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Taxing Sugary Drinks

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Taxing Sugary Drinks

Roy Bahl and Richard Bird

June 2020

Abstract

Countries everywhere are considering the increasing evidence on the possible health benefits from reducing the consumption of sugary drinks – often called sugar-sweetened beverages (SSB). This paper examines the rationale for taxing sugary drinks as a way to reduce sugar consumption and considers the experience to date. That excess consumption of sugar has serious adverse health consequences and that taxing sugar-sweetened beverages (SSB) may reduce the consumption of sugar are both largely supported by the evidence. What is less clear is whether SSB taxes can adequately address the problems arising from the excess consumption of sugar. If so, the question becomes how taxes might best be structured to do the job.

The principal argument for a tax on SSB is to counter the harm that consumers may do to themselves by consuming too many sugary drinks. External costs are a much smaller part of the story. In any case, one may accept the basic public health case for discouraging the excess consumption of sugar without concluding that SSB taxes are the most effective and equitable way to achieve that objective. An excise tax on sugar-sweetened beverages is attractive because of its simplicity and its relatively low compliance and administrative costs. However, it covers less than half the consumption of added sugar, designing an appropriate tax is not an easy task, especially in the context of most developing countries, and the tax rate required to have a major impact on obesity may well higher than most countries are likely to accept. A better way to combat obesity might be a tax on sugar itself combined with such policies as more transparent labelling and measures that will encourage healthier lifestyles and diets

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Executive Summary

Over the last few years, the world of soft drink taxation has turned upside down. Countries everywhere are considering the increasing evidence on the possible health benefits from reducing the consumption of sugary drinks – often called sugar-sweetened beverages (SSB). Most countries are always interested in new revenue sources, but this new interest in taxing sugar consumption is also heavily influenced by an increased awareness of the incidence of obesity and its associated social costs and by the apparently increased public acceptance of such taxes. This paper examines the rationale for taxing sugary drinks as a way to reduce sugar consumption and considers the experience to date.

That excess consumption of sugar has serious adverse health consequences and that taxing sugarsweetened beverages (SSB) may reduce the consumption of sugar are both largely supported by the evidence. What is less clear is whether SSB taxes can adequately address the problems arising from the excess consumption of sugar. If so, a central question becomes how taxes might best be structured to do the job.

Many believe that taxing sugar will follow a similar path to taxing tobacco and alcohol. That seems unlikely. The case for taxing sugar differs from that for taxing tobacco and alcohol in at least three key respects: the importance of externalities, the revenue implications, and the politics. First, unlike the case of drinking and smoking, the principal argument for a tax on SSB is to counter what is commonly referred to as an ‘internality’ – the harm that consumers may do to themselves by consuming too many sugary drinks. External costs are a much smaller part of the story. Second, the tax base is usually considerably smaller than in the case of the (often much higher valued) traditional ‘sin’ products, so there is little to be gained in terms of revenue. Third, the politics are fierce, the opposition to soft drink taxes is influential and well-funded, and many people see no harm and some pleasure in the occasional soft drink and no reason why they – the moderate consumers – should pay more. The fact that most of the world as yet has not imposed special SSB taxes suggests that not everyone is convinced of the strength of the public health case for reducing sugary drink consumption through taxation.

In any case, designing a good sugar tax is not easy. The success of such a tax depends in large part on its effect on prices, which in turn depends on the own-price elasticity, the tax base, the share of household expenditure affected, and the pass-through rate. An excise tax on sugar-sweetened beverages is attractive because of its simplicity and its relatively low compliance and administrative costs. But it covers less than half the consumption of added sugar, and the tax rate required for a major impact on obesity is almost certainly higher than most countries are likely to accept. A better way to combat obesity might be a tax on sugar itself combined with such policies as more transparent labelling and measures that will encourage healthier lifestyles and diets.

Contents

1. Introduction 4

2. The Public Health Case for Taxing Sugar-Sweetened Beverages 4

Too Much Sugar is Bad for You 5

Sugary Drinks are a Substantial Contributor to the Problem 5

Taxing Sugary Drinks Reduces the Amount Consumed 5

Reducing SSB Consumption Improves Health Outcomes 9

3. The Economics of Taxing Sugary Drinks 11

Externalities 11

Internalities 13

Revenue 16

4. The Politics of Taxing Sugary Drinks 17

5. Designing a Good Sugar Tax	19
The Costs of Taxation	20
The Distributional Impact	22
The Supply Side	23
Taxing Sugar Directly	24
Earmarking the Revenue	27
6. Conclusion	28
Appendix	29
Endnotes	34
References	39

1. Introduction¹

There is nothing new about levying special taxes on soft drinks. A number of European countries – Austria, Belgium, Denmark, Finland, France, and Norway, for example – long levied such taxes and some still do.

Many developing countries have followed their lead. For example, Cnossen (2019) reports that 28 of the 45 countries in Africa with VATs (and four of the nine countries without VATs) impose special taxes on soft drinks.² In most cases, the tax base is simply ‘soft drinks’, but some countries define the tax base more broadly as including a variety of non-alcoholic beverages (carbonated water, mineral water, fruit juice), one (Niger) singles out cola (and fruit juice) for taxation and the Central African Republic and (to some extent) Cameroon specifically tax imported beverages. In a few countries, the tax is imposed at a specific rate per litre but in most it is levied at ad valorem rates ranging from 2 percent (Gambia) to 40 percent (Ethiopia). All the taxes mentioned, past and present, have two things in common: they were levied essentially to raise revenue, but they do not yield much revenue. Given this record, it is not surprising that the conventional fiscal wisdom with respect to such ‘nuisance excises’ as those on soft drinks is that, especially in the case of developing countries, imposing special taxes on “trifling sources of revenue [is] a luxury that a tax system not based on voluntary compliance cannot really afford (Cnossen, 2006, p. 190).”

Over the last few years, however, the world of soft drink taxation has turned upside down. As shown in the Appendix to this paper, in the last few years about 40 countries, both rich and poor – as well as several cities in the United States – have implemented special taxes on soft drinks (or ‘sugary drinks’, or ‘sugar-sweetened beverages – SSB) often citing the public health rationale as one reason for doing so.³ Other countries are considering the increasing evidence on the prevalence of obesity and its associated social costs and the extent to which such taxes may alleviate this problem.⁴ One estimate is that perhaps half the world population will be obese or at least overweight by 2030, and that the associated economic cost may amount to as much as 2-3 percent of global GDP.⁵ Obesity continues to be among the top preventable causes of non-communicable diseases in all countries in the world (Shekar and Popkin, 2020).

As the public in different countries has become more aware of the seriousness of the obesity problem, calls for government policies to slow this trend have gained traction. Taxing sugar seems to many to be an obviously correct response to this problem, and there is some evidence that taxes on sugary drinks are working in the right direction.⁶ It is too early to know if this issue will again rise to the top of the policy agenda once the world recovers from the Covid-19 pandemic, but since many such taxes have been under discussion in recent years an examination of the rationale for taxing sugary drinks and how best to do so may be useful.

Section 2 of this paper reviews the public health rationale for taxing sugar-sweetened beverages and the evidence on the extent to which SSB taxes have reduced sugar consumption and obesity and improved health outcomes. This body of work has been produced by contributors from the health and medical fields, social scientists, international agencies, governments and industry experts. Each group has largely stuck to its own competences and interests. Medical and health professionals have focused mainly on the relationship between healthier diets and the incidence of non-communicable diseases. Social scientists have concentrated more on the economic impacts of policies and, to a limited extent, on the political and social aspects of policy. Industry representatives have unsurprisingly focused more on the problems with taxes and on possibly better non-tax solutions. Governments and politicians have been concerned largely with the practical issues of getting policies accepted and making them work properly as well as the possibility of additional revenue. Given the breadth of the problems, all have made useful contributions to the discussion.

We are not experts in many of the subjects covered in this discussion, since our own experience is primarily with designing and implementing tax policy. This paper thus does not pretend to be a full-blown evaluation of taxes on sugar-sweetened beverages, nor does it present any new empirical work. Its aim is modest: after the initial summary of the public health case for such taxes in Section 2, in Sections 3 and 4 we single out a few issues that appear to deserve careful consideration when designing taxes to reduce sugar consumption and obesity. Finally, in Section 5 we discuss how such taxes might best be designed and implemented and suggest a possible alternative approach to taxing sugar that might be simpler and more effective than imposing special excise taxes on sugary drinks. Section 6 concludes.

2. The Public Health Case for Taxing Sugar-Sweetened Beverages

The excess consumption of sugar adversely affects health. If sugar is bad for people, taxing it seems to many an obviously good idea. As we discuss later, however, this may not always be true, in part because one person's 'bad' may be another's 'good', but mainly because, even if there is broad agreement that some particular activity is undesirable and should be discouraged, it does not follow that taxing it is the only or best way to do so. The World Health Organization's well-known recommendation that every country should impose at least a 20 percent tax on sugary drinks may provide a simple and attractive policy target (WHO, 2015). But this simple target seems unlikely to provide the best answer for all countries at all times, and perhaps not even for any country at any time. In addition, as many have argued, no single intervention is likely the best way to address the obesity problem. A well-considered portfolio of policy instruments extending well beyond taxes is likely needed to do the job (McKinsey Global Institute, 2014).

Still, the basic public health argument for taxing soft drinks seems simple and convincing. Sugar consumption is linked to obesity. Obesity is linked to poor health (e.g., Type 2 diabetes and cardiovascular disease) and imposes substantial social costs. Sugary drinks provide a substantial fraction of the sugar consumed. People tend to reduce consumption of products when their prices increase. Taxes tend to increase prices, thus reducing sugar consumption, obesity, and undesirable health consequences. Therefore, taxing soft drinks should make people healthier. End of story.

Each link of this argument has been investigated with numerous modelling exercises as well as by observational studies in a number of different jurisdictions, as conveniently summarized in a number of meta-analyses, some of which are referenced here.⁷ First, excess sugar consumption clearly contributes to obesity, and obesity is strongly associated with serious illness. Secondly, sugary drinks have been shown to constitute a significant part of sugar consumption for many people. Thirdly, taxing such drinks will tend to raise their prices and hence should reduce the amount people consume. Finally, since reducing the consumption of soft drinks likely reduces the total amount of sugar consumed, it will reduce the incidence of obesity and related illnesses. Unfortunately, as many have noted (e.g., Nakimovsky et al., 2016), this last point is the weakest link in the chain. It is the reason why, for example, an earlier careful review of the evidence concluded that “the evidence that sugar taxes improve health is weak.”⁸ A closer look at each of these points seems worthwhile.

Too Much Sugar is Bad for You

To begin with, it is certainly true that too much sugar is bad for you. The public health literature demonstrates without any doubt that excess sugar consumption is associated with obesity and that obesity is associated with harmful and even fatal health problems such as Type 2 diabetes.⁹ Many people, it seems, do not always make the best possible choices with respect to their health when they choose what to eat and drink.

Sugary Drinks are a Substantial Contributor to the Problem

The evidence also suggests that the consumption of sugary drinks is a significant factor associated with obesity, especially in younger people, in part because ingesting sugar in liquid form leads to its being absorbed more quickly owing to the lack of nutrient density, and in part because the added sugar in such drinks is relatively inexpensive in terms of price per serving. By one estimate, SSB consumption accounted for over 46 percent of added sugar in the US (Drewnowski and Rehn, 2014); a similar study in the UK found SSB accounted for a third of the sugar intake of British youth (Science Advisory Committee on Nutrition, 2015).¹⁰ A meta-analysis of 30 studies in a wide variety of countries concluded that “...SSB consumption is positively associated with or has an effect on obesity indices in children and adults (Luger et al., 2017, pp. 674-675).” Data reported in Euromonitor (2020) indicate that in the U.S. the sugar from soft drink consumption alone exceeds WHO’s recommended daily limit of sugar intake (50 grams, or 10 percent of energy intake). Mexico runs a close second in this respect and in a number of other countries soft drinks account for over 25 grams of sugar a day, that is, over 50 percent of the recommended total intake. Again, the evidence seems solid: too much sugar is bad for you, and people around the world get a lot of their sugar from soft drinks.¹¹

Taxing Sugary Drinks Reduces the Amount Consumed

So far, then, the story seems sound: in excess, sugar, like tobacco or alcohol, is ‘bad’ in the sense that its real cost in social terms is greater than the private costs that largely govern individual decision-making when it comes to buying a chocolate bar or a refreshing cool beverage on a warm day. Sugar is obviously an attractive consumption item to many. But, as with tobacco and alcohol, too much is consumed from the perspective of society as a whole. One way to make people take such hidden costs – costs that are real to society in terms of losses in terms of welfare but not immediately real to people when they make consumption choices – into account is to ensure that the price they pay incorporates a tax element sufficient to capture the hidden social cost of their decision. Economists call such taxes ‘corrective’ taxes or, after the first author to identify them clearly (Pigou, 1960), ‘Pigovian’ taxes. Not only is taxing such ‘bads’ a good idea in itself to the extent it reduces the consumption of such goods, it also seems to be a better way to raise revenue than taxes like the income tax that may discourage work effort and saving and hence reduce the size of the economic pie for society as a whole.

But do taxes like the SSB taxes described in Table 1 actually reduce sugar consumption? Some studies have concluded that significant changes in sugar consumption have resulted from taxing soft drinks. For example, a substantial increase in the sales of bottled water as well as some movement toward cheaper SSBs was also observed in Barbados when a 10 percent ad valorem tax was applied to SSB (Alvarado et al., 2019). An especially frequently referenced case is that of Mexico, where there was a 6 percent decline in soft drink purchases in the first year after the tax was introduced and an additional 4 percent decline in the second year, with the greatest impact being on lower income groups (17 percent decline in two years) –and especially on the largest consumers – and very little impact on higher-income groups. In contrast, bottled water purchases increased by about 4 percent (Shekar and Popkin, 2020, Box 5.1; Colchero et al., 2016, 2017). Another case often mentioned is the introduction of a soft drink tax in Berkeley, California, in 2015. The effect of this tax was evaluated using a combination of methods, including scanner data and a telephone survey of consumers. In the first year, about two-thirds of the tax was estimated to have been passed through in the form of higher taxes, with an associated decline of about 9.6 percent in SSB consumption (compared to a 3.6 percent increase in non-taxed goods) compared to what a ‘no tax’ counterfactual would have predicted (Popkin et al., 2016).¹² A subsequent meta-analysis of 17 studies of the impact of SSB taxes in six jurisdictions found that on average a 10 percent SSB tax resulted in an average decline in beverage purchases and consumption of 10 percent and a small (non-significant) increase in untaxed (e.g. water) beverage consumption (Teng et al., 2019).¹³

Table 1. Taxing Sugary Drinks: Some Examples

Country	Year	Type of Tax	Rates	Base
Norway	1981	Flat rate	\$0.24/L	Volume
France	2012	Sliding scale	\$0.12-\$0.22/L varying with sugar content	Volume and sugar content
Mexico	2014	Flat rate	\$0.05/L	Volume
Chile	2014	Ad valorem	10-18% varying with sugar content	Value and sugar content
Berkeley, CA	2015	Flat rate	\$0.34/L	Volume
Belgium	2016	Flat rate	\$0.45/L	Volume
India	2017	GST	28% additional rate	Value
Philadelphia, PA	2017	Flat rate	\$0.51/L	Volume
Boulder, CO	2017	Flat rate	\$0.68/L	Volume

Thailand	2017	Combined specific and ad valorem	14% + small specific tax varying with sugar content up to \$0.03/100mL (rates scheduled to increase every two years)	Volume and value and sugar content
Saudi Arabia	2017	Ad valorem	50%	Value
United Kingdom	2018	Tiered flat rate	\$0.23/L >5g sugar/100mL \$0.31/L >8g sugar/mL	Volume and sugar content
South Africa	2018	Flat rate	\$0.0014 g sugar	Sugar content
Peru	2018	Ad valorem	12-25% varying with sugar content	Value and sugar content
Malaysia	2019	Flat rate	\$0.096/L	Volume
<i>Source: see Appendix</i>				

An observational study of over 450,000 people in 10 European countries over the 1992-2000 period highlights an additional aspect of taxing soft drinks (Mullee et al., 2019). This study found that, while higher soft drink consumption – 2 or more glasses a day compared to 1 or less a month) – was associated with higher mortality, those who consumed diet drinks -artificially-sweetened beverages (ASB) - had more deaths from circulatory diseases, while those who consumed SSB had more deaths from digestive diseases.¹⁴ As usual, questions may be raised about these results. One comment, for example, suggested that perhaps those who drank more ASB were already less healthy and that, as always, many other factors may have affected the results (NHS, 2019). There is no consensus on the long-term health effects of sugar substitutes. Drinking water – assuming it is safe – is always a better substitute for SSBs from a health perspective, but if one effect of taxing SSB is to increase consumption of ASB,¹⁵ it is not clear that there is a net health gain. A few countries, like France, include ASB under the same tax regime as SSB, but many, like the UK and Mexico, do not. Since it seems unlikely that ASB can be considered part of a healthy diet, recommending that any taxes applied to SSB should also be applied to ASB seems sensible (Borges et al., 2019). It is not clear if those governments that taxed ASB did so for health reasons or to get more revenue.

A recent study of the expected impact of soft drink taxes in New Zealand - which as yet has no such taxes - also deserves mention (Waterlander et al., 2019). This study utilized an unusually large and carefully structured randomized study of the effects of various pricing options on consumption. It concluded, like some of the works cited earlier, that the introduction of SSB taxes (ranging from \$0.40/100g to \$0.80/100g of sugar) did indeed reduce the consumption of taxed drinks by (on average) about 2 percent. However, the study also found that there was no significant increase either in the volume or share of 'healthy' foods purchased. In contrast, a tax on sugar (ranging from \$0.20/100g to \$0.40/100g), which would affect a much broader range of products, did have a significant effect, increasing the 'healthy' share of food purchases by 1.1 percent.¹⁶ This study, with its randomized methodology and careful examination of the troublesome substitution issue, is another useful step down the long path to understanding fully the interaction between targeted tax policies and health outcomes.¹⁷ But it is only a step, and there is much more work to be done on this subject.

A recent study in France, which like Mexico, has a relatively low tax, illustrates this point. This study (Allais et al., 2020) appears to be the first empirical work to incorporate adjustments on both the demand and supply sides of the market. It is not specifically on soft drinks but covers a wide variety of sugary desserts in the French market. Consumers may, as discussed earlier, adjust consumption patterns in response to taxes on particular food items. Similarly, producers may also adjust, especially when the structure of the tax creates a financial incentive for them to modify the characteristics of the product. In addition to reformulating products, firms may also change their pricing and marketing (e.g. package sizes) in order to maintain their competitive position given the structure of the market. Modelling the effects of France's latest version of its 'soda tax' and taking adjustments on both sides of the market into account showed that both product reformulation and the strategic price reactions of firms had an impact on sugar consumption.¹⁸ Product reformulation resulted in a 7 percent decrease in caloric sweeteners, and the combined effect of reformulation and pricing adjustments by firms was to decrease sugar consumption by 23 percent compared to the 16 percent reduction estimated without taking firm reactions into account. Although this study is, like many in the literature, a modelling exercise that can and should be extended and improved, it provides a useful reminder that markets have two sides – demanders (consumers) and suppliers (firms) -- and that the reactions of both must be taken into account in analyzing and understanding the impact of taxes on SSB.

Given the differences between countries and tax designs and the considerable difficulties facing modellers and analysts, it is not surprising that not all the literature goes the same way. On the whole, however, it seems fair to conclude that there is perhaps enough evidence to support the argument that taxing SSB reduces the consumption of sugar, although the issue of substitutability needs to be more carefully explored.

The traditional excise tax – such as those on alcohol and tobacco – is levied on goods with a broad enough base to generate significant revenue for which demand is price inelastic. The consumption responses to such a tax are fairly predictable. However, if consumption is elastic in response to a tax-induced increase in prices, a complicated array of changes is set in motion that may lead to unintended consequences.¹⁹ Harding and Lovenheim (2014), for example, estimate a structural demand model over product-nutrient groups for the US and use the resulting own and cross price and expenditure elasticities to simulate the effect of a tax on SSB. One such effect is that an increase in the price of SSB could cause households to substitute towards other goods with more or less sugar in them as well as some substitution towards other unhealthy nutrients, such as fat. This result underlines the importance of fully understanding the price elasticities of demand not only for the taxed good but for all likely substitute (or complementary) goods. As Harding and Lovenheim (2014) note, justifying an excise tax on a specific product when price (and income) elasticities are large is not an easy task. One reason the impact on health of a tax on SSB is not yet fully known is because the tax may lead to changes in consumption patterns which themselves may have largely unknown effects on health.

Box 1. Is Sugar Addictive?

A careful recent review of the case for taxing SSB concluded that there is little or no evidence that sugar has any addictive properties (Lloyd and MacLaren, 2018). However, this conclusion may not do full justice to a question that has been discussed for some years in the literature. As an earlier study noted, for instance, there is some evidence suggesting that sugar and 'sweetness' "...can induce reward and craving that are comparable in magnitude to those induced by addictive drugs (Ahmed, Guillem and Vandaele, 2013). Although there is no evidence that there is any metabolic need or physiological requirement for any sugar, people have, always and everywhere, or so it seems, liked and sought out sources of sweetness, and they seem likely to continue to do so, although of course to very different degrees (Dinicolantonio, O'Keefe and Wilson, 2017). Instead of having to look for fruit in season or find a beehive, refined sugar is now available readily and cheaply to almost everyone everywhere, not least in the form of sugary drinks, so the question is worth more careful consideration.

Although it is not simple to define precisely what constitutes addiction, there are some established diagnostic criteria for substance dependence with respect to 'food addiction' (Gearhardt, Corbin and Brownell, 2009). These criteria are now

essentially incorporated in the standard psychiatric diagnostic manual of mental disorders (DSM-5).²⁰ In a detailed recent literature review, Wiss, Avena and Rada (2018) found that sugar met at least five out of eleven of the diagnostic criteria commonly used for addiction or substance abuse such as craving and withdrawal. Since only two criteria need to be satisfied for a diagnosis, they concluded that sugar could indeed be appropriately labelled as addictive in at least some cases. There has long been laboratory evidence from animal studies that consumption of sugar (among other foods) may lead to addictive consumption and hence be a factor leading to obesity and its attendant ills. However, there is no solid empirical evidence of sugar addiction in humans. Only very recently have attempts been made to assess the nature and extent of 'sugar addiction' in humans.

A study utilizing university students - the favorite guinea pigs of the academic researcher - found a weak statistical correlation between the diagnostic scale used to measure addiction and body mass indexes (BMI). However, it concluded that the principal explanation appeared to be the consumption of high-fat (and savoury or sweet) foods, with sugar as such contributing relatively little to either 'food dependence' or obesity and having little more effect on weight gain than any other energy source (Markus et al., 2017). To the extent some people could be said to be 'food addictive' this study attributed the addiction not to sugar but to their life experiences with food and eating. What we eat and drink is the outcome of a complex interaction between biological and social factors, and there is much we do not yet fully understand about the social (income, education, access, culture) factors that affect food consumption patterns as much or more than prices. Similarly, although the review by Wiss, Avena and Rada (2018) found that human studies using criteria consistent with DSM-5 report 'food addiction' in some form in about 20 percent of the groups that have been studied – a level similar to that found for tobacco and alcohol addiction -- only 20 percent of those addicted were considered to be obese. With respect to sugar addiction, the main conclusion that seems to emerge most clearly is that, as usual, much more research is needed on both the neurological/psychological and social/culture factors involved before any causal inference can be sustainably maintained.

Even though 'sugar addiction' has not been clearly demonstrated, may not be all that widespread, and is in any case probably more psychological than physical in nature, it may nonetheless exist, and it may be harmful. The key link in the public health argument is that between sugar (and especially SSB) consumption and obesity, and obesity often results from strong psychological drivers (OECD, 2019). Still, from the health perspective taken by most proponents of much higher SSB taxes, it is presumably good that orange soda is less addictive than beer or tobacco because it means that taxes increasing the price of sugary drinks will result in a greater reduction in consumption than if the market were dominated by the demand of addicts.²¹ To the extent demand simply shifts to other sugary (or somehow 'bad') products, the health effects may be muted.

Reducing SSB Consumption Improves Health Outcomes

It is thus unsurprising that there is not as yet solid evidence of the long-term effect of SSB taxes on health outcomes, especially since most such taxes have only recently been introduced (New Zealand Institute of Economic Research, 2017; NHS, 2019). There is doubtless much more debate to come about the potential of taxes on sugary drinks to eliminate or even dent excess sugar consumption. Still, the observable effects to date on obesity and hence on health have been characterized by some experts as "frustratingly small" (Jaacks, 2019) even when the tax is just one of a set of health-oriented policies such as better labelling and monitoring.²² One reason for this may be because there are some 'sugar addicts', who, like those addicted to tobacco, alcohol and other drugs, may provide a hard-core consumer base resistant to price-induced reduction of their chosen addiction. However, as Box 1 discusses, this seems unlikely to be a major concern in designing policy in this area.

Two ways to strengthen the health impact of SSB taxes have been suggested. One approach is to couple taxes with stronger regulations and such other non-tax measures as more enlightened food policy, information campaigns, exercise regimens, and healthy diet subsidies with any taxes in order to increase the impact of taxation on sugar consumption. See Box 2 for examples of such measures. The other approach is to redesign the taxes both to target them more effectively and to broaden their base to achieve more meaningful effects. An obvious first step in this direction, which some countries have come much closer to taking than others, would be to include all sugary drinks, even those with no added sugar, such as 100 percent fruit juice. From a health perspective, sugar is sugar whether 'added' or not (Jones, Veerman and Hammond, 2017). The sugar tax discussed in Section 5 below goes even further, bringing 'ultra-processed' foods such as canned goods, breakfast cereals and other products with a high sugar content into the tax base.²³

Despite the lack of definitive evidence of significant real effects on health outcomes as a result of taxing soft drinks, the substantial body of work on the probable damage to health from excessive sugar consumption and the potentially beneficial effects of soft drink taxes in reducing sugar consumption are sufficient to warrant a closer look at how best to design and implement taxes on sugar to achieve this goal. No matter how one weighs the factors mentioned above, deciding on the most efficient, effective and equitable tax (or alternative instruments) to do the job in any particular country (or region or city) is not a simple task. What is right for a (prospective) national tax in the United States is most unlikely to be right for a low-income country in Africa or for an EU country, or for a city tax anywhere. The question is not simply one of tax design and administration. As with all tax policy decisions, there are important equity and political economy considerations that need to be thought through carefully. The balance of this paper takes up some aspects of these issues.²⁴

Box 2. Non-Tax Measures

Most proponents of corrective SSB taxes acknowledge that the best tax from an economic perspective is almost certainly part of a package of ‘nudges’ (such as information provision) and regulatory actions (such as quantitative restrictions). Restrictive policies are most important when the targeted externalities are more heterogeneous than preferences (Farhi and Gabaix, 2020) – for instance, if some people are ‘addicted’ to sugar or particular groups such as children are considered either especially vulnerable or more likely to be ignorant, or both.

Many non-tax policies have been suggested, and sometimes employed, to spread the word that less sugar is better, to raise the price to consumers of sugary products, and to restrict access to SSB (and sometimes other sugary products).²⁵ For example:

- Mandatory labelling on packages and menus: fully disclosing health implications in visible labels comprehensible to consumers; this measure also should encourage producers to reformulate their products
- Mass media and public awareness campaigns
- Mandatory standards, including restrictions on availability in schools and hospitals and perhaps limiting sales to specified (and perhaps licensed) outlets, times, or clients as well as placement in stores
- Regulation of advertising in general and to children in particular
- Encouraging (and perhaps even mandating) product reformulation such as the reduction of sugar
- Incentives to increase availability of healthier foods e.g. school fruit programs, farm markets
- Increasing the availability of clean water
- Promotion of physical activity by doctors, in schools and in general
- Increased access to public transit (and walkable urban areas)
- Provision of nutrition advice in health care settings in particular and education about nutrition in general
- Earmarking revenues (to health care, to improving information, to promoting healthy activities).

Programs in these and other areas may not only be useful complements to a tax approach but may also in some instances be perhaps more effective in achieving health-related objectives. In Latin America, for example, Bergallo et al. (2018) report that a number of countries have in varying degrees regulated (and reduced) the availability of SSBs in schools, although there is as yet little evidence that such restrictions have had much effect on obesity in children. Only South Korea seems to have extended restrictions against the sale of such beverages (and ‘junk food’ in general) to the area near schools (“the Green Food Zone” within 200 meters). Some countries have also imposed restrictions on advertising SSBs, especially to children, although there is little evidence that this is monitored very strictly or that any significant penalties have been applied for noncompliance. Many have also imposed labelling requirements to some extent, but again there seems to be little information on how much, if any, impact such regulations have had on health outcomes (Bergallo et al., 2018). The effectiveness of any tax is likely to be affected to some extent by the existence and effectiveness of such related policies, although there seems to be little attention to this issue in the literature.

3. The Economics of Taxing Sugary Drinks

“Many public health advocates explicitly or implicitly take the perspective that the goal of policymakers should be to maximize health or minimize unhealthy behaviors. It’s easy to see why this can’t be the right social objective. The way to maximize health is to ban any sugary or fatty food or drink, including sugary drinks, red meat, and dessert. Such a ban would preclude any enjoyment that people get from eating steak or dessert, and it’s not clear where to draw the line on what foods or drinks to ban” (Alcott, Lockwood and Taubinsky, 2019a, p. 227).

As discussed above, there is considerable merit in the basic public health argument for increasing taxes on sugary drinks: too much consumption of SSB is not good for you, and measures like taxes that reduce SSB consumption may therefore improve health outcomes for the population as a whole. Even if one fully accepts this argument, however, it does not follow that a special tax on SSB is the best way to achieve this goal. Many who have written on this subject seem to think that the case for taxing SSB on health grounds is as strong as the case for the well-established (and often quite heavy) ‘sin’ taxes on tobacco and alcohol already existing in most countries. It is not.²⁶ The case for taxing sugar differs from that for taxing tobacco and alcohol in several key respects: the importance of externalities, the revenue implications, the ease of substitution, and the politics. We discuss the first two of these concerns in this section and the political economy of SSB taxes in Section 4, and we suggest a way to deal with the issue of substitution in Section 5.

Externalities

The health literature assumes that the only relevant policy objective is to maximize positive health outcomes. As the quote at the head of Section 3 suggests, however, this is clearly wrong when viewed from an economic standpoint. It is not only possible but likely that even fully informed people may at times enjoy consuming sugary drinks (or other ‘bad’ food choices such as ultra-processed foods). Designing the economically optimal tax requires taking both health and the pleasure derived from consumption into consideration as well as correcting for the biases inevitable in a heterogeneous population and allowing for any distributional concerns. The externality argument for a corrective tax on sugary drinks is weaker than the case for taxing tobacco products and much weaker than the case for taxing alcoholic beverages (Blecher, 2015). Excessive drinking may harm drinkers directly and often imposes high costs on their families. In addition, however, since people often drive or behave recklessly while inebriated, others may also suffer direct harm as a result of someone else’s drinking. There is also some evidence suggesting that non-smokers, when frequently exposed to tobacco smoke, may suffer physical harm. Smokers, and especially drinkers, may thus directly harm others by their actions. But there is no evidence that anyone sitting next to a table of people drinking sugar-sweetened beverages runs a health risk or that those who have imbibed soft drinks are more likely to harm others than those who drink water.

Sugar consumption, obesity and ill-health may impact on others in many ways of course, as discussed briefly in Box 3. However, there is little direct externality case for taxing SSBs because most of the large costs of obesity mentioned earlier are, as it were, largely ‘paid for’ by those who incur the associated illnesses. In fact, as Alcott, Lockwood and Taubinsky (2019b, p.1565) note, the major relevant externality is a “pecuniary fiscal externality” that arises largely because public health care costs may increase as result of excess sugar consumption.

Box 3. Environmental Impact of Unhealthy Diets

Sugar consumption, obesity, and environmental health and sustainability are strongly linked. Some linkages are direct. For instance, sugar is a water-intensive crop vulnerable to drought, which competes with other uses of water. The stripping of

fields to plant cane reduces the fertility of the soil and the crop, which is vulnerable to pests, requires both pesticides and heavy fertilizer treatment, which may foul the water supply. In addition, sugar mills and processing plants release wastewater, emissions, and solid waste materials that may harm the environment.

Other linkages are more indirect and arise from unhealthy diets. A major reason for the increased prevalence of overweight and obesity is the failure of food systems to deliver healthy diets at affordable prices (Monteiro et al., 2018). The consumption of processed foods high in trans fats, sugar, salt, and chemical additives is growing in most countries and crowding out more healthy diets (Springmann et al., 2018). And both the production of ultra-processed foods and the growing demand for animal-sourced food are linked to increased use of energy, increased carbon emissions, and increased water use (Popkin, Schneider and Shekhar, 2020). Many of these less healthy foods give rise to increased waste and costs owing to the growing use of plastic, metal, and glass containers, with beverages such as sugary drinks being a particularly large contributor in this respect. All this is of course in addition to the detrimental effects on human health emphasized in the literature.

In the U.S. only half of health care expenditures are financed from government revenue (including social insurance contributions). However, much of the remainder (about 40 percent) is financed from private insurance, primarily employer health plans, and it has been estimated that about 90 percent of the medical costs of obesity are borne by third parties (Cawley and Meyerhofer, 2012). Alcott, Lockwood and Taubinsky (2019b) estimate that the average health cost externality arising from this financing structure might be 0.8-0.9 cents per ounce of SSB consumed. As they report in another paper (2019a), a rough estimate from their model is that the 'optimal' SSB tax for the U.S. (given the existing income tax) would be about 1.5 cents per ounce (about 40 percent of the average SSB price). However, since the corrective tax needed to adjust for this social externality is only about 0.8 cents per ounce, the optimal tax, leaving the 'externalities' discussed next out of account, would be only 0.4 cents per ounce or about 11 percent.²⁷

As noted, the only significant externality is that arising from shared financial health-care costs, which is sometimes called the 'moral hazard' of health insurance: see Box 4. Since public health coverage is generally more extensive in other high-income countries (e.g. in northern Europe) than in the US, and is considerably less extensive in most low-income countries, higher externality taxes on SSB may be appropriate in some rich countries with largely publicly funded health care systems. As a glance at the Appendix shows, however, most countries that have imposed SSB taxes are not rich and seldom have extensive public health systems, so clearly much more than simply offsetting externalities is at issue in this discussion. As Alcott, Lockwood and Taubinsky (2019a) mention, the correctness of their externality estimate depends on many factors that may differ from place to place and time to time, such as whether the poor are more price elastic in their demand habits (as some evidence mentioned later indicates), and also on such value judgements as whether the weight attached to the welfare of the poor exceeds the marginal cost of public funds. Even if one thinks that the goal of taxing sugary drinks is simply to counteract negative externalities it is not easy to decide how best to achieve it, but this argument suggests that rich countries with large public health systems should on externality-correcting grounds alone impose higher SSB taxes than countries that are poorer and have less complete public health systems.

Box 4. Moral Hazard

Economists have a habit of labelling things in ways that seldom accord with common understanding. The “moral hazard” of health insurance is an example. Arrow (1963) introduced the term, emphasizing the extent to which insured people tended to use health care services more than uninsured people. As Pauly (1968) observed, however, assuming that insured people deliberately take more risks with their health simply because some of the financial cost of doing so might be covered by insurance is not very plausible. If people with insurance use it, they are simply being rational and ‘buying’ more of something that is cheaper. There is nothing ‘moral’ (or immoral) about doing so. Nonetheless, the term ‘moral hazard’ seems often to be taken as implying some deviation from correct (socially moral) behaviour.

There are actually two separate questions here (Grignon et al., 2018). The first concerns the nature of the demand for health care: is moral hazard immoral? Pauly (1968) says no, but even Pauly accepts that there is a welfare loss for society from health insurance. The second question is then: is a moral hazard really a hazard? Insurance has both income and price effects: if one becomes ill when insured, there is indeed a price effect that makes care cheaper, but there is also an income effect which increases the income of the sick at the expense of the healthy. If one thinks that health insurance is beneficial mainly because it transfers income over time and makes people better off who are ill but cannot afford the care they need because they are ill, it is hard to see it as a hazard at all (Nyman, 2003).

These are deep issues with which policy-oriented economists are seldom comfortable. Policy decisions on health care require us to weigh in some way the costs and benefits involved. To do so inevitably requires a considerable degree of judgement. As is also true with respect the ‘internalities’ discussed in the text, in the end the only solution may sometimes seem to require the essentially arbitrary imposition of values on people who may not accept their validity.

Internalities

Pigovian taxes are not only attractive to correct for externalities but also internalities. However, to the extent that internalities are more prevalent among the poor, these taxes have adverse distributive consequences leading to a trade-off between internality correction and redistribution. Nudges are an attractive intervention to circumvent this trade-off and target internalities while avoiding reverse redistribution (Farhi and Gabaix, 2020, p. 299).

In the most detailed analysis yet of the economics of taxing sugar-sweetened beverages – Alcott, Lockwood and Taubinsky (2019 a,b) – perhaps the single most striking conclusion is that the principal argument for such a tax is not to offset the externality associated with consuming sugary drinks - that is, the effects of a consumption decision on others – but to counter what is commonly referred to as an ‘internality’ – the harm that consumers do to themselves.²⁸ As mentioned above, this analysis concluded that an SSB tax of little more than 10 percent would suffice to correct the externalities although the optimal tax taking into account both internalities and redistributive concerns would be closer to 40 percent. The estimated internality correction is at least twice as large as that needed for externalities alone. While the numerical results of even this unusually complete and thorough analysis are of course only rough, this conclusion is probably correct because the main rationale for taxing sugary drinks is to save people from themselves. In the words of an earlier review (New Zealand Institute of Economic Research, 2017, pp.2-3): “that high sugar consumption causes adverse health effects is not the problem that a sugar tax is trying to address, it is a symptom. The underlying problem is that people do not always make decisions about their behaviour when it comes to health matters that will improve their ability to lead the lives they value.” This seems right, but it does give rise to some important questions.

Internalities are not at all the same as externalities. They are not simply market failures that can easily be remedied by Pigovian taxes (or equivalent regulations). Rather, as Congdon, Kling and Mullanaitan (2011) noted, they are perhaps best thought of as a sort of redistributive policy intended to offset socially suboptimal market outcomes. The biases that lead to such ‘internalities’ may arise from the costs of acquiring and processing information – a problem that may perhaps be remedied in part by information and education – or they may be generated by such psychological issues as high time discounting and lack

of self-control that result in increased susceptibility to immediate (sweet) rewards. Or they may originate from more socially and culturally determined factors such as custom, early childhood feeding habits, and the associated feelings of self-esteem and social acceptance.²⁹

Whatever the nature of ‘internalities’ related to health care, the most important rationale for SSB taxes is to “nudge” people to do what is in their own best interests by altering market prices through taxation – resulting in what some have labelled “benevolent price discrimination” (Gerster and Kramm 2019): see Box 5.

The idea is simple: when market outcomes are sub-optimal governments should intervene to redistribute resources in a more socially beneficial way. One approach is to alter prices through taxes. The argument is plausible: governments arguably exist in part at least to cope with the weaknesses of their citizens, and some nudging may seem necessary if, for example, consumers are uninformed of the real costs, perhaps because they are (rationally or otherwise) ignorant of them, or have been seduced by misleading advertisements, or make decisions without taking into account the potential long-term damages they may be doing to themselves (Thaler and Sunstein, 2009). Younger (and perhaps less educated or lower income) people may be more likely to act in such ways. Those who advocate and design taxes to correct internalities in effect assume that they know what is good for people better than people themselves do and can thus ‘nudge’ them to make more rational decisions in their own interests.

The idea that some people – often those with lower incomes - fail to look after themselves properly owing to insufficient self-control or limited foresight seems one that usually better-off decision makers (who may often attribute their own good fortune solely to their own efforts) find easy to accept. But it seems wrong to lay the blame for bad things happening on those to whom they happen, when they happen most often to people who must daily contemplate the possibility of losing their job, their housing, and perhaps even their children to events largely beyond their control. It is much easier to decide how other people should behave - in their own interests of course (as ‘we’, the decision-makers, see them) - than to begin to tackle the huge task of changing the reality of unequal access to resources to something closer to the ‘just distribution’ (Lindahl, 1958) that should presumably be the starting point for an economically efficient (optimal) tax policy.³⁰ Even the much less difficult but never-ending effort needed for a truly inclusive democratic process (Dhami and Bienhocker, 2019), which would place everyone on a level playing ground (at least initially) and then inform people fully and to allow them to decide for themselves, lies far beyond the horizon in most countries.

Whatever one thinks of this argument, there is obviously a thin line between benevolent ‘nudging’ and paternalistic ‘father knows best’ policies – a line that some think may be crossed when a nudge takes the form of a tax (Tanzi, 2018, p.142).³¹ Altering the market prices facing consumers with respect to certain prices is less paternalistic than banning or restricting access to the products – a treatment usually reserved for the young (e.g. school food policies). But it is more paternalistic than, say, requiring more informative (and understandable) labelling and regulating (and even banning) some types of advertisement. A broad spectrum of policies may be needed to combat obesity as many have argued (McKinsey Global Institute, 2014). But the policies chosen and the emphasis placed on each should be carefully considered, not only in terms of their possible effects on health (and on government and private expenditures on health care) but also their costs (in terms of market distortions as well as direct effects), their effectiveness, and the degree of ‘choice restriction’ that governments should and can impose on people’s consumption choices.

Box 5. Nudging and Taxes

“Nudges” have been much discussed since being introduced by Thaler and Sunstein (2009).³² A basic problem in designing nudge policies is that the extent and nature of consumer ‘irrational’ bias is inherently heterogeneous (Gerster and Kramm, 2019). Because not all consumers are the same, no simple linear one-size-fits-all tax design is optimal, and appropriately

targeted policies are difficult to design. For some (e.g., children) inducements to consume fewer sugary drinks may, on average, be life-lengthening, as the health literature suggests. For others, however, when such inducements take the form of taxes the overall effect may perhaps be less beneficial, when they weigh it against the reduction in their freedom of choice even if they are fully aware of the health consequences. As a recent observational study of Mexico (Alvarez-Sanchez et al., 2018) notes, those most likely to reduce consumption as a result of the SSB tax were, so to speak, those who need it the least because they were more aware and had a higher degree of 'self-efficacy' (self-control).

To be socially optimal, a corrective tax requires some degree of alignment between how consumers perceive things and how those determining policy think consumers would perceive them (if they were as fully informed and mature in their judgements (as they – the 'deciders' – presumably are). To achieve this outcome requires some way of targeting those with the greatest bias. In the case of soft drinks, as with many other life experiences, it is likely the young who have the greatest biases and hence the most to gain, so – if a total ban is not practicable – any tax approach should, to be most effective, perhaps be supplemented with restrictions on the access to the product e.g. in school cafeterias and perhaps even by age restrictions on purchases anywhere.³³

An additional concern is what has sometimes been called the law of unintended consequences defined as "...what happens when a simple system tries to regulate a complex system. The political system is simple, it operates with limited information (rational ignorance), short time horizons, low feedback and poor and misaligned incentives. Society in contrast is a complex, evolving, high-feedback, incentive-driven system" (Tabarrok, 2008).³⁴ Decisions about taxation, like all policy decisions, do not really have what are often called 'side effects'; they only have effects, whether intended

or not (Hirschman, 1967). Given the inevitable ‘unknown unknowns’ of life (Rumsfeld, 2002) and the heterogeneous nature of most societies, decision-makers can never get it right for everyone at any time, let alone in a world that is continually changing.

Policy is a process, not a product. The best way to develop and implement any policy is almost always to move slowly, cautiously, and incrementally, while observing closely and measuring as precisely as possible the effects of any change and adjusting policies as necessary to yield more acceptable results. To do the right thing in a democracy one must follow the right process. Ideally, one needs to be as transparent as possible about exactly what is being done and why it is being done as well as inclusive as possible in discovering, understanding and responding to the views of all those affected, as well as implementing the policy properly and – importantly – regularly and explicitly assessing, analysing and adjusting it as outcomes and changing circumstances require. This is a counsel of perfection. No one – and no policy – is or can be perfect. Policies often fail to achieve their advertised intentions because little attention is paid to all the relevant facts before a decision is made; it is hard to find them, to understand them, and to explain them to legislators with limited time horizons let alone to citizens at large.

Despite the increasing work on behavioral economics and nudging it is as yet unclear how effective many nudging efforts have been. Questions may be raised about the underlying philosophy – often called ‘libertarian (or benevolent) paternalism’). We do not have a good understanding of precisely how preferences are constructed in the first place, let alone or whether and when they can be considered to be well-ordered by others.³⁵ How can anyone possibly know whether any nudge will make people better off as judged by themselves rather than by whatever ‘choice architect’ devised the nudge or by the officials or politicians who approved it? Even if it succeeds in inducing people to be more rational (by someone’s standards), it may make them even less likely to act rationally on their own?

Altering people’s choices raises deep questions. Any parent must of course make such decisions about their children. But anyone who has been through the experience of parenthood is likely to agree that such decisions tend to be based much more on learned experience and guesswork than on any deep rational framework. Governments are unlikely to do even as well as the average parent, who is usually better acquainted with those concerned and more attuned to feedback, but they should do better than they often do. More attention needs to be paid to the likely lack of congruence between the preferences, interests, and world views, of those proposing policy changes and those who will actually feel the consequences of the changes in question.³⁶ Decision-makers are people, and people almost invariably assess and appraise other people’s decisions from their own (usually unexamined and seldom well understood) perspective. We are seldom able to see clearly that our own decisions are necessarily context, frame and state dependent (Dhami and al-Nowaihi, 2007). Others, facing other contexts, and working, often unknowingly, within different frames and states may make decisions that seem sensible to them but may seem irrational or self-harming from the perspective of others. Preferences are not fixed: they are malleable, subject to change through experience (usually through simple adaptive learning and rules of thumb), and affected by the specific context as well as by institutions, social norms, public information campaigns and private advertising. Nudging through taxation is thus inevitably a largely context-dependent and tentative exercise. It may sometimes be advisable and even necessary, but it should never be engaged in lightly.

Revenue

As the preceding discussion indicates, although some concrete numbers are emerging from such well-done theoretical and empirical economic studies as Alcott, Lockwood and Taubinsky (2019a, b), there remain many deep issues that need to be thought through before coming to a clear decision on imposing a tax designed primarily to correct externalities in any country.³⁷ Few non-experts have devoted much time to discussing such deep issues or for that matter to reading the extensive public health literature arguing that SSB taxes are good for health. Politicians and government officials likely spend more time thinking about the revenue aspects and political prospects of particular tax proposals than about their potentially beneficial effects on health. From a revenue perspective, the case for taxing sugary drinks is weaker than for taxes on alcohol and tobacco for several reasons, which may be why most countries have not (yet) moved to impose such taxes

First, the tax base is usually considerably smaller than in the case of the (often much higher valued) traditional ‘sin’ products, so there is little to be gained in terms of revenue. Secondly, because the consumption of soft drinks is more sensitive (elastic) to price changes than the consumption of tobacco and alcohol, increased taxes will lead to a greater fall in consumption than would a similar increase on tobacco and alcohol. This result may be good from a health perspective because it means a larger ‘bang’

in the form of potential health benefits may be obtained for a given tax rate. But it also means that the treasury will receive fewer ‘bucks’ in the form of revenue.³⁸ Finally, in many countries people have come to accept that both smoking and drinking are, if not ‘sins’, at least ‘guilty pleasures’ for which they may rightly be asked to pay. As Frey (2005) notes, if people accept that something is ‘bad’ it is easier to tax. One reason the traditional sin taxes are found everywhere is simply because governments can collect substantial taxes in a politically acceptable way. As a seminal study of alcohol control in the US noted, it is politically much simpler to tax tobacco than alcohol because twice as many Americans drink as smoke, because drinkers as a group are better educated, richer, and more influential politically and, above all perhaps, because while “most smokers say that they want to quit. Most drinkers express no such aspiration” (Cook, 2007, p. 5).

Even if one fully accepts the public health argument, the case for imposing special taxes on sugary drinks essentially rests on two pillars: (1) the ‘fiscal externality’ discussed above, the size and nature of which is largely institutionally determined (and difficult to measure) and (2) the inherently controversial internality argument – that is, the aim of offsetting the ignorance, lack of self-control, or (presumably) irrational preference for risk-taking that may lead consumers to make ‘bad’ choices. Increasing market prices sufficiently to discourage consumption through taxes is not necessarily the best or most powerful tool to achieve these objectives and to be really effective should in any case usually be accompanied by a suite of regulatory and other policies (see Box 2).

Summing up, governments everywhere impose heavy taxes on alcohol and tobacco because (a) they get a lot of revenue; (b) people generally accept such taxes; and (c) they have a ‘health rationale’ for doing so. Only the last of these reasons applies in the case of SSB taxes. One outcome of the recent discussions of this issue in some countries may be to convince more people of the ‘rightness’ of such taxes, as happened with respect to tobacco before much of the increase of tobacco taxes in recent years. As some have noted, however, in most countries that increased tobacco taxes substantially for health reasons tobacco consumption had been declining in any case (Blecher, 2015). Since it appears that the consumption of soft drinks has also been declining in at least some countries even before SSB taxes were introduced (Euromonitor, 2020), one may speculate that this, although not good from a revenue perspective, may over time increase the acceptability of such taxes in political terms. An important outcome of the extensive recent discussion of soft drink taxes may be to make more people aware of the potential dangers of consuming excessive amounts of sugar in this (or any) form and hence more supportive of attempts to reduce such consumption. Once the premise is accepted, few are likely to object to increasing information (e.g. on the evils of too much sugar) or even to regulatory measures such as limiting the amount of sugar per ounce of SSB, eliminating SSB from schools, and the like. However, forcing people to pay higher prices for something they are accustomed to consuming and are unpersuaded is dangerous may prove a step too far in the paternalistic direction for some to accept.

4. The Politics of Taxing Sugary Drinks

A widely discussed example of introducing a special tax on sugar-sweetened beverages is that in Mexico. The adoption of the SSB tax in Mexico can best be understood as the outcome of three factors: (1) a significant change of government, (2) the build-up over time of evidence and public concern – partly facilitated by funding from a foreign NGO – that led some politicians to see obesity as a problem and the tax as a partial solution, and, most directly and importantly, (3) a window of opportunity that arose when the finance ministry, faced with a major budget problem and the need to increase revenue, decided to include the SSB tax in its budget partly because the evidence suggested that this tax would both yield revenues and discourage obesity. The potential opposition – mainly the beverage industry, but also many small traders – was taken by surprise and was unable to muster sufficient support in the new Congress to defeat the bill (James, Lajous and Reich, 2020).³⁹

When an industry is singled out for attack – or a tax – its reactions are likely to follow the usual pattern of denial, counterattack, blame-shifting and, usually after some lag, some transformation in how it produces and markets its products. The soft drinks industry's reaction to the worldwide push from health advocates to increase SSB taxes on the whole has followed this pattern. A common first response to the growing literature documenting the connection between SSB consumption and adverse health outcomes was to deny that SSBs were major contributors to obesity, often shifting the blame to e.g. fatty foods, while emphasizing the adverse effects of an SSB tax on employment and lower income families (e.g. Beverage Association of South Africa 2016). More sophisticated responses, as critiqued in several subsequent reviews in the public health literature (Du et al., 2018; Fooks et al., 2019; George, 2019) included extensive and sometimes expensive lobbying activities, shifting the blame for obesity to physical inactivity, and casting doubt on – and, in some instances, reportedly distorting -- the evidence.⁴⁰ In some cases, public health advocates in some countries were reported to have even been subjected to direct threats (Du et al., 2018). Whatever the tactics used, industry efforts were successful in some instances, for example, in blocking the proposed SSB tax in Colombia.

One of the few industry arguments that even pro-tax advocates seem to think has merit is that the incidence of an SSB tax is likely to be regressive. Although, as discussed below, this is not necessarily true, especially in lower-income countries, tax proponents usually accept it as correct. They often counter by noting that any such extra tax burden is unlikely to be important because any regressivity on the tax side will be more than offset by the long-term beneficial effects on the health of low-income groups, an argument that rests more on assertion than it does on evidence. Moreover, a surprising number of studies go on to assert that some or all of the revenue can and should (through earmarking) be spent in ways that will presumably benefit such groups. Earmarking and the distributive effects of SSB taxes are discussed further in Section 5 below.

Governments are of course critical players in the tax game, both in passing tax laws and in administering them. In most developing countries, which generally have more than enough to do trying to administer major taxes like the income tax and VAT, asking the tax administration to stop people from harming themselves through poor consumption decisions seems an unpromising approach. Attempting to finetune a small tax to achieve a non-fiscal objective has costs in terms of reducing the resources focused on the important and difficult task of producing revenue to finance the public sector in an efficient and equitable fashion.⁴¹ Establishing a special VAT (or other general sales tax) rate for soft drinks, as, for example, India has done (see Appendix) is not the answer. Every new complexity added to a VAT not only opens the door to still more 'special' treatments; it also increases the difficulty of administering this important pillar of the revenue structure, especially in developing countries.

A regulatory approach may give rise to similar costs in countries with limited administrative capacity, but it may be more effective since it can be more tightly focused on areas of specific concern (such as consumption by children). As with other 'sin' goods, both theory (Christiansen and Smith, 2009) and practice (restrictions on sales and control of drunk drivers) suggest that an appropriate combination of regulation and taxation is often both more effective (in health terms) and more efficient in economic terms than relying on taxes alone (Cnossen, 2010).

In the end, the public health policies that governments adopt inevitably depend more on politics than on research, whether by health experts or economists. As Hagenaaers, Jeurissen and Klazinga (2018) note in a comparison of SSB policies in the EU and the US, for example, most of the literature has focused on the extent and effects of policy changes on consumer behavior rather than on the factors that in the end really shape policy such as the political and administrative context and the implementation strategy adopted. One such factor worth mentioning is the salience of an SSB tax, that is, its visibility to consumers. If a tax is included in the sales price, as is almost always (except in Canada) true with respect to the VAT, it may alter consumption patterns more (Chetty, Looney and Kroft 2009).⁴² Since people vary substantially in the extent to which they are aware of taxes, it is inherently difficult to

determine the effect of increasing or reducing tax salience. A few studies have recognized that this salience may have an important effect on how people react (e.g., Wright, Smith and Hellowell 2017). Those that do seem generally to accept the view that the effect of the tax is strongest on consumption when the tax is incorporated in the price rather than when, as with retail sales taxes in the U.S. and the VAT (the GST) in Canada, it is applied only at the cash register.

On the other hand, taxes quoted separately may strengthen the ‘signalling’ effect mentioned earlier by leading to more public discussion and awareness of the extent of the tax, and of the underlying public health rationale for it.⁴³ A highly visible SSB tax may be an important symbol not only in affecting consumer decisions and increasing public attention to the problem but also because it signals to producers that product redesign may reduce its impact, thus aiding achievement of the policy objective of a healthier population. How a tax is framed and presented is often a critical determinant of both its acceptance and its effects.

5. Designing a Good Sugar Tax

Much of the literature concludes that imposing selective taxes on sugary drinks—like those on alcohol and tobacco—is a cost-effective way to achieve any desired reduction in sugar consumption and hence improved health outcomes. However, not much attention has been paid to how a tax should be designed and implemented (but see Allen and Child, 2019). A good tax is one that achieves its objectives as effectively and efficiently as possible, so that its imposition results in a net improvement in social wellbeing. The costs arising from the imposition of the tax—both its ‘direct’ costs (administrative, compliance) and its ‘indirect’ costs (efficiency, equity, political)—and the benefits achieved in terms of improved health outcomes, revenue, and possibly equity must be at least balanced. Estimating the size of each of these items in any particular case is an inherently difficult exercise, inevitably involving considerable estimation and judgement. Even in the most advanced countries the information required to do the best design is often difficult to find.

To determine how effective any tax is in discouraging sugar consumption, one must first determine its ‘pass-through’ rate, which depends on market structure, product heterogeneity, price level, location, timing and, often, interjurisdictional competition (see Box 6). Next, one needs estimates of both the price elasticity of supply, which depends on the characteristics of the market and the pricing strategies of firms, and the price elasticity of demand, which depends both on such factors as the availability of substitutes (cross-price elasticity) and income (income elasticity depends on factors ranging from demography to the distribution of income and consumption to how products are marketed and the social and cultural factors that affect how they are perceived in different societies). Each of these numbers must be carefully estimated within an appropriate analytical framework with the data available. Assuming this is done well, as it has been in most of the studies cited here, the links between sugar, obesity, and illness provide a reasonable basis for estimating the potential health benefits of discouraging sugar consumption. Unfortunately—though unsurprisingly given the time horizon needed to see any such effects in the data—little work to date has shown any significant effects on health.

Not enough attention seems to have been paid to some other questions critical to tax decisions. For instance, concerns about the costs imposed on governments and taxpayers are usually dismissed as trivial. This is perhaps not unreasonable, given the relatively minor nature of this tax, but it can be a real concern in developing countries and also to some extent at the subnational level even in high income countries. How the revenues will be spent is often critical to the successful adoption and implementation of any SSB tax. Many studies assert that any net increase in revenues should be spent on health programs both because they are good in themselves and because doing so will increase the political acceptability of the tax. There is some merit in the second of these points, but the first is clearly wrong: if a public health program is worth financing, it should be financed whether or not there is a tax on soft drinks. In addition, although the desirability (even the necessity) of a portfolio of accompanying policies is often mentioned,

few systematic comparisons of the relative efficiency and effectiveness of different tax regimes has been carried out. There has also been little thorough analysis of the extent to which taxes and regulations may substitute for each other or change the relative costs and benefits of pursuing particular policies. The major exception is McKinsey Global Institute (2014) which studied 44 interventions (including taxation and subsidies) to address obesity in terms of their potential costs and impacts and evaluated and ranked each of these initiatives in terms of cost effectiveness if each were implemented in the UK. Tax policies were found to be cost effective but were ranked as a second-tier intervention, and the main conclusion reached was that no single solution can create sufficient impact to reverse obesity, and that only a program of multiple interventions is likely to be effective. This conclusion seems more generally applicable. Finally, few studies have considered the political aspects of taxing sugar as such. A few of the issues just mentioned are discussed next.

Box 6. Pass-Through

Many studies simply assume that taxes are fully passed on to final consumers. If taxes are under-shifted, prices rise by less than the tax; if taxes are over-shifted, they increase by more than the tax. The efficiency estimates (impact on social welfare) on which economists focus and the health outcomes on which the public health literature focuses as well as the distributive implications and the possible impact on production and employment are all highly sensitive to assumptions about pass-through. SSB taxes may be passed forward to consumers or backwards to producers and down the supply chain to sugar growers, an issue that has caused concern in some producing countries.

Alcott, Lockwood, and Taubinsky (2019b) review the literature on pass-through in three U.S. cities, noting that six of the eight papers they consider found less than full pass-through, that is, that some of the tax was borne by suppliers rather than consumers. They attribute this result at least in part to the structure of the industry and its relative insensitivity to specific local conditions.⁴⁴ In Philadelphia, for example, the pass-through rate was 100 percent, while it was less than 50 percent in Berkeley (Cawley, Frisvold and Jones, 2019). This study also found no significant effect on beverage consumption except in Philadelphia, which had the highest tax rate, the broadest tax base, and the highest pre-tax consumption. Given the variability of results, and how little is known of the relative value of marginal resources to consumers and producers or the welfare weight that policy-makers place on these two groups, as well as the precise relation between industrial structure and pass-through, it is not surprising that neither of the US studies just mentioned was willing to make any general assumption about the extent to which taxes are passed forward. While such results are not surprising when dealing with small local taxes, the national studies (France, Chile) mentioned in the text make the common assumption of full pass-through look a bit better grounded.⁴⁵ In theory, as Keen (1998) demonstrates, and as some empirical studies support (Ardaland and Kessing, 2019) specific excise taxes at the national level do usually seem to be largely shifted forward and sometimes, when markets are especially concentrated, even over-shifted.

Nonetheless, as a study in South Africa (Stacey et al., 2019) reports, it is clear that there is considerable heterogeneity in how firms react to taxes on SSB. In the South African case, although the tax only applied to drinks with more than 4 grams of sugar per 100 millilitres, the prices on carbonized drinks below this level increased by about the same amount as the prices of high sugar drinks, apparently because firms compensated for lost sales of high sugar products by raising the price of the (now more demanded) low sugar products. Even when products were reformulated to reduce sugar (and thus taxes), prices were also sometimes increased, in part perhaps because reformulation is itself costly. A firm’s pricing response is likely to encompass its whole portfolio of products, taxed and untaxed, and one effect might sometimes be to mute the intended reduction in sugar consumption. As Stacey et al. (2019, p.19) conclude: “reality is complex and includes simultaneous existence of highly heterogeneous products, multiproduct firms, and heterogeneous consumers with differential demand across a variety of beverages.”

The Costs of Taxation

Both the compliance and administrative costs of any special SSB tax are likely to be relatively lower with a national tax. A recent study even suggested that an EU-wide tax would be better than a set of disparate national taxes, especially given the importance of multinational firms as producers (Levaggi, Marchiori, and Panteghini, 2020). Although taxing at least at the national level is obviously preferable from both a health and an economic perspective, it is not always possible or necessary. The question of subnational taxation of soft drinks has, understandably, been most closely examined in the United States, where consumption taxation is almost entirely in the hands of state and local governments.

Such local taxes are inevitably vulnerable to substantial cross-border shifting (He and Balagtas, 2019). For this reason, Alcott, Lockwood, and Taubinsky (2019a) suggested that the appropriate local tax rate on SSB would be only about one-fifth the level of their estimate of the optimal national tax – a level already exceeded in a few U.S. cities. Moreover, although the literature suggests strongly that any health-oriented tax should be focused on sugar content rather than sales value (on which subnational sales taxes are usually based), the costs to local governments of imposing an ‘optimal’ (efficient) SSB tax on this new and different base would obviously be more burdensome. Cities usually tax manufacturers or distributors rather than retailers. In Berkeley, California, however, retailers are liable if the tax has not been paid by the distributor, and complex arrangements are needed to ensure the tax is paid only once in the distribution chain. Matters become even more complex when – as in Berkeley – some small retailers are exempted (Francis, Marron and Rueben, 2016).

Low-income countries face more difficult administrative problems. How well any tax is administered – that is, how effectively and efficiently it is applied – depends to a large extent on how effectively governments operate in general. While government effectiveness is complex and difficult to measure, some attempts have been made to do so, notably in the World Bank’s Governance Indicators, which focus on perceptions of institutional quality with respect to such things as the quality of policy formulation and implementation. Countries are rated on a scale ranging from 2.5 (very good) to -2.5 (very bad). In general, as one might expect, higher-income countries tend to be rated much higher than lower-income countries: in 2018, for example, to cite only a few of the countries commonly discussed in the SSB literature, government effectiveness in the US was rated at 1.6 compared to only 0.3 for South Africa and -0.2 for Mexico.⁴⁶ This does not mean that any particular policy is necessarily better designed and implemented in the US than in, say, Mexico. But it does suggest that the intended results of any particular policy are more likely to be achieved in higher-income (and better governed) countries than in lower-income (and often not so well governed) countries. Policy designs for countries with weaker administrative structures need to both fit local conditions and as a rule be simpler. For instance, administering a tax based on sugar content (rather than ex-factory price) requires tax officials to have skills they may not have. In any case, given the generally weaker information about conditions and the consequently greater uncertainty about what is ‘right’, policies may have to be adjusted and changed, which is often a difficult exercise in many countries. A simpler design may not be optimal in technical terms, but it is often likely to be both more feasible and more effective in many countries.

The costs and effectiveness of any tax depend to a considerable extent on the precise structure of the tax (Allen and Child, 2019). Each tax design differs in how it affects each possible objective as well the costs of taxation. Taxing SSB proportional to sugar content (number of grams) as done in the UK and some other countries – and also recommended by Alcott, Lockwood and Taubinsky (2019a) – may be an efficient Pigovian tax in a perfectly competitive market. But in the imperfectly competitive markets that usually prevail for SSBs in most developing countries, the best tax from an efficiency perspective may, because market power leads to inefficient levels of output and sugar content, sometimes be one based not only on sugar content but also on the volume of the drink – that is a tax that has both a constant element regardless of sugar content and also an element varying with sugar content (Cremer, Goulão and Lozachmeur, 2019). Unfortunately, since governments know little about the specific characteristics of the relevant market in many countries, it can be difficult to know what is best – or even good – practice. It is clear, however, that few developing countries can match the UK’s combination of a well-designed tax administered by a well-run tax administration alert to evasion and backed up by sanctions that treat such evasion as a criminal offense (Backholer et al., 2018). Instead, as McDonald (2015) stresses, weak enforcement in many low-income countries seems likely to weaken, perhaps substantially, the health effects from increasing SSB taxes.

Countries where state capacity is lower – and the problems facing governments are often larger – usually have considerable difficulty raising sufficient revenue to meet the minimal needs of their citizens. Those concerned with the well-known Sustainable Development Goals never seem to hesitate to recommend

that low-income countries should raise more in taxes than many of them do.⁴⁷ One reason countries often fall short in this respect may be because they do not focus sufficiently clearly on the revenue goal when it comes to designing and especially implementing taxation. Tax design is too often made complicated and administration made difficult by exemptions and features intended to achieve essentially non-fiscal objectives. Rich countries may be able to afford such policies. Poorer countries should hesitate to further burden their already strained bureaucracies with tasks which even the best-equipped states often struggle to manage. Proposals to introduce a new tax for even the best of reasons must be both less costly and substantially more effective than alternative approaches to the problem at hand. It is far from clear that taxing SSBs significantly higher than other forms of 'sugary' (or 'bad') foods – as the WHO (2015) 20 percent rule suggests -- meets this test. If it does not, burdening them with implementing dictates like this 20 percent make little sense.

An additional difference between rich and poor countries is that as a rule the former have less market power with respect to taxing multinational enterprises (MNEs), as evidenced by their generally lower business income taxes (especially, given the proliferation of incentives, in terms of effective tax rates). The few multinational corporations that supply much of the global carbonated beverage market are as likely as other MNEs to attempt to minimize their total corporate tax burden (Levaggi, Marchiori and Panteghini, 2020). This is perhaps one reason why developing countries have generally not imposed high SSB taxes:

the heavier the tax, the more likely it is that MNEs may attempt to offset its impact by, for example, altering the product mix or restructuring in ways that may result in shifting more profits abroad.⁴⁸

The Distributional Impact

Most concern with the distributional impact of taxing SSB focuses on the potential effect on the tax burdens (and perhaps also expenditure benefits) on households at different income levels. There are other important effects to be considered. For example, the relative importance of purchases of fruits and vegetables, packaged meals and snacks and candy generally increase with income, while purchases of soft drinks, meat and milk may decline with income, reflecting perhaps both better health awareness and the higher opportunity cost of time of higher-income households (Harding and Lovenheim, 2004). The distributional impact of SSB taxes is affected by differential preferences for food groups at different income levels and perhaps also by different behavioral responses. One result may be that such taxes are less regressive in at least some lower income countries simply because the poorest groups are unlikely to be the largest consumers. In Indonesia, for example, not only do higher income groups consume more sugary drinks, they also appear to reduce consumption more in response to higher prices (Bourke and Veerman, 2018). Since these groups were also more likely to become ill from diabetes and other non-communicable diseases, the study just cited concluded that any health benefits from SSB taxation in Indonesia were likely greater for higher-income groups than for the poor. However, experience with other 'sin' taxes in poor countries suggests that increasing prices by taxation may sometimes discourage consumption by lower-income consumers so much that they end up not only healthier but also, owing to the reduction in the amount they spend on the taxed product, no worse off or perhaps even better off in income terms (Bosch and Koch, 2014; World Bank, 2014).

The effects of any tax depend in large part on its effect on prices, which in turn depends on the own-price elasticity, the tax base, the share of household expenditure affected, and the pass-through rate. As just discussed, responses to price changes are complex, varying with the context and over time, which makes it difficult to estimate revenues with much confidence. For example, if the result of the price increase is to alter consumption behaviour, revenues may fall over time. If, on the other hand, the result is that consumers simply keep on buying as before, revenues may even increase over time. The reverse is also true: if prices rise, and consumers buy less, revenues will fall – though if the result is to reduce sugar consumption, there may be an offsetting gain in health terms. Studies have suggested different results in

different places. In France, for example, there was full pass-through of the (low) 2012 soda tax but little effect on purchases, although more in the case of the top quartile in volume terms (Capacci et al., 2019). In Chile, however, although a study found full – even over shifting - of the 2014 tax for carbonized beverages, there was considerable heterogeneity in the price movements in other beverage categories over time, apparently owing to the different price-setting behaviour of firms facing different market structures, a complex and little-understood issue in Chile, as in most countries (Cuadrado et al., 2020; see also Box 6).

Although the degree of responsiveness of consumption to price changes – the elasticity of demand – varies between countries and among different groups within countries, the evidence suggests that demand is more elastic in low-income than in high-income countries and that, at least in the latter, it is higher for younger people (Muhammad et al., 2019).⁴⁹ However, it may not always be higher for poorer people, as in the Indonesian case mentioned above. One reason may be because many poor people in low-income countries, most of which have tropical climates, do not have easy access to potable water. For some, SSBs may even be the safest and cheapest source of this necessity of life, especially when water is not cheap and may not be safe, and alcoholic beverages are not available or desired.⁵⁰ When potable water is not easily and cheaply available, most possible substitutes have their own problems. For example, bottled water is not always available (or necessarily safe) and can be as or more expensive.⁵¹ Milk-based products are sometimes sweetened, sometimes not available (or safe), and sometimes not culturally acceptable. Fruit juices are, even if not artificially sweetened, on the whole less desirable than fruit itself and often considerably more costly.⁵² Sugar substitutes (diet drinks) are not always available, usually more expensive, and, as noted earlier, may arguably also have health risks for some.⁵³

The Supply Side

Firms may respond to increased taxes on their products by reformulating the product to reduce the taxed element or by substituting something for it. The tiered tax varying with sugar content introduced in the UK and subsequently adopted in a number of other countries was in fact explicitly designed in part to provide an incentive for producers to reformulate their product to include less sugar and thus reduce the tax applied. The UK tax was first announced in 2016 but not implemented until 2018, but simply announcing the policy seems to have had a major impact, with the average sugar content of SSB in the UK falling from 4.4g/100ml in 2015 to 2.9g in 2018. Moreover, sales of SSB with >5g fell by 50 percent, while sales of those with less than 5g rose 40 percent, and the sales of bottled water and other exempted drinks rose 23 percent. Most of the sugar reduction (73 percent) was attributed to product reformulation, with the balance coming from changes in purchasing behaviour (Bandy et al., 2020). Just as consumers may adjust to new prices by altering their consumption decisions to keep their energy intakes constant, producers may also adjust by altering the formulation of their products to reduce the proportion of some ‘bads’ (sugar, salt, saturated fat) but increase the proportion of another, thus reducing the net long-term effect on health (Public Health England, 2018).⁵⁴

Taxes may thus serve as a signal to both consumers and producers that (1) there is a problem and (2) the government is serious about doing something about it – though the credibility of the second element may be less in countries where government’s capacity to deliver policies that will actually bite is generally perceived to be low. Nonetheless, as the UK case mentioned above suggests, sometimes simply announcing that a tax will be introduced may induce at least the more alert and capable firms in the industry to explore and apply less sugary sweet – if not necessarily more healthy - solutions (Lloyd and MacLaren, 2018).

An interesting question is whether and when it may be less costly, more effective and more politically acceptable to target not the demand but the supply side of the market. Or perhaps both sides may be targeted with a mixture of publicity, regulatory, and budgetary policies. Requiring that producers rather than consumers ‘internalize’ the social costs imposed by their products is an approach that could

certainly be applied with respect to the sugar included in soft drinks. When this approach has been applied in other areas, one notable effect has been to make producers carefully examine what they produce and how they produce it in order to reduce costs, thus forwarding both their presumed goal of profit maximization and society's goals, such as waste reduction, pollution reduction, and the availability of a more healthy 'food basket' for consumers.

Many people around the world earn their living from sugar, so reducing sugar production could have adverse economic impacts. Small-scale farmers as well as a complex chain of millers, refiners, processors and traders are involved in the production and marketing of sugar. Sugar is relatively cheap to produce, with almost 90 percent of sugar coming from cane sugar produced in tropical climates, largely in a small number of countries. Brazil is by far the largest exporter, accounting for 46 percent of all exports compared to 21 percent of production (World Cancer Research Fund International 2015). Most other sugar comes from sugar beets grown in temperate climates. Some sugar also comes in the form of high fructose corn syrup (HFCS), particularly in the US and Mexico.⁵⁵

One way to reduce the amount of sugar consumed, whether sold as such or the 'added sugar' (including syrups) added to foods and drinks during production is to raise its price.⁵⁶ Since "taxing only SSBs is like taxing only beer and not liquors and wine (Lloyd and MaLaren, 2018, p. 24)," from a health perspective a tax on sugar itself would seem preferable. Such a tax might be applied at any point in the production chain and would likely be simplest to implement if applied not at the first (farm) or last (consumer) link in that chain. A tax imposed on the relatively small group of sugar mills and on sugar imports would likely be as or more economically effective and administratively much simpler than a tax at either end of the chain. From this perspective, the current focus on taxing SSB seems both too limited and unnecessarily complex. Still, although perhaps the least ambitious target from a health perspective, the emphasis is not surprising. Taxes on SSBs even in poor countries are not hard to implement, may act as a useful 'signal' that public health is an important and legitimate policy aim, and may, once in place, perhaps pave the way for still further fiscal health targeting.

Sugar prices are already considerably higher in some countries than the price at which sugar is available in the world market because of the array of protective policies some developed countries employ to protect more expensive locally produced sugar. In the case of the US, for example, where domestic sugar producers are clearly subsidized through protective tariffs and in other ways (USDA, 2019), the prices of SSB are higher, and consumption lower, than they would otherwise be. The US is of course not the only country to subsidize sugar producers (Hudson, 2019). Indeed, so many countries follow similar policies that "the international sugar market is one of the most highly distorted agricultural commodity markets" (Nyberg, 2009).⁵⁷

The voluminous literature on the evil effects of sugar for health seldom mentions how much worse health outcomes might be if some countries were not (in effect) spending billions in subsidies of various types to sustain their domestic production of sugar by keeping domestic prices high— at the cost, of course, of more efficient (and often poor) sugar farmers elsewhere. The apparent unwillingness of governments to contemplate (or health advocates to advance) taxing the root of the problem – sugar – rather than focusing (almost) solely on just one of the final products – sugary drinks – is a bit puzzling. While it is clearly much simpler to put an excise tax on sugary drinks than to reform agricultural and industrial policy around the world, it is worth setting out briefly how a more general tax on sugar might work.

Taxing Sugar Directly

An alternative tax approach to reducing the consumption of sugar would be to levy a tax, directly on sugar production and imports as well as on high fructose corn syrup which is now a widely used sugar sweetener.⁵⁸ The tax would be imposed at the refinery level in the taxing country and likely would be passed through in some proportion to final consumers of products with sugar content. It would also be

imposed on all imported refined sugar as well as other imported sugary products and would be based on sugar content. Such a tax would better fit the profile of a good excise tax. It would broaden the tax base to tax all sugar consumption, would be more inelastic in demand, and would be potentially much more effective in discouraging the excess consumption of sugar than a tax on SSB. As Harding and Lovenheim (2014) show, a specific tax on a nutrient (sugar) has much larger effects on nutrition than a tax on a product (SSB) and does so without imposing a larger welfare loss owing to its broader base.

As mentioned earlier, the world market for sugar is far from perfect, with the size and nature of the imperfections varying from country to country. Sugar subsidies and protection policies have distorted the sugar market in some countries. In the US, for example, protective policies have kept sugar prices above world prices. The price reduction that would result from trade liberalization would need to be taken into account in setting the tax rate under any new excise tax on production. In addition, all separate taxes on sugar (such as on sugar sweetened beverages and confectionary) could be eliminated because the basic sugar input will already have been taxed.⁵⁹

The principal objective of such a national excise tax on sugar production should be clearly specified as reducing the consumption of sugar to some target level and the tax rate would be specific and as in the UK, tiered in terms of sugar content. The precise rate would be driven by the targeted level of sugar consumption and the price elasticity of demand for sugar. Every country would be free to determine how healthy it would like its national diet to be, and what role the price increase of sugar should play in getting to this goal.⁶⁰ But the target would be more easily hit because the tax base is broader and less substitution would occur.

The tax would be collected at the refinery level (sugar and corn) and based on output. It would also be collected at the import level on products such as processed foods, breakfast foods, canned goods and the like depending on their sugar content.⁶¹ The implementation and management of such a tax would need to be coordinated by the national tax (and customs) administration with the collection of VAT, company income taxes, and other taxes and tariffs on trade (as well as GATT rules).

One advantage of this approach is that, unlike soft drink taxes, this tax would affect all consumption of sugar. It would, for example, bring all packaged foods, breakfast cereal, canned goods and sugary snacks into the tax base.⁶² One study using data from the U.S. National Health and Nutrition Examination Survey found that such foods comprised about 60 percent of total calories in the U.S. diet (Steele et.al., 2006). Domestically produced products would have the added sugar already taxed at the production level and those produced abroad would be taxed at import. Since the aim of this tax is simply to reduce the excess consumption of sugar, special attention should be paid to tracking the impact of the tax on sugar consumption so that the rate structure can be tuned if needed.

The principal determinant of the tax rate in any country would be the targeted level of sugar consumption. However, setting this target could well be a controversial and heatedly debated subject. If the recommended level of sugar consumption in the United States is about one-half the current level (Euromonitor, 2020), cutting sugar intake to half its previous level would not go well. Other countries such as the UK, France, and Norway have somehow managed to fix rates that seem acceptable although it is far from clear exactly how these rates were determined or how (or if) they are related to targeted (desired) levels of sugar consumption. Given a target, a simplified version of the rate-setting formula is set out in Box 7. Measuring the elements of the formula is not easy. Estimates of the own price elasticity of demand (the percent reduction in sugar consumption resulting from a one percent higher level of sugar excise tax) vary widely, and the choice of which elasticity to use in setting the initial rate is almost as subjective as setting the target level of consumption. Such choices become more critical, the higher the rate required to achieve the target level. A tax aiming solely to offset fiscal externalities, however, would, as noted earlier, be considerably lower and hence perhaps more politically feasible.

Because many other policy instruments could (and likely should) be employed to deal with excess sugar consumption such as information campaigns and regulatory measures, ideally policy makers should, before setting the tax rate, have some idea of the extent to which such measures complement or substitute for the tax. Since there is almost no information on the separate or combined effects of such policies, this too must, at least initially, in practice be based more on faith than evidence, though the package may of course be improved as information improves.⁶³

Box 7. Setting the Rate

To set the rate of a tax on sugar production, consider the following (oversimplified) identity. $dQ =$

$[(dq/dp) (dp/dt) (dt)]$

where

dQ is the percent change in the consumption of sugar chosen as the target objective for the tax and

dt is the percent change in the tax rate required to produce this change in the quantity of sugar consumed.

In order to estimate dt , we must know both the price elasticity of demand and the pass-through rate which measures the extent to which the tax is passed forward to prices. As discussed above, both of these elasticities have been the subject of considerable research but as yet there is little agreement about their magnitudes, although they seem likely to be different in different countries. In addition, the income and cross price elasticities of demand as well as reformulation, need to be factored into the projected targeting.

In reality, countries are unlikely to use such a formula to try make a point estimate of the tax rate that would be needed to reduce SSB consumption by a target amount. To do so would require making estimates of the elasticities based on studies for the country itself (instead of relying on cross-section statistical analyses) and data may not be available to do this.⁶⁴ Moreover, countries are often more interested in the revenue to be expected from the tax than in the reduced consumption of SSB, so many other political economy issues would be involved in any discussion of 'targeting'.

The distributional effects of a tax on sugar production will vary from country to country. Sugar growing countries with protected sugar markets, where tariff and other barriers would be replaced by the tax, would probably see the closure of farms and refineries and hence significant job losses. Countries that are not sugar producers would see an increase in sugar prices from the tax, and likely a reduced level of sugary products produced and consumed. The net effects on the distribution of tax burdens from the set of changes in employment and consumption patterns that would be put in play are difficult to see. But at least in some countries, a tax on sugar production and imports could impose a heavier financial burden on poorer families. For this and other reasons, this proposal would meet resistance from consumers as well as from the affected industry groups. As with almost all policy changes, the potential losers are likely to be far more vocal than the winners. Over time, presumably many of the short run economic effects will fade as both capital and labor shift from the sugar industry to other uses, with the final burden of the tax being distributed among owners of capital, owners of land, and consumers, depending on many demand and supply factors and on the degree of mobility of capital and labor.

A tax like that suggested here would almost certainly – depending on the consumption target – yield much more in revenue than taxes on soft drinks alone. It would also have broader impacts on government budgets in a number of ways. For example, company income taxes and payroll taxes in the sugar industry would be reduced as consumption declined although this would presumably be offset to some extent over time as capital, land, and labor become employed in other sectors. On the other hand, if sugar consumption is decreased and health outcomes improved, presumably public sector expenditures on health may decline to some extent.

A sugar tax levied at the refinery level might be more acceptable to the general public because it would be less visible. But because the base would be broader, proposing such a tax would doubtless soon lead to the emergence of a substantial and influential lobby to provide opposition. And, of course, countries

with protective tariffs (or equivalent policies) supporting sugar producers would have an even more difficult task in putting such a tax into place.

An excise tax on sugar would have widespread impacts on budgets, consumption patterns, production sectors, regions, and countries as well as on health outcomes. Designing, introducing and implementing such a tax would be a big job. But if a country really wants to reduce sugar consumption through taxes, such a tax would provide a potentially much more powerful policy instrument than the (usually low) taxes on a select segment of the beverage market that up to now have been the fiscal instrument of choice. With more power, however, comes more reliance on relatively unknown and often subjective factors and, perhaps most important, much more political risk if governments get it wrong or are overwhelmed by lobbying and opposition. Still, those interested in using fiscal measures to improve health outcomes should perhaps aim at this bigger target.

Earmarking the Revenue

Much of the health literature suggests that the proceeds of any SSB tax should be earmarked for health expenditures or some other worthy activity. Because money is fungible, in reality such earmarking is invariably 'soft' and seldom seems to result in any actual increase in the designated areas (Bird and Jun, 2007). Spending more on health may often be sensible but there is no apparent reason why decisions to spend more should be tied to the revenue yield of any particular tax. Urging that any revenue should be spent in such a way as to make the distributive impact of SSB taxes less regressive also seldom makes sense. Even the poorest country usually has more effective and efficient ways to offset regressivity if it wishes to do so. In the end, the only real argument for earmarking such taxes is that doing so may improve their public acceptability.

Although some sort of health earmarking exists in at least 80 countries, there is almost no empirical evidence about the results of any of these experiences, and what little exists is invariably highly contextdependent and does not lend itself to generalization. A WHO study (Cashin, Sparkes, and Bloom, 2017) tries hard to make a case for such earmarking – and argues, for example, that in some instances, notably South Africa, it was key to mobilizing against HIV/AIDS – it nonetheless concludes, as experience in dozens of countries supports, that earmarking for health has on the whole not only had little effect on health spending, it has often made the already weak budgetary process in low-income countries more rigid.

As South Africa and some other jurisdictions have shown, however, earmarking may sometimes help politicians make policy changes. In the case of Philadelphia, for instance, it has been singled out as an important factor. Initially, however, the revenue was intended to provide funding not for health but for extending pre-kindergarten services and for community improvement projects. The health objective only came up at the end of the discussion.⁶⁵ Still, linking a new tax with a desired expenditure may indeed increase the acceptability of the tax, even if the linkage is purely verbal and, given the fungibility of funds, has little or no effect in reality (Lucinda and Moita, 2019).

Not all responses to such linkage may be positive. The groups most at risk – the overweight and high consumers – are those most opposed to taxes (Hagmann, Siegrist and Hartmann, 2018). It is not surprising that people seem to find policies more acceptable when they are not explicitly intended to change their own behaviour but can be seen as aimed at others, such as children. Familiar instruments seen as less intrusive (and perhaps also) less effective are preferred. In the most detailed comparative study so far of alternative approaches (in Switzerland), labeling turned out to be the most easily accepted and taxes among the least (Hagmann, Siegrist and Hartmann, 2018).⁶⁶ As Arno and Thomas (2016) suggest, regulatory nudges – such as reducing portion sizes – may perhaps be easier to accept than taxes because they may be easier to offset e.g. by having two helpings.

Imposing a tax to achieve a health-related objective is not a simple matter. Economists (and others) are often frustrated in studying issues such as the effects on health of particular policy changes. The knowledge base for policy with respect both to improving health outcomes and the relative effectiveness of using taxes for non-fiscal purposes would be substantially improved if countries that adopted SSB taxes on health grounds did more to collect the data needed to evaluate and understand the impact of these taxes. In addition to designing an appropriate tax, ideally attention should be paid to systematically collecting and analyzing the prices and volume (both of imported and domestic) of taxed products sold and to verifying sugar content and especially changes in formulation, in terms of specifically identified products. All this would require a much more disaggregated approach than that now in place in most countries. In addition, careful and continuing studies of the effects on incomes and expenditure patterns by groups and high- and low-volume consumers are needed, together with continued study of the effects of any changes in consumption on obesity and, over time, on illness and fatalities. As the discussion of SSB taxes illustrates, perceived policy needs evolve over time. Actual policy change may sometimes result from such discussions. Almost never, however, is the information needed to evaluate – and, if necessary, adjust – the effectiveness of policy changes collected, analyzed, and put to good use. This reality seems unlikely to change soon anywhere.

6. Conclusion

The reality is, and will remain, that what to tax, when to tax, and how to tax, are always and everywhere as much or more political than technocratic issues. Taxes explicitly intended to alter people's decisions are only likely to be successful in a democratic setting if the decision to tax and the design of the tax have been widely and thoroughly discussed and found to be acceptable by most people (Frey 2005). When it comes to 'taxing for health' even the best tax is likely to be only a component, and not necessarily the main or most effective component, of a package of regulatory and fiscal measures that the population as whole may be willing to accept.

Although in practice decisions are likely to be determined more by the immediate concerns of policy makers than by the studies of experts, the appropriate design and level of any SSB tax requires close and careful study of the circumstances of each case. Still, some jurisdictions have made mistakes that should be corrected. In the United States, for example, the exemption of soft drinks (and often other foods that appear to contribute to health problems) from retail sales taxes (in a few states) or the application of a lower than normal rate (in a few others) may be criticized not only from a health perspective but also because such measures substantially increase the cost and complexity of tax administration and compliance (Loughead, 2018)

Conventional tax analysis assumes taxes operate only by changing prices and often considers only contemporaneous prices. Because the results may differ when future price changes and behavior are taken into account, the short-term effects of a tax in terms of reducing consumption may differ from the long-term effects as both suppliers (through product reformulation and altered marketing strategies) and consumers (through stockpiling, substitution of products or cross-border shopping) change their behavior. The ease with which consumers (and suppliers) can alter their behavior when faced with a specific tax means that the static textbook analysis of welfare costs may easily be exaggerated (Buchanan and Forte, 1964). Changes in behavior, in information, and in the costs and benefits that both sides of the market perceive may change both supply and demand and hence the net costs and benefits of any tax change. Even with the long-established US tobacco excises, for example, Rees-Jones and Rozema (2019) estimate that much of the change in cigarette consumption is explained by non-price factors that are often largely independent of changes in taxes.

The level and design of a tax may thus sometimes be less important determinants of its effects than the discussions before the tax is imposed. The 'expressive effect' of a tax may sometimes dominate its 'price effect' emphasized in economic analysis. Discussions about imposing a tax on a particular behavior may

influence expectations of how one should behave, and changed behavior may result as people alter their beliefs, sometimes to the point that social norms change accordingly: witness the change from the general acceptance a few decades of smoking everywhere as acceptable to the current situation. Such changes may occur because of the altered information frame within which people make decisions or because of the moral disapproval (shaming) signalled by the law.⁶⁷ Persuasion, information, and the legal (and moral) signals expressed by a tax, regulation, or law may alter preferences. Tax analysts have long known that there can be an ‘announcement effect’ which occurs before a tax is actually imposed as people’s expectations alter. Sometimes, as when people stockpile at the pre-tax price, this reaction may reduce both the effect of the tax (at least in the short run) and revenues. In other circumstances, however, the impact of a tax on the institutional, psychological and sociological factors that shape demand may be as or more important than the tax itself.

Finally, consider the link between marketing a new tax and compensating for its unwanted distributive effects. The only distributive effect usually considered in the literature is the impact of the tax on the average progressivity (or regressivity) of the fiscal system (Sassi et al., 2018). But the distributive effect that is perhaps most important with respect to specific excise taxes intended to alter behavior depends on how the tax is perceived to impact on a population which is highly heterogeneous not only in terms of income but also in terms of consumption patterns, with the two being somewhat, but not tightly, related. Unlike the usual analysis of tax incidence, the concern here is not a normative concern with how the poor are affected but rather a positive concern as to how best to ‘sell’ the tax. As Sallee (2019, p.9n) puts it: “...horizontal equity matters for preventing the creation of losers and thereby improving political acceptability.”

Although taxing sugar may impact most strongly on the income and consumption of low-income households, it may sometimes be considerably less effective for the presumably targeted population of heavy sugar consumers, as Serse (2019) found in a Belgian study. Because the correlation of health gains and fiscal and other welfare losses is never perfect, corrective taxes need to be carefully nuanced to fit the case in hand if they are to be both accepted and effective in achieving their objective. Designing such a tax policy is extremely difficult given the usual constraints on information, administrative feasibility and other factors.⁶⁸ In the end, however, politics, unlike the analysis of theoretical social welfare functions, is seldom concerned with maximizing any objective other than getting a policy through the process, a task that usually requires considerable negotiation and compromise as well as persistence, and one to which analysts usually have relatively little to contribute.

Appendix

Taxing Jurisdiction	Year implemented	Type	Rate	Base	Exemptions
Finland	1940/2011	Excise	\$0.24/L	Sugar-containing soft drinks	
			\$0.13/L	Sugar-free soft drinks; mineral water	
Norway	1981	Excise	\$0.36/L	Drinks with added sugar or sweeteners	
			\$2.22/L	Syrup concentrates	
Samoa	1984	Excise	\$0.15/L	Carbonated beverages	

French Polynesia	2002	Excise	\$0.37/L \$0.55/L	Local sweetened drinks Imports	
Palau	2003	Import duty	\$0.28175/L	Imported carbonated drinks	
Latvia	2004/2016	Excise	\$0.074/L	Drinks with added sugar, sweetener, or other flavoring	Fruit/vegetable juice <10% added sugar; waters without added sweeteners or flavorings
Fiji	2007/2017	Excise Import duty	\$0.16/L \$0.16/L 15% 10%	Local sweetened drinks Sweetened drinks Concentrates	
Nauru	2007	Import duty	30%	All products with added sugars	
France	2012/2018	Excise	Sliding scale from \$0.12 to \$0.22/L If >11g sugar/100mL	Drinks with added sugars or artificial sweeteners	
Mauritius	2013/2016	Excise	\$0.00082/g sugar	Sodas, syrups, and fruity drinks with added sugar	
Cook Islands	2013	Import duty	15% (rising 2%/year)	Sweetened drinks	

Taxing Jurisdiction	Year implemented	Type	Rate	Base	Exemptions
St. Helena	2014	Excise	\$0.97/L	Carbonated drinks with >15g sugar/L	
Mexico	2014	Excise	\$0.05/L	Drinks with added sugar	Milks, yogurts
Chile	2014	Ad valorem	10%	Drinks <6.25 g sugar/100mL	100% fruit juice; dairy-based

			18%	Sugary drinks >6.25 g sugar/100mL including all nonalcoholic drinks with added sweeteners	beverages
Kiribati	2014	Ad valorem	40%	Drinks containing added sugar and fruit concentrates	100% juices
Barbados	2015	Ad valorem	10%	Sugary drinks including carbonated soft drinks, juice drinks, and sports drinks	100% juice, coconut water, and plain milk
Dominica	2015	Ad valorem	10%	Food and drinks with high sugar content, including soft drinks and energy drinks	
Vanuatu	2015	Excise	\$0.42/L	Carbonated beverages containing added sugar or other sweeteners	
Berkeley CA (U.S.)	2015	Excise	\$0.01/oz	Sugary drinks	Diet sodas, meal replacement and dairy drinks, fruit juice, and alcohol
Navajo Nation (U.S.)	2015	Sales tax	2%	Minimal-to-nonnutritional value items including sugar-sweetened beverages	
Belgium	2016	Excise	\$0.45/L \$0.75/kg	Soft drinks with added sweeteners Powders (concentrates)	
Catalonia, Spain	2017	Excise	\$0.09/L \$0.13/L	Sugar 5-8 g/100mL >8g/mL	

Taxing Jurisdiction	Year implemented	Type	Rate	Base	Exemptions
Portugal	2017	Excise	\$0.09/L	Sugar <80g/L	

			\$0.18/L	Sugar >80g/L	
India	2017	GST	28% (additional to 12% on packaged processed food)	Aerated beverages and lemonades	
Sri Lanka	2017	Excise	Higher of \$0.003/g sugar or \$0.066/L	Sweetened drinks	
Maldives	2017	Import duty	\$2.18/L \$0.30/L	Energy drinks Soft drinks (carbonated sodas, sports drinks)	
Brunei	2017	Excise	\$0.29/L	Drinks >6 g sugar/100mL	
Thailand	2017	Combined specific and ad valorem		Drinks >6 g sugar/100mL	
Saudi Arabia	2017/2019	Ad valorem	100% 50%	Energy drinks Sweetened drinks	
Bahrain	2017	Ad valorem	100% 50%	Energy drinks Aerated soft drinks	
U.A.E.	2017/2019	Ad valorem	100% 50%	Energy drinks Any drinks with added sugar or sweeteners	
Oakland CA (U.S.)	2017	Excise	\$0.01/oz	Drinks with added caloric sweeteners	Milk-based drinks,100% juice; beverages from retailers with <\$100,000/annum
Albany CA (U.S.)	2017	Excise	\$0.01/oz	Drinks with added caloric sweetener	Milk-based drinks,100% juice; beverages from retailers with <\$100,000/annum

Taxing Jurisdiction	Year implemented	Type	Rate	Base	Exemptions
Boulder CO (U.S.)	2017	Excise	\$0.02/oz	Beverages with >5g added caloric sweeteners/12 oz	Milk-based drinks, 100% juice
Philadelphia PA (U.S.)	2017	Excise	\$0.015/oz	Sugar and artificially sweetened drinks	Milk-based drinks, 100% juice
San Francisco CA (U.S.)	2018	Excise	\$0.01/oz	Drinks with added sugar and >25kcal/12 oz	Artificially sweetened beverages, 100% juice, infant formula, milk products, medical drinks, and alcoholic beverages
Seattle WA (U.S.)	2018	Excise	\$0.0175/oz	Sugary drinks	Diet sodas, milkbased drinks, 100% fruit juice
United Kingdom	2018	\$0.23/L \$0.31/L	>5g sugar/100mL >8g sugar/100ml	Sugary drinks	
Ireland	2018	\$0.22/L \$0.33/L	>5g sugar/100mL >8g sugar/100mL	Sugary drinks; in 2019 added milk and similar drinks if <119mg calcium/100mL	
South Africa	2018	Excise	\$0.0014 g sugar; If not labeled, tax based on 20g/100mL	Sugary drinks and concentrates	<4g/100mL; Dairy items, fruit, vegetable juices
Philippines	2018	Excise	\$0.23/L \$0.11/L	Drinks using HFCs Drinks with sugar and artificial sweeteners	Dairy drinks, sweetened instant coffee, drinks using coco sugar or stevia, 100% juices
Bermuda	2018	Import duty	75%	Sugar, sugary drinks, candies, dilutables	Diet sodas, 100% juice, diet iced teas
Peru	2018/2019	Ad valorem	12% 17% 25%	Drinks <0.5g/100mL 0.5-6g/100mL >6g/100mL	Plain water, 100% juice/plain milk, drinkable yogurts

Taxing Jurisdiction	Year implemented	Type	Rate	Base	Exemptions
Panama	2019	Ad valorem	5%	Other non-alcoholic drinks with added caloric sweeteners	Dairy drinks, juices <7.5g sugar/100mL
			7%	Sodas	
			10%	Syrups, concentrates	
Qatar	2019	Ad valorem	100%	Energy drinks	
			50%	Sweetened aerated drinks and concentrates	
Oman	2019	Ad valorem	100%	Energy drinks	Sparkling water
			50%	Carbonated drinks	
Seychelles	2019	Import duty	\$0.29/L	Beverages >5g sugar/100mL	Fresh local drinks without additives, plain milks
Malaysia	2019	Excise	\$0.096/L	Carbonated, flavored and other nonalcoholic drinks >5g sugar/100mL and fruit or vegetable juices >12g sugar/100mL	
Isle of Man	2019	Excise	\$0.23/L	>5g sugar/100mL	Sugary drinks
			\$0.31/L	>8g sugar/100ml	

Source and notes: Information from Global Food Research Program, University of North Carolina, as updated December 2019, accessed April 22, 2020. Rates stated in USD as converted from local currency in source document. The year implemented is from this source, as is the year of the most recent change in the tax. Taxes labeled excises have specific rates. Other separate taxes, which may sometimes also formally be excises, are labeled as ad valorem here if they are imposed on the basis of value rather than specific volume or sugar content.

A few minor changes have been made to the information in the source cited, such as including the recent imposition of the UK tax in the Crown dependency of the Isle of Man. SSB taxes have also been introduced in a few countries (Estonia, Morocco) but not yet implemented for various reasons. Governments in other countries such as Italy, Pakistan, and Poland have also announced their intention to impose special taxes on soft drinks. Several US states, notably California (the state in which most US local SSB taxes have been implemented) but also Michigan and Arizona have banned new local taxes. In Cook County IL (Chicago) a tax was introduced in 2017 but almost immediately abolished.

Endnotes

¹ We are grateful for support from the International Tax and Investment Center and for helpful comments on earlier versions from Pierre-Pascal Gendron, Blake Marshall, and Daniel Witt.

- ² Although Egypt applies a higher value-added tax (VAT) rate (22% compared to the standard 14%) to soft drinks, in most African countries, as in most countries everywhere that have VATs, such beverages are usually subject to the normal VAT rate (usually in the 15%-20% range), with any excise tax being included in the taxable base.
- ³ “Sugar sweetened beverages,” “sugary drinks,” and “soft drinks” are all terms for beverages that contain any form of added sugar and are used interchangeably, as is the abbreviation SSB, in this paper. As the Appendix shows, countries have defined and labelled their taxes on sugary drinks in many ways. A recent paper provides a more operational definition as “... any drink with caloric sweeteners, including carbonated soft drinks, sports drinks, energy drinks, fruit drinks, chocolate (or otherwise sweetened) milk, and sweetened coffee or tea, but not including 100 percent fruit juice or ‘diet’ drink alternatives with noncaloric sweeteners (Allcott, Lockwood, and Taubinsky, 2019a, p. 204).” Euromonitor (2020) reports that in 2019 the world soft drinks industry had sales estimated at \$870 billion, with the carbonated beverages usually called ‘soft drinks’ accounting for 36 percent of the total, followed by bottled water (27 percent), juice (16 percent), ready-to-drink tea and coffee (10 percent), energy and sports drinks (7 percent), and concentrates (2 percent).
- ⁴ For example, Morocco and Estonia have introduced such taxes, although they are not yet implemented, and Italy, Poland, and Croatia have announced their intention to do so. There has also been much discussion of the case for such taxes in other countries such as Australia and New Zealand (as some of the references we cite in this paper indicate) although as yet no legislation has been introduced.
- ⁵ As Shekar and Popkin (2020) discuss, there are many different and seldom readily comparable numbers and concepts involved in estimating such ratios so they should be read as informed guesses rather than established facts. We do not discuss here the possible effects of excess sugar consumption on tooth decay and gum disease, although some studies have related oral health to cardio-vascular and other general health problems.
- ⁶ In addition to the evidence discussed in this paper, see also the summaries in the useful recent surveys commissioned by the OECD (2019) and by the World Bank (Shekar and Popkin 2020).
- ⁷ Meta-analysis, although a useful approach to weighing and summarizing the results of disparate case studies, can of course never provide definite answers. Like the studies on which it is based, meta-analysis can be no better than the data available, the choices made with respect to such things as modelling (e.g., fixed vs. random-effect models), subgroups reported, and the procedures used to deal with publication selection bias (Nelson, 2020; Nelson and Moran, 2019).
- ⁸ This is the concluding sentence of the (unpaginated) “Key Issues” summary that leads off New Zealand Institute of Economic Research (2017).
- ⁹ Much of the huge literature on this subject is usefully summarized in two recent reports (OECD, 2019; Shekar and Popkin, 2020).
- ¹⁰ As seems usual on this topic, different numbers may be found in different sources, often because of definitional differences. The Sugar Association (2020), for example, estimates that SSB consumption accounts for 39 percent of added sugar intake in the US. Of this, soft drinks are 25 percent, fruit drinks 11 percent and sport and energy drinks 3 percent.
- ¹¹ It should perhaps be noted, however, that at least in some countries, even in the absence of SSB taxes sugar consumption seems to have been decreasing in recent years, although as yet with little apparent effect on obesity (see, for example, Barclay and Brand-Miller (2020) on Australia). Even without special SSB taxes, SSB consumption in the U.S. has been falling for some years (Valizadeh, Popkin and Ng, 2020).
- ¹² Both the Mexico and Berkeley studies tested whether the post-tax trend in purchases was significantly different from the pre-tax trend, using a common econometric approach -- a difference-in-difference fixed effects model, which adjusts for both macroeconomic variables that can affect the purchase of beverages over time and pre-existing trends. The variables used in the analysis included demographic information on household composition (age and sex of household members) and socioeconomic status (low, middle, and high). The volumes of taxed and untaxed beverages purchased in the observed post-tax period are then compared to the (counterfactual) estimated volumes that would have been purchased if the tax had not been implemented based on pre-tax trends. Of course, one can always debate whether this counterfactual adequately controls for the impact of all other factors.
- ¹³ Studies like Teng et al. (2019) provide a useful and helpful picture of the present state of knowledge. However, although the authors attempt to deal with many of the problems related to the comparability of results in any cross-sectional analysis of very heterogeneous jurisdictions, the differences in the data used, the different tax designs, the different accompanying policies, and the different analytical approaches taken, one can, as usual, quibble with the conclusions drawn.

- ¹⁴ People who had cancer, heart disease, stroke or diabetes in 1992 were excluded from the study.
- ¹⁵ One reason might be because companies may respond to taxes and increased public concern about the health dangers of SSB by increasing their marketing of alternative ASB substitutes.
- ¹⁶ See the discussion of such a tax in Section 5 below.
- ¹⁷ As Deaton and Cartwright (2018) and others have noted, while RCTs (randomized control trials) may now be seen by many as the ‘gold standard’ when it comes to assessing policies, even the best randomized study, like the most refined and up-to-date econometric or behavioural analysis, can never tell the whole story.
- ¹⁸ The French tax, originally a low rate flat tax, in 2018 was graduated according to added sugar content.
- ¹⁹ For the same reason, the effects of more traditional excise taxes like those on alcohol may also be difficult to analyze: see, for instance, Gehrsitz et al. (2020) on the substantial substitution (and potential health) effects arising from the common practice of imposing differential taxes on e.g. beer, wine, and spirits.
- ²⁰ Diagnostic and Statistical Manual of Mental Disorders, 5th Edition (American Psychiatric Association)
- ²¹ With respect to tobacco and alcohol, much of the revenue is collected from the relatively small proportion of the population that is addicted and hence do not reduce their consumption much if at all when confronted with taxes, which is one reason these taxes can be, and are, levied at much higher rates than any proposed SSB taxes and still produce so much revenue.
- ²² Even with respect to the much heavier and long-standing ‘corrective’ taxes on alcohol, the jury is still out with respect to their effectiveness. A recent review of alcohol consumption in US states, for example, after the almost ritual complaint in all studies about the inadequacy of the data, found no systematic relationship between tax rates (or alcohol policy in general) and alcohol consumption (Fogarty and Voon, 2018). As Farhi and Gabaix (2020, p. 327) note in a general comment on the growing corrective tax literature: “...numerous quantities can in principle have a big impact on optimal policy but have scarcely or not yet been measured.”
- ²³ Ultra-processed food is food incorporating such additives as added sugar, preservatives, artificial flavors, and colors.
- ²⁴ We do not discuss illicit trade, which is sometimes an issue with excise taxes, because – apart from the obvious ‘cross-border’ implications of local taxes – such trade seems unlikely to be important with respect to relatively low value products like those subject to SSB taxes.
- ²⁵ For a discussion of many such policies, see McKinsey Global Institute (2014); see also Pomeranz (2011), World Cancer Research Fund International (2015), and OECD (2019).
- ²⁶ We are hardly the first to make this point. For example, Gruber (2010) noted that the case for reducing obesity through taxing some ‘input’ (like SSB) is more challenging than the case for taxing tobacco and alcohol for a number of reasons – mostly, in his view, for such technical reasons as the non-monotonic nature of the damage from poor eating habits as well as the uncertainty of the science linking consumption of particular goods to socially undesirable outcomes and the uncertainty about possibly undesirable substitution reactions. If obesity is the problem, he suggests, the best tax approach is simply to tax obesity – e.g. tax people on their body weight (or some imperfect proxy like BMI). Although it seems unlikely that there is anyone anywhere who would dare (or want) to adopt this ultimate way to make ‘fat shaming’ official, a broader-based nutrient tax, like the sugar tax we discuss in Section 5, may be a more acceptable approach to the problem, as well as considerably more effective than taxing only sugary drinks.
- ²⁷ All these numbers are of course rough estimates, but it is clear that the optimal tax is considerably lower when correcting only for externalities. (See Kalamov and Runkel (2019) for a theoretical argument showing that doing so is sometimes the optimal approach in any case.) The numbers mentioned in the text may not seem to add up, but the reason is that the full ‘optimal’ calculation in addition to externalities and internalities also includes adjustments for the progressivity of internality correction and the regressive incidence of the tax, and these different components interact in complex ways that result in the estimates reported in the text.
- ²⁸ A tax aimed at offsetting internalities should in principle be based on the cost of the harm consumers do themselves, just as an externality-offsetting tax should be based on the cost to others. It is so difficult to measure the extent of such ‘self-harm’ in a heterogeneous population that some have concluded that it is simply not practical to offset such costs by a tax (Marron, 2015). ²⁹ For a good initial discussion of these issues, see e.g. Congdon, Kling and Mullainathan (2011).
- ³⁰ As Kaplow (2020) has recently argued, the correct way to analyze any tax policy is first to consider its effects on welfare (‘efficiency’ in economic terms) assuming that the policy in question is accompanied by policies which assure that it will have

no redistributive effect, and then consider separately how to deal with the redistributive effect. This approach is not always accepted, let alone simple to implement, but separating the issues in this way has the virtue of making it clear what is being done. In the end, tax decisions are always political decisions and in politics making things clear may not always be conducive to reaching an acceptable decision. Still, it is critical to think things through as clearly as possible when it comes to designing tax policy.

- ³¹ However motivated, such taxes at best fit somewhat uneasily within the public finance framework because, as tax experts have long argued “...excises are not finely calibrated instruments capable of achieving social and economic policy objectives (Cnossen, 1977, p. 121).”
- ³² Devereux (2019) suggests that the recent ‘nudge’ literature in many ways seems to be a modern version of the well-known ‘socialist calculation’ debate that took place between prominent economists (notably Ludwig von Mises and Oskar Lange) almost a century ago, with ‘big data’ now playing the role of a wise government in determining how to apply control theory, and some being as doubtful of the wisdom of trusting algorithms in the hands of governments as others are with respect to trusting governments. A more cynical take on the nudge literature might be to the eagerness with which some governments have taken up this approach may at least to some extent simply reflect the eternal search for the elusive ‘free lunch’ of politics – namely, a simple answer to complex problems.
- ³³ Jaacks (2019) who emphasizes the relatively small impact of ‘moral’ taxes on SSB and other ‘bad’ foods similarly stresses the need for much tighter market regulation as part of the needed “suite of coordinated policies.” See also Box 2 above.
- ³⁴ Another way to make much the same point is to say that “...government itself is the institutionalization of confusion (arising out of the need to moderate competing demands); of red tape (arising out of the need to satisfy demands that cannot be moderated); and of avoided responsibility (arising out of the desire to retain power by minimizing criticism (Sandler and Hudson, 2008, p.4)”
- ³⁵ For a useful view, see Bannerjee and Duflo (2019, chap. 4), who stress that wants may not be needs and needs may not be wants and that preferences are largely shaped by life experiences and hence by events and community.
- ³⁶ For an excellent review of this problem in the context of foreign advisers in a particular country, see Bridges and Woolcock (2017). Few seem to realize how easy it is for experts and policy makers to face similar obstacles and make similar mistakes in their own country.
- ³⁷ As DeCicca, Kenkel and Lovenheim (2020) have recently noted, there has been surprisingly little welfare analysis of the internalities argument even in the much more important and more explored context of tobacco taxation.
- ³⁸ One reason the demand for SSB is more elastic than that for tobacco or alcohol is because ‘sugar addiction’ is, if one thinks it is real, likely less widespread and deep than tobacco or alcohol addiction. See Box 1.
- ³⁹ In contrast, a few years later, similar proposals in Colombia and Argentina were defeated by well-organized and well-financed counterattacks by industry opponents (Bergallo et al., 2019)
- ⁴⁰ Fooks et al.(2019), for example, provide a lengthy list of the ‘agnogenic’ (which the dictionary says means ‘of unknown origin’, but which seems to be used in this paper as meaning something closer to ‘unacceptable in scholarly work’) practices and techniques reportedly used by the industry in South Africa. Their comments on the selective use of references, problems with the data and the modelling, and the likely overstatement of the adverse economic effects of the tax in terms of employment seem to have some merit. Even the careful recent work of Alcott , Lockwood and Taubinsky (2019a) on which we draw extensively, depends to a considerable extent on three concepts not always accepted as appropriate guides to policy – internalities, optimal taxation (modified a bit to incorporate a bit of behavioralism), and benevolent paternalism.
- ⁴¹ An interesting example of what can happen is the differential treatment of soft drinks in Ireland during the 1975-1992 period which led to some very messy classification problems that turned out to impose significant administrative costs (Bahl, Bird and Walker, (2003).
- ⁴² As Cornelsen and Smith (2017, p.139) correctly observe, “...if the aim is to raise revenue, the tax should not be posted and if the aim is to reduce consumption, it should be posted and well signalled to the consumer.”
- ⁴³ Separately quoted taxes which are not included in the posted sales price but added on at check-out may perhaps also play a useful role in a democracy by increasing public awareness of taxes and alertness as to how governments spend the money they collect (Bird, 2010).
- ⁴⁴ Nelson and Moran (2019) in a systematic review and meta-analysis of the pass-through of taxes on alcohol in the US and elsewhere, similarly found that existing studies were so diverse and difficult to compare that their conclusion is simply that

pass-through rates depend on many factors that all that can be concluded is that this is yet another factor that makes the design of optimal corrective taxes inherently complex.

- ⁴⁵ A study in South Africa also found up to 100% pass-through despite the heterogeneous response of firms (Stacey et al., 2019).
- ⁴⁶ See <https://info.worldbank.org/governance/wgi/> accessed April 22, 2020.
- ⁴⁷ For a critical comment on this common practice, which appears to be surprisingly unexamined and, perhaps in part for that reason, generally accepted in the literature, see ICTD (2015).
- ⁴⁸ Note, however, that if an international agreement on dividing the corporate tax base can be reached – which Bird and Mintz (2020) suggest seems unlikely in the near future – and the resulting apportionment weights sales heavily, this factor would become much less important.
- ⁴⁹ Of course, the effects reported in studies made soon after any tax is introduced may in some cases reflect short-term stock adjustments in purchasing that may not be sustained over time. (Hall, Hammond and Rahmandad, 2014).
- ⁵⁰ Similar situations may occur even in developed countries. In Canada, for example, where some remote northern indigenous communities have no potable water, the main source of hydration, especially for children, is often SSB, which are both potable and not perishable (Reidiger and Bombak, 2018) and also often much cheaper – sometimes as little as one-quarter of the cost of bottled water (Arango, 2018). Interestingly, the government of the Northwest Territories, where some of these communities are located, is the only subnational government in Canada to have presented an official report on the possibility of an SSB tax (Northwest Territories, 2019). The only other provincial government that has published anything on this issue, British Columbia, has as yet not acted in response to a commissioned report which concluded that a special tax would have undue administrative and compliance costs and that a better approach would simply be to impose the existing provincial sales tax (which at present as in some US states exempts soft drinks) on all non-alcoholic beverages except non-carbonated water and unflavored milk (Tedds, Duff and Ramsey, 2018).
- ⁵¹ In one country, we observed street vendors of bottled water filling up the bottles with tap water which was known not to be safe.
- ⁵² Jones, Veerman and Hammond (2017) note that 100 percent fruit juices are also an important source of sugar and should be included in the tax base. As shown in the Appendix, some countries seem to agree.
- ⁵³ Kane and Malik (2019) suggest diet beverages should be included in the tax base. As noted earlier, some countries do so, though, as in the case of fruit juice, it is not clear if the aim is to achieve a stronger health effect or simply to broaden the tax base and (perhaps) increase revenue.
- ⁵⁴ One way to capture this effect is to use price elasticities ‘scaled’ by the appropriate ‘total food elasticity’ (the elasticity for all food given the policy-induced changes in prices). Using this method with New Zealand data, Blakeley et al. (2020) suggest that the result is invariably to reduce the estimated impact on health. Other methods produce other results, as Allais et al. (2020) recently suggested in a French study summarized above.
- ⁵⁵ Cane sugar, like corn, is also used in the production of ethanol, which is often combined with gasoline as a fuel source.
- ⁵⁶ Note that this will not affect the consumption of ‘free sugar – the sugars naturally present in honey, fruit juices and concentrates. From a health perspective, it does not matter if sugar is free or added.
- ⁵⁷ Interestingly, the Mexican SSB tax as initially imposed put a lower tax on beverages sweetened with cane sugar than with those sweetened beet sugar and especially HFCS. This was found to be, contrary to GATT rules, protectionism for domestic cane sugar, and was consequently removed (George, 2019).
- ⁵⁸ The US federal excise tax on petroleum is a similar tax.
- ⁵⁹ Obesity is a national problem, and is better addressed with a national tax, so special sugar taxes at the subnational level for health reasons would presumably no longer be needed. When states and localities have general retail sales taxes, the tax base should include any sugar tax included in the price. In countries with VATs, the basic VAT rate should, as with excise taxes in general, be levied on a base that includes the sugar tax.
- ⁶⁰ As an example, Norway – which has more experience with special sugar taxes than anywhere else - increased its taxes on added sugars by more than 80 percent in 2018 as part of its goal of reducing sugar intake by 12.5 percent by 2021 (World Economic Forum, 2018).

- ⁶¹ Of course, appropriate labelling would be required, as Allen and Child (2019) discuss.
- ⁶² These items are sometimes called ‘ultra-processed foods’, one definition of which is “formulations of several ingredients which, besides salt, sugar, oils, and fats, include food substances not used in culinary preparations, in particular flavours, colours sweeteners, emulsifiers, and other additives used to imitate sensorial qualities of unprocessed or minimally processed foods and their culinary preparations or to disguise undesirable qualities of the final product” (Steele et al. 2016, p.6). As this definition suggests, it can be quite difficult to classify ultra-processed foods (Monteiro, et.al., 2019) and doing so would make the administration of the import component of the sugar tax complex and expensive.
- ⁶³ A recent paper (Rodemeier and Loschel, 2020) illustrates how complex such questions can be and how little we really know about designing the best ‘set’ of policy instruments. Their analysis suggests that providing full information to prospective purchasers (of energy-efficient appliances) reduced demand while partial disclosure actually increased demand. However, because providing full information reduced social welfare (the loss in terms of increased environmental externalities outweighed the gain in consumer surplus), a better approach, they concluded, was not only to tax energy-inefficient products but to provide little information to consumers because the more they knew, the less responsive they were to the taxes.
- ⁶⁴ But see the interesting New Zealand study by Blakeley et al. (2020).
- ⁶⁵ The revenue objective – underlined by the Mayor’s attack on producers and retailers for raising beverage prices (an outcome that would presumably have increased health benefits) - is why the tax in Philadelphia, unusually in American cities, was extended to tax diet beverages (where, as mentioned earlier, the jury is still out on the health effects). Given the political context, it also helped that the inclusion of diet beverages, which are consumed more by higher-income consumers, moderated the regressivity of the tax as a whole although on the same time it may also have reduced potential health gains by reducing the scope for substitution.
- ⁶⁶ As noted earlier, however, so little is known about how different policy elements interact that the outcome of any policy mix can seldom be precisely predicted.
- ⁶⁷ Packer (2016, p. 3) characterizes the campaign for SSB taxes as yet another example of “the white (male) middle-class...curtailing, shaming, monitoring and policing lower (and immigrant) classes’ eating cultures.” One may think this is too strong, but her basic point seems correct in two respects. First, what people eat or do not eat is not dictated by health concerns. It is shaped much more by cultural, religious, and family background as well as personal pleasure. Secondly, the tax-as-solution approach (much like the almost as common education-as-cure approach) may, when it comes to eating habits, come across as little more than ‘fat shaming’ which tends often to stigmatize those most at risk. As discussed earlier, if libertarian paternalism (nudging) is not to slide into outright authoritarianism, decisions made about food policies need to be made with the knowledgeable consent of those affected.
- ⁶⁸ The same factors of course constrain the extent to which transfers can be used to compensate those harmed by the imposition of corrective taxes. Earmarking the limited amount of revenue from an SSB to some sort of health, nutrition, or other presumably pro-poor objective is unlikely to do the job. Such policies may provide some compensating gain to those who lose most when the tax is imposed (Sassi et al., 2018). But they cannot ensure that there are not still, after all is said and done, some big losers, who are more likely to be low-income people than multinational enterprises: Sallee (2019), for instance, argues that if a gasoline tax is intended to correct carbon emissions, it is simply not possible to design a national policy in the US that will not leave a third of the population as losers. No matter how well designed a policy is, there will almost always be losers, and in practice the biggest losers will likely be those with the weakest political voice.

References

- Ahmed, S., K. Guillem, and Y. Vandaele (2013) “Sugar Addiction: Pushing the Drug-Sugar Analogy to the Limit,” *Current Opinion in Clinical Nutrition and Metabolic Care*, 16(4): 434-439.
- Alcott, H., B. Lockwood, and D. Taubinsky (2019a) “Should We Tax Sugar-Sweetened Beverages? An Overview of Theory and Evidence,” *Journal of Economic Perspectives*, 17 (3): 202-227.
- Alcott, H., B. Lockwood, and D. Taubinsky (2019b) “Regressive Sin Taxes, with an Application to the Optimal Soda Tax,” *Quarterly Journal of Economics*, 134 (3): 1557-1626.
- Allais, O. et al. (2020) Reformulation and Taxes for Healthier Consumption: Empirical Evidence in the French Dessert Market, Working Paper No. 1082, Toulouse School of Economics, March.

- Allen, L. and D. Child (2019) *Guidebook: Taxing Sugar in Food and Beverage Products* (Washington: International Tax and Investment Center).
- Alvarado, M. et al. (2019) "Assessing the Impact of the Barbados Sugar-sweetened Beverage Tax on Beverage Sales: An Observational Study," *International Journal of Behavioral Nutrition and Physical Activity*, 16 (13). <https://doi.org/10.1186/s12966-019-0776-7>
- Alvarez-Sanchez, C. et al. (2018) "Does the Mexican Sugar-sweetened Beverage Tax have a signaling effect?" *PLoSOne*, 2018 Aug 22, 13(8) <https://doi.org/10.1371/journal.pone.0199337>
- Arango, M. (2018) "A Made-in Canada Sugary Drink Levy Can Help Reduce Intake While Being Mindful of Addressing Health Disparities," *CMAJ* 2018 Aug 20; 190 (33): E992. <https://doi.org/10.1503/cmaj.69859>
- Ardalan, A. and S. Kessing (2019) Tax Pass-through in the European Beer Market, CESifo Working Paper No 7626, April.
- Arno, A. and S. Thomas (2016) "The Efficacy of Nudge Theory Strategies in Influencing Adult Dietary Behaviour: A Systematic Review and Meta-analysis," *BMC Public Health* 16: 676. <https://doi.org/10.1186/s12889-016-3272-x>
- Arrow, K. (1963) "Uncertainty and the Welfare Economics of Medical Care," *American Economic Review*, 53(5): 941-973.
- Backholer, K, et al. (2018) "Sugar-sweetened Beverages in 2018: A Year of Reflections and Consolidation," *Public Health Nutrition*, 21 (18): 3291-3295.
- Bahl, R., R. Bird, and M. Walker (2003). "The Uneasy Case Against Discriminatory Excise Taxation: Soft Drink taxes in Ireland" *Public Finance Review*, 31 (5): 510-534.
- Bandy, L. et al. (2020) "Reductions in Sugar Sales from Soft Drinks in the UK from 2015 to 2018," *BMC Medicine* 18:20. <https://doi.org/10.1186/s12916-019-1477-4>
- Banerjee, A. and E. Duflo (2019) *Good Economics for Hard Times* (New York: Public Affairs).
- Barclay, A. and J. Brand-Miller (2011) "The Australian Paradox: A Substantial Decline in Sugar Intake over the Same Timeframe that Overweight and Obesity have Increased," *Nutrients*, 3(4): 491-504.
- Bergalio, P. et al. (2018) "Regulatory Initiatives to Reduce Sugar-sweetened Beverages (SSB) in Latin America," *PLOS One*, October. <https://doi.org/10.1371/journal.pone.0205694>
- Beverage Association of South Africa (2016) Response to Taxation of Sugar-sweetened Beverages, Policy Paper, August.
- Bird, R. (2010) "Visibility and Accountability-- Is Tax-Inclusive Pricing a Good Thing?" *Canadian Tax Journal*, 58 (1, 2010): 63-76.
- Bird, R. and J. Jun (2007) "Earmarking in Theory and Korean Practice," in S. Phua, ed., *Excise Taxation in Asia* (Singapore: National University of Singapore, 2007), pp. 49-86.
- Bird, R. and J. Mintz (2020) "International Tax Sharing: Can the Dream Become Reality?" in R. Krever and F. Vaillancourt, eds., *The Allocation of Multinational Business Income: Reassessing the Formulary Apportionment Option* (Wolters Kluwer, 2020), pp. 299-321.
- Blakely, T. et al. (2020) "Modelling the Health Impact of Food Taxes and Subsidies with Price Elasticities: The Case for Additional Scaling of Food Consumption Using the Total Food Expenditure Elasticity," *PLoSOne*15(3): [doi: 10.1371/journal.pone.0230506](https://doi.org/10.1371/journal.pone.0230506)
- Blecher, E. (2015) "Taxes on Tobacco, Alcohol and Sugar Sweetened Beverages: Linkages and Lessons Learned," *Social Science & Medicine*, 136-137: 175-179.
- Borges, M. et al. (2017) "Artificially Sweetened Beverages and the Response to the Global Obesity Crisis," *PLOS Medicine*, <https://doi.org/10.1371/journal.pmed.1002195>
- Bosch, A. and S. Koch (2014) Using a Natural Experiment to Examine Tobacco Tax Regressivity, Working Paper, Department of Economics, University of Pretoria, May.
- Bourke, E. and L. Veerman (2018) "The Potential Impact of Taxing Sugar Drinks on Health Inequality in Indonesia," *BMJ Global Health*, doi:10.1136/bmjgh-2018-00092

- Bridges, K. and M. Woolcock (2017) How (Not) to Fix Problems that Matter: Assessing and Responding to Malawi's History of Institutional Reform, World Bank Policy Research Paper 8289.
- Buchanan, J. and F. Forte (1964) "Fiscal Choice through Time: A Case for Indirect Taxation?" *National Tax Journal*, 17(3): 1441-57.
- Capacci, S., O. Allais, C. Bonnet, and M. Mazzocchi (2019) "The Impact of the French Soda Tax on Prices and Purchases. An Ex Post Evaluation," *PLOS One*, 14(10): <https://doi.org/10.1371/journal.pone.0223196>
- Cashin, C., S. Sparkes, and Danielle Bloom (2017) Earmarking for Health: From Theory to Practice, Health Financing Working Paper No. 5 (Geneva: World Health Organization).
- Cawley, J., D. Frisvold and D. Jones (2019) The Impact of Sugar-sweetened Beverage Taxes on Purchases: Evidence from Four City-Level Taxes in the U.S., NBER Working Paper 26393, October.
- Cawley, J., D. Frisvold, A. Hill and D. Jones (2020) "Oakland's Sugar-sweetened Beverage Tax: Impacts on Prices, Purchases and Consumption by Adults and Children," *Economics & Human Biology*, 37, available at <https://doi.org/10.1016/j.ehb.2020.100865>
- Cawley, J. and C. Meyerhoefer (2012) "The Medical Care Costs of Obesity: An Instrumental Variables Approach," *Journal of Health Economics*, 31(1): 219-230.
- Cawley, J., D. Frisvold, A. Hill, and D. Jones (2019) Oakland's Sugar-Sweetened Beverage Tax: Impacts on Prices, Purchases and Consumption by Adults and Children, NBER Working Paper 26233, September.
- Chetty, R., A. Looney, and K. Kroft (2009) "Salience and Taxation: Theory and Evidence," *American Economic Review*, 99(4): 1145-1177.
- Christiansen, V. and S. Smith (2012) "Externality-correcting taxes and regulation", *Scandinavian Journal of Economics*, 114(2): 358-383
- Cnossen, S. (1977) *Excise Systems: A Global Study of the Selective Taxation of Goods and Services* (Baltimore: Johns Hopkins University Press).
- Cnossen, S., ed. (2006) *Excise Tax Policy and Administration in Southern African Countries* (Pretoria: University of South Africa).
- Cnossen, S. (2010) "Excise Taxation in Australia," In Melbourne Institute, *Australia's Future Tax and Transfer Policy Conference* (Melbourne: Melbourne Institute of Applied Economic and Social Research), pp. 236-256.
- Cnossen, S. (2019) *Modernizing VATs in Africa* (Oxford: Oxford University Press).
- Colchero, M. et al. (2016) "Beverage Purchases from Stores in Mexico Under the Excise Tax on Sugar Sweetened Beverages: Observational Study," *British Medical Journal*, 352: h6704, January.
- Colchero, M., J. Rivera-Dommarco, B. Popkin, and S. Ng (2017) "In Mexico, Evidence of Sustained Consumer Response Two Years after Implementing a Suga-Sweetened Beverage Tax," *Health Affairs*, 36(3): available at <https://doi.org/10.1377/hlthaff.2016.1231>
- Congdon, W., J. Kling and S., Mullainathan (2011) *Policy and Choice: Public Finance through the Lens of Behavioral Economics* (Washington: Brookings Institution).
- Cook, P. (2007) *Paying the Tab: The Costs and Benefits of Alcohol Control* (Princeton NJ: Princeton University Press).
- Cornelsen, L and R. Smith (2018) "Soda Taxes – Four Questions Economists Need to Address," *Food Policy* 74: 138-1432.
- Cremer, H. C. Gouldao, and J. Lozachmeur (2019) Soda Tax Incidence and Design Under Monopoly, CESifo Working Paper No. 7525.
- Cuadrado, C. et al. (2020) "Effects of a Sugar-sweetened Beverage Tax on Prices and Affordability of Soft Drinks in Chile: A Time Series Analysis," *Social Science and Medicine*, 245: <https://doi.org/10.1016/j.socscimed.2019.112708>
- Deaton, A. and N. Cartwright (2017) "Understanding and Misunderstanding Randomized Controlled Trials," *Social Science & Medicine*, 210(August): 2-21.

- DeCicca, D. Kenkel, and M. Lovenheim (2020) The Economics of Tobacco Regulation: A Comprehensive Review, NBER Working Paper 26923, April.
- Devereaux, A. (2019) "The Nudge Wars: A Modern Socialist Calculation Debate," *Review of Austrian Economics*, 32: 139-158.
- Dhami, S. and A. al-Nowahi (2007) "Why Do People Pay Taxes: Expected Utility versus Prospect Theory," *Journal of Economic Behaviour and Organization*, 64: 171-192.
- Dhami, S. and E. Beinhocker (2019) The Behavioural Foundations of New Economic Thinking, INET Oxford Working Paper No. 2019-13.
- DiNicolantonio, J. O'Keefe, and W. Wilson (2018) "Sugar Addiction: Is It Real? A Narrative Review," *British Journal of Sports Medicine*, 52(14):910-913. doi:10.1136/bjsports-2017-097971
- Drewnowski, A. and C. Rehn (2014) "Consumption of Added Sugars among US Children and Adults by Food Purchase Location and Food Source," *American Journal of Clinical Nutrition*, 100(3): 901-907.
- Du, M., A. Tugendhaft, A. Erzse, and K. Hofman (2018) "Sugar-sweetened Beverage Taxes: Industry Response and Tactics," *Yale Journal of Biology and Medicine*, 91(2): 185-190.
- Euromonitor (2020) Passport: Global Sugar-Sweetened Beverage Taxes: Global Learnings and Outlook for 2020, March.
- Farhi, E. and X. Gabaix (2020) "Optimal Taxation with Behavioral Agents," *American Economic Review*, 110(1): 298-336.
- Fogarty, J. and D. Voon (2018) "Alcohol Consumption in the United States: Past, Present and Future Trends," *Journal of Wine Economics*, 13(2): 121-143.
- Fooks, G., S. Williams, G. Box and G. Sacks (2019) "Corporations' Use and Misuse of Evidence to Influence Health Policy: A Case Study of Sugar-Sweetened Beverage Taxation," *Globalization and Health*, 15:56, doi.org/10.1186/s12992-019-0495-5.
- Francis, N., D. Marron, and K. Rueben (2016) *The Pros and Cons of Taxing Sweetened Beverages Based on Sugar Content*, Urban Institute, Washington, December.
- Frey, B. (2005) "Excise Taxes: Economics, Politics, and Psychology," in S. Cnossen, ed., *Theory and Practice of Excise Taxation* (Oxford: Oxford University Press), pp. 230-244.
- Gearhardt, A., W. Corbin, and K. Brownell (2009) "Food Addiction: An Examination of the Diagnostic Criteria for Dependence," *Journal of Addiction Medicine*, 3(1): 1-7.
- Gehrsitz, M., H. Saffer and M. Grossman (2020) The Effect of Changes in Alcohol Tax Differentials on Alcohol Consumption, NBER Working Paper 27117, May.
- George, A. (2019) "Not So Sweet Refrain: Sugar-Sweetened Beverage Taxes, Industry Opposition and Harnessing the Lessons Learned from Tobacco Control Legal Challenges," *Health Economics, Policy And Law*, 14:509-535.
- Gerster, A. and M. Kramm (2019) Correct Me If You Can – Optimal Taxation of Internalities, CESifo Working Paper 7732, June.
- Grignon, M. et al (2018) "Moral Hazard in Health Insurance," *Oeconomia*, 8 (3): 367-405.
- Gruber, J. (2010) "Commentary," in *Dimensions of Tax Design: The Mirrlees Review* (Oxford: Oxford University Press), pp. 407-422.
- Hagenaars, L., P. Jeurissen, and N. Klazinga (2018) "Sugar-sweetened Beverage Taxation in 2017: A Commentary on the Reasons Behind Their Quick Spread in the EU Compared with the USA," *Public Health Nutrition*, 22(1): 186-189.
- Hagmann, D., M. Siegrist, and C. Hartmann (2018) "Taxes, Labels, or Nudges? Public Acceptance of Various Interventions Designed to Reduce Sugar Intake," *Food Policy*, 79:156-165.
- Hall, K. R. Hammond, and H. Rahmandad (2014) "Dynamic Interplay among Homeostatic, Hedonic, and Cognitive Circuits Regulating Body Weight," *American Journal of Public Health*, 104: 1169-1175.
- Harding, M. and M. Lovenheim (2014) The Effect of Prices on Nutrition: Comparing the Impact of Product- and Nutrient-Specific Taxes, NBER Working Paper 19781.

- He, X. and J. Balagtas (2019) Spatial Competition and Pass-through of Soda Taxes: Evidence from Philadelphia, Paper presented to 2019 Agricultural and Applied Economics Association Annual Meeting, Atlanta GA, July
- Hirschman, A. (1967) *Development Projects Observed* (Washington: Brookings Institution).
- Hudson, D. (2019) An Examination of Foreign Subsidies and Trade Policies for Sugar, ICAC-BP-19-01, International Center for Agricultural Competitiveness, Texas Tech University.
- ICTD (International Centre for Tax and Development) (2015) The Sustainable Development Goals – Reject Tax Targeting, available at <https://www.ictd.ac/blog/the-sustainable-development-goals-reject-tax-targeting/>
- Jaacks, L. (2019) “Taxes on Saturated Fat, Salt, And Sugar Improve the Healthiness of Grocery Purchases, But Changes Are Frustratingly Small,” *The Lancet*, 4, August www.thelancet.com/public-health
- James, E., M Lajous, and M. Reich (2020) “The Politics of Taxes for Health: An Analysis of the Passage of the Sugar-Sweetened Beverage Tax in Mexico,” *Health Systems & Reform*, 6 (1). <https://doi.org/10.1080/23288604.2019.1669122>
- Jones, A., L. Veerman, and D. Hammond (2017) The Health and Economic Impact of a Tax on Sugary Drinks in Canada, University of Waterloo, School of Public Health and Health Sciences.
- Kalamov, Z. and M. Runkel (2019) Sin Taxes, Insurance and the Correction of Internalities, <http://hdl.handle.net/10419/203620>
- Kane, R. and V. Malik (2019) “Understanding Beverage Taxation: Perspective on the Philadelphia Beverage Tax’s Novel Approach,” *Journal of Public Health Research*, 8: 1466
- Kaplow, L. (2020) A Unified Perspective on Efficiency, Redistribution, and Public Policy, NBER Working Paper 26683, January
- Keen, M. (1998) “The Balance between Specific and *Ad Valorem* Taxation,” *Fiscal Studies*, 19: 1-378.
- Levaggi, R. C. Marchiori, and P. Panteghini (2020) Lifestyle Taxes in the Presence of Profit Shifting, CESifo Working Paper No. 8138, February.
- Lindahl, E. (1958) “Just Taxation—A Positive Solution,” in R. Musgrave and A. Peacock, eds., *Classics in the Theory of Public Finance* (London: Macmillan), pp. 168-176.
- Lloyd, P. and D. MaLaren (2018) “Should We Tax Sugar and If So How?” *Australian Economic Review*, 52(1):19-40.
- Loughead, K. (2018) Sales Taxes on Soda, Candy, and Other Groceries, 2018, Tax Foundation, Fiscal Fact No.598, July.
- Lucinda, C. and R. Moita (2019) The Political Economy of an Optimal Congestion Tax: An Empirical Investigation, Department of Economics, FEA-USA Working Paper No. 2019-10.
- Luger, M. et al. (2017) “Sugar-sweetened Beverages and Weight Gain in Children and Adults: A Systematic Review from 2013 to 2015 and a Comparison with Previous Studies,” *Obesity Facts*, 10:674-693.
- Markus, C. et al. (2017) “Eating Dependence and Weight: No Human Evidence for a “Sugar Addiction” Model of Overweight,” *Appetite*, 114: 64-72.
- Marron, D. (2015) Should We Tax Internalities like Externalities? Working Paper, Tax Policy Center, Urban Institute and Brookings Institution, Washington, November.
- McDonald, A. (2015) Sugar-sweetened Beverage Tax in Pacific Island Countries and Territories: A Discussion Paper (Noumea, New Caledonia: Secretariat of the Pacific Community) available at <https://www.otago.ac.nz/wellington/otago665562.pdf> (accessed 25 March 2020).
- McKinsey Global Institute (2014) Overcoming Obesity: An Initial Economic Analysis, McKinsey Global Institute, November
- Monteiro, C. et al. (2019) Ultra-processed Foods, Diet Quality, and Health using the NOVA Classification (Rome: FAO)
- Muhammad, A., B. Meade, D. Marquandt, and D. Mozaffarian (2019) “Global Patterns in Price Elasticities of Sugar-Sweetened Beverage Intake and Potential Effectiveness of Tax Policy: A Cross-sectional Study of 164 Countries by Sex, Age and Globalincome Decile,” *BMJ Open* 2019, 9: doi: 10.1136/bmjopen-2018-0265390
- Mullee, A. et al (2019) “Association between Soft Drink Consumption and Mortality in 10 European Countries,” *JAMA Intern Med* 179(11): 1479-1490.

- S. Nakimovsky et al. (2016) "Taxes of Sugar-Sweetened Beverages to Reduce Overweight and Obesity in Middle-Income Countries: A Systematic Review," *PLOS One*, 11(9) doi:10.1371/journal.pone.0163358
- NHS (2019) Soft Drinks, Including Sugar-free Versions, Linked to Earlier Death, September, available at <https://www.nhs.uk/news/food-and-diet/soft-drinks-including-sugar-free-versions-linked-earlier-death/>
- Nelson, J. (2020) Fixed-effect versus random-effects meta-analysis in economics: a study of pass-through rates for alcohol beverage excise taxes, available at <http://www.economics-ejournal.org/economics/discussionpapers/2020-1>
- Nelson, J. and J. Moran (2019) "Effects of Alcohol Taxation on Prices: A Systematic Review and Meta-analysis of Pass-Through Rates," *B.E. Journal of Economic Analysis & Policy*, 20 (1): 10.1515/bejeap-2019-01342019:20190134
- New Zealand Institute of Economic Research (2017) Sugar Taxes: A Review of the Evidence, Wellington, August.
- Northwest Territories (2019) *Using the Tax System to Encourage Healthy Choices: Implementing a Sugar-sweetened Beverages Tax in the Northwest Territories* (Yellowknife NWT).
- Nyberg, J. (2009) Sugar International Market Profile, Background Paper for the Competitive Commercial Agriculture in SubSaharan Africa Study, World Bank.
- Nyman, J. (2003) *The Theory of the Demand for Health Insurance* (Stanford CA: Stanford University Press).
- OECD (2019) *The Heavy Burden of Obesity* (Paris).
- Packer, M. (2016) "Soda Policies and Social Anxieties," *Berkeley Journal of Sociology* <http://berkeleyjournal.org/2016/05/sodapolicies-and-social-anxieties/>
- Pauly, M. (1968) "The Economics of Moral Hazard: Comment," *American Economic Review*, 58(3): 531-537.
- Pigou, A. (1960) *The Economics of Welfare* (4th ed.; London: Macmillan).
- Pomeranz, J. (2012) "Advanced Policy Options to Regulate Sugar-sweetened Beverages to Support Public Health," *Journal of Public Health Policy*, 33(1): 75-88.
- Popkin, B., P. Schneider and M. Shekar (2020) "Addressing Overweight/Obesity: Lessons for Future Actions," in Shekar and Popkin, eds., *Obesity*, pp. 109-160.
- Public Health England (2018) *Sugar Reduction and Wider Reformulation Programme: Report on Progress towards the First 5% Reduction and Next Steps* (London: Public Health England).
- Reidiger, N. and A. Bombak (2018) "Sugar-sweetened Beverages as the New Tobacco: Examining a Proposed Tax Policy through a Canadian Social Justice Lens," *CMAJ* 2018 Mar 19, 190(11): E327-330.
- Rees-Jones, A. and K. Rozema (2019) Price Isn't Everything: Behavioral Response around Changes in Sin Taxes, NBER Working Paper 25958, June.
- Rodemeier, M. and A. Loschel (2020) The Welfare Effects of Persuasion and Taxation: Theory and Evidence from the Field, CESifo Working Paper 8259.
- Rumsfeld, D. (2002) "Press Conference by US Secretary of Defence, Donald Rumsfeld," *NATO Speeches*, June 2, 2002. www.nato.int/docu/speech/2002/s020606g.htm
- Sallee, James (2019) Pigou Creates Losers: On the Implausibility of Achieving Pareto Improvements from Efficiency-enhancing Policies, NBER Working Paper 25831, May.
- Sandler, M. and D. Hudson (2008) *Beyond the Bottom Line: How to Do More with Less in Nonprofit and Public Organizations* (Oxford: Oxford University Press).
- Sassi, F. et al. (2018) "Equity impacts of Price Policies to Promote Healthy Behaviours," *Lancet*, 391: 2059-2070.
- Science Advisory Committee on Nutrition (2015) *Carbohydrates and Health* (London: TSO).
- Serse, V. (2019) Do Sugar Taxes Affect the Right Consumers? CORE DP 2019/7.,

- Shekar, M. and B. Popkin, eds. (2020) *Obesity: Health and Economic Consequences of an Impending Global Challenge* (Washington: World Bank).
- Silver, L. et al. "Changes in Prices, Sales, Consumer Spending, and Beverage Consumption One Year after a Tax on Sugarsweetened Beverages in Berkeley, California: A Before-and-after Study," *PLOS Medicine* (2017) doi.or/10.1371/journal.pmed.102283, April.
- Springmann, M. et al. (2018) "Options for Keeping the Food System within Environmental Limits," *Nature* 562: 519–525.
- Stacey, N. et al. (2019) "Sugar-based Beverage Taxes and Beverage Prices: Evidence from South Africa's Health Promotion Levy," *Social Science & Medicine*, 238, October, 112465.
- Steele, E. et al. (2016) "Ultra-processed Foods and Added Sugars in the US Diet: Evidence from a Nationally Representative Cross-sectional Study," *BMJ Open* 2016;6:e009892. doi: 10.1136/bmjopen-2015-009892
- Sugar Association (2020) <https://www.sugar.org/diet/sources-of-added-sugars/>
- Tanzi, V. (2018) *Termites of the State: Why Complexity Leads to Inequality* (Cambridge University Press).
- Tarrabok, A. (2008) The Law of Unintended Consequences, <https://marginalrevolution.com/marginalrevolution/2008/01/thelaw-of-unin.html>
- Tedds, L., D. Duff, and P. Ramsay (2018) *Medical Services Premium Task Force: Tax Reform Proposals for the Province of British Columbia*, April, available at <https://mpira.ub.uni-muenchen.de/96928/>
- Teng, A. et al, (2019) "Impact of Sugar-sweetened Beverage Taxes on Purchases and Dietary Intake: Systematic Review and Meta-Analysis," *Obesity Review*, 20 (9): 1187-1204.
- Thaler, R. and Sunstein, C. (2009) *Nudge: Improving Decisions about Health, Wealth, and Happiness* (Penguin Books).
- USDA (2019) Sugar and Sweeteners Policy, Economic Research Service, United States Department of Agriculture.
- Valizadeh, P., B. Popkin and s. Ng (2020) "Distributional Changes in U.S. Sugar-Sweetened Beverage Purchases, 2002-2014," *American Journal of Preventive Medicine*, available at <https://doi.org/10.1016/j.amepre.2020.02.002>
- Waterlander, W. et al. (2019) "The Effect of Food Changes on Consumer Purchases: A Randomized Experiment," *The Lancet Public Health* 4: e394-405.
- Wiss, D., N. Avena, and P. Rada (2018) "Sugar Addiction: From Evolution to Revolution," *Frontiers in Psychiatry*, 9:545. doi:10.3389/fpsy.2018.00545
- World Bank (2014) *Philippines: Delivering Successful Sin Tax Reform* (Washington)
- World Cancer Research Fund International (2015) *Curbing Global Sugar Consumption: Effective Food Policy /actions to Help Promote Healthy Diets and Tackle Obesity*, London.
- World Economic Forum (2018) Will a Sugar Tax Help Reduce Obesity? <https://www.weforum.org/agenda/2018/03/will-a-sugartax-help-reduce-obesity/>
- World Health Organization (2015) *Fiscal Policies for Diet and Prevention of Noncommunicable Diseases* (Geneva).
- Wright, A., K. Smith, and M. Hellowell (2017) "Policy Lessons from Health Taxes: A Systematic Review of Empirical Studies," *BMC Public Health* 17:583 <https://doi.org/10.1186/s12889-017-4497-z>