohol purchases after move; geographic area is defined as 3-digit zip code; move inside versus across states

	Quantity				Expend.
	Total	Beer	Liquor	Wine	Total
	(1)	(2)	(3)	(4)	(5)
	Panel A: move across states				
$\Delta\cdot$ After move	0.422***	0.649***	0.362*	0.655***	0.596***
	(0.152)	(0.158)	(0.188)	(0.149)	(0.106)
Households	701	701	701	701	701
Observations	21032	21032	21032	21032	21032
	Panel B: move inside state				
$\Delta\cdot$ After move	0.183	-0.062	0.337	0.142	0.251**
	(0.125)	(0.138)	(0.213)	(0.135)	(0.109)
Households	1262	1262	1262	1262	1262
Observations	39568	39568	39568	39568	39568

Notes: Dependent variable is the logarithm of alcohol purchases. $\Delta_i = \bar{y}_{D,i} - \bar{y}_{O,i}$ is the difference in average logarithm of alcohol purchases between the destination and origin 3-digit zip code of the mover. Each regression includes quarter-year dummies and household fixed effects. The sample includes movers that move across 3-digit zip codes, limiting the sample to those that move only once, and move between 3 digit zip codes where at any time period there are at least 50 households in the dataset; the year of the move is excluded from the sample. Standard errors are clustered at the household level. *** Indicates significance at the 1 percent level, ** at a 5 percent level, * at a 10 percent level.

Table A.12: Heterogeneity: Change in alcohol purchases after move; separating by retail conditions: liquor control states

	Quantity				Expend.
	Total	Beer	Liquor	Wine	Total
	(1)	(2)	(3)	(4)	(5)
Panel A: Moves between non-liquor-control states					
Δ· After move	0.665***	0.624***	0.676***	0.907***	0.717***
	(0.107)	(0.117)	(0.122)	(0.127)	(0.079)
Households	1738	1738	1738	1738	1738
Observations	52060	52060	52060	52060	52060
Panel B: Moves between liquor control states					
Δ· After move	0.899**	1.017***	0.535	0.584**	0.829***
	(0.423)	(0.352)	(0.411)	(0.292)	(0.244)
Households	198	198	198	198	198
Observations	5496	5496	5496	5496	5496
Panel C: Moves: from CS to not CS; or from not CS to CS					
Δ· After move	0.770***	0.765***	0.503***	0.750***	0.648***
	(0.136)	(0.138)	(0.168)	(0.151)	(0.090)
Households	1331	1331	1331	1331	1331
Observations	40304	40304	40304	40304	40304

Notes: Dependent variable is the logarithm of alcohol purchases. $\Delta_i = \bar{y}_{D,i} - \bar{y}_{O,i}$ is the difference in average logarithm of alcohol purchases between the destination and origin state of the mover. Each regression includes quarter-year dummies and household fixed effects. The sample includes movers that move across state lines, limiting the sample to those that move only once, the year of the move is excluded from the sample. In panel A, the sample is further restricted to moves between states that are not liquor control states; in panel B, to moves between states that are liquor control states; in panel C, to the remaining moves (either from liquor control state to non-control state or from non-control state to control state). Standard errors are clustered at the household level. *** Indicates significance at the 1 percent level, ** at a 5 percent level, * at a 10 percent level.

Table A.13: Heterogeneity: Change in alcohol purchases after move; by retail conditions: whether wine available in the majority of grocery stores

	Quantity				Expend.
	Total	Beer	Liquor	Wine	Total
	(1)	(2)	(3)	(4)	(5)
	Panel A: Moves between states wine available				
$\Delta\cdot$ After move	0.504***	0.386**	0.732***	0.511***	0.401***
	(0.147)	(0.183)	(0.152)	(0.162)	(0.109)
Households	1795	1795	1795	1795	1795
Observations	53660	53660	53660	53660	53660
	Panel B: Moves to/from wine not available				
$\Delta\cdot$ After move	0.807***	0.772***	0.490***	0.993***	0.799***
	(0.100)	(0.099)	(0.120)	(0.115)	(0.068)
Households	1472	1472	1472	1472	1472
Observations	44200	44200	44200	44200	44200

Notes: Dependent variable is the logarithm of alcohol purchases. $\Delta_i = \bar{y}_{D,i} - \bar{y}_{O,i}$ is the difference in average logarithm of alcohol purchases between the destination and origin state of the mover. Each regression includes quarter-year dummies and household fixed effects. The sample includes movers that move across state lines, limiting the sample to those that move only once, the year of the move is excluded from the sample. In panel A, the sample is further restricted to moves between states where wine is available in more than 80% grocery stores (calculated from the NielsenIQ Retail Scanner Data as described in Online Appendix D); in panel B, to moves to/from states where wine is not available in more than 80% of the grocery stores. There is not enough moves between the states where wine is not available in the grocery stores to estimate analogous regressions for those. Standard errors are clustered at the household level. *** Indicates significance at the 1 percent level, ** at a 5 percent level, * at a 10 percent level.

Table A.14: Heterogeneity: Change in alcohol purchases after move; by retail conditions: whether beer available in the majority of grocery stores

	Quantity				Expend.
	Total	Beer	Liquor	Wine	Total
	(1)	(2)	(3)	(4)	(5)
	Panel A: Moves between states beer available				
$\Delta\cdot$ After move	0.660***	0.582***	0.730***	0.696***	0.597***
	(0.105)	(0.135)	(0.113)	(0.112)	(0.075)
Households	2392	2392	2392	2392	2392
Observations	71324	71324	71324	71324	71324
	Panel B: Moves to/from beer not available				
$\Delta\cdot$ After move	0.766***	0.765***	0.222	1.092***	0.831***
	(0.132)	(0.111)	(0.180)	(0.170)	(0.092)
Households	875	875	875	875	875
Observations	26536	26536	26536	26536	26536

Notes: Dependent variable is the logarithm of alcohol purchases. $\Delta_i = \bar{y}_{D,i} - \bar{y}_{O,i}$ is the difference in average logarithm of alcohol purchases between the destination and origin state of the mover. Each regression includes quarter-year dummies and household fixed effects. The sample includes movers that move across state lines, limiting the sample to those that move only once, the year of the move is excluded from the sample. In panel A, the sample is further restricted to moves between states where beer is available in more than 80% of the grocery stores (calculated from the NielsenIQ Retail Scanner Data as described in Online Appendix D); in panel B, to moves to/from states where beer is not available in more than 80% of the grocery stores. There is not enough moves between the states where beer is not available in the grocery stores to estimate analogous regressions for those. Standard errors are clustered at the household level. *** Indicates significance at the 1 percent level, ** at a 5 percent level, * at a 10 percent level.

Table A.15: Heterogeneity: Change in alcohol purchases after move; heavy drinkers and moderate drinkers

	Quantity				Expend.
	Total	Beer	Liquor	Wine	Total
	(1)	(2)	(3)	(4)	(5)
	Panel A. Sample: Heavy drinkers				
$\Delta\cdot$ After move	0.740**	0.797**	0.522	1.236***	0.539***
	(0.354)	(0.346)	(0.455)	(0.395)	(0.171)
Households	521	521	521	521	521
Observations	15880	15880	15880	15880	15880
	Panel B. Sample: Moderate drinkers				
$\Delta\cdot$ After move	0.714***	0.702***	0.656***	0.779***	0.750***
	(0.079)	(0.093)	(0.091)	(0.094)	(0.067)
Households	2201	2201	2201	2201	2201
Observations	67716	67716	67716	67716	67716

Notes: Dependent variable is the logarithm of alcohol purchases. $\Delta_i = \bar{y}_{D,i} - \bar{y}_{O,i}$ is the difference in average logarithm of alcohol purchases between the destination and origin state of the mover. Each regression includes quarter-year dummies and household fixed effects. The sample includes movers that move across state lines, limiting the sample to those that move only once, the year of the move is excluded from the sample. In panel A, the sample is further restricted to movers whose before move alcohol purchases where above the 80th percentile (heavy drinkers); in panel B, to movers who purchased alcohol before the move but who purchases were below the 80th percentile (moderate drinkers). Standard errors are clustered at the household level. *** Indicates significance at the 1 percent level, ** at a 5 percent level, * at a 10 percent level.

Table A.16: Change in food purchases after move. Dependent variable: the logarithm of food purchases

	Calories	Expenditures
	(1)	(2)
$\Delta\cdot$ After move	0.138	0.136
	(0.098)	(0.093)
Households	3267	3267
Observations	97860	97860

Notes: Dependent variable is the logarithm of food of purchases, either calories (column 1) or expenditures (column 2). Food purchases include all grocery purchases, except breakfast foods and random weight purchases. $\Delta_i = \bar{y}_{D,i} - \bar{y}_{O,i}$ is the difference in average logarithm of the calories or expenditures of purchases between the destination and origin state of the mover. The sample includes all movers that move across state lines, limiting the sample to those that move only once, the year of the move is excluded from the sample. Each regression includes quarter-year dummies and household fixed effects. Standard errors are clustered at the household level. *** Indicates significance at the 1 percent level, ** at a 5 percent level, * at a 10 percent level.

Table A.17: Change in purchases after move: beer brands, soda, and fruits and vegetables

	Quantity		
	(1)	(2)	(3)
	Panel A: Beer		
	Bud Light	Miller Light	Coors Light
$\Delta\cdot$ After move	0.377***	0.625***	0.667***
	(0.113)	(0.129)	(0.202)
Households	3267	3267	3267
Observations	97860	97860	97860
	Panel B: Beer		
	Budweiser	Natural Light	Busch Light
$\Delta\cdot$ After move	0.531**	0.484**	0.569**
	(0.207)	(0.210)	(0.284)
Households	3267	3267	3267
Observations	97860	97860	97860
	Panel C: Other products		
	Regular soda	Low-calorie soda	Fruits & vegetables
$\Delta\cdot$ After move	0.088	-0.129	0.136
	(0.098)	(0.114)	(0.105)
Households	3267	3267	3267
Observations	97860	97860	97860

Notes: Dependent variable is the logarithm of quantity of purchases. $\Delta_i = \bar{y}_{D,i} - \bar{y}_{O,i}$ is the difference in average logarithm of the quantity of purchases between the destination and origin state of the mover. The sample includes all movers that move across state lines, limiting the sample to those that move only once, the year of the move is excluded from the sample. In panel A and B, the dependent variable is one of the six most sold brands of beer. In panel C, dependent variable is either regular soda, low-calorie soda, fruits and vegetables. Each regression includes quarter-year dummies and household fixed effects. Standard errors are clustered at the household level. *** Indicates significance at the 1 percent level, ** at a 5 percent level, * at a 10 percent level.

Table A.18: Robustness: Change in alcohol purchases after move, extensive margin, aggregate and asymmetric effects. Difference-in-differences estimates.

	(1)	(2)	(3)
	Extensive margin		
	Purchasing		
	Beer	Liquor	Wine
Panel A: Average effects			
$\Delta\cdot$ After move	0.604***	0.478***	0.538***
	(0.075)	(0.083)	(0.059)
Households	3267	3267	3267
Observations	86112	86112	86112
Panel B: Asymmetric effects			
$\Delta \cdot 1[\Delta > 0]\cdot$ After move	0.872***	0.796***	0.829***
	(0.117)	(0.125)	(0.098)
$\Delta \cdot 1[\Delta < 0]\cdot$ After move	0.295***	0.199	0.253***
	(0.113)	(0.130)	(0.085)
Wald test, coef. equality, p-value	0.001	0.002	0.000
Households	3267	3267	3267
Observations	86112	86112	86112

Notes: Each column-panel combination presents estimates from a separate regression. Dependent variable is an indicator for purchasing beer (column 1), liquor (column 2) or wine (column 3); it is calculated as a rolling average over four quarters. $\Delta_i = \bar{y}_{D,i} - \bar{y}_{O,i}$ is the difference in the share of households purchasing any beer (column 1), liquor (column 2) or wine (column 3) between the destination and origin state. $1[\Delta_i > 0]$ is an indicator for Δ_i being strictly positive, that is, a move to a state with a larger share of households purchasing that category of alcohol products, and $1[\Delta_i < 0]$ indicates a move to a state with smaller share of households purchasing that category of alcohol products. Each regression includes quarter-year fixed effects and household fixed effects. Sample includes all movers that move across state lines, limiting the sample to those that move only once; the year of the move is excluded from the sample. In panel B, to test whether the effect is asymmetric, p-value of the Wald test for the equality of the two coefficients is included. Standard errors (in parentheses) are clustered at the household level. *** Indicates significance at 1 percent level.

B Online appendix: Alternative decomposition of alcohol purchases to individual characteristics and location effects

Using data on both movers and non-movers, we estimate the following equation for household i in state j in period t:

$$y_{ijt} = \alpha_i + \gamma_j + \tau_t + \rho_{it} + \varepsilon_{ijt} \tag{2}$$

where households are indexed by i, states by j, and periods by t, and where α-s are household fixed effects, γ-s are state fixed effects, τ-s are time period fixed effects, and for movers ρ_{it} are relative period effects since the move.

This approach provides an alternative way of measuring the importance of the environment and, as such, it works as a robustness check for the analysis described in the main text.

Table B.1 presents the additive decomposition of the difference between the high and low alcohol consumption areas. It reports the overall difference between the two areas R and R' in average log. consumption $\hat{y}_R - \hat{y}_{R'}$, the difference in estimated state-level location effects $\hat{\gamma}_R - \hat{\gamma}_{R'}$, and the share of the difference due to the location effects $S_{locat}(R, R') = \frac{\hat{\gamma}_R - \hat{\gamma}_{R'}}{\hat{y}_R - \hat{y}_{R'}}$.

While to identify the location effects equation (2) uses the variation from movers, the results of the decomposition need not to be the same as the difference-in-differences estimates in table 1. There are two main differences. First, here, the model is estimated using data also from non-movers, which helps to measure time varying effects. Second, here, the comparision is between two groups instead of all households.

The estimates (table B.1) show that about 60% of the difference between the above- and below- median alcohol consumption states and 70% of the difference between the states in the top and bottom alcohol-consumption deciles is due to the current environment. Overall, the results are similar to those from the event study and difference-in-differences analysis in the main text.

Table B.1: Additive decomposition of log. alcohol purchases to location and household effects

	Quantity			Expenditures		
	Above & below median	Top & bottom 25%	Top & bottom 10%	Above & below median	Top & bottom 25%	Top & bottom 10%
	(1)	(2)	(3)	(4)	(5)	(6)
	Difference in average log. purchases:					
Overall	0.109	0.169	0.219	0.522	0.800	0.995
Due to location	0.066	0.102	0.154	0.361	0.438	0.576
	Share of difference due to:					
Location	0.607	0.601	0.705	0.692	0.548	0.579
	(0.123)	(0.107)	(0.141)	(0.089)	(0.081)	(0.109)

Notes: Table is based on the estimates from equation (2). Dependent variable is log. quantity (columns 1–3) or log. expenditures (columns 4–6). Each regression includes quarter-year dummies, indicators for quarters since move, state fixed effects, and household fixed effects. Each column defines areas R and R' based on percentiles of average log. consumption. The first row measures the overall difference in average log. consumption $\hat{y}_R - \hat{y}_{R'}$, where $\hat{y}_R$ is calculated in 3 steps: first, taking averages across households in a given state in a given quarter to calculate the state-quarter average; second, calculating the average across time to obtain the state average; third, calculate average across the states in region R. The second row measures the difference due to location effect $\hat{\gamma}_R - \hat{\gamma}_{R'}$, and the third row reports the share of the difference due to location effects. Sample includes movers and non-movers (3,110,488 consumer-quarters). Standard errors (in parentheses) are calculated using a bootstrap with 50 repetitions at the household level.

C Online appendix: Characteristics of high-alcohol-consumption environments

Which characteristics are common to environments with high alcohol consumption? To answer the question, first, using data on both movers and non-movers, we regress alcohol purchases on household, state, and time fixed effects in order to quantify the role of locations in explaining the variation in alcohol purchases. Second, we measure which state-level characteristics are correlated with the estimated state-level location effects. For the first step, we use the estimates of equation (2) from online appendix B. This gives us the estimates of the state-level location effects. Using the estimates we proceed to step two.

Correlates of state-level location effects. We study which state-level characteristics are correlated with the estimated state-level location effects ($\hat{\gamma}$). The state-level characteristics describe alcohol availability, taxes, and prices. Two types of measures are used to capture alcohol availability. First, whether the state is a control state (i.e., has a state monopoly over selling wine or liquor). Even in states where alcohol is not restricted to be sold only in state-owned liquor stores, there could still be dry counties and restrictions on the number of alcohol licenses available for grocery stores. Therefore, we also measure availability as the percentage of grocery stores selling alcohol. Alcohol price includes excise taxes and, as such, captures both taxes and market conditions. Details of the construction of the characteristics are in the Online Appendix D.

Figure C.1 presents the correlates of estimated location effects: bivariate OLS estimates are presented on the left, and post-Lasso multivariate regression estimates are on the right. The bivariate OLS estimates show that states, where more grocery stores are selling stronger alcohol and where alcohol prices are lower, have statistically significantly higher location effects. In the post-Lasso multivariate regression, alcohol price and the share of grocery stores selling wine remain significant at the 90% level.[16] Similar estimates for alcohol expenditures and for beer, wine, and liquor quantities, are presented on figures C.2–C.5.

We note that figures C.1–C.5 do not necessarily describe causal effects and instead could capture endogeneous responses to voters' and consumers' preferences. This could happen both across states and time. For example, during economic downturns, governments tend to increase alcohol taxes (because other revenue sources have decreased), and alcohol consumption also tends to increase during economic downturns. This positive correlation between taxes and consumption does not mean that higher taxes lead to more drinking. In cross-section, in states with high demand, voters may support lower taxes and fewer restrictions on alcohol availability.

[16]For the share of grocery stores selling wine, the p-value equals 0.085, and for alcohol price, $p < 0.001$.

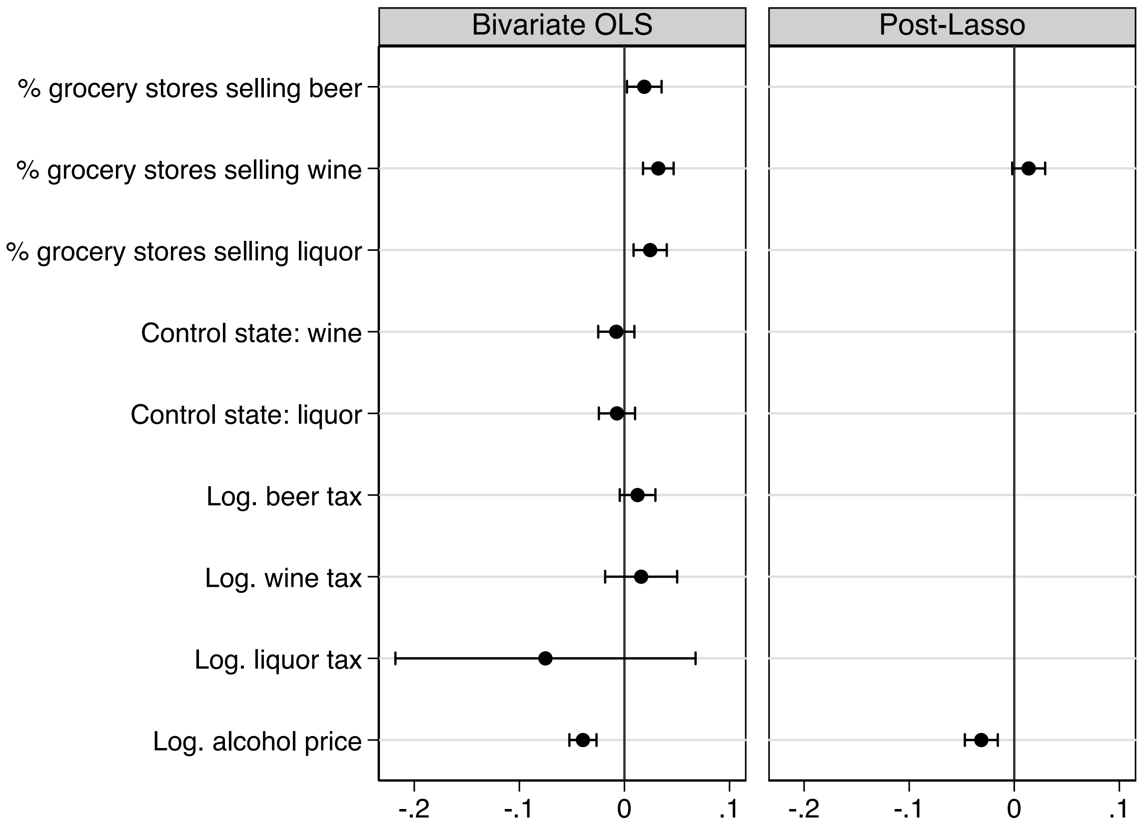


Figure C.1: Correlates of average place effects

Notes: Figure presents point estimates and 95% confidence intervals from bivariate OLS regressions (left) and a post-Lasso multivariate regression (right) of average state level location effects on state-level characteristics. Average state-level location effects ($\hat{\gamma}$) are estimated from equation (2) where dependent variable is the logarithm of alcohol quantity, and the sample includes movers and non-movers (3,110,488 household-quarters). In the OLS, Lasso, and Post-Lasso regressions the unit of observation is a state and the sample includes 49 observations (48 mainland states and Washington, D.C.), except for the excise taxes, where the sample includes only non-control states. All covariates are standardized to mean zero and standard deviation one. Post-Lasso estimates are obtained by first running a Lasso regression on the full set of covariates and then an OLS regression using the set of covariates chosen by Lasso. In the Lasso regression, the penalty level is chosen by the theory-based rule by Belloni et al. (2012), which is also applicable with heteroscedasticity.

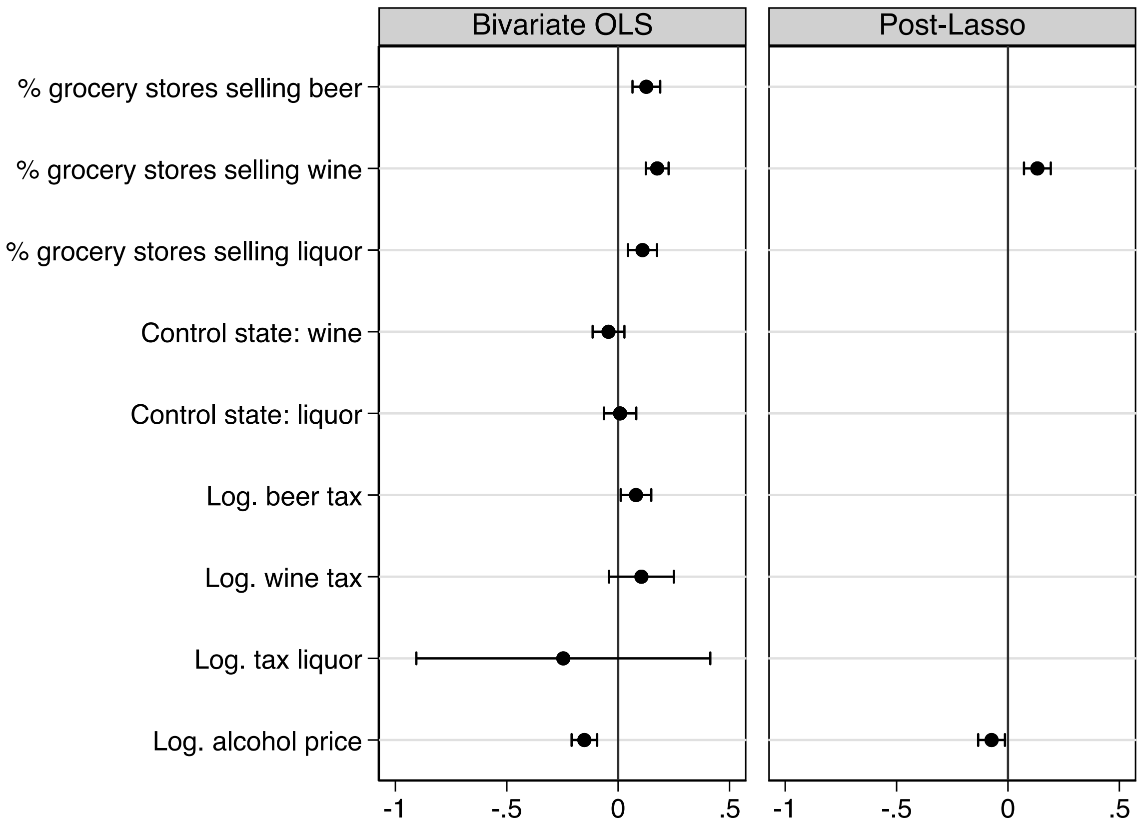


Figure C.2: Correlates of average place effects, log. expenditure of alcohol

Notes: Figure presents point estimates and 95% confidence intervals from bivariate OLS regressions (left) and a post-Lasso multivariate regression (right) of average state-level location effects on state-level characteristics. Average state-level location effects ($\hat{\gamma}$) are estimated from equation (2) where dependent variable is the logarithm of alcohol expenditures, and the sample includes movers and non-movers (3,110,488 household-quarters). In the OLS, Lasso, and Post-Lasso regressions the unit of observation is a state and the sample includes 49 observations (48 mainland states and Washington, D.C.), except for the excise taxes, where the sample includes only non-control states. All covariates are standardized to mean zero and standard deviation one. Post-Lasso estimates are obtained by first running a Lasso regression on the full set of covariates and then an OLS regression using the set of covariates chosen by Lasso. In the Lasso regression, the penalty level is chosen by the theory-based rule by Belloni et al. (2012), which is also applicable with heteroscedacity.

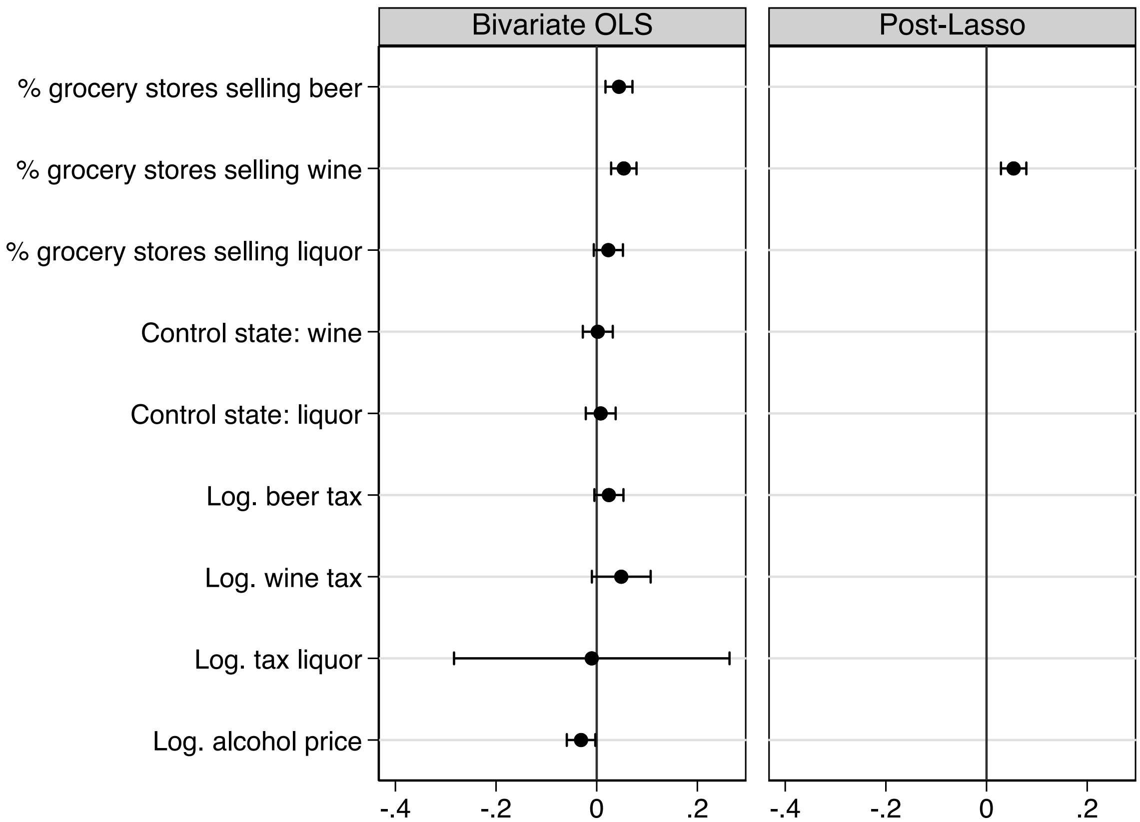


Figure C.3: Correlates of average place effects, log. quantity of beer

Notes: Figure presents point estimates and 95% confidence intervals from bivariate OLS regressions (left) and a post-Lasso multivariate regression (right) of average state-level location effects on state level characteristics. Average state-level location effects ($\hat{\gamma}$) are estimated from equation (2) where dependent variable is the logarithm of beer quantity, and the sample includes movers and non-movers (3,110,488 household-quarters). In the OLS, Lasso, and Post-Lasso regressions the unit of observation is a state and the sample includes 49 observations (48 mainland states and Washington, D.C.), except for the excise taxes, where the sample includes only non-control states. All covariates are standardized to mean zero and standard deviation one. Post-Lasso estimates are obtained by first running a Lasso regression on the full set of covariates and then an OLS regression using the set of covariates chosen by Lasso. In the Lasso regression, the penalty level is chosen by the theory-based rule by Belloni et al. (2012), which is also applicable with heteroscedacity.

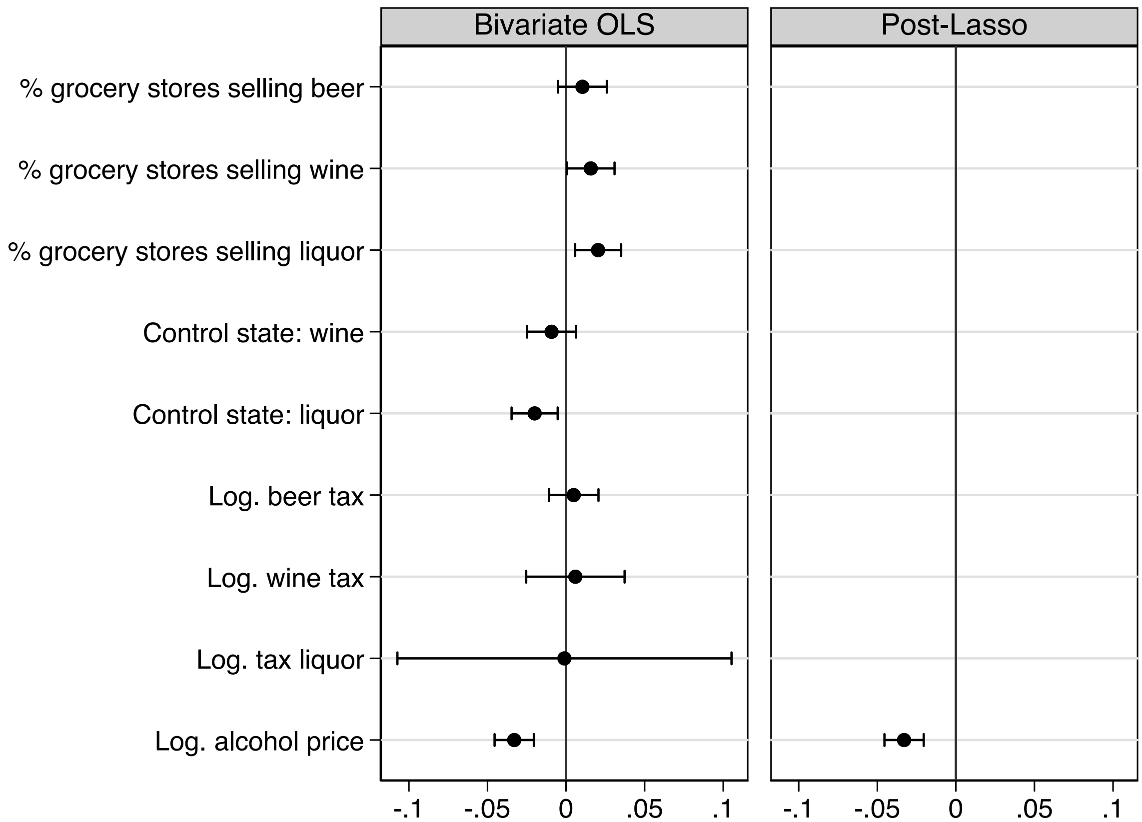


Figure C.4: Correlates of average place effects, log. quantity of liquor

Notes: Figure presents point estimates and 95% confidence intervals from bivariate OLS regressions (left) and a post-Lasso multivariate regression (right) of average state-level location effects on state level characteristics. Average state-level location effects ($\hat{\gamma}$) are estimated from equation (2) where dependent variable is the logarithm of liquor quantity, and the sample includes movers and non-movers (3,110,488 household-quarters). In the OLS, Lasso, and Post-Lasso regressions the unit of observation is a state and the sample includes 49 observations (48 mainland states and Washington, D.C.), except for the excise taxes, where the sample includes only non-control states. All covariates are standardized to mean zero and standard deviation one. Post-Lasso estimates are obtained by first running a Lasso regression on the full set of covariates and then an OLS regression using the set of covariates chosen by Lasso. In the Lasso regression, the penalty level is chosen by the theory-based rule by Belloni et al. (2012), which is also applicable with heteroscedacity.

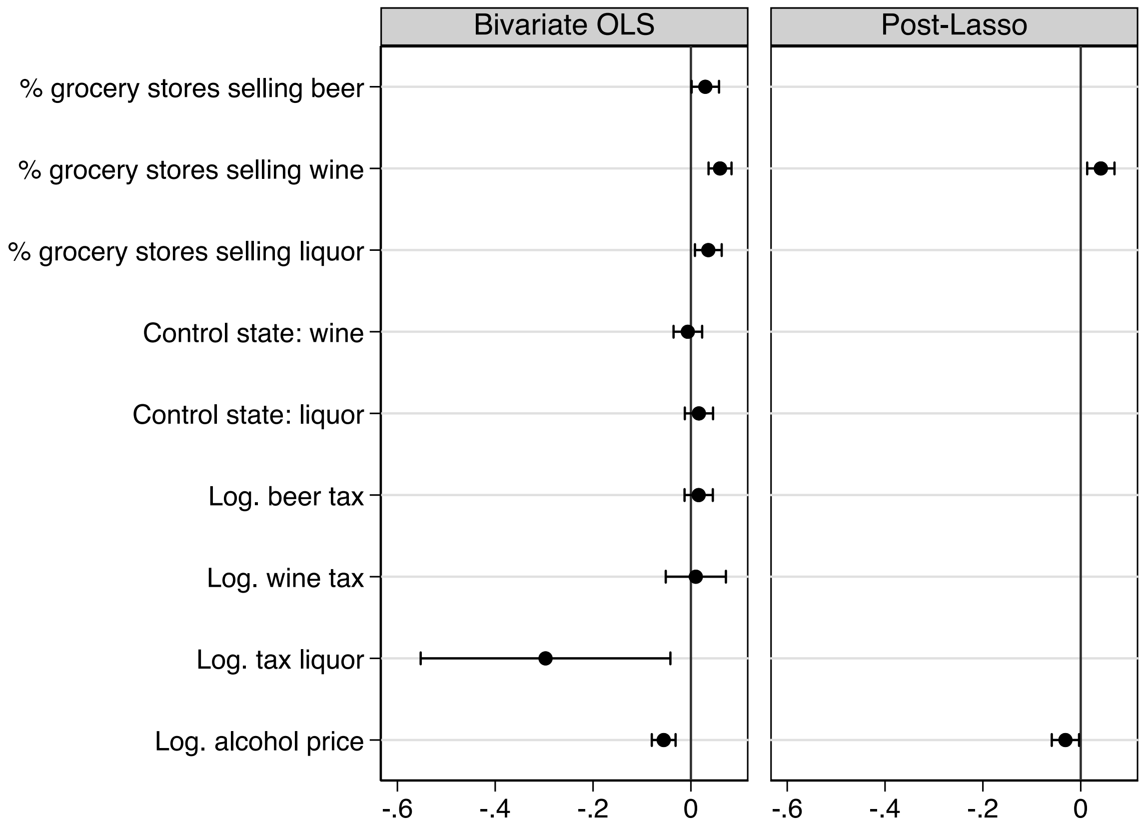


Figure C.5: Correlates of average place effects, log. quantity of wine

Notes: Figure presents point estimates and 95% confidence intervals from bivariate OLS regressions (left) and a post-Lasso multivariate regression (right) of average state-level location effects on state level characteristics. Average state-level location effects ($\hat{\gamma}$) are estimated from equation (2) where dependent variable is the logarithm of wine quantity, and the sample includes movers and non-movers (3,110,488 household-quarters). In the OLS, Lasso, and Post-Lasso regressions the unit of observation is a state and the sample includes 49 observations (48 mainland states and Washington D.C.), except for the excise taxes, where the sample includes only non-control states. All covariates are standardized to mean zero and standard deviation one. Post-Lasso estimates are obtained by first running a Lasso regression on the full set of covariates and then an OLS regression using the set of covariates chosen by Lasso. In the Lasso regression, the penalty level is chosen by the theory-based rule by Belloni et al. (2012), which is also applicable with heteroscedacity.

D Online appendix: Variable definitions

Control state (for wine or liquor) and beer, wine, and liquor state-level excise taxes. Data about control states and state-level alcohol excise tax rates is obtained from The Urban-Brookings Tax Policy Center.[17] The dataset includes yearly data from 2004–2017. It includes indicators of whether the state is a wine control state and liquor control state. It also includes excise tax rates per gallon of beer, wine, and liquor. It does not include tax rates on wine and beer for control states (because the control states set the alcohol prices). We deflate tax rates to 2015 dollars using the consumer price index for urban consumers. For all the variables, we calculate averages across all years in 2004-2017. In the OLS regressions on figure C.1, dependent variables are logarithms of the average (across years) alcohol taxes plus one cent.

Percent of grocery stores selling beer, wine, or liquor. To calculate these measures, we use data from NielsenIQ Retail Scanner Data from 2006-2017.[18] We start with a sample of all food (grocery) stores that in a given calendar year sold at least one unit of commonly bought grocery products: milk (dairy refrigerated milk) or bread. For each store and year, we measure whether the store sold at least a unit of a given alcohol product (beer, wine, or liquor). Then for each year and alcohol product, we calculate the share of stores selling it. Finally, for each product, we take the simple average of the shares across years. We define beer products as all beer products excluding near beer. We exclude from wine products non-alcoholic wine and wine-flavored refreshments. Liquor products consist of brandy, gin, rum, tequila, vodka, and whiskey, excluding all products that can have lower alcohol content than regular liquor (for example, ready-made cocktails).

Alcohol price. To generate the state-level aggregate alcohol prices, we use NielsenIQ Consumer Panel from 2004-2017. We calculate prices in the following steps. First, we convert all the prices into comparable units (price per unit of ethanol). Second, we calculate the weighted average price of ethanol separately for each product group (beer, liquor, and wine) for each year and state. It is calculated as the weighted average of brand and product size pair prices in a given product group, year, and state. The weight of a brand and product size pair

[17]The Urban-Brookings Tax Policy Center. 2020. "State Alcohol Excise Taxes". (`https://www.taxpolicycenter.org/statistics/state-alcohol-excise-taxes`, accessed July 8, 2020.)

[18]While we would like to use the same time period as in our main dataset, years 2004–2005 are not available in NielsenIQ Retail Scanner Data. This is unlikely to be a problem because over time there are not many changes in alcohol regulation that could affect alcohol availability.

is equal to its share in volume in that product group in a given year. To allow market shares to evolve, the weights vary across years. Each year weights are the same across states, to avoid that aggregate price is artificially cheaper in states where consumers purchase cheaper brands. We don't use price data on local brands, to be able to compare prices of the same products across states. Third, we calculate weighted average price of ethanol for each state and year, averaging across the product groups (beer, liquor, and wine). The weight of a product group is equal to its share in volume (including all brands, local and non-local) in a given year. Again, weights are constant across states and vary over years. Fourth, we deflate all the prices to 2015 dollars using the consumer price index for urban consumers and take simple average over years. We have also calculated aggregate prices in alternative ways, and it has led to similar estimates.