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The Impact of Selective Food and Non-Alcoholic Beverage Taxes

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INTERNATIONAL TAX AND INVESTMENT CENTER

International Tax and Investment Center

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Executive Summary

Use of targeted taxes on specific types of food and drink is on the rise around the world. Concerns over lifestyle-related Non-Communicable Diseases (NCDs) and associated risk factors, coupled with increasing fiscal pressures, have led to growing government interest in the use of selective food and non-alcoholic beverages taxes (SFBTs). Proponents see them as a mechanism to either reduce consumption of certain products in order to improve health outcomes or to raise government revenue.

Whether such taxes are successful in meeting either of these outcomes depends on four main factors.

The first factor in determining the effectiveness of SFBTs is the extent to which such taxes are passed through to the prices that consumers pay. It is very difficult to predict the pass-through rate before a tax is introduced given the complexity of determinants that feed into it—including the structure of the tax, the portfolio of products it applies to, and the intensity of competition between firms in that sector. Most studies positing potential health benefits from SFBTs are based on simulations of changes in demand that would result from price changes. But such studies do not necessarily consider that, in some cases, consumers see little or no increase in prices as they are instead absorbed by producers or retailers.

Empirical evidence from across the world, however, illustrates that a wide range of outcomes is possible. In some cases, there has been little observed pass-through to consumers, indicating that taxes will be effective at raising revenue but have no health benefits, since consumption will hold up. But in other cases full pass-through of the tax—or even 'over-shifting' whereby prices increase by more than the amount of the tax—has been observed. In such cases levels of consumption, of the taxed good, might decline but the flip-side is little fiscal benefit since taxes fall in line with reduced sales.

Where consumers do, however, face price hikes as a result of SFBTs, a second factor comes into play in determining their effectiveness, namely how responsive demand for the taxed good is to price rises. Here the evidence suggests that demand for the types of goods subject to SFBTs is typically relatively unresponsive to changes in price. As such, food and soft beverages may be considered attractive candidates where the incentive is to raise revenue, since increases in the tax rate are unlikely to be substantially offset by reductions in sales. However, by the same token, this means that any health goals of such taxes are less likely to be achieved.

Thirdly, even where a tax is passed on to consumers in the form of higher prices, further uncertainty about the final impact on health objectives arises because consumers may substitute taxed products for others that are not subject to the tax, but are no less unhealthy. What matters here is the specific design and breadth of the tax chosen, and as such there is limited empirical evidence on the degree to which demand for other products may change in response to the introduction of an SFBT. However, some experience suggests that consumers may do one or more of the following: switch to cheaper, and potentially lower-quality food and drink; switch to untaxed products with similar nutritional characteristics; or switch to other kinds of products entirely, with uncertain implications for health. It is important that the potential for these kinds of substitution effects is considered by policymakers when designing an SFBT.

Finally, where the introduction of an SFBT increases price differentials between neighbouring geographical areas it may lead to an increase in trans-border purchasing. This second form of switching is most likely to occur in areas close to borders, and where there are no border controls. In these areas, it makes sense for consumers to make purchases across the border at a lower total cost than to make purchases in their home jurisdiction. This dynamic can undermine both the revenue-raising and health goals of any such tax.

These four factors each play a part in determining the effectiveness of SFBTs and the above highlights the uncertainties associated with their introduction in terms of either revenue or health aims in aggregate. As well as these, other dimensions related to the impact of SFBTs are also worthy of consideration.

For example, the distributional impact of SFBTs is often raised as a cause for concern. It is argued that such taxes will disproportionately affect those in lower-income groups, which conflicts with IMF guidance suggesting that selective taxes should be used where they result in a proportionately greater impact on those in higher income groups—where they are progressive not regressive.

Some governments have sought to address these concerns by earmarking SFBT revenue for programs intended to address health objectives. In theory this might help secure tax revenue while improving health outcomes and redressing the negative impact of SFBTs on lower-income groups. However, such earmarking creates its own problems. It can distort the efficiency of government spending allocations and potentially reduce the ability of government to control how budgets are allocated. Moreover, in practice, more often than not revenue from SFBTs is seemingly allocated to the general government budget rather than targeted to support health objectives.

The evidence outlined in this paper suggests that the impact of introducing an SFBT can be wide-ranging and highly uncertain. Very few studies provide a robust and complete account of the effects of such taxes, meaning that governments seeking to introduce them are doing so in a highly speculative context.

1. Introduction

The rationale for introducing SFBTs has increasingly emphasised both revenue and health

Concerns over lifestyle-related Non-Communicable Diseases (NCDs) and associated risk factors, coupled with increasing fiscal pressures, have raised government interest in the use of selective food and non-alcoholic beverages taxes (SFBTs) as a way to lower consumption in order to both improve health outcomes and raise government revenue.

Indeed, some countries have already introduced SFBTs—notably Denmark, Hungary, France, and Mexico, as well as a number of cities and states in the US. Others—notably South Africa and the UK—have set a date for introducing SFBTs or are considering such measures.[1]

Clearly, the effectiveness of SFBTs must be judged against what governments hope to achieve by the introduction of such taxes. A review of the stated rationale for the introduction of SFBTs in 30 countries that have done so suggests that, over time, the primary motivation has shifted from the revenue imperative to more of a focus on public health as the policy goal.[2]

More recently still, stated rationales have increasingly emphasised both revenue and health objectives in combination. To an extent, the two revenue and health outcomes are in conflict with one another. Achievement of either is related to how effectively an SFBT changes consumer behaviour, but maximising revenues is dependent on limited change in patterns of consumption while maximising health outcomes is dependent on the extent to which the tax is successful in reducing consumption of the products in question. Although achievement of both goals concurrently would appear to be challenging, it has been argued by some that by using revenues from SFBTs to fund public health programs, rather than necessarily relying on decreasing consumption, SFBTs can be an effective revenue-raising and healthful policy mechanism.

Regardless of the motivation, according to IMF guidance, international best practice is to limit the use of selective taxes to circumstances where:

- The good or service to be taxed is an efficient generator of tax revenue;
- Negative side effects (or 'externalities') result from consumption of the good or service;[3]
- The tax will fall more heavily on higher income earners (it will create a more 'progressive' tax base); or
- The subject of the tax is a 'luxury good'.[4]

Examples of products that are considered to qualify under one or more of these criteria include jewelery, petrol, and tobacco. This paper explores the extent to which the same is true of the kinds of products that might be the subject of an SFBT, and the effectiveness of such taxes in meeting either or both government revenue and health outcomes.

The effectiveness of the tax on policy objectives is determined by four main factors: tax pass-through, price elasticities, substitution effects and trans-border trade.

How consumer behaviour might shift in response to the introduction of a new tax is often highly uncertain. It will be determined by four main factors:

- The extent to which the tax is passed on to the end consumer ('pass-through') or absorbed by manufacturers or retailers;
- The responsiveness of demand to changes in price (the so-called 'price elasticity of demand');
- The types of good that consumers consume in place of the taxed product ('substitution effects'); and finally
- Whether it is possible to purchase the taxed product from another jurisdiction where it is subject to less or no tax (trans-border trade).

The proceeding sections explore each of these questions in turn in order to assess the likely effectiveness of SFBTs in pursuit of either, or both, revenue-raising or health policy goals.

Forms of SFBTs

Governments considering SFBTs will need to decide on the precise form that an SFBT may take, as appropriate to the product in question and the prevailing tax regime. Figure 1 outlines the three most common approaches. Governments must also decide which particular nutrient (e.g., fat, sugar, salt) will be taxed, and how to apply the tax to different products. For example, they might tax products that have a nutrient content above some threshold within certain food and non-alcoholic beverages categories, or they might tax all food and non-alcoholic beverages in those categories according to their nutrient content.

Fig. 1. Summary of tax mechanisms

Tax Mechanism	Example	Pros	Cons
Specific excise tax	A specific—or fixed amount—tax based on weight or volume of the final product or the weight or volume of certain ingredients used in their production (e.g. fat or sugar content). Denmark, Finland and France follow this approach. Denmark introduced a tax on the volume of saturated fat per KG of product; Finland levies a tax on confectionary products and ice cream (taxed by weight) and beverages with sugar at €0.22 per litre, and sugar-free beverages at €0.11 per litre); and France levies a tax on all non-alcoholic beverages with added sugar or sweeteners.	• Revenue streams can be anticipated. • All product prices are increased by a fixed amount.	• Without regular adjustment inflation can remove the effectiveness of the tax. • Changes in product characteristics such as package size or composition can reduce the impact of the tax. Albeit, this is more of an issue for unit as opposed to tax per kg measures.
Ad valorem excise tax	A tax levied on the sale of goods, determined as a percentage of the gross value of cost of the product as point of sale (e.g. 30% of the pre-sales tax price paid by the consumer) The use of ad valorem for excise duties is common throughout the world, particularly in developing economies.	• Automatically adjusts for inflation. • Reduces profit margins on subsequent price increases of products.	• Difficult to predict revenue stream. • Widens price differences between cheap and expensive products.
VAT or sales tax	A tax on the value added to a product (VAT) or on the final sale of the product (sales tax). Such taxes may be extended to some food and non-alcoholic beverages, or imposed at different rates for certain food and non-alcoholic beverage items. The United Kingdom uses its VAT regime to discriminate between selected food items. For example, while most food items for home consumption are exempt from tax, the standard rate of VAT is applied to ice cream and biscuits. Twenty US states levy higher sales taxes on soda than on food products.[5]	• Considered efficient as it only taxes the value added and helps generate self-enforcement of collection.	• Generally applied at a fixed rate for all goods with few exemptions and therefore lacks the ability to create price differentials between goods which could lead to changes in behaviour.

Source: Oxford Economics and World Health Organisation[6]

2. The Impact of SFBTs on Revenue and Other Economic Objectives

2.1. Pass-Through

Pass-through measures the extent to which producers and retailers pass on the tax in the prices paid by consumers.

As indicated in the introduction, a key determinant of the effectiveness of an SFBT in either raising revenue or meeting health outcomes will be the response by relevant producers and retailers to the tax change. In essence, how does the tax ultimately affect the price that consumers pay at the till.

Of vital importance is understanding the extent to which producers and retailers will absorb or pass on the new costs to end-consumers. If producers or retailers choose to fully absorb a new tax (i.e. there is zero pass-through), then the volume of sales will remain unchanged. In this case there is likely to be little impact on health objectives since consumption holds up. At the same time, of course, revenue will be generated for the government, but, importantly, by absorbing costs, the economic health of the industry will be affected—in the form of lower profits or reduced employment and growth etc., which is likely to have a subsequent impact on other tax revenues over time—see section 2.3 for a discussion of this.

Pass-through rates vary across different brands, product categories, size of product, and by outlet.

If, on the other hand, the tax is passed on in full to consumers, prices will increase, the volume of sales will fall (as determined by the price elasticity of demand), and direct revenues for government will be lower than if absorbed by producers or retailers. If the intent is to reduce consumption in order to promote beneficial health outcomes, then either full or substantial pass-through is needed, as this will maximise the shift in consumer behaviour. And in some case this has been seen. For example, evidence suggests that France's tax on Sugar-Sweetened Beverages (SSBs) was passed on in full for soda prices and at least 85 percent passed on into flavoured water and juice prices, though the study did not extend the analysis to review the subsequent impact on consumption patterns.[7]

In other instances, however, companies may choose to absorb some of the tax change rather than pass the full price increase through to their customers, in order to maintain or increase their market share. From the perspective of health objectives at least, this will reduce the effectiveness of the tax. For example, estimates indicate that there was relatively little pass-through from the Berkeley SSB tax to consumers across brands and sizes, with retail prices rising by less than half the amount of the tax.[8] Similar findings were estimated by Falbe et al. with pass-through shown to be lower on larger packaged sodas, and non-taxed diet sodas also rising in price.[9]

Predicting the degree of pass-through in advance of introducing a tax is complex and uncertain.

Importantly, it can be very difficult for a government to predict the degree of pass-through in advance of introducing a tax. The responses of firms are typically determined by a complex interaction of factors, such as the structure of the tax, the portfolio of products produced or sold, and the intensity of competition between firms in that category. For example, in the Berkeley case cited above, one explanation may have been that the possibility of cross-border substitution meant that retailers opted to absorb price increases rather than face a marked drop in sales. Although this will be positive for direct tax revenues generated (as consumption will have held up) it will not have been effective if the intent was to reduce demand for health reasons.

2.2. Price Elasticity

Consumers' responsiveness to price changes vary by product type and by country.

Determining the ultimate effect of a tax change on either raising revenue or meeting health outcomes is not just about how the introduction of an SFBT affects prices at the till but on how sensitive consumers are to the price of that product or category of product.

Economic theory suggests that if the objective of a tax is to efficiently generate revenue, the tax should generally be applied to price inelastic goods. These are goods for which consumption falls less than proportionately when price increases. Petrol, for example, is price inelastic—demand tends to hold up fairly well in the face of rising prices as there are few viable alternatives for consumers with cars.

In general, demand for products subject to SFBTs holds up in the face of price changes suggesting that SFBTs may be an effective revenue raising mechanism.

Estimates of the price elasticity of demand for the kinds of products that might be subject to an SFBT vary widely by product type and country. For example, Andreyeva et al. conducted a literature review of 160 studies on the demand for various food and non-alcoholic beverage types in the United States.[10] The authors showed that estimates of price elasticity for non-alcoholic beverages were between -0.13 (inelastic) and -3.18 (highly elastic), with a mean of -0.79, while estimates of price elasticity for sweets and sugars were between -0.05 (inelastic) and -1.00 (unit elastic), with a mean of -0.34.[11] The price elasticity for fats/oils was also shown to have a mean of -0.48 and lie between -0.14 (inelastic) and -1.00 (unit elastic).

On this basis, although not conclusive, it seems that food and non-alcoholic beverages might appear to be attractive candidates for an SFBT where the intention is to raise revenue. And indeed, both the theoretical literature and the experience on the ground in countries that have implemented such measures suggest that SFBTs can directly raise tax revenue.

In the academic literature, for example, the previously referenced study by Andreyeva et al. suggests that the introduction of a 20 percent tax on sugar-sweetened beverages (SSBs) in the US would have raised US $79 billion between 2010 and 2015, based on an assumption of a price elasticity of -0.8.[12] Moreover, Wang et al. state that the same tax regime could have been expected to raise tax revenues of $13 billion each year between 2010 and 2020, using a lower price elasticity of -0.5.[13]

In countries which have actually implemented taxes too, the evidence suggests that food and non-alcoholic beverages are indeed price inelastic and therefore may be effective mechanisms for raising tax revenues. For example:

- A special tax on sugary drinks introduced in Mexico in January 2014 generated $1.4 billion in its first year;
- The tax on sugary drinks implemented in Berkeley, California, has raised $1.5 million since its introduction in March 2015;[14]
- The saturated sugar tax in Denmark raised €134 million between November 2011 and August 2012; and
- The public health product tax in Hungary raised €61.5 million between January 2013 and December 2013.[15]

The UK Exchequer forecasts that the soft drinks levy due to be introduced in the UK in April 2018 will raise £520 million for the UK Exchequer in its first year.[16]

2.3. Wider Economic Effects

Changes in consumption inevitably impact the level of economic activity in industries producing, distributing and supplying the taxed products.

Even where evidence of the direct revenue raising potential of SFBTs has been identified, there remains a wider question of economic impact. Reductions in consumption will inevitably have an impact on levels of activity in the industries producing and distributing the taxed product, and in associated supply chains. This in turn can affect tax revenues. For example, the numbers quoted above all relate to gross revenues. On a net basis, however, total revenue to the exchequer may be considerably lower than these studies imply. This is for several reasons. For example, even for relatively inelastic goods, some consumer behaviour change can be anticipated. For widely consumed goods the impact of reduced demand, even by a small percentage, could be substantial in terms of its wider economic effects.

Tax changes may have knock-on impacts on jobs and therefore overall government tax revenue.

For example, the Hungarian government introduced a 'public health product tax' on 1st September 2011. The tax was levied on salt, sugar and various confectionary products. Research on the impact of the tax showed that between December 2011 and May 2012 the industry experienced a 10 percent decline in net income from the sale of confectionary products and a 15 percent decline in the net income from the sale of salty snacks. Arguably of course, this was an intended consequence of the tax, since it was explicitly billed as being motivated by public health concerns, but it also resulted in a $4.5 million (HUF 1 billion) decline in VAT due to lower sales by member companies.[17]

And it is not just tax receipts that will have been affected. Since the introduction of a 1 Peso per litre tax on sugar sweetened beverages (SSBs) in Mexico in May 2013, research suggests that employment in the beverage industry has fallen by 1,700, and some 30,000 corner shops (Tienditas) have closed.[18] The following Box outlines two further examples of how SFBTs can have a detrimental impact on the industries which are subject to the tax.

The Economic Impact of Changes Made to SFBTs

(1) Philippines: How increases in VAT would damage the economic health of the soft drinks industry through its knock-on implications for the wider economy

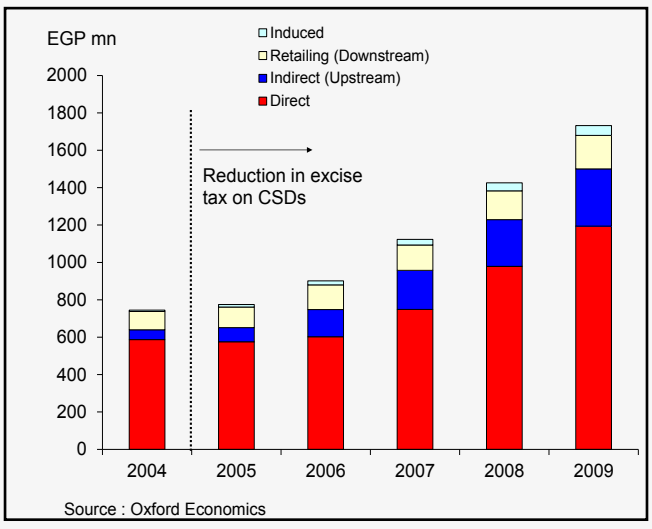
Terosa et al. estimated that non-alcoholic beverages producers in the Philippines had an output multiplier of 2.2. This means that a $1 increase in the consumption of non-alcoholic beverages produced in the Philippines generates $2.20 worth of additional output in the whole economy.[19] The study estimated that a 10 percent increase in the price of non-alcoholic beverages would reduce household income among the industry's direct and indirect workforce by 16 percent due to the multiplier effects.

(2) Egypt: How a reduction in the sales tax on carbonated non-alcoholic beverages generated wider economic benefits in Egypt

A new tax regime introduced for carbonated soft drinks (CSDs) in April 2005 in Egypt reduced the effective sales tax on CSDs from 29 percent to 19 percent. Estimates of the impact on the CSD industry showed that:

- The contribution of the industry to GDP increased by over 27 percent per year on average between 2005 and 2009, adding 0.5 percent to Egypt's annual GDP.
- Employment (direct, indirect and induced) increased by over 11 percent per year on average during the same period, to reach 173,000 in 2009, representing one percent of all jobs in Egypt.
- The full tax contribution paid to the government increased by more than 20 percent per year on average over the period 2005-2009, accounting for more than one percent of the government's total tax revenue in 2009.

Fig. 2. Tax contributions for the CSD industry in Egypt 2004-2009



Source : Oxford Economics

2.4. Trans-Border Trade

As the Berkeley example also illustrates, a particular complication for governments to consider is the impact of any changes on consumer behaviour as regards to other jurisdictions. Faced with higher prices at home, consumers may opt to purchase goods elsewhere rather than change their choices.

Consumers may opt to purchase goods elsewhere rather than change their choices as evidenced in Denmark and in some US states.

Where SFBTs are introduced in one jurisdiction (such as a country or state) but not in neighbouring jurisdictions, it will increase price differentials between the two areas. This creates an opportunity for trans-border purchases, whereby goods are purchased in the untaxed jurisdiction for import into the taxed jurisdiction. In this way consumers may be able to avoid paying the tax on the products they consume, thus undermining both the government's ability to achieve either revenue or health objectives of the tax.

This is most likely to occur in areas close to borders, and where there are no or only light border controls. Under these conditions the cost (in terms of time and money) of making purchases from a neighbouring country or state may be sufficiently low to be worthwhile.

International experience illustrates the impact of changes in trans-border shopping in response to tax-induced price changes. One of the most notable examples of trans-border purchases undermining the effectiveness of an SFBT comes from Denmark, where the Tax Ministry confirmed that the effect of the SFBT in encouraging Danes to shop in neighbouring Germany and Sweden was one of the factors which led to the tax being abolished just 15 months after it was introduced.[20] A similar boost to trans-border trade has been observed between neighbouring US states when a significant differential in the level and coverage of food sales taxes prevailed.[21]

Taxes Promote Trans-Border Purchasing

West Virginia: a sales tax on food increased trans-border purchases of food from neighbouring states

In 1989, the sales tax on food in the US state of West Virginia was increased from one percent to six percent, while neighbouring states (Kentucky, Maryland, Ohio, Pennsylvania, and Virginia) either exempted food from sales tax or taxed food at a reduced rate. Tosun and Skidmore showed that the tax rise reduced food sales in West Virginia border counties by about four percent as consumers crossed into neighbouring states to make food purchases. The sales tax resulted in a significant outflow of expenditure in border counties worth $6.3 million a year during the period 1990-2000.[22]

Taxes Promote Trans-Border Purchasing (cont.)

Denmark: SFBTs encouraged increased trans-border purchases from Germany and Sweden

Shoppers cut back on buying taxed items in Denmark due to higher prices created by SFBTs and opted instead to shop in Germany and Sweden to stock up on items where prices are relatively lower — estimates showed that a family could save at least $455 (€350) a year by shopping in Germany.[23] Survey evidence also suggested that 60 percent of Danish households purchased beverages in Germany within the past year [2012], whereas only four years ago 60 percent of households in the same survey said that they "never" traded across the border in Germany.[24]

2.5. Luxury Goods

In the introduction we noted that one of the conditions in the IMF guidance on when selective taxes might be used is that the item is a luxury good. Goods are classed as 'luxury' when they have an 'income elasticity of demand' of greater than one, meaning that consumers spend an increasing share of their budget on such goods as their income rises (for example, jewellery tends to be a luxury good).

However, on balance, and unlike luxury goods, food and non-alcoholic beverages tend to be broadly consumed, widely produced products, with income elasticities of less than one.[25] This means that, as incomes increase, the proportion of spending on food and non-alcoholic beverages tends to fall.

2.6. Regressive Taxes

SFBTs are shown to be regressive.

A further condition in the IMF guidance on when selective taxes might be used is that they should fall more heavily on those with higher incomes. That is, selective taxes should be 'progressive'. However, as the above discussion has highlighted, the kinds of products to which an SFBT might usually be applied are widely consumed, inelastic goods, which make up a larger proportion of expenditure for lower-income consumers than for wealthier consumers. As such, a tax, which raises the price of these goods, will fall disproportionately on lower-income households.[26] An SFBT will therefore tend to be 'regressive'. There is evidence of this issue from Mexico, where a recent study of spending on taxed items by The Center for Economic Research at the Autonomous Technological Institute of Mexico (ITAM) found that the burden of the SSB tax fell more on lower socio-economic level groups than average.[27]

Complexities arise with strategies that seek to offset the regressive impact of SFBTs.

Advocates of SFBTs suggest that policymakers could adopt several strategies to address concerns that the taxes may be regressive. For example, policymakers could increase income tax credits or provide subsidies to low-income consumers to offset the impact of SFBTs.[28] Pairing an SFBT with an offsetting subsidy for other foods and non-alcoholic beverages could, it is argued, encourage consumers to switch to healthier products.[29] Alternatively, policymakers could earmark the net revenue from the tax to fund health programs, including those that promote physical activity, which would disproportionately benefit the poor.[30] But complexities arise with both mechanisms (problems with earmarking and offsetting as solutions are discussed in the following chapter).

3. Achieving Health Outcomes

What matters most for achieving positive health outcomes is the overall behavioural response by consumers to price changes.

As noted earlier, if producers or retailers choose to fully absorb a new tax, then the volume of sales will remain unchanged. In this case there is likely to be little impact on health objectives. However, evidence to date suggests that an SFBT is likely to be passed on to consumers, with the rate dependent on a range of factors such as the structure of the tax, the portfolio of products produced or sold, and the intensity of competition between firms in that category. What matters then for achieving health outcomes is the behavioural response by consumers to price changes, which we now discuss.

3.1. Elasticity and Health Objectives

As discussed, the second, and increasingly important, reason that governments are considering introducing SFBTs is in pursuit of health outcomes. The critical factor here is the extent to which price rises at the point of sale will incentivise consumers to adjust their behaviour and make healthier choices.

Two widely reported reviews of the potential health impacts of the imposition of SFBTs on NCDs and associated risk factors are those conducted by Andreyeva et al. and Thow et al. both of which undertook a meta-analysis of existing literature.[31] While Andreyeva et al. focused solely on US-based studies, with a particular emphasis on the price elasticity of demand for major food categories, Thow et al. was broader in scope, covering international studies that examine the effect of taxes on food consumption or expenditure, disease and body weight.[32] Both reviews suggest that while food and non-alcoholic beverages are mainly price inelastic, SFBTs may still be an effective mechanism by which to change consumption behaviour. The authors conclude that health-related food and non-alcoholic beverage taxes may improve health outcomes by lowering the incidence of NCDs and their associated risk factors.

The effect SFBTs have on consumption patterns is unclear.

On the other hand, a more recent systematic scoping review of 880 studies by Shemilt et al. concluded:

"Our findings have exposed a complex, limited and largely equivocal evidence base, suggesting that the public health case for using economic instruments to promote dietary and physical activity behaviour change may be less compelling than some proponents have claimed [emphasis added]. *This conclusion provides an important counterpoint to what are, in our view, overly optimistic claims made by some authors of individual primary studies and reviews for the use of economic instruments to improve population health behaviour. It implies a need for caution in the development of public health policies intended to alter economic environmental stimuli to incentivise health-enhancing dietary and physical activity behaviour change at population level."*[33]

To date the academic literature mostly relies on modelling studies to estimate the impact of price changes on consumption and, subsequently, health outcomes.

Indeed, closer examination of the evidence for using tax to promote dietary behaviour change raises a number of important aspects for consideration. In particular, the vast majority of published papers reviewed in the Andreyeva and Thow meta analyses were based on modelling studies, rather than actual experience in the limited number of countries which have implemented these types of tax. Such studies typically use economic data such as elasticity estimates to simulate how price changes would affect consumption and diet.

For example, Mytton et al. suggest that taxing unhealthful foods might avert around 2,300 deaths per annum, primarily by reducing salt intake, while taxing a wider range of foods could avert up to 3,200 cardiovascular deaths in the UK each year (a 1.7 percent reduction).[34]

One of the most frequently quoted studies on the health benefits of the SSB tax in Mexico is Colchero et al.[35] But here, too, there are complexities in the analysis. Firstly, it seems not to have taken account of possible 'hoarding' effects that were identified by Jensen et al. in their analysis of the short-run impact of a tax on saturated fat in Denmark.[36] Secondly, the study did not assess whether consumers switched their expenditure towards other types of products, and the subsequent health implications of any such substitution effects (see following section). Alternative data from Neilson suggested that consumption was broadly unchanged, compared to the decline suggested by the survey upon which the Colchero paper was based.[37] Even if the reduction in consumption over the study period is correct, the authors themselves acknowledge that the extent to which it was *caused* by the tax is uncertain because a number of other factors may have influenced trends during the study period. These included health campaigns targeted at SSBs, anti-obesity programmes, and wider economic trends.

Evidence of the link between a tax and health outcomes is not as compelling as some proponents have claimed.

3.2. Substitution Effects

As discussed in previous sections, the impact of an SFBT on tax revenues or health outcomes largely depends on the extent to which consumers change their consumption patterns. However, even if consumption of a taxed product changes significantly, the final outcome can still be uncertain because there might be an offsetting increase in consumption of non-taxed products.

As with other types of effects identified in this paper, there is very little empirical evidence on the likely value of cross-price elasticities for the types of product which may be subject to SFBTs. Once again, this makes the impact of introducing an SFBT extremely uncertain.

The link between a tax and health outcomes is highly uncertain due to substitution effects.

More formally, the impact of introducing an SFBT depends not only on the own-price elasticity of demand (the percentage change in demand for a product in response to a one percent change in price), but also the so-called cross-price elasticity. The latter measures the effect on the demand for a product of price changes in other products, and so provides an indication of the extent to which consumers may switch between different categories of goods when prices change. Understanding how tax changes will play out is critical to assessing any likely impact: as Mytton et al. point out *"taxing food stuffs can have unpredictable health effects if cross-elasticities of demand are ignored."*[38]

Four main types of substitution effect have been identified in previous research that may affect the effectiveness of SFBTs in achieving health outcomes.

First, consumers may switch to a lower-cost version of the same product. This was observed in Denmark, where there was a downturn in the sales of premium-branded butter as consumers switched to cheaper varieties following the introduction of a tax on saturated fat.[39] Along similar lines, very low-income consumers may compensate by buying more energy dense, lower-nutrient foods to stretch their limited budgets, thereby limiting the health benefits of the tax.[40]

Consumers in Denmark switched to a lower-cost version of the same product while consumers in Hungary switched to products with similar nutritional characteristics but that were not subject to an SFBT.

Second, consumers may simply switch to an untaxed product with similar nutritional characteristics in terms of sugar, fat or salt content.[41] In Hungary, consumption of products subject to the public health tax (e.g. chocolate, biscuits and sweets) decreased, while consumption of products with similar nutritional characteristics but not subject to the tax increased (e.g. plain chocolate and popcorn).[42] Indeed, the selective nature of the tax in Hungary meant that consumers could switch to untaxed products that were not pre-packed, but which were very close substitutes for taxed products, such as home-made cakes and pastries. Switching to a untaxed product with similar nutritional characteristics is also a concern with the UK soft drinks tax announced in the 2016 Budget, with the Institute of Fiscal Studies noting that the levy is leaving fruit juices untaxed.[43] Examples of this happening further highlight the limitations of modelled studies, as is also reinforced by Jou et al., in their cross-country analysis. It showed that the degree of association between sugar-sweetened non-alcoholic beverages and obesity may be minimal as consumers may switch to alternative non-alcoholic beverages with a similar nutrient content.[44]

The Danish saturated fat tax led to increased salt consumption and a decline in fruit consumption among some population groups.

Third, substitution may result in some adverse dietary impacts as consumers increase consumption of an untaxed nutrient. The first study to evaluate the health impact of the Danish saturated fat tax found that while consumption of the targeted nutrient (saturated fat) reduced as a result of the tax, the substitution effects had some unintended consequences, most notably an increase in salt consumption for some gender and age groups, and a decrease in fruit consumption among other groups.[45]

Finally, in some cases people may even switch to different types of product, some of which may be unhealthier than the product that is subject to the new tax. A six-month experiment in a US city demonstrated that a ten percent tax on SSBs encouraged increased consumption of alcohol among some households.[46]

Perhaps the most robust approach to assessing how tax changes might affect consumer behaviour and health outcomes would be to use 'natural experiments' based on comparing actual experience in an area which introduced an SFBT to experience in a similar area which did not introduce a tax (e.g. US cities or states). Indeed, the few studies based on such approaches provide no clearer evidence of the impact of taxes on health outcomes. For example, Powell and Chaloupka used natural experiments to examine the health effects of food taxes in the US and found no significant association between taxes and the prevalence of NCDs (in this instance obesity) at a state level.[47]

3.3. Earmarking as an Alternative

Some governments have implemented SFBTs with the intention of allocating some of the revenue raised directly to programs intended to address health objectives. Such an approach seeks to overcome the inherent contradiction between the competing goals of revenue raising (which is most successful when the SFBT has little impact on consumption) and improving health outcomes (for which a reduction in consumption is a necessary, but not sufficient, condition). However, earmarking has long been out of favour with budgetary experts, in large part because the expected benefits seldom seem to have materialised in practice.[48]

Earmarking introduces inflexibility into the fiscal system and there is little evidence of revenues being directed to support health objectives.

One of the major criticisms of earmarking tax revenues is that it introduces budget inflexibility into the fiscal system. As Michael highlights, earmarking can distort decisions as earmarked spending is allocated not on the basis of need or value for money, but is determined by default through the earmarking regime. As a result, earmarking may result in excessive spending (or underfunding) on the associated programs. Statutory earmarked taxes can also take power away from policymakers, who no longer have the flexibility to set public spending as they consider most appropriate.[49] The potential loss of control over public finances has also been noted by the IMF.[50]

In any case, Bird cites a range of studies that find little or no relationship between the importance of earmarking and levels of expenditure on the programs they are intended to fund.[51] Similar conclusions were reached by Dye and McGuire, who looked at US state spending and found that earmarking leads to: "Either no change in expenditures or in expenditures that are much smaller."[52]

And so far there is little evidence of earmarking SFBT revenue in practice. Among countries that have recently introduced SFBTs, the revenue is not being directly targeted to support health objectives, or to tackle the regressive nature of the taxes. Revenue from the French soda tax is used to raise revenue for the general budget; Hungary currently uses the revenue to supplement the salaries of health-care professionals; in Mexico revenue is currently being allocated to the general budget rather than to fund access to drinking water or programs to tackle obesity as originally proposed.[53]

4. Conclusion

Ultimately, the outcome of an SFBT depends on several complex behavioural responses from consumers and businesses.

Concerns over lifestyle-related Non-Communicable Diseases (NCDs) and associated risk factors, coupled with increasing fiscal pressures, have led to growing government interest in the use of selective food and non-alcoholic beverages taxes (SFBTs).

Ultimately the outcome for each objective depends on a whole range of complex behavioural responses from both consumers and businesses. These responses are shown to include: the extent to which the tax is passed on to the prices that consumer pay (i.e. pass-through); how responsive consumers are to price changes (i.e. price-elasticity of demand); substitution effects; and trans-border trade.

Predicting the extent of pass-through in advance of introducing a tax is difficult since it is determined by the complex interaction of a range of factors. Evidence on tax pass-through illustrates that a wide range of outcomes are possible. If pass-through is low, the tax will be effective at raising revenue but have limited health benefits. In cases of full pass-through or over-shifting, where prices increase by more than the tax, such taxes could have little fiscal benefit but may affect levels of consumption.

The evidence outlined in this paper suggests that demand for the type of goods subject to SFBTs are typically inelastic and unresponsive to price. This may mean that while health goals are less likely to be achieved, such taxes can be successful in raising revenue from the tax itself. However, there is need for more detailed research to trace the full range of effects SFBTs may stimulate across an economy that may off-set these gains.

Evidence to date shows the final impact on overall revenue and health outcomes is highly uncertain.

But even when a tax is passed on to consumers in the form of higher prices, the final impact on revenue and health objectives can be uncertain since consumers may substitute their consumption towards non-taxed products. Our research finds evidence to suggest that consumers may switch to lower-cost, and potentially lower-quality, foods and drinks; switch to untaxed products with similar nutritional characteristics; or switch to other kinds of products entirely, with uncertain implications for health. In addition, an SFBT may promote trans-border purchasing, which can undermine both the revenue raising and health objectives of any such tax.

The distributional impact of SFBTs is often a cause for concern. Such taxes may disproportionately affect those in lower-income groups. Efforts to offset these concerns by earmarking SFBT revenue for programmes intended to address health objectives and redress the negative impact of SFBTs on lower- income groups creates its own problems. Earmarking can distort the efficiency of government spending allocations and potentially reduce governments' ability to control how their budgets are allocated.

The evidence outlined in this paper suggests that the impact of introducing an SFBT can be wide-ranging and highly uncertain. Very few studies provide a robust and complete account of the effects of such taxes, meaning that governments seeking to introduce them are doing so in a highly speculative context.

ANNEX

This table provides examples of countries that currently implement SFBTs, are discussing a tax policy intervention, or have repealed such measures. It draws from a tracking service performed by ITIC and OE that monitors government statements, media reports, and academic articles on a monthly basis.

Country	Target items	Start date	Current status
Albania	Energy drinks	January 2014	Active
Barbados	Sweetened beverages	August 2015	Active
Belgium	All soft drinks	Prior to 2016	Active
Brazil	Soft drinks tax	Prior to 2014	Active
Chile	Soft drinks tax	October 2014	Active
Dominica	Food and drinks with high sugar content	September 2015	Active
Finland	Non-alcoholic beverages, confectionary, chocolate and ice cream.	"Sweet tax": reinstated 2010 (non-alcoholic beverages tax ongoing)	Active *
France	Non-alcoholic beverages with added sugar or sweeteners	January 2012	Active
Hungary	Public health tax. SSBs, energy drinks, confectionary, salted snacks and condiments, alcohol with a high sugar content, fruit jams and ice cream	September 2011	Active
India	Carbonated soft drinks with added sugar	Prior to 2015	Active
Latvia	Non-alcoholic drinks	October 2003	Active
Mauritius	SSBs	January 2013	Active
Mexico	SSBs, high calorie density non-basic foods	Janaury 2014	Active
Norway	Sugar, sugar products, chocolate and non-alcoholic beverages	1981	Active
St Helena	High-sugar content CSDs	May 2014	Active
Tonga	SSBs and animal fat products	2013	Active
Thailand	Non-alcoholic drinks with high content of sugar	Prior to 2006	Active
Denmark	Saturated fat		Repealed November 2012
Iceland	Sugar tax		Repealed January 2015
Zambia	CSD / packed water		Repealed January 2013
Australia	Sugary drinks (as part of broader 'corrective taxes')	N/A	In discussion. Tax reform White Paper due in 2016
Brunei	SSBs	N/A	In discussion
Bulgaria	Foods and soft drinks high in fats, sugar and salt	N/A	In discussion
Canada	SSBs	N/A	In discussion
Colombia	SSBs	N/A	In discussion
Indonesia	SSBs	N/A	In discussion
Philippines	CSDs and flavoured drinks with <10% natural fruit.	N/A	In discussion
Russia	Sugary drinks	N/A	In discussion
Serbia	Non-alcoholic drinks (excluding water)	N/A	In discussion to implement in 2016-17
Singapore	SSBs	N/A	In discussion
South Africa	SSBs	April 2017	Proposed in General Budget
UK	Sugar tax	April 2017	Pending implementation

As of May 2016

Source: Oxford Economics, World Cancer Research Fund International

* Excise tax on sweets and ice cream to be abolished in 2017. Tax on non-alcoholic beverages will remain in force, but changes are anticipated in its scope of application.

ENDNOTES

[1]South Africa is set to introduce a tax on sugar-sweetened beverages on 1st April 2017, while the UK government has announced a new soft drinks industry levy to be paid by producers and importers of soft drinks that contain added sugar that will be implemented from April 2018.

[2]Our review encompassed countries that have proposed, enacted or repealed SFBTs.

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