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The impacts of inclusive and exclusive taxes on healthy eating: An experimental study

Xiu Chen, Harry M. Kaiser *, Bradley J. Rickard

Charles H. Dyson School of Applied Economics and Management, Cornell University, United States

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ABSTRACT

Based on a laboratory experiment conducted with 131 adults (non-students subjects), we empirically examine the differential impacts of an inclusive and exclusive tax on changing consumers' eating behavior. We compare the caloric and nutrient content of the meals selected by the subjects using a difference-in-difference regression model to determine the efficacy of the policy treatments. The results indicate that an inclusive tax has a significantly stronger effect on reducing the consumption of total calories, calories from fat, and the intake of carbohydrates, cholesterol, sugar and sodium compared with an exclusive tax.

Introduction

Obesity among U.S. adults has reached epidemic proportions. As reported in 2013, the adult obesity rate in the United States is 34.9% (Centers for Disease Control and Prevention, 2014). The prevalence of obesity among middle-aged adults was 39.5% in the United States in 2011–2012 (Ogden and Carroll, 2010). According to the Centers for Disease Control and Prevention (2014), obesity is a major risk factor for a number of chronic diseases, including heart disease, stroke, type II diabetes and certain types of cancer. One study estimates that the current direct and indirect costs of obesity are more than $190 billion annually in the United States (Institute of Medicine [IOM], 2012). The Centers for Disease Control and Prevention (2014) states that the fundamental cause of people being overweight or obese is an energy imbalance between calories consumed and expended, and an increased intake of foods that are high in fat is undoubtedly one of the major contributions.

In order to reduce obesity, economic incentives/disincentives have been considered, and in some cases implemented, to promote healthy diets. Chief among these policies is a tax on unhealthy foods. The Rudd Center for Food Policy and Obesity at Yale suggest two methods for raising prices of unhealthy foods: (1) tax foods with poor nutrients profiles; and (2) tax broader categories of unhealthy food and beverages, such as carbonated drinks and snacks. Most of the states and cities in the United States implementing tax policies to fight obesity have adopted the first method and levied taxes on the soft drink category. For example, supervisors in San Francisco, California introduced a 2-cents-per-ounce tax on sugary drinks sold in the city, and lawmakers in Berkeley, California adopted a 1-cent-per-ounce tax on sugary drinks in 2014. A second method of levying an unhealthy food tax (also known as a "fat tax") has also been discussed, proposed, and even implemented in several countries. In 2011, Denmark imposed the world's first fat tax on foods with more than 2.3% saturated fats; but the policy was abolished in 2012 (Jensen and Smed, 2013). These food taxes are collected in the form of a higher sales tax rate compared to the regular food tax rate, or an additional excise tax. Among the thirty-three states in the United States that levy taxes on soft drinks, twenty-five of them apply only the sales tax to the category, one applies only an excise tax, and seven apply both excise and sales taxes (Zheng et al., 2013).

The difference between a sales and an excise tax is key to understanding how they induce different consumer behaviors. The fundamental difference is whether the tax is levied at the point of production or the point of sale. An excise tax is levied at the point of production (e.g., wholesale or manufacturing-level), and it is added to the posted-price of the product. Therefore, excise taxes are expressed in tax-inclusive terms, which refer to the amount of tax paid as a proportion of the after-tax value. Virginia, in addition to having a sales tax, also imposes a state excise tax on soda, which is an example of inclusive tax. Alternatively, a sales tax can be either inclusive or exclusive. For example, in the United States, the sales tax on clothing and food items in grocery stores and restaurants is generally not reflected

* Corresponding author.

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by the posted-price, but rather is added at the register upon checkout. Consequently, sales taxes on these items are typically expressed in tax-exclusive terms (Tax Policy Center, 2012; Chetty et al., 2009; Zheng et al., 2013).[1] A tax-exclusive tax rate refers to the amount of tax paid as a proportion of the pretax value of whatever is taxed.

An exclusive tax typically has lower salience than an inclusive tax. The economic literature has investigated and compared the efficacy of these two types of taxes. Miao et al. (2012) suggest that both a sales tax on sweetened goods and a sweetener input tax can reduce added sweetener consumption, but the latter policy causes about five times less consumer surplus loss than the former. Chetty et al. (2009) find that consumers tend to under-react to taxes that are not included in posted prices because of the difficulty in computing the gross after-tax price. Relatedly, Zheng et al. (2013) focus on the effect of imperfect tax knowledge, and conclude that a sales tax (i.e., exclusive tax) change does not reduce demand as much as an excise tax (i.e., inclusive tax) change of the same magnitude. While these and other studies are useful in understanding tax salience, there is an absence of empirical research on the impact of applying the taxes on food and beverage demand.

Accordingly, the goal of this research is to empirically study the impact of exclusive and inclusive taxes on nutrient composition of a meal selection. To our knowledge, no earlier work has compared how these two types of taxes impact the nutrient content of a meal selection. As defined by Chetty et al. (2009), the "salience" of a tax indicates the simplicity of calculating the gross-of-tax price of a good. To achieve our goal, we designed a controlled laboratory experiment conducted with 131 adult, non-student subjects that were asked to select lunch items from a cafeteria menu. Each subject was randomly assigned to a control group or one of the two treatments: (1) 20% inclusive tax on unhealthy foods and beverages and (2) 20% exclusive tax on unhealthy foods and beverages. We examine taxes that are levied on unhealthy foods. A difference-in-difference regression model is used to determine the efficacy of the various policy treatments on the intake of calories, fat, sugar, cholesterol, and sodium. The results confirm our hypothesis that while both taxes reduce caloric and other nutrient intake, an inclusive tax has a more significant impact on consumers' eating behavior, calorie consumption, and nutrient intake than an exclusive tax.

The remainder of the paper is organized as follows: the second section summarizes the related literature. This is followed by a discussion of the experimental design of the study. The fourth section presents the empirical model, and discusses the estimation results. The fifth section discusses the implications of the study's findings. The last section summarizes the conclusions of the study.

An overview on the debate over fat taxes

The idea of levying an "overweight fee" dates back to 1940s (Engber, 2009), but was not well known until the 1980s when Dr. Brownell proposed that revenue from junk-food taxes be used to subsidize more healthful foods and fund nutrition campaigns, and only recently has spurred a debate in the literature. Some members of the scientific community, including public health advocates, have emphasized that fat taxes are important too and should be considered in the public policy arena. Brownell (1994) argued that healthy foods cost more than unhealthy foods in a New York Times, Op-Ed piece and proposed the concept of a "fat tax". Since then, the idea of adopting food tax policies to combat obesity has been discussed worldwide, and in some cases has been implemented.

Kim and Kawachi (2006) and Powell and Chaloupka (2009) find that changes in the relative prices of healthy and unhealthy foods impact consumption patterns and have the capacity to lower obesity levels. Brownell and Frieden (2009) argue that taxes on fattening foods have three justifications: (1) the contribution of unhealthful diets to the illnesses cited previously creates an externality to health care costs; (2) food nutritional information is asymmetric between consumers and food firms; and (3) the revenue generated from such taxes can increase societal benefits by promoting healthy diets. They believe that a tax on sweetened beverages would encourage consumers to switch to more healthful beverages and hence reduce caloric intake. Along similar lines, Chaloupka et al. (2011a) argue that a sizeable tax on sugar-sweetened beverages would not only lead to a significant reduction in calorie intake, but would also generate significant new revenues that can be used to support obesity prevention efforts. Chaloupka et al. (2011b) furthermore argue that the revenue generated by such a tax would further enhance the effectiveness of a large tax on sweetened beverages. Fletcher et al. (2011a) argue that policymakers can improve health outcomes further by expanding the scope of the tax to include all calorie-dense foods (beyond sugar-sweetened beverages).

However, these results are not universally accepted in the literature, and there is growing evidence from economists showing that fat taxes have limited effectiveness in the marketplace, and have highlighted that there may be unintended consequences from using such instruments. Cash and Lacanilao (2007) suggest that the economic evidence on food price interventions to improve healthy diets is far from complete, and that the full impact of such policies is unclear. Chouinard et al. (2007) argue that fat taxes are extremely regressive, and would cause greater welfare losses on the elderly and poor. Similarly, Engber (2009) contends that a fat tax would fall disproportionately on poorer people who tend to consume more fattening food and who are more sensitive to price. Gandel (2014) casts doubt on the efficacy of taxing unhealthy food, suggesting that taxes have little impact on altering consumer behavior.

Among the supporters of fat tax policies, the question of which stage, production or sale, should the tax be levied at has attracted much attention. Engelhard et al. (2009) argue that although an "upstream" tax can avoid administrative complications for stores, a sales (exclusive) tax has countervailing advantages, including generating revenue that rises with inflation, and allowing for a short-term tax exemption. Brownell and Frieden (2009), however, point out that by levying tax as a percentage of the retail price, sales tax policies would actually encourage the purchase of larger containers at a lower unit price; while an excise tax structured as a fixed cost per ounce would be more effective in reducing consumption. The authors also indicate that as manufacturers pass the excise tax along to customers, the amount of the tax would be included in the price consumers see when making selection, and therefore cause a greater drop in consumption than a sales tax.

In order to examine how an exclusive tax such as a sales tax would lead to sub-optimizing shopping behavior, Chetty et al. (2009) conduct an experiment and an observational study, according to which they conclude that salience is an important determinant of the effect of a tax. To explain their empirical findings, they introduce small cognitive costs into a neoclassical model of consumer choice and show that such costs can significantly affect the welfare consequences of tax policies. Likewise, Feldman and Ruffle (2015) show based on data generated from a lab experiment that people buy more under a tax-exclusive regime than under an

[1] The focus of this analysis is on exclusive versus inclusive taxes. While some have used the term "sales tax" synonymously with "exclusive tax," some countries/regions such as the European Union, New Zealand, and Australia include "sales taxes" in their posted prices on the shelf. To avoid confusion over our terminology, throughout the rest of the article, we use the terms "exclusive" and "inclusive" taxes rather than "sales" and "excise" taxes.