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The Effect of Soda Taxes on Beverage and Candy Purchases

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***Selected Paper prepared for presentation at the 2024 Agricultural & Applied Economics Association
Annual Meeting, New Orleans, LA; July 28-30, 2024***

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Obesity is a significant health risk in the United States. The National Health and Nutrition Examination Survey (NHANES) shows that between 1999–2000 and 2017–March 2020, the prevalence of obesity in the U.S. rose from 30.5% to 41.9%. One key contributor to obesity is the high intake of added sugars (Finkelstein et al., 2013; Bailey, Fulgoni, Cowan, & Gaine, 2018; Zhen et al., 2023). In addressing the escalating obesity crisis, a number of public policy strategies have been proposed at local and national levels to discourage sugar consumption (Zhen et al., 2014; Cawley et al., 2019; Lozano and Rojas, 2022).

Several U.S. cities impose a tax on sugar-sweetened beverages (SSBs) at one penny per ounce to reduce the intake of added sugars from these drinks. Recent research has analyzed the substitution effect between soda and unhealthy food in response to exercise tax on SSBs (e.g., Allcott et al., 2019; Powell and Leider, 2020). For example, Finkelstein et al. (2013) showed that a 20% price increase on sugar-sweetened beverages reduces soda purchases without increasing sugary food consumption. On the other hand, other research indicates that the implementation of taxes on sugar-sweetened beverages (SSBs) might result in substitution behaviors, potentially causing a rise in sugar and calorie intake from alternative sources, such as candy (Zhen et al., 2014). More recently, Lozano-Rojas and Carlin (2022) found that the substitution with sugary foods offsets 19% of the sugar intake reduction from sugar-sweetened beverages (SSBs).

Few studies tackle questions concerning the effectiveness of taxing unhealthy food through sales taxes in grocery shopping at the state level which are far more widespread.¹ Many

¹ One exception is Restrepo and Cantor (2020), they found that adolescents reduced their consumption of soft drinks due to increased tax rates levied on soda using NHANES data from 1999-2014. However, they offset this reduction by increasing their consumption of milk-based drinks.

states impose exemptions for groceries from sales tax but do not extend this exemption to sugar-dense foods, such as soda and candy. However, there are exceptions; California, Ohio, Pennsylvania, Washington, and West Virginia do not treat soda as a grocery item, but they do include candy in the category of grocery items, which means that sales tax applies only to soda during household grocery shopping (Tax Foundation, 2013). Our analysis of state-level tax changes complements ongoing studies of the impacts of city-level taxes, providing a broader perspective on consumer responses to beverage tax change. On September 1st, 2013, Ohio increased its sales tax rate from 5.5% to 5.75%. As a result, households now pay more for soda than for candy since candy is categorized as a grocery item and is exempt from sales tax in grocery stores. To analyze the effect of this plausibly exogenous policy change in Ohio on household purchases of soda and candy, we estimate a series of Difference-in-Differences (DID) models and use neighboring states as a control group due to their geographical proximity. Additionally, we exclude bordering census tracts to control for cross-border shopping effects.

We have three objectives in this paper. First, we investigate the response in household consumption of both taxed and tax-exempt sugary foods to the tax increase, as well as the substitution effect between these categories. Second, we consider the effect of tax on average purchase price and sugar intake from candy and soda. Third, we examine the heterogeneous effects of the tax change on households with an obese member. Zhen et al. (2023) found that obese consumers may improve the healthfulness of their purchases in response to sugar-sweetened beverage (SSB) taxes, whereas non-obese consumers do not significantly improve their diet quality through healthy food subsidies. Therefore, understanding preference heterogeneity related to obesity status is crucial for developing effective policies aimed at enhancing health and diet quality.

In this paper, we employ household purchase data from the 2013 Nielsen HomeScan dataset, which covers the period of the tax change in Ohio. Households participating in the Nielsen panel scan the barcodes of all their food purchases over the course of a year. Specifically for this paper, the HomeScan data tracks purchases of all candy and soda from grocery stores. To determine sugar intake at the household-weekly level, we retrieve nutritional facts information from products extra attributes files match it with the purchase data using UPC. In addition, we merge the HomeScan data with the Nielsen Annual Ailments, Health, and Wellness Survey to identify whether a household includes a member with obesity.

Our preliminary results show that after the tax increase, consumers decreased their purchases of soda but significantly increased their purchases of candy. To be specific, Ohio's tax change led to an 8-ounce decrease in the quantity of taxed soda purchased, equivalent to a 12% reduction from the pre-tax consumption level, and a 19% increase in the quantity of candy purchases. Then, we find that sugar intake does not change due to the tax increase on soda. This implies that applying a sales tax solely on soda, without including other sugary foods in grocery stores, may not effectively promote diet quality because consumers may substitute soft drinks with other unhealthy foods. Additionally, we find no evidence of households stockpiling soda before the tax change. This is important as the potential benefits of the tax in reducing household body weight might be mitigated if households stockpile soda prior to the tax implementation, resulting in less favorable public health outcomes. Furthermore, our findings that both soda and candy are elastic suggest that taxing a broader range of unhealthy sugary foods in grocery stores, not just soft drinks, could improve diet quality.

Our paper contributes to the current literature in several ways and thus promises to stimulate discussion at the AAEA annual meeting. First, given that only a small number of cities

implement sugar-sweetened beverage (SSB) taxes, our analysis of state-level tax changes related to grocery shopping could offer more comprehensive implications for policies aimed at improving diet quality and health. Second, we broaden our focus to the substitution effects on sugary foods in grocery stores, rather than limiting our analysis to a single beverage category. Last, we estimate the preference heterogeneity associated with the obesity status of household members in response to the tax change.

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