



## Conference on ‘What governs what we eat?’ Symposium 2: Drivers of food choice: food chain perspective

### State-of-the-art for food taxes to promote public health

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The use of taxes to promote healthy nutritional behaviour has gained ground in the past decade. The present paper reviews existing applications of fiscal instruments in nutrition policy and derives some perspectives and recommendations from the experiences gained with these instruments. Many countries in different parts of the world have experiences with the taxation of sugar-sweetened beverages, in some cases in combination with taxes on unhealthy food commodities such as confectionery or high-fat foods. These tax schemes have many similarities, but also differ in their definitions of tax objects and in the applied tax rates. Denmark has been the only country in the world to operate a tax on saturated fat content in foods, from 2011 to 2012. Most of the existing food tax schemes have been introduced from fiscal motivations, with health promotion as a secondary objective, but a few have been introduced with health promotion as the primary objective. The diversity in experiences from existing tax schemes can provide valuable insights for future use of fiscal instruments to promote healthy nutrition, in terms of designing effective and efficient tax or subsidy instruments, and in terms of smooth and politically viable implementation of the instruments.

#### Food tax: Tax objects: Tax rates: Policy experiences

Taxation of unhealthy commodities, such as tobacco, alcohol or sugar, is not new, but traditionally these taxes have been used for purely fiscal reasons, i.e. to generate tax revenues in order to finance public spending. Often, such taxes have been levied on non-essential ‘luxury’ goods, in order to minimise potentially harmful societal effects of the taxes. For example, the US President Woodrow Wilson proposed a special revenue tax on soft drinks, beer and patent medicine in 1914 to compensate for a decline in import tariffs after the outbreak of World War I<sup>(1)</sup>, and several Nordic countries have had taxes on sweets and sugared beverages since the 1920s or 1930s.

The active use of fiscal instruments, such as taxes or subsidies, to promote desired (e.g. healthy) behaviour is relatively new. In the past decade, increasing interest in the use of such instruments to promote healthier dietary behaviour has attracted increasing interest in academia<sup>(2)</sup>, as well as among policy-makers, where a

range of countries and cities have introduced such taxes. The use of fiscal instruments to promote healthy eating has also been recommended by the WHO<sup>(3,4)</sup>.

The general idea of fiscal instruments in health and nutrition policy is to make the unhealthy option less affordable and less economically attractive by increasing the price via a tax, and hence to reduce the incentive to consume these products, or conversely to make the healthier choice more attractive and affordable by subsidising healthier products to lower their consumer price.

Several prospective modelling and experimental studies have been made over the years to illustrate the potential consumption and health outcomes of such taxes or subsidies, as demonstrated in several reviews<sup>(5–9)</sup> and specific modelling studies<sup>(10–12)</sup>. However, during the past 5–10 years, the use of taxes as an active tool in the promotion of healthier nutrition has rallied, with new taxes introduced in several countries and regions all over the globe.

Abbreviation: SSB, sugar-sweetened beverages.

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The objective of the present paper is to review some of the characteristics of tax instruments aiming at promoting healthier nutrition, and to derive some perspectives and recommendations from the insights gained from these applications.

### Fiscal measures and nutritional behaviour: some theoretical and practical considerations

The idea of using taxes to regulate behaviour (also called Pigovian taxes) dates back to the economist Pigou<sup>(13)</sup>. He was one of the first to suggest tax instruments to reduce undesired side-effects (externalities) from economic activities, such as production or consumption. Typical examples of such undesired externalities include pollution from production activities, or negative health effects from consumption of tobacco, alcohol or unhealthy foods, to the extent that the costs of these externalities are not reflected in the market prices of the goods, and hence in the market incentives facing producers and consumers. The main idea behind the taxes is thus to incorporate (internalise) the external cost into the market price, so that the market price reflects the 'real' cost of production or consumption to the society (including the external cost).

Theoretically, a fiscal measure such as a tax (or subsidy) on foods or beverages can be characterised by four attributes: what is targeted with the measure (object); who is targeted with the measure (subject); the size of the measure (tax rate); under what circumstances does the measure apply (setting).

The object of taxation can be a specific commodity or commodity category (e.g. sugar-sweetened beverages (SSB) or candies). The object can also be some specific nutrient in the products, such as the product's content of added sugar, saturated fat or salt. A tax or subsidy can be an excise tax targeting physical quantities (i.e. € per kg product or nutrient) or an *ad valorem* tax based on price (percentage of price). The choice of object for taxation/subsidisation is important for the incentive mechanisms for substitution towards or away from other products, and hence for the measure's effectiveness in terms of promoting healthier overall dietary patterns<sup>(10)</sup>. For example, a tax on SSB may trigger incentives to replace SSB with beverages containing artificial sweeteners or fruit juices, whereas a tax on all sweet soft drinks will likely reduce the consumption of both SSB, and artificially and naturally sweetened beverages. A tax based on price (*ad valorem*) may invoke replacement of high-quality products with lower quality products in consumption, because the tax will tend to increase the absolute consumer price of high-quality (and high-priced) products more than low-priced counterparts. Conversely, quantity-based excise taxes tend to invoke larger percentage price increases on low-quality product varieties, which may stimulate a stronger reduction in the consumption of these low-quality varieties than that of higher priced high-quality varieties.

Tax subjects are the legal entities (persons, firms, organisations) from whom the tax is collected or to whom a

subsidy is paid. Examples of subjects could be the retail consumers, which would be the case for a general sales tax levied on the retail price, or food manufacturers or importers faced with an excise tax on their products. In the latter case, they may attempt to pass such an excise tax on to their customers, but may also be encouraged to adjust their recipes or product portfolios to secure their sales and profitability<sup>(2)</sup>. A third example of subjects could be economically vulnerable consumers, who benefit from a targeted food subsidy programme yielding discounts on core food products (such as bread, fruit, vegetables or milk) for these groups of consumers. The subjects addressed by a taxation/subsidisation can also be important for the effectiveness of the scheme, depending on the conditions facing these subjects, market structure, etc. and their initial dietary patterns<sup>(14)</sup>.

A high tax or subsidy rate is expected to have a stronger influence on demand than a lower rate. Price elasticity estimates, i.e. the relationship between percentage price change and percentage change in demanded quantity, are often used to describe these relationships<sup>(15,16)</sup>. However, the relationship is not necessarily linear, which also makes revenue effects difficult to predict for high tax or subsidy rates<sup>(17)</sup>. First, there may be a threshold effect such that the rates below a certain level have minor or no effect on demand, because the tax is too small to substantially affect the consumers' tradeoffs. Second, the effects may level off for high rates. With larger increases in price, more and more consumers will exit the market for the taxed commodities up to a certain point where the remaining buyers have strong preferences for the taxed products due to habits, loyalty, etc. When this point is reached, further changes in demand will be small.

Setting is the circumstances under which the measure is applied. Examples include retail shopping, domestic manufacturers' wholesale transactions to the domestic market, import transactions or a restaurant setting. The setting for the tax/subsidy can also influence the effectiveness of a tax or subsidy scheme<sup>(15)</sup>. For example, the effect of taxing SSB may differ according to whether the beverage is taxed when consumed in a restaurant or purchased in a retail store and consumed at home. If the consumers' responsiveness to price changes differ between these different settings, or if a tax constitutes a smaller share of the price in a restaurant setting than in a retail store, this may have important implications for the tax effects on consumption.

In addition to such characteristics of a tax/subsidy instrument, the effects on consumption also depend on the behavioural patterns and responses of the consumers. In the first place, a tax on a specific commodity (e.g. SSB) is not likely to have much effect for consumers who rarely or never consume such beverages, whereas the effects are potentially larger for consumers with frequent consumption. Next, the consumption response to a tax change may depend on the consumer-perceived substitutability of the taxed commodity (e.g. SSB) with other commodities (e.g. artificially or naturally sweetened beverages, mineral water, tap water, confectionery, etc.) as well as the real availability of substitutes, for example,

whether clean tap water is available or not. This substitutability depends on the consumers' adaptory skills, which in turn may depend on age, family structure or education<sup>(11)</sup>, and also on the diversity in supplies that are available to different consumers. Third, the responsiveness to a tax change can depend on the consumers' income/budgetary situation, for example, such that a consumer with a relatively tight budget will be more likely to respond to a tax increase by reducing the purchase of the taxed product, whereas a consumer with a more relaxed budget constraint may to a higher extent respond by reducing his/her savings and increase the total budget for foods and beverages<sup>(15)</sup>.

Generally, tax instruments can be adequate regulation tools to regulate behaviours, where any reduction is desirable, irrespective of with whom the reduction takes place. Conversely, such instruments may be less appropriate, if the distribution of the reduction matters. Considering pollution, a CO<sub>2</sub> tax could be a good example of a suitable scheme, and in the public health domain, a tax on tobacco or SSB could be examples.

#### Taxes to regulate consumption of sugar-sweetened beverages and confectionery

A number of countries and cities are already operating, or have operated, taxes on SSB and/or confectionery, and more are expected to come, including the UK, Ireland and a number of large US cities. Global overviews of existing tax schemes for soft drinks and confectionery have been made by the World Cancer Research Fund International<sup>(18)</sup> and Sautet<sup>(19)</sup>, whereas more detailed descriptions of soft drink tax schemes in Pacific countries have been provided by Thow *et al.*<sup>(20)</sup>.

Nordic countries such as Denmark, Finland and Norway have had taxes on confectionery, ice-cream and soft drinks since the 1920s or 1930s, which have been introduced to raise tax revenues for general purposes. In the case of Finland, these taxes were abolished following Finland's entry into the European Union, but were reshaped and reintroduced in 2011, with a differentiation of tax rates between SSB (€0.22/litre) and artificially sweetened (€0.11/litre) beverages<sup>(18)</sup>. Due to conflicts with EU regulations, the tax on sweets and ice-cream was however repealed by the end of 2016. Denmark modified its taxation of soft drinks in 2010 as part of a broader tax reform, where income taxes were lowered and environmental and so-called health taxes were increased. The health taxes included upward adjustments of existing taxes on confectionery products, sugar-sweetened soft drinks (but a reduction in the tax rate for sugar-free soft drinks), tobacco and alcohol, and the introduction of a tax on saturated fats (the saturated fat tax is discussed later). In this modified tax scheme, the tax rates were about €0.22/litre and €0.08/litre for SSB and artificially sweetened beverages, respectively, and €3.49/kg for confectionery<sup>(21)</sup>. However, Denmark decided in 2013 to abolish the soft drink tax along with the new, but equally unpopular fat tax, with the goal of creating jobs, decreasing cross-border

shopping and helping the local economy (refer later). Hence, Denmark repealed the fat tax in January 2013 and the tax on soft drinks in 2014. Norway also operates a tax on confectionery, ice-cream and beverages. The Norwegian tax scheme has been stable for many years and does not include differentiation of tax rates between, for example, SSB and artificially sweetened beverages.

A few European countries have introduced new food and beverage tax schemes during the most recent decade, where health concerns have played a role in the motivation for the schemes. France introduced a targeted tax on sweetened drinks at a national level in 2012. The tax targets all drinks with added sugar and artificially sweetened drinks. Beverages without added sweetener, such as natural fruit juices, beverages with alcohol content over 1.2% (0.5% for beer), infant milk products and liquid food products used in nursing and health care are excluded from the tax base<sup>(22)</sup>. Hungary's Public Health Product Tax came into effect in September 2011. Beverages with >8 g sugar per 100 ml were taxed with a tax rate of HUF7/litre (about €0.02/litre), whereas a range of specified soft drinks or soft drink syrups are exempt. Furthermore, confectionery products are taxed at a rate of HUF130/kg (about €0.43/litre), and the Public Health Product Tax also includes taxes on energy drinks, salted snacks, condiments, fruit jam and flavoured alcohol drinks. Introduction of the tax was followed by other initiatives (including, e.g. awareness raising activities and education campaigns) with the same or similar objectives as those of the tax scheme<sup>(23)</sup>.

In September 2013, as part of the federal budget agreement, the Mexican congress passed an excise tax on SSB and a sales tax on several highly energy-dense foods (along with a range of other product categories: fuel, alcohol, tobacco, pesticides, etc.). A specific excise tax of 1 peso/litre (approximately €0.05/litre or a 10% price increase based on the 2013 prices) on non-dairy and non-alcoholic beverages with added sugar came into effect at the beginning of 2014, and an *ad valorem* tax of 8% on a defined list of non-essential highly energy-dense foods (containing  $\geq 275$  kcal/100 g) was implemented<sup>(24)</sup>. Following the experience in Mexico, Chile increased its taxes on sales and imports of non-alcoholic, naturally or artificially flavoured beverages, which have a sugar content >15 g/240 ml (or an equivalent portion) from 13 to 18%, and reduced the tax rate for other beverages<sup>(18)</sup>. In September 2015, the Government of Barbados introduced a 10% *ad valorem* tax on SSB<sup>(18)</sup>. The approach in Mexico is likewise followed by the Island of Dominica that introduced a \$0.2 tax on soft drinks and 10% *ad valorem* tax on energy drinks<sup>(18)</sup>.

The USA does not have federal or state-level soft drink taxes, but a few cities have passed their own taxes. In Berkeley, California, a soda tax took effect from January 2015. The measure imposes a tax of 1 cent per ounce on the distributors of specified SSB, such as soda, sports drinks, energy drinks and sweetened ice teas but excluding milk-based beverages, meal replacement drinks, diet sodas, fruit juice and alcohol. Some researchers have found that average prices for

beverages covered under the law rose by less than half of the tax amount (with a relatively low pass-through for brand sodas), whereas others have found a higher pass-through rate for the tax<sup>(25)</sup>.

Thow *et al.*<sup>(20)</sup> have reviewed soft drink tax schemes in four Pacific island states: Fiji, French Polynesia, Nauru and Samoa. Many of the Pacific Island states are challenged with very high rates of overweight and obesity, and some of the states are also facing relatively high costs of drinking water. Samoa introduced a soft drink excise tax already in 1984, combined with an import duty, at the outset mainly for fiscal reasons. Taxes were increased in 2008, triggered by the pressure to increase tax revenue, but also presented as a means to improve health outcomes. Fiji introduced its soda tax in 2006, mainly for fiscal reasons. After pressure from the beverage industry, the tax scheme was modified in 2007, replacing an excise tax on domestic production with a duty on imported raw materials. In contrast, French Polynesia and Nauru introduced their soft drink taxes with the primary goal to promote health, according to Thow *et al.*<sup>(20)</sup>, although they were also driven by a need to raise tax revenues. The import duty in Nauru not only covered soft drinks but also sugar and other products with high sugar content, and the scheme in French Polynesia included confectionery and beer.

In 2013, Mauritius introduced an excise tax on soft drinks. The rate was set at 2 cents per g, which was increased to 3 cents per g from 1 January 2014<sup>(26)</sup>. The beverage tax scheme in Mauritius is particularly interesting in that the tax rate is graduated according to the sugar content in the beverages, rather than the amount of the final product. This tax scheme design provides suppliers with an incentive to reduce the sugar content in the beverages and the consumers to choose sugared beverages with low sugar content rather than high-sugar beverages. The mentioned revision of the Fiji soda tax to target imported raw materials may have similar features, as it may encourage domestic soft drink producers to use as little imported raw materials as possible in their products.

The reviewed tax schemes for soft drink, confectionery, etc. have a number of features in common. In almost all cases, the schemes imply a symmetric and non-discriminatory taxation of domestically produced and imported products, perhaps with the exception of small island states with negligible domestic production (or where domestic production is almost entirely based on imported raw materials). Asymmetric tax schemes, with higher tax rates on imported products, will often be in conflict with international trade agreements, within the World Trade Organization or within the regional trade arrangements such as the European Union, the North American Free Trade Agreement, etc. In most of the cases, production aimed for export is exempt from taxation, and small producers are also exempt from taxation in some of the countries. The tax schemes moreover have in common that the taxes are collected at the import or domestic manufacturing stage, which makes the administration simpler than if the taxes were to be collected from the retailers or from the consumers.

### The Danish tax on saturated fat in foods

As afore-mentioned, the Danish tax on saturated fat was introduced as part of a larger tax reform implemented in Denmark around 2010, with the overall aim to reduce the pressure of income taxation rates and to finance this by, among other things, increased taxes on 'adverse health behaviour'. A novelty in the tax reform was the introduction of a tax on saturated fat, paid on the weight of saturated fat in foods, if the content of saturated fat exceeds 2.3 g per 100 g. The threshold of 2.3 g saturated fat per 100 g implied that all kinds of drinking milk were exempt from taxation. The tax was levied on food manufacturers and food importers, but was expected to be transmitted to the consumer prices. Foods determined for exports or animal fodder were exempt from the tax. The tax rate was set at DKK16 (€2.15) per kg saturated fat, which was topped up by 25% general value-added tax. The tax came into force on 1 October 2011, but was repealed by 31 December 2012. Fatty products, such as butter and margarine, are the food commodities for which prices were most affected by the fat tax, due to their high content of saturated fat<sup>(18,27)</sup>.

Several studies have investigated the effects of the saturated fat tax on food consumption, showing statistically significant substitution effects from high-fat towards low-fat product varieties<sup>(27,28)</sup> as well as significant effects of the tax on overall dietary quality and potential reductions in mortality<sup>(29)</sup>.

Although the saturated fat tax fulfilled the government's expectations in terms of the revenue it generated<sup>(21)</sup>, and even though it implied a reduction in the consumption of saturated fat<sup>(27-29)</sup>, the Danish fat tax was abolished as part of the Danish Parliament's agreement on the fiscal budget for 2013, most likely due to political pressure from various stakeholders in Danish society<sup>(30)</sup>. Many actors including representatives from the food industry and nutrition researchers opposed the tax both before and after its introduction, claiming that it harmed the economy and had no positive influence on health, rather the contrary. Few actors in the policy debate defended the tax<sup>(30)</sup>. Public health played a prominent role in the arguments for introducing the tax, but was hardly mentioned in the debate on the repeal. Just after the repeal of the tax, research was published that showed a decrease in the consumption of saturated fat in Denmark as a consequence of the tax<sup>(27,30)</sup>.

### Strengths, mechanisms and opportunities with fiscal policy measures

Health taxes on sugared, fatty or salty food or beverage products have gained more ground in recent years, with new or updated tax schemes in a range of countries. While tax schemes on sweetened beverages appear similar across countries at a first glance, they still have important differences in their design, which also has impacts on their potential direct and indirect effects. In some of the schemes, taxes target sugar-sweetened non-alcoholic beverages, thus providing consumers with an

incentive to replace these SSB with, for example, naturally or artificially sweetened beverages. Replacement with naturally sweetened beverages (such as fruit juices) may not reduce the consumers' energy intake much despite a decrease in the consumption of added sugar. Conversely, replacement with artificially sweetened beverages or water may have an effect on energy intake (but may have other undesired consequences). A few of the considered tax schemes (the soda tax in Mauritius and the saturated fat tax in Denmark) address the content of a considered nutrient in the products. This provides a fine-grained stimulus to replace high-sugar or, fat product varieties with low-sugar or, fat varieties in consumption as all products are taxed according to the content of the detrimental nutrient. In contrast, a tax with the same tax rate on all SSB will not trigger such fine-grained substitution effects.

In general, the tax schemes addressing soft drinks operate with tax rates about 10–20% of the consumer price. The resulting demand changes can be assessed by means of existing estimates of price elasticities. Green *et al.*<sup>(15)</sup> and Andreyeva *et al.*<sup>(16)</sup> have reviewed the literature on such price elasticity estimates and have found that for soft drinks, a 10% price increase is likely to lead to between 5 and 8% reduction in the demand. This suggests that existing tax levels on soft drinks are hardly likely to reduce the consumption of these soft drinks by more than 10–20%, depending also on the design of the tax schemes such as whether substitute beverages are also taxed or not.

Targeted tax schemes on food products are generally not popular with the food industry and the food retailers<sup>(30)</sup>. In several of the countries, the introduction of such tax schemes have met resistance from the industry, mainly based on claims related to: risk of job losses in the food industry; lack of real-experiment evidence of the effectiveness of such taxes to reduce obesity and promote health; possible regressive effects in that food taxes will be economically more harmful to low-income consumers than to high-income consumers; difficulties to design tax schemes that properly address the relevant mechanisms to reduce obesity; taxes to regulate food consumption behaviour are patronising and compromise the individuals' free choice.

Many of the existing tax schemes have been fiscally motivated, with health promotion as a secondary objective, but a few have been introduced with health promotion as the primary goal. The existing tax schemes have both similarities and differences in their designs, and different experiences have been obtained from the schemes. First, the targeting of the tax is important (tax objects, subjects and setting), because taxes will induce behavioural adjustments (e.g. substitution) in consumption and production and it is important to take such adjustment effects into account in the design of the scheme. Second, the size of the tax rate is important: the nutritional challenges to be addressed with taxes may call for rather substantial price changes, but conversely the revenue effects will be more uncertain the larger the tax rate. Third, the administrative aspects of a tax, for the industry and for the government authorities, should be taken carefully into consideration. And fourth, the

involvement of relevant stakes and expertise in the preparation of a tax should be taken seriously, to take into account their suggestions to handle some of the most pressing challenges from their perspective, and in turn to optimise the political viability of the scheme.

However, the introduction or revision of tax schemes in several countries provides a golden opportunity to evaluate scientifically the empirical validity of these claims, and researchers in the respective countries are encouraged to undertake research to investigate this.

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### Conflicts of Interest

None.

### Authorship

J. D. J. drafted the manuscript. S. S. contributed with sections of the manuscript and via comments and discussion during its preparation.

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