Persistence in 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. Right after moving, movers' alcohol purchases converge sharply toward the average level in their destination state, implying that the current environment explains about two-thirds of the differences in alcohol purchases. The adjustment takes place both on the extensive and intensive margin.

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

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younger) worldwide (World Health Organization, 2018). Beyond direct health consequences, excessive alcohol consumption generates social and economic burden on other people (Cook and Moore, 2000; Cawley and Ruhm, 2011). While a vast literature has shown that various factors affect alcohol consumption, less is known about the relative importance of these factors in driving differences in alcohol consumption.

In this paper, we study how much alcohol consumption is driven by the current environment versus individual characteristics. 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 alcohol consumption is mainly driven by the current environment, then we would expect a jump in the mover's purchases to a level similar to that of other consumers in the destination state. On the other hand, if alcohol consumption is only driven by individual characteristics, 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 Nielsen 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 take place as a response 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 that chose to go to different states before the move had similar trends in their purchases.

We find that right after the move, movers' alcohol purchases converge sharply toward the average level in their destination state, implying that the current environment explains a large share in the differences in alcohol purchases. About two-thirds of the gap in alcohol purchases between the origin and destination state closes immediately when a consumer moves. No sizable further convergence is seen after the immediate jump. 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 margin. 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 adjust more when they move to states with larger average alcohol purchases, while they adjust less when moving to states with smaller average alcohol purchases. We perform a number of robustness checks using alternative samples, functional forms, controls, and geographic aggregation levels. Throughout, we find that movers' alcohol purchases converge sharply toward the average level of their destination.

Our work contributes to the ongoing debate about how malleable alcohol consumption is and how much it is driven by the environment.[1] 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. In addition to the direct effect on consumption, in the long term these factors affect each other. These indirect effects either magnify or decrease the direct effect of each factor. 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 in the long term. This combined long-term effect is difficult to measure because in the long term, economic and other conditions change that also affect alcohol consumption. Therefore, 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.

[1] The literature has studied the impact of environmental factors such as, alcohol taxes and regulations (Marcus and Siedler, 2015; Bernheim et al., 2016; Hinnosaar, 2016; Kueng and Yakovlev, 2020; Griffith et al., 2019; Miravete et al., 2019; Illanes and Moshary, 2018; Seo, 2019; Aguirregabiria et al., 2016; Miller and Weinberg, 2017), 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).

Our work also adds a new finding to the literature on how changes in the environment affect consumer behavior. In the case of food and drinks, the question has been studied using movers in the same dataset, the Nielsen scanner data, by Bronnenberg et al. (2012); Allcott et al. (2019); Hut (2020).[2] 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 the healthiness of food purchases changes with a move. Both find that the magnitude of the change in the few years after the move is very small. Our results are in contrast to the evidence on a little change in the healthiness of food purchases and instead are more in line with larger changes in brand choices. 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 the case of food healthiness while existing in the case of brands.

More generally, the paper relates to the recent work of Chetty et al. (2016) and also 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 partly echoes this point and could provide an additional mechanism of why environment matters. According to our finding, the current environment largely determines individuals' alcohol purchases. Using a simple back-of-envelope calculation would suggest that if a household of two adults with one underage child moves from Utah to New Hampshire, the family's alcohol consumption would permanently increase by $27 per quarter. This permanent shift of the household's alcohol consumption could have a direct impact on household asset accumulation and other indirect impacts, such as on household earnings, crime, and potential exposure to alcohol abuse. This permanent increase could affect the wellbeing of both the household heads and their child.

Section 2 describes the data and presents summary statistics. Section 3 describes the empirical strategy. Section 4 presents our main analysis of the role of environment versus individual characteristics in explaining variation in alcohol purchases. Section 5 explores which local characteristics describe the environment with large average alcohol purchases.

[2] Other papers using data of movers have estimated the impact of urban sprawl on obesity (Eid et al., 2008), the impact of location on health-care 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., 2019), 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).

Section 6 concludes.

2 Data

Nielsen Homescan Panel. We use Nielsen Homescan Panel from 2004–2017 to measure household-level alcohol purchases, both 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 dataset includes Universal Product Code level information of the purchased quantities and prices for each household each day. The reliability of the data has been analyzed by (Einav et al., 2010).

Each year, the households report demographic characteristics, including income, household composition, marital status, geographic location, employment status, education, and age for male and female household heads. For households with two heads, we combine some of their characteristics by calculating their mean age and highest education level.

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 exactly once.[3] We exclude from the sample households whose state of residence changes more than once. Robustness analysis shows that further restricting the sample only 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 the move during the year. The geographic location of the stores where movers shop confirms that indeed they change the shopping location during the year of move from their state of origin to the state of destination (figure A.1 in Online Appendix). Unsurprisingly, there is heterogeneity in terms of timing: some movers start to shop in their destination at the beginning of the move year, while others switch later. We drop the year of move from our main sample to avoid the mismeasurement problems associated with not knowing the exact timing of the move. Robustness analysis shows that dropping the year of move is not critical

[3]We analyze robustness to alternative geographic levels, such as county and 3-digit zip code. But we focus on state-level moves because first, a lot of the variation in the alcohol regulation is at the state level, and second, at a more disaggregate geographic level, our data could be quite noisy.

for our results. Specifically, in the robustness analysis, we assume that a household moves in the quarter when the first shopping trip in the state of destination occurs during the move year. However, this definition of the move's timing is imprecise, as we observe the store location only 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 purchased, 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.[4] We calculate alcohol purchases per adult by dividing household purchases by the number of persons aged 21 and above.[5] 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 absolute 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 non-weighted averages across time periods.[6]

Summary statistics. Table 1 presents summary statistics of movers (in column 1) and for a comparison non-movers (in column 2). The movers and non-movers are rather similar in terms of demographic characteristics, although not the same. Movers are more likely to have higher income, be college-educated, and women are less likely to be employed. Movers are also likely to consume more alcohol.

The Online Appendix A presents additional summary statistics. Figure A.2 shows that moves are rather symmetric; that is, moves to states with larger average alcohol purchases

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

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

[6]State-level alcohol purchases have been rather stable over time. Figure A.3 in Online Appendix shows that the ranking of states by alcohol purchases does not change much from the first to the second half of our sample period.

Table 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. 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 difference between movers and non-movers is statistically significantly different from zero at the 1-percent significance level according to the Wilcoxon rank-sum test.

are about as likely as moves to states with smaller average alcohol purchases. Table A.1 shows that moves take place between all regions.

Table A.2 compares the pre-move household characteristics and alcohol purchases of movers to states with larger versus smaller average alcohol purchases. It shows that 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. In our analysis, these differences among movers will be absorbed by household fixed effects.

Data limitations. While the length of the panel, the level of detail of the purchases, and household demographics provide great advantages in answering the question in the paper, the dataset also has limitations. First, as with any consumption survey data, underreporting is also a concern with our dataset. Cook (2007) describes that other survey-based measures of alcohol consumption capture about half of the per capita consumption in the alcohol tax data. In our analysis, underreporting is not necessarily a problem, as long as it does not change at the move. Furthermore, in the main analysis, we drop the year of the move, which should alleviate the concern that specifically during the move, consumers are too busy to report all their purchases. Second, the dataset includes only off-premise alcohol purchases. This also is a concern only if it changes at the move. Off-premise alcohol purchases is more likely to change when there are other changes in personal circumstances. Therefore, in the robustness analysis, we limit the sample to movers whose main demographic characteristics, such as marriage, employment status, and household size, remain constant.

3 Empirical strategy

In this section, we present our main empirical strategy, which decomposes the variation in alcohol purchases to the current environment versus individual factors. In the main specification, we restrict the sample only 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.[7] 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.[8]

[7] An alternative strategy presented in Online Appendix B that instead of the size of the move is based on household and state fixed effects using data on both movers and non-movers, gives similar estimates.

[8] As described in section 2, we exclude the calendar year of the move from the sample in order to avoid mismeasurement due to not observing the exact quarter of the move. Hence, by the first quarter in the new

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 outcomes converge towards the destination's average. If, after the move, the mover's alcohol purchases are the same as the average in the area of origin, the coefficient $\theta_{r(i,t)}$ equals zero. If instead the mover's alcohol purchases are the same as in the destination, $\theta_{r(i,t)}$ equals one. 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 time of move measures the share of the average difference between areas that is attributable to the current environment (as opposed to individual characteristics).[9] We calculate standard errors clustered at the household level.[10]

In addition to the event-study specification, we also estimate a difference-in-difference regression. 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. However, 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.

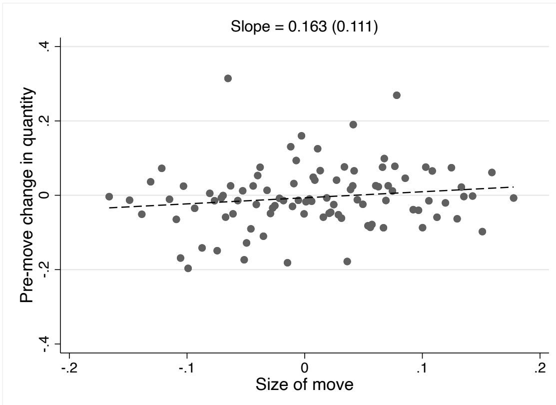
A possible concern is that movers to higher (lower) alcohol purchasing states would have increased (decreased) their purchases anyway. For example, it is possible that moves to states with higher alcohol purchases take place as a response to shocks that lead to higher alcohol purchases, such as divorce. Or that the moves and changes in alcohol purchases are a response to becoming unemployed or retiring. 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. Figures 1a–1b

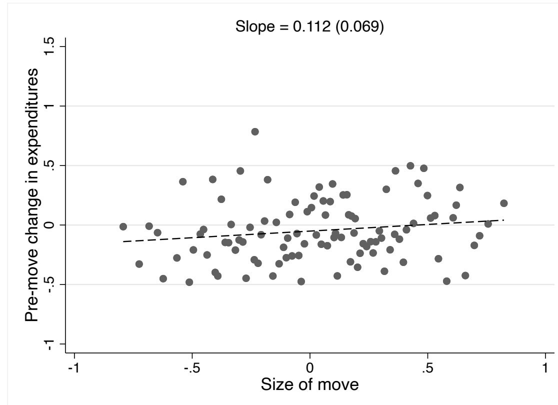
state we mean the first quarter after the year of the move; and by the last quarter in the origin state we mean the last quarter before the year of the move.

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

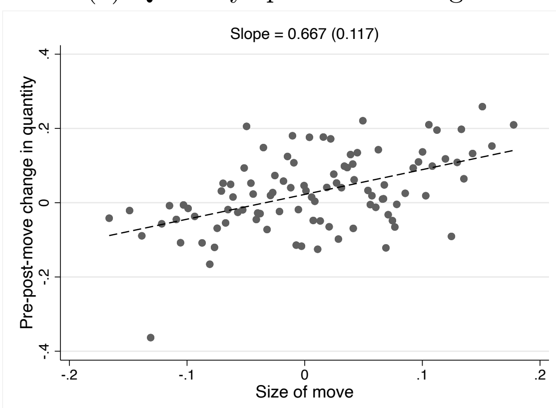
[10]The estimates retain their level of statistical significance when clustering at the level of origin-destination states pair.



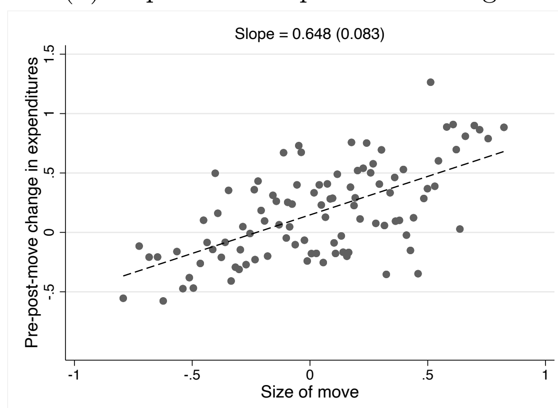
(a) Quantity: pre-move change



(b) Expenditures: pre-move change



(c) Quantity: pre-post-move change



(d) Expenditures: pre-post-move change

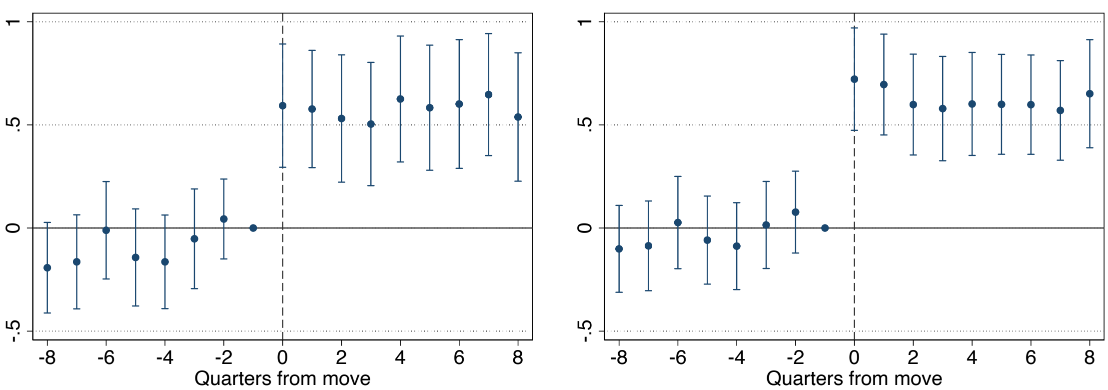
Figure 1: Changes in alcohol purchases by the size of move: pre-move (1a and 1b) and from pre- to post-move (1c and 1d)

Notes: Each figure presents a binned scatter plot of the change in 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 figures 1a–1b, 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 figures 1c–1d, 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. Sample includes all movers that move across state lines, limiting the sample to those that move only once and who are observed 3 calendar years before the move up to one calendar year after the move (1339 households).

present 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 (figures 1c–1d).

4 Results

Event study results. Figure 2 presents event study estimates. It shows a sizable jump in the total quantity of ethanol purchased as well as alcohol expenditures at the time of the move, from 0 to more than 0.5. This indicates that the current environment plays a sizable role affecting the quantity of alcohol purchased. Figure A.4 in the Appendix presents similar results separately for beer, liquor, and wine.



(a) Quantity

(b) Expenditures

Figure 2: Event study of alcohol purchases

Notes: Each figure presents the coefficients $\theta_{r(i,t)}$ estimated from equation (1). The coefficient for the last time period before the move is normalized to 0. The dependent variable on figure (a) is logarithm of quantity of total pure alcohol purchased and on figure (b), logarithm of alcohol expenditures. 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 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.

Difference-in-differences results. Panel A of table 2 presents our main results. It summarizes the above event-study estimates, re-estimating regression (1) pooling all time periods before the move and all time periods after the move.[11] It shows that the change in alcohol purchases after move equals about 70% of the destination minus origin difference. There is some heterogeneity across the types of alcohol. Specifically, the adjustment (importance of the current environment) is slightly larger for wine and smaller for liquor.[12]

Is the change in alcohol purchases coming from the intensive or extensive margin? About 30% of U.S. adults don't drink alcohol. Does the move change whether consumers purchase any alcohol (the extensive margin)? Or is all the adjustment coming only from those who purchased alcohol before the move, and they are now simply changing the quantity? Panel B shows that movers make large changes in their alcohol purchases both on the intensive and extensive margin.

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 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 asymmetric. When moving to a state with a larger share of consumers purchasing alcohol ($\Delta > 0$), movers are more likely to adjust (start to purchase alcohol), compared to adjusting (stopping purchasing alcohol), when moving to a state with a smaller share of consumers purchasing alcohol ($\Delta < 0$). The difference is sizable—the location effect is more than twice as large for moves to states with a higher share of consumers purchasing alcohol than to states with a lower share.

Robustness. Below, we summarize the analysis meant to explore the sensitivity of our results to alternative samples, functional forms, controls, clustering, and geographic levels. Details are presented in Online Appendix A.

[11] Robustness checks show that when restricting time periods to 2 years before and after the move, results are very similar.

[12] To compare with the literature, in Online Appendix table A.3, we use the same 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). Specifically, we focus on the most popular beer brands to compare the results with Bronnenberg et al. (2012). We estimate the average convergence to equal 0.48, which is the same magnitude as the average over all grocery products in Bronnenberg et al. (2012). To compare with Allcott et al. (2019), we focus on soda and fruits and vegetables, as the over- or underconsumption of these has been viewed as playing an important role in unhealthy 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 being 0.03.

Table 2: 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 margin, 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)
Households	2722	2722	2722	2722	3267
Observations	83596	83596	83596	83596	86112
Panel C: Intensive and extensive margin, 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. 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. 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. 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 the 1 percent level, ** at a 5 percent level, * at a 10 percent level.

We evaluate whether the results are robust to using alternative samples. This is motivated, first, by the concern that alcohol consumption changes as a response when a person becomes unemployed or divorces, which also leads to a move. When we restrict the sample to movers whose employment, marital status, household size, and the number of members aged 21 and above don't change, our results remain the same. Additionally, our results are robust to: restricting the sample to households who are observed continuously two years before and after the move; restricting the sample to the balanced panel two years around the move; including the year of move; or including non-movers in the analysis (tables A.4–A.5).

The results are not driven by the specific functional form of the outcome variable (table A.6). Instead, the results are similar with three alternatives: when we measure alcohol purchases using the absolute value of quantity or expenditures, Inverse Hyperbolic Sine transformation, or percentile rank (as used by Chetty and Hendren (2018b)). To calculate the percentile ranks, in each time period, we rank all households by alcohol purchases (either quantity or expenditures). We define household's percentile rank of alcohol purchases based on the position in the national distribution of alcohol purchases relative to all others in a given time period. Then the area-level change is measured as a change in the area-level average percentile rank.

Including event time fixed effects or demographic characteristics as controls also does not change the results (table A.7). As demographic characteristics we include the 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. 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 (table A.8).

Finally, we explore robustness to the geographic area, comparing zip codes, counties, states, and census regions (tables A.9–A.11). Our results remain similar as long as movers cross state lines. However, for moves inside the state, there is much less convergence towards the destination zip code or county level. We hypothesize that it has to do with differences in state-level regulation. In the next section, we further explore what state-level characteristics are associated with a high-alcohol consumption environment.

5 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. Then, we measure which state-level characteristics are correlated with the estimated state-level location effects. 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 previous section.

Estimating state-level location effects. Using data on both movers and nonmovers, 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 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. State fixed effects (γ), are identified by movers. Note that there are moves to or from all the states.

As an alternative to the above event study and difference-in-differences estimates, equation (2) provides another method to measure the importance of the current environment versus individual characteristics in explaining the variation in alcohol purchases. Appendix B presents the analysis based on equation (2). The estimates 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.

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 restrictions on the number of alcohol licenses available for regular stores. Therefore, we also measure availability as the percentage of grocery stores selling stronger alcohol (regular beer, wine, or liquor). 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 C.

Figure 3: Correlates of average place effects

Notes: Figure presents point estimates and 90% 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 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 heteroscedacity.

Figure 3 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. The post-Lasso multivariate regression shows that the share of grocery stores selling wine and alcohol price remain significant. Similar estimates for alcohol expenditures, also conducted separately for beer, wine, and liquor quantities, are presented in the Online Appendix in figures A.5–A.8.

We note that figure 3 does 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.

6 Conclusion

Analyzing the purchases of households that move across states, we find robust evidence that alcohol purchases are strongly affected by the current environment. We find that about two-thirds of geographic variation in alcohol purchases is due to the current environment as opposed to individual characteristics. Movers adjust their alcohol purchases toward the destination average as soon as they move, with no sizable convergence later. We provide evidence that high-alcohol-consumption environments are characterized by higher alcohol availability in grocery stores and lower prices.

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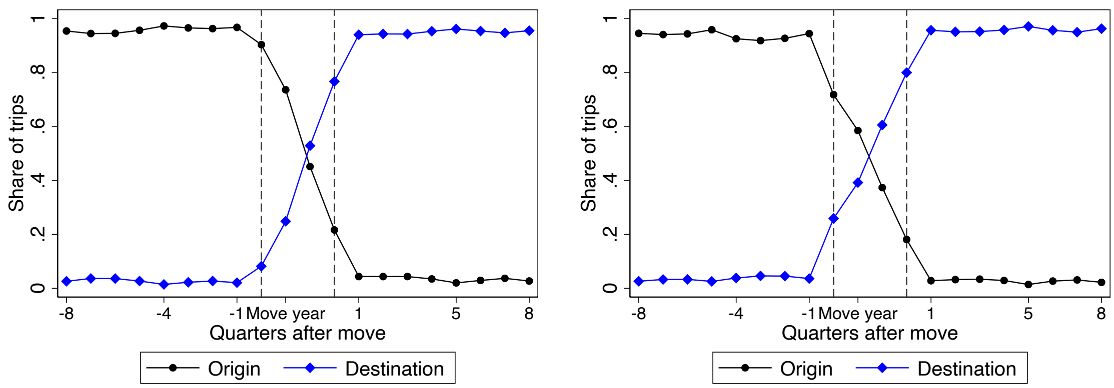
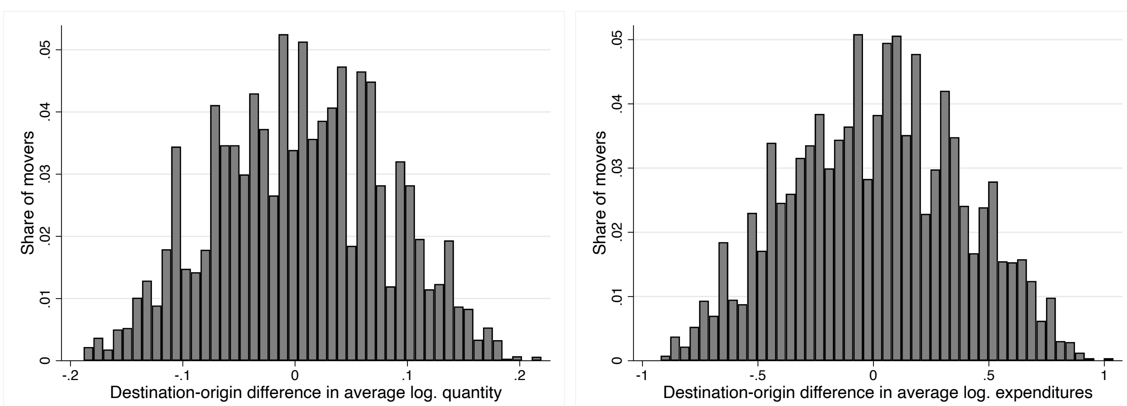
A Online Appendix: Additional tables and figures



(a) Balanced panel (b) Unbalanced panel

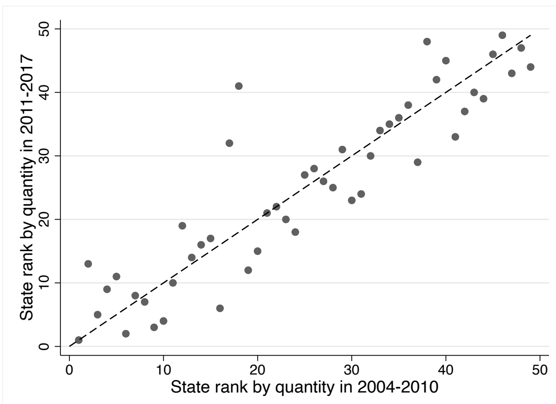
Figure A.1: Share of shopping trips to the destination versus origin state of residence

Notes: The shares are calculated using all trips to stores in Nielsen Retail Scanner Dataset. 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.

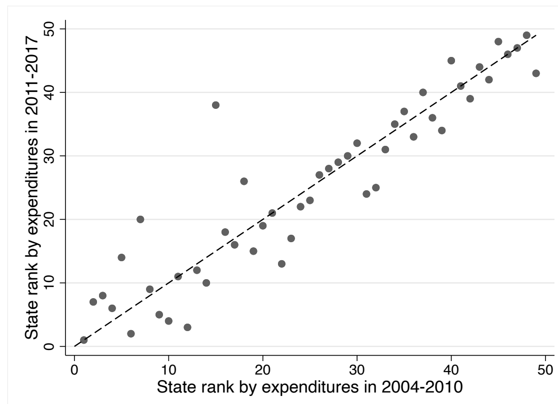


(a) Quantity (b) Expenditures

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



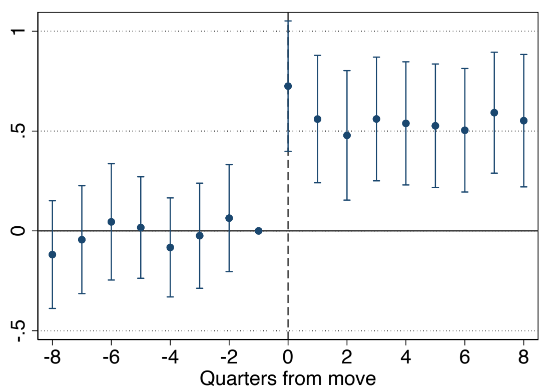
(a) Quantity



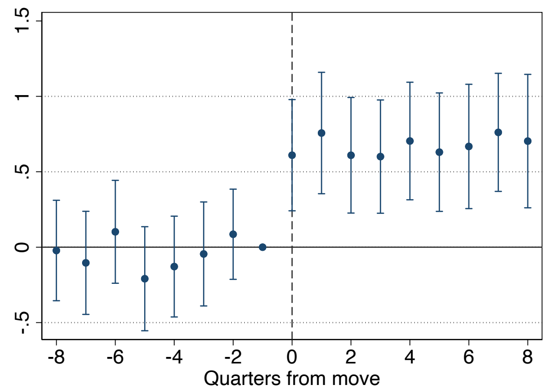
(b) Expenditures

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

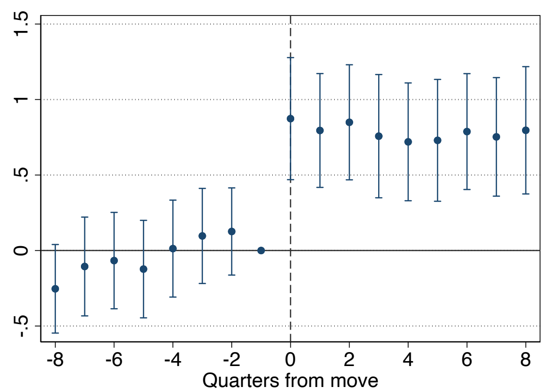
Notes: States ranked by average alcohol purchases of nonmovers in 2004-2010 vs 2011-2017. The dashed line is a 45-degree line.



(a) Quantity of beer



(b) Quantity of liquor



(c) Quantity of wine

Figure A.4: Event study of alcohol purchases

Notes: Each figure presents the coefficients $\theta_{r(i,t)}$ 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. 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 move itself is excluded. Standard errors are clustered at the household level.

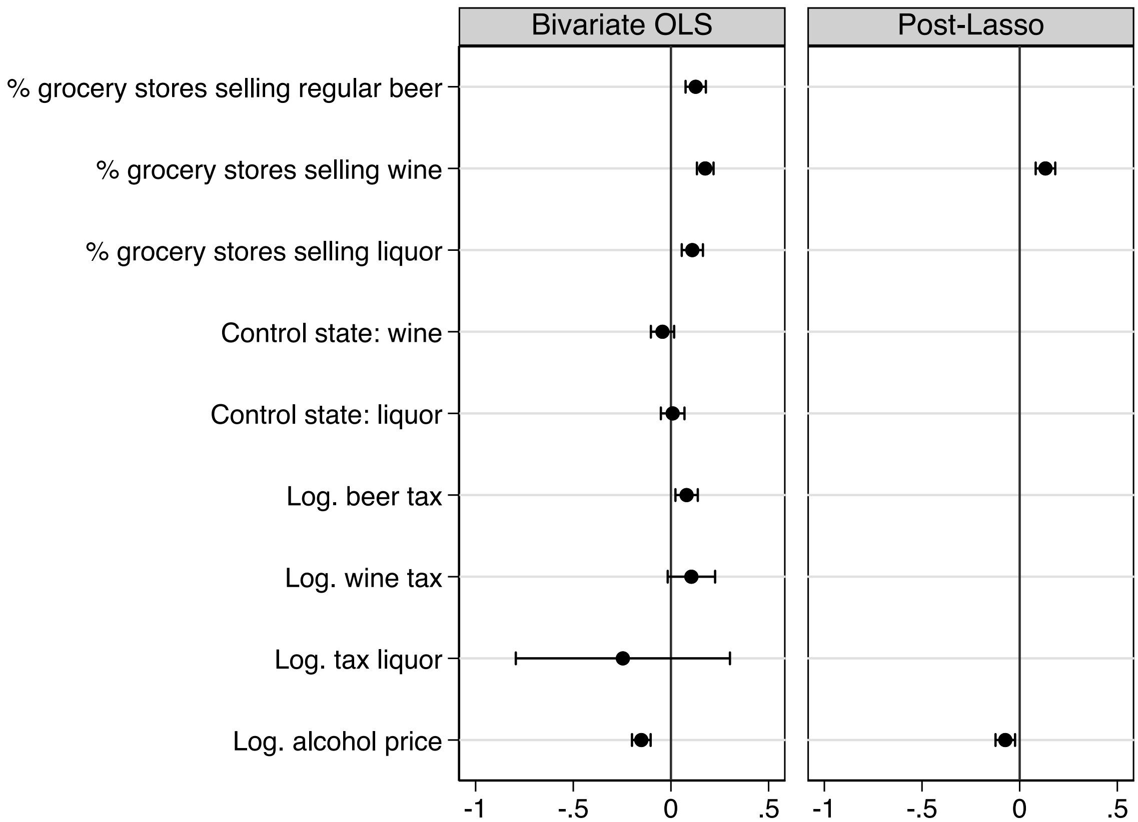


Figure A.5: Correlates of average place effects, log. expenditure of alcohol

Notes: Figure presents point estimates and 90% 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 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.

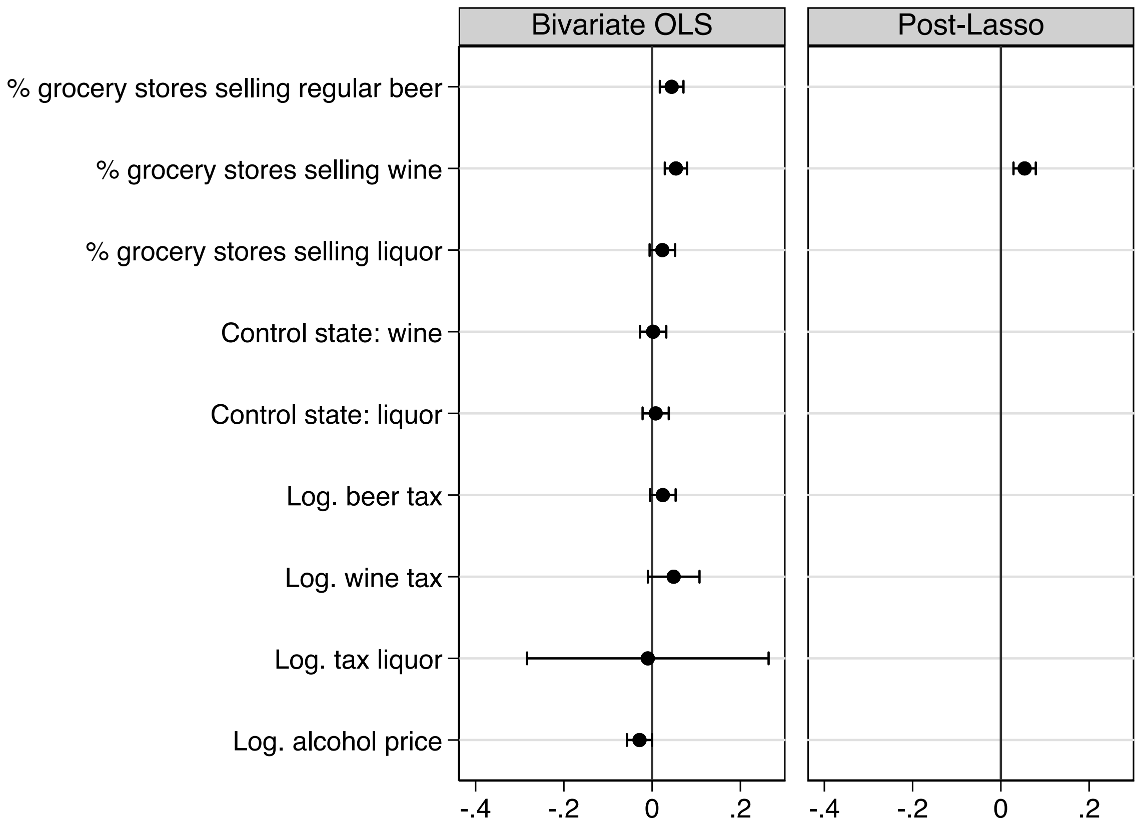


Figure A.6: Correlates of average place effects, log. quantity of beer

Notes: Figure presents point estimates and 90% 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 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.

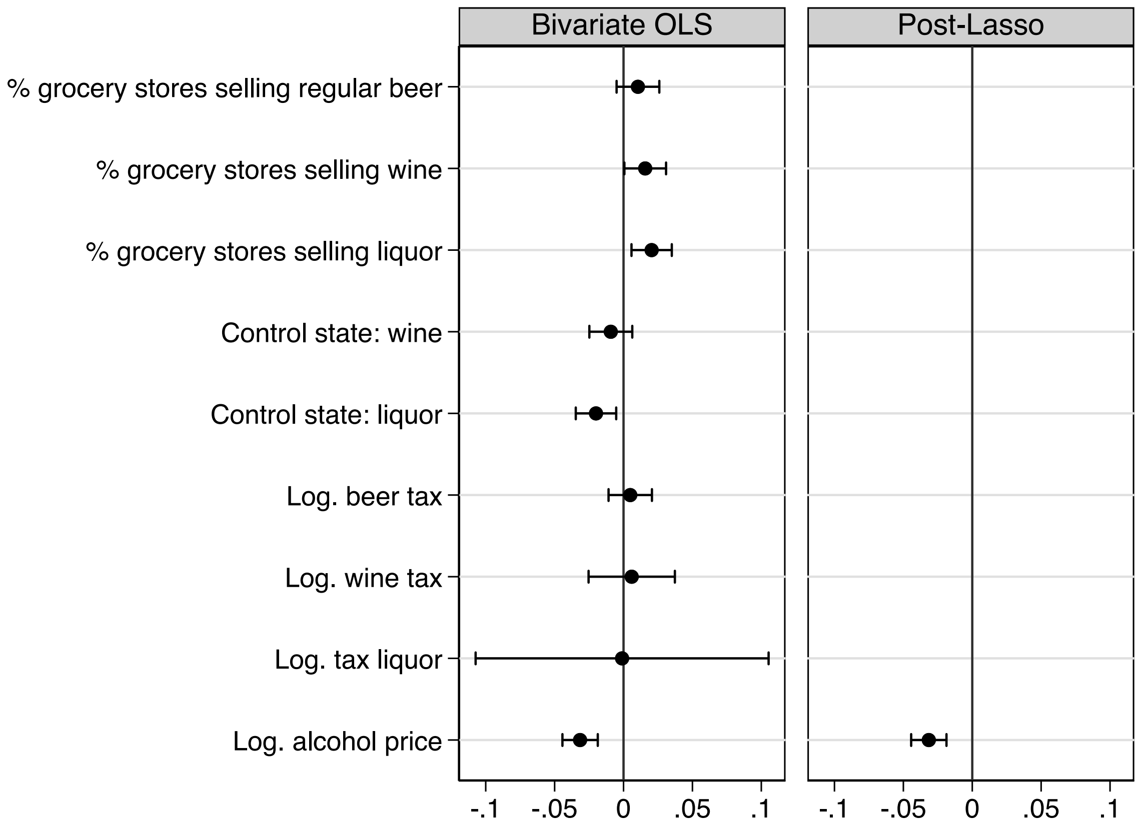


Figure A.7: Correlates of average place effects, log. quantity of liquor

Notes: Figure presents point estimates and 90% 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 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.

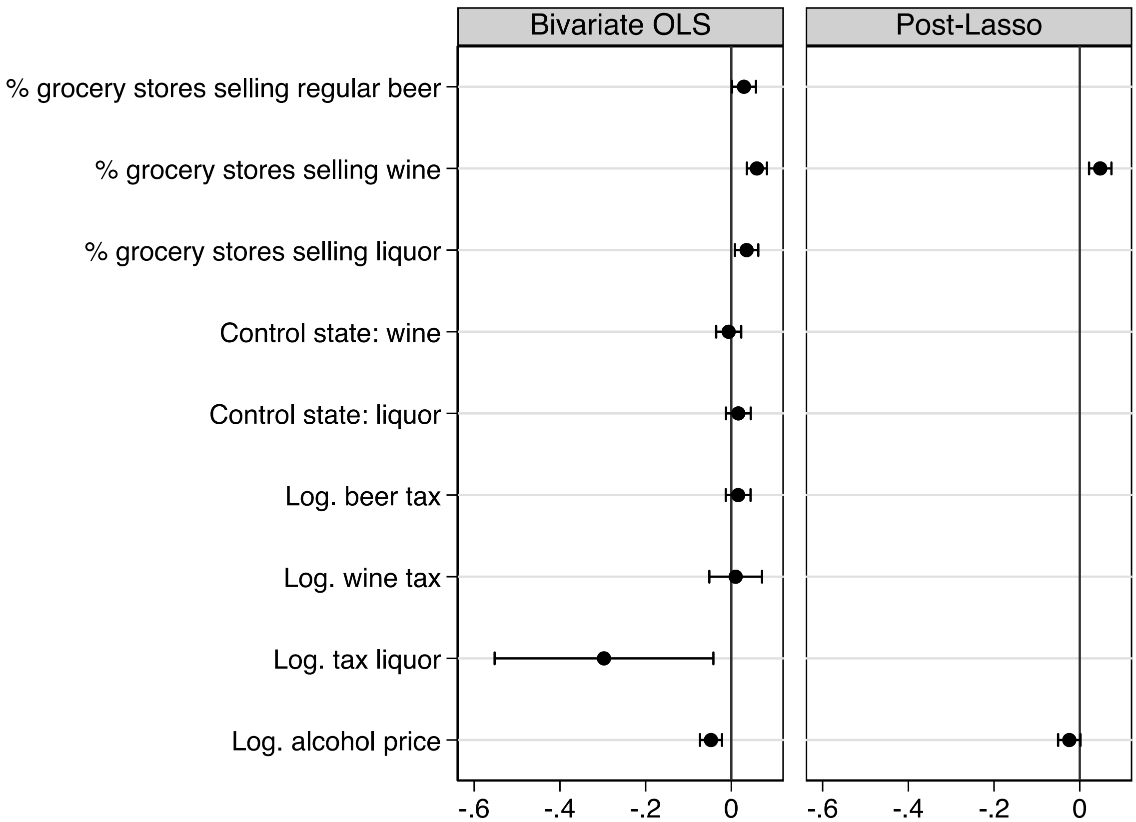


Figure A.8: Correlates of average place effects, log. quantity of wine

Notes: Figure presents point estimates and 90% 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 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.

Table A.1: 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.2: Comparison of movers to states where alcohol consumption is lower versus higher than in the state of origin

	Movers to states with alcohol purchases lower	Movers to states with alcohol purchases higher	t-test p-value	Wilcoxon test 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. 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.3: Change in purchases after move: beer brands, soda, and fruits and vegetables

	Quantity		
	(1)	(2)	(3)
		Panel A: Light beer	
	Bud Light	Coors Light	Miller Light
$\Delta\cdot$ After move	0.377***	0.667***	0.625***
	(0.113)	(0.202)	(0.129)
Households	3267	3267	3267
Observations	97860	97860	97860
		Panel B: Regular beer	
	Budweiser	Busch	Miller High Life
$\Delta\cdot$ After move	0.531**	0.537***	0.131
	(0.207)	(0.205)	(0.264)
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 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 move is excluded from the sample. In panel A and B, the dependent variable is one of the three most sold brands of light (panel A) or regular (panel B) beer. 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.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 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 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	0.699***	0.680***	0.628***	0.772***	0.668***
	(0.071)	(0.075)	(0.082)	(0.078)	(0.049)
Households	4519	4519	4519	4519	4519
Observations	134332	134332	134332	134332	134332
	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

Notes: Dependent variable is 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 includes both movers and non-movers. 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					
$\Delta\cdot$ 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					
$\Delta\cdot$ 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: Absolute value of purchases					
$\Delta\cdot$ 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 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.					
Δ· 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					
Δ· 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 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 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 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 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 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 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 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 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				
Δ· 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				
Δ· 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 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 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.

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

The analysis is based on the estimates of equation (2), which we replicate here for convenience.

$$y_{ijt} = \alpha_i + \gamma_j + \tau_t + \rho_{it} + \varepsilon_{ijt} \tag{3}$$

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. The equation is estimated using data on both movers and nonmovers.

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 2. 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.

Column 1 of Table B.1 shows that about 60% of the difference between above and below median alcohol consumption states is due to location effects. Other partitions of states provide similar results. Location share is about 60% for the difference between top and bottom quartiles (column 2) and about 70% for the difference between top and bottom deciles (column 3). Columns 4–6 provide similar estimates for alcohol expenditures. Overall, the results are similar to those from the event study and difference-in-differences analysis.

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: Variable definitions

Percent of grocery stores selling regular beer, wine, or liquor. To calculate these measures, we use data from Nielsen Retail Scanner Dataset from 2006-2017.[13] 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 (regular 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 regular beer products as all beer products excluding near beer and light 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 Nielsen Homescan data 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 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.

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

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.[14] 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 3, dependent variables are logarithms of the average (across years) alcohol taxes plus one cent.

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