# Food taxes and their impact on competitiveness in the agri-food sector

## Interim Report

Client: DG Enterprise and Industry

Rotterdam, 28 February 2014

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Compiled by the following partners of the ECSIP consortium:

- Ecorys
- Euromonitor
- IDEA
- DTI

Rotterdam, 28 February 2014

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# 1 About this interim report

## 1.1 Background of the study

The European Commission, specifically DG Enterprise and Industry, have engaged the ECSIP consortium to conduct a detailed analysis of the impact of food taxes on competitiveness in the agri-food sector. The study begins in November 2013 and concludes in May 2014.

The study aims to answer three key questions on how food taxes impact:

- the consumption of foods with a high percentage in fat, salt and sugar additives?
- the competitiveness of the agri-food sector?
- employment, investments and trade flows within the EU internal market?

Whilst not being the focus of the study, a general assessment of the impact on public health of these taxes will be taken into account.

By providing answers to the above questions, the study aims to help policy makers in decisions on whether or not to introduce food taxes and to provide broader insight into the health, social and economic impacts of food taxes.

## 1.2 Content of the report

In this report, we present the results of two activities: the literature review and the analysis of data on consumption.

Task 1 of the study included a comprehensive literary review which was aimed to identify and review information on consumption, competitiveness and health patterns as a result of food taxes. The conclusions of this literature review will provide a basis for the empirical research. Findings of the literature review are presented in Chapter 2 of this report.

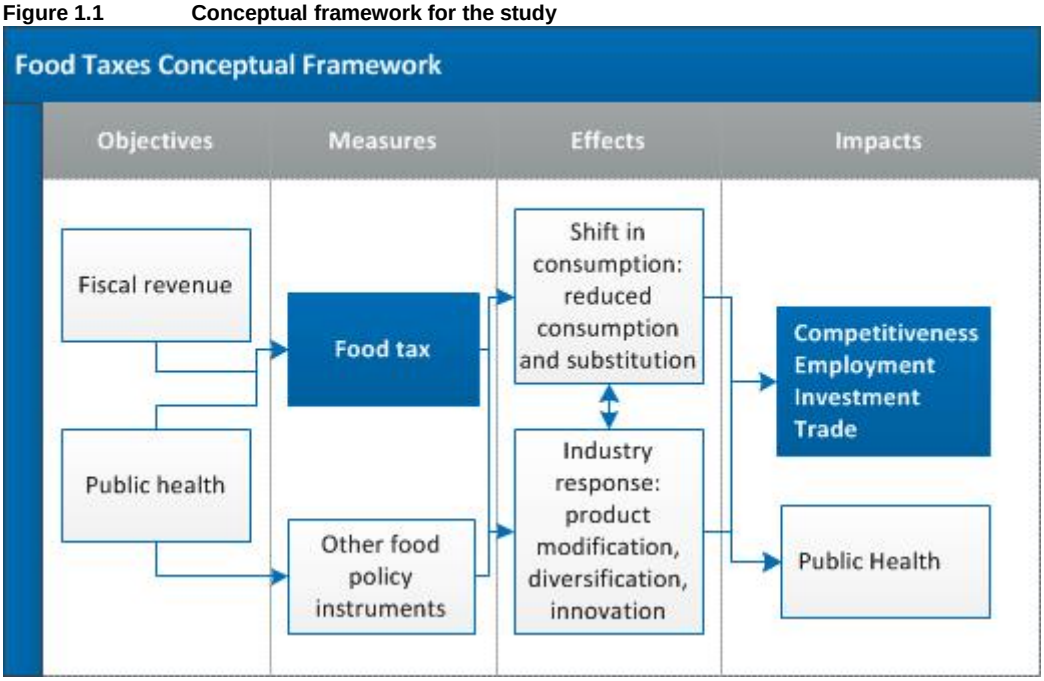
The data collection (Task 2) concerns the analysis of consumption patterns in order to obtain quantitative information on the impact of food taxes on consumption levels. Preliminary findings of the data analysis are presented in Chapter 3 of this report.

***As the study is currently still in progress, any conclusions presented in this report should be considered as preliminary conclusions, subject to change.***

## 1.3 Analytical framework

Based on the results of the literature review, we have developed a conceptual framework to study impacts of food taxes. The outline of the framework is presented in figure 1.1 below.

**Figure 1.1 Conceptual framework for the study**




Source: Ecorys analysis

Introduction of a food tax may be driven by public health concerns, but also by fiscal revenue objectives. Close scrutiny of the policy maker's considerations for introducing the tax and the way in which the generated revenues are used provides indications of the objective underlying food taxes. To achieve public health objectives other policy measures, such as education and labelling, may also be implemented.

A potential direct effect of food taxes (and other policy instruments) is a change in consumption patterns. Changes in consumption may include an overall reduction of demand for the taxed products and substitution of the now-taxed foods with other products. Product substation may involve consumers switching to a cheaper (taxed) version of the product or non-taxed foods. Also, a shift to non-taxed (foreign) suppliers may take place to circumvent the tax.

Implementation of a food tax also necessitates a response by industry, both producers and retailers, in terms of pricing decisions for both the newly taxed goods and product substitutes. For example, taxation of products may result in the producer of these products deciding to not pass on the tax fully and instead absorb the tax in the supply chain to prevent or reduce consumers switching to other products. Similarly, a tax-induced shift in consumption from taxed foods to similar non-taxed foods may force producers to reformulate products, or even develop new, non-tax-attracting products. Meanwhile, cross-border purchases may lead to geographic shifts in production.

Both shifts in consumption and industry response ultimately lead to impacts on industry and on consumers. For the industry, the changes following the introduction of food taxes may influence sector competitiveness, employment, investment and trade. For consumers, the changed consumption pattern and any resulting industry response may lead to changes in public health.

In the next chapter, we will more closely review the linkage between the various elements of the conceptual framework.

# 2 Findings of the desk-based research

The desk-based research consisted of three key tasks:

1. collection of information on existing EU food taxes,
2. literature review, and
3. collection of information on non-tax measures for obesity reduction.

This chapter presents the findings of the first two tasks. The third task, although not specifically defined in the ToR, is required for the final ranking of measures (Task 5). This task is still in progress with results expected prior to the start of Task 5.

## 2.1 Existing EU food taxes

### *2.1.1 Introduction*

The aim of the desk top research on existing EU food taxes was to identify and produce an inventory of recently (since 2004) introduced, changed or withdrawn non-harmonised food taxes in EU-countries. Information to be collected included:

- Country,
- Date of the tax coming into force,
- Date of the tax being abolished (if relevant),
- Tax rate,
- Tax base, and
- VAT rules.

Note that taxes on coffee or tea were determined to be “luxury taxes” rather than health motivated food taxes and were therefore excluded from the analysis. Excise duties on alcohol were found to mainly serve fiscal purposes instead of health related objectives. In addition, excise duties on alcohol have been established for a long period of time without significant recent adjustments, meaning they become less useful for the study’s purpose. We have covered excise duties on alcohol, albeit less extensive than the other taxes.

#### Food taxes

This has led to a list of recent, health motivated EU food taxes as presented in **Table 2.1**.

**Table 2.1 Summary of recent, health motivated food taxes**

| Country | Tax(es) |
|---|---|
| Denmark | Excise duty on saturated fat<br>Excise duty on chocolate and sweets<br>Excise duty on ice cream<br>Excise duty on soft drinks |
| Finland | Excise duty on sweets, ice cream and soft drinks |
| France | Sugar-sweetened beverage tax<br>Energy drink tax |
| Hungary | Public health product tax |

A more detailed overview of these taxes is presented in Table 2.2.

**Table 2.2 Detailed information on recent, health motivated food taxes**

| Member State | Description of Tax | Date introduced | Date abolished | Tax Rate | Tax base | Comments | VAT |
|---|---|---|---|---|---|---|---|
| Denmark | Excise duty on saturated fat | Oct 2011 | Jan 2013 | DKK 16 / kg of saturated fat | Food products such as meat, dairy products, animal fats and vegetable oils which contain more than 2.3 % saturated fat. | Applies to food producers with a yearly turnover of more than DKK 50,000 of the corresponding food products in Denmark. | Standard rate 25% |
| | Excise duty on ice cream | 2010 (increased) | - | DKK 6.61 / L of ice cream | Ice cream or ice cream mix with a content of sugar above 0.5 g per 100ml. | In place since 1946. | |
| | | | | DKK 5.29 / L of ice cream | Ice cream or ice cream mix with a content of sugar below 0.5 g per 100ml. | | |
| | Excise duty on soft drink | 2013 (reduced) | 2014 (planned) | DKK 1.64 on litre of soft drink | Sugar-sweetened soft drinks. | In place since the 1930's. From July 2013 reduced by half. | |
| | Excise duty on chocolate and sweets | 2013 (increase) | - | DKK 24.61 /kg | Chocolate and chocolate products, liquorice products, marzipan, sweets, effervescent products, chewing gum, cakes with a certain sugar, cacao or chocolate content etc. Certain products that can be used for the production of chocolate and sweets, such as almonds, nuts and cocoa nuts, are subject to raw materials tax. | In place since 1968. In 2010 increased from DKK 14.20 to DKK 17.75/kg and a reduced rate of DKK 14.20 for low sugar products. 2012 raised again to DKK 23.75 and 20.2 for low-sugar products. | |
| | | | | DKK 20.93 / kg | Products, as per above, containing less than 5 grams of sugar /kg. | | |

| Member State | Description of Tax | Date introduced | Date abolished | Tax Rate | Tax base | Comments | VAT |
|---|---|---|---|---|---|---|---|
| Finland | Excise duty on sweets, ice cream and soft drinks | 2013 (increased) | - | EUR 0.95 /kg or EUR 0.11 /L | Sweets, chocolate, ice-cream and soft drinks, including fruit juices, mineral water and lemonade. Exemptions: Sweets, ice-cream and soft drinks used in the manufacture of other products; Products produced by legally and economically independent small manufacturers when the amount of products released for consumption does not exceed 10,000 kg or 50,000 L; Goods transported by travellers and acquired for their own use. | Used to be excise duty on soft drinks, abolished in 1999. Reintroduced in 2011 at a rate of EUR 0.75 /kg or EUR 0.075 /L | Standard rate 24% Reduced rate 14% for foodstuffs |
| France | Excise duty on sugar in non-alcoholic drinks | 2012 | - | EUR 7.16 / hectolitre | Sugar-sweetened beverages. | Tax is paid by producers, importers and those in France acquiring the drinks from other EU countries. Exoneration applies to exports (in and outside EU). | Standard rate 20% Reduced rate 5.5/10% for foodstuffs. |
| | Energy drink tax | 2014 | | EUR 1 / litre | Drinks containing a minimum of 0.22 gram of caffeine (or 0.3 g of taurine) per liter, dedicated to human consumption and conditioned in a container/recipient for retail sale. The amendment refers to a minimum threshold of 150mg of caffeine for 1000ml or a minimum threshold of 420mg of taurine for 1000ml. | | |

| Member State | Description of Tax | Date introduced | Date abolished | Tax Rate | Tax base | Comments | VAT |
|---|---|---|---|---|---|---|---|
| Hungary | Public health product tax (NETA) | 2011 | - | 7 HUF/litre | Soft drinks: Added sugar: more than 8g/100ml. Drinks with more than 25% fruit content exempted. | Based on the weight or volume (kg or litres) of the product. Applicable for products sold over 50 kg or 50 litres. The tax is payable by the first domestic distributor or the producer of the own brand product. | Standard rate 27% Reduced rate 18% for milk and milk products |
| | | | | 200 HUF/litre | Syrups or concentrates for soft drinks. | | |
| | | | | 250 HUF/litre | Energy drinks: Methylxanthines content: more than 1mg/100ml Taurine: more than 100mg/100ml. | | |
| | | | | 130 HUF/kg or 70 HUF/kg for sweetened coca powder | Confectionery: Added and total sugar: more than 25g/100g Chocolate: added and total sugar more than 40g/100g and cocoa content less than 40g/100g. | | |
| | | | | 250 HUF/kg | Salty snacks: Salt: more than 1g/100g. | | |
| | | | | 250 HUF/kg | Condiments: Salt: more than 5g/100g (exemptions for mustard and ketchup). | | |
| | | | | 20 HUF/kg | Flavoured beers/alcopops: Beer or any other alcohol with added sugar that has a total sugar content of more than 5g/100ml. | | |
| | | | | 500 HUF/kg | Fruit jam: All fruit flavours except extra jam, extra jelly, marmalade and special quality jams. | | |

## EU excise duties on alcohol

In 1993 excise duties for alcoholic beverages were harmonised across the EU Member States according to Directive 92/83/EEC. There is a minimum excise duty for all Member States regulated by Directive 92/84/EEC. However, Member States can issue further taxes on alcoholic products. There are currently three duty regimes that cover beer, wine and spirits. Due to the flexibility given to Member States in setting additional excise duties, there is large variation of excise duties across the EU.

**Table 2.3 EU excise duties on alcoholic beverages (as at 1 July 2013)**

| | SPIRITS € per litre of pure alcohol | | STILL WINE € per litre of pure alcohol | | BEER € per litre of pure alcohol | |
|---|---|---|---|---|---|---|
| 0 | Minimum rate in Directive 92/82: | 5.50 or 10.00 | | 0 | | 0.748 |
| 1 | SWEDEN | 58.66 | IRELAND | 38.62 | FINLAND | 32.05 |
| 2 | FINLAND | 45.55 | FINLAND | 30.82 | UK | 22.91 |
| 3 | IRELAND | 42.57 | UK | 29.06 | IRELAND | 22.55 |
| 4 | UK | 33.82 | SWEDEN | 24.32 | SWEDEN | 20.62 |
| 5 | GREECE | 25.50 | DENMARK | 13.42 | SLOVENIA | 11.00 |
| 6 | BELGIUM | 21.19 | NETHERLANDS | 8.03 | NETHERLANDS | 7.59 |
| 7 | DENMARK | 20.11 | ESTONIA | 7.70 | DENMARK | 7.51 |
| 8 | FRANCE | 17.19 | LATVIA | 5.82 | FRANCE | 7.33 |
| 9 | NETHERLANDS | 16.86 | LITHUANIA | 5.21 | ITALY | 6.75 |
| 10 | ESTONIA | 16.43 | BELGIUM | 5.18 | GREECE | 6.50 |
| 11 | MALTA | 13.50 | POLAND | 3.40 | ESTONIA | 6.28 |
| 12 | POLAND | 13.48 | CROATIA | 0.96 | CYPRUS | 6.00 |
| 13 | LATVIA | 13.38 | FRANCE | 0.34 | HUNGARY | 5.47 |
| 14 | GERMANY | 13.03 | AUSTRIA | 0.00 | CROATIA | 5.25 |
| 15 | LITHUANIA | 12.79 | BULGARIA | 0.00 | AUSTRIA | 5.00 |
| 16 | PORTUGAL | 12.52 | CYPRUS | 0.00 | BELGIUM | 4.62 |
| 17 | SLOVENIA | 12.00 | CZECH REPUBLIC | 0.00 | POLAND | 4.60 |
| 18 | HUNGARY | 11.26 | GERMANY | 0.00 | MALTA | 4.33 |
| 19 | CZECH REPUBLIC | 11.11 | GREECE | 0.00 | PORTUGAL | 3.73 |
| 20 | SLOVAKIA | 10.80 | HUNGARY | 0.00 | SLOVAKIA | 3.59 |
| 21 | LUXEMBOURG | 10.41 | ITALY | 0.00 | CZECH REPUBLIC | 3.12 |
| 22 | AUSTRIA | 10.00 | LUXEMBOURG | 0.00 | LATVIA | 3.10 |
| 23 | ROMANIA | 10.00 | MALTA | 0.00 | LITHUANIA | 2.46 |
| 24 | CYPRUS | 9.57 | PORTUGAL | 0.00 | ROMANIA | 2.06 |
| 25 | ITALY | 9.20 | ROMANIA | 0.00 | SPAIN | 1.99 |
| 26 | SPAIN | 9.13 | SLOVAKIA | 0.00 | LUXEMBOURG | 1.98 |
| 27 | CROATIA | 6.96 | SLOVENIA | 0.00 | GERMANY | 1.97 |
| 28 | BULGARIA | 5.62 | SPAIN | 0.00 | BULGARIA | 1.92 |
| | EU Average | 17.59 | EU Average | 6.17 | EU Average | 7.58 |

Source: The above summary table was provided by SpiritsEurope, based on the latest DG TAXUD report[1].
Note: Many countries have reduced rates and exceptions, for full details refer to the DG TAXUD report.

[1] DG TAXUD 2013. "Excise Duty Tables Part 1: Alcoholic Beverages" European Commission. http://ec.europa.eu/taxation_customs/index_en.htm#.

### Taxes not implemented

In addition to the implemented, changed or withdrawn non-harmonised food taxes, a number of other EU Member States have actively considered introducing food taxes. Policy discussions have occurred in Ireland (10% sugar-sweetened beverage tax), the United Kingdom ("fat taxes" targeting sugar, fat and salt), Belgium (soda tax), Estonia (taxes on sugary, salty and fatty food), Italy (general food tax) and Sweden ("fat taxes" targeting fat and sugar).

Further qualitative assessment of selected taxes, either implemented or proposed, will be undertaken in the case studies, discussed in Chapter 5 of this report.

## 2.2 Literature review

The objective of the literature review was to gain an overall understanding of the extent of research available on the subject of food taxes and provide a qualitative overview highlighting the key findings, as well as data and information gaps requiring further analysis.

### *2.2.1 Process*

The literature review was undertaken in three steps,

- collection of literature (identifying literature based only on article titles),
- review of literature (reading of articles to check relevance of content), and
- analysing and summarising (writing an overview of the evidence and conclusions of the literature).

At the conclusion of the literature search process, a total of 102 sources were identified (Annex 1). Of the 102 literary sources, we consider the 9 empirical studies (including randomly controlled trials) to provide the most credible evidence as these studies observe and analyse actual consumer/industry responses to an implemented food tax (or controlled, experimental price change). The 27 modelling studies which simulate implementation of a food tax in a particular country provide supporting research. However, their findings must be viewed together with their limitations, such as quality of the national data used, robustness of economic modelling approach and existence of simplifying assumptions. Systematic literature reviews and reports conducted by research institutes are also drawn upon where relevant.

A table summarising the key findings of the 9 empirical and 27 modelling studies is provided in section 2.2.2. The results of the literature review are presented in section 2.2.3. For further detail on the review process including information on the methodological approaches, thematic topics, geographical focus and product/nutrient taxes studied in the literature, please refer to Annex 2.

### *2.2.2 Summary table of key findings in empirical and modelling studies*

Table 2.4 lists the empirical and modelling studies from both the peer-reviewed and grey literature. Further discussion on the studies and an analysis of their findings on consumer behaviour, industry impacts and health effects is presented in section 2.2.3.

**Table 2.4 Summary table of key findings in empirical and modelling studies**

| Study and year | Study focus | Study type and country | Data | Taxation change | Key Findings | Additional findings |
|---|---|---|---|---|---|---|
| **Peer-reviewed literature - Empirical** | | | | | | |

| Study and year | Study focus | Study type and country | Data | Taxation change | Key Findings | Additional findings |
|---|---|---|---|---|---|---|
| Jensen and Smed 2013 | Excise duty on saturated fat | Empirical, Denmark | Weekly food purchase data from household panel dataset of ~2000 households. Jan 2008 to Jul 2012. | In Oct 2011, introduction of tax of DKK16/kg of saturated fat. | Consumption of fats dropped by 10–15%. The average price of butter increased by 8.17 DKK/kg, average price of margarine increased 4.57 DKK/kg. | Hoarding - a few weeks prior to introduction of the tax. Shifts in demand - from high price supermarkets towards low-price discount stores. Heterogeneity in transmission of tax to consumer prices. |
| Bahl et al. 2003 | Excise duty on soft drinks | Empirical, Ireland | Data from 1975 to 1996 of soft drink prices, soft drink sales, and food price index. | 1990 tax was reduced from IR£0.37 to IR£0.29 per gallon (~21%) 1992 tax was abolished. | Price elasticity of demand for soft drinks -1.10. A 10% reduction in the tax rate caused an 11% increase in consumption, other factors held constant. | Consumer prices did not fall by the full amount of the tax reduction. The price of other foods did not have an impact. |
| Fletcher, Frisvold, and Tefft 2010 | Sales taxes on soft drinks | Empirical, US | Soft drink tax data from 1989 to 2006, combined with National Health Examination and Nutrition Survey data. | Sales taxes on soft drinks in US, average rate varies between 1.5 and 2.3% during the period. There were 53 tax rate changes within states over the time. | A one percentage point increase in the soft drink tax rate reduces the amount of calories consumed by soda by nearly 6 cal, which is about 5% of the average calories from soda - for children and adolescents. | A one percentage point increase in the soft drink tax rate increases caloric intake from whole milk by nearly 8 cal per day, which is 13% of the average calories from whole milk. Some suggestive evidence that soft drink taxes affect the consumption of juice or juice-related drinks. |
| Block et al. 2010 | Soft drink price increase | Randomly controlled trial, US | Sales data on food and beverages in two nearby hospital cafeterias (one with price intervention and one without), over 18 weeks. | A price increase on regular soft drinks of $0.45 (35%). | Sales of regular soft drinks declined by 26%. At the comparison site (with no price increase), no difference in regular soft drink sales occurred. | Diet soft drink sales increased by 20%. Snack and dessert sales did not significantly change throughout the study period. |
| Waterland er et al. 2013 | Fruit and vegetable discounts | Randomly controlled trial, Netherlands | Supermarket register receipts over a nine month period, including baseline, intervention and post intervention data. Total of 151 participants. | A 50% price discount on fruit and vegetables, plus education. | At 6 months, 5.4 kg more F&Vs were purchased per households for 2 wks, which corresponds to 124g/person per day. (Dutch people consume, on average, 198g of F&Vs/d). No difference was observed in the non-discount groups. | Results showed that participants did not spend the money saved from the discounts in other supermarket (food) categories. At month 9, 3 months after the interventions were completed, all effects had vanished. |
| Lachat et al. 2009 | Fruit and vegetables for free | Randomly controlled trial, Belgium | Food and beverage intake during lunchtime at a university canteen, 209 participants. | Two portions of fruits and one portion of vegetables for free at lunchtime, for three days. | Participants ate 80g more fruits and 108g more vegetables on a daily basis than the participants receiving no free F&V. | No differences were found for energy density, total energy, Na and energy from fat between the groups per day. Meaning that increased F&V did not displace other foods. |
| **Grey literature - Empirical** | | | | | | |
| National Institute for Health Developm ent 2013 | Public health product tax | Empirical, Hungary | Price, sales and tax revenue data 2010 - 2012. Survey of manufacturers (69 respondents). 2010 and 2011 balance sheet data of companies paying the major part of NETA. | From 2011, taxes introduced on added salt, caffeine and sugar in packaged products. | Supply and sales of products containing taxed ingredient(s) decreased by 27%. People consumed 25-35% less products subject to NETA than one year before. | Estimated tax revenue was almost fully realized (less than 5% deviation) The average price of manufacturers products subject to NETA decreased by 29%. Balance sheet data of "large NETA payers" improved from 2010 to 2011. |

| Study and year | Study focus | Study type and country | Data | Taxation change | Key Findings | Additional findings |
|---|---|---|---|---|---|---|
| Bergman and Hansen. 2010 | Excise duties on alcoholic beverages and soft drinks | Empirical, Denmark | Product, brand, store and regional level price data from 1998-2010 of beverages. | liquor ↓ 2003, soft drinks ↑ 1998 and 2001 and ↓ 2003, beer ↑ 1997 and ↓ 2005. | Taxes are more than fully passed through to consumers when there is a tax hike, undershifting when taxes are cut. The amounts of soft drinks and beers bought outside Denmark increased in the years following the reduction of excise taxes. | Considerable heterogeneity across products, brands, types of stores and regions. Large differences between the tax pass–through across regions but no strong empirical result suggesting a German or a Swedish border effect on strategic pricing behaviour. |
| Berardi et al. 2012 | Tax on sugar-sweetened beverages | Empirical, France | Product, brand and store price data from Aug 2011 to Jun 2012 of non-alcoholic beverages. | From Jan 2012, tax of €7.16 per hectolitre of sugar-sweetened beverage. | Gradual passed-through to consumer prices, full transmission to soda prices after 6 months, fruit drinks and flavoured waters pass-through was not complete. | Considerable heterogeneity across products, brands and retailing groups. Pass-through was significantly higher for private labels than it was for other brands. |
| **Peer-reviewed literature - Modelling** | | | | | | |
| Salois and Tiffin. 2011 | Tax on saturated fat and subsidy for fruit and vegetables | Demand modelling, UK | Household level data from the UK Expenditure and Food Survey, using two week food expenditure diaries. The sample is from 2003-2004, based on 7,014 households. | A price increase of each food group by 1% for every percent of saturated fats, with a ceiling of 15% price increase. A subsidy on fruit and vegetables is introduced, so as to exactly cancel the costs of the fat tax paid by consumers. | Average intake of saturated fats fall by 6.2% and average intake of total sugar falls by 2.4%. | The general trend in changes in nutrient intakes is that most nutrient intakes tend to fall as a result of the combination of fat taxes and thin subsidies. It remains unclear what health repercussions may arise from such substantial dietary changes. |
| Tiffin and Arnoult. 2011 | Tax on saturated fat and subsidy for fruit and vegetables | Demand modelling, UK | Household level data from the UK Expenditure and Food Survey, using two week food expenditure diaries. The sample is from 2005-2006, based on 6,760 households. | A price increase of each food group by 1% for every percent of saturated fats, with a ceiling of 15% price increase. A subsidy on fruit and vegetables is introduced, so as to exactly cancel the costs of the fat tax paid by consumers. | product: % tax, demand ↓ full fat milk: 2.6%, 2.20%, skim milk: 0.13%, 0.13%, chips: 13.77%, 14.24% The estimated consumption reductions in fat intake are found insufficient to meet dietary recommendations. The tax/subsidy policy leads to a marginal increase in the consumption of sugar. | A subsidy approaching 15% of the price of fruit and vegetables is predicted to be effective in bringing mean levels of fruit and vegetable consumption in line with dietary recommendations. Once the changes in diet are converted into changes in the risks of disease, the impacts of the policy are negligible. |
| Nnoaham et al. 2009 | Taxes on saturated fat | Demand and health modelling, UK | Expenditure data from the Expenditure and Food Survey. Estimates of effect on cardiovascular disease and cancer mortality of changing fat, salt, fruit and vegetable intake were taken from previous meta-analyses. | Four scenarios involving only a tax on saturated fat, tax on high fat/sugar/salt foods, and two different combination scenarios of a subsidy on F&V with a tax on HSSF. | Few obesity-related CVD deaths are averted by any of the regimens. | The tax is regressive and positive health effects will not necessarily be greater in lower income groups. |

| Study and year | Study focus | Study type and country | Data | Taxation change | Key Findings | Additional findings |
|---|---|---|---|---|---|---|
| Jensen and Smed. 2007 | Tax on saturated fat and subsidy for fruit and vegetables | Demand modelling, Denmark | Aggregate annual data from Statistics Denmark, spanning the period 1972–1996. | 7 scenarios are created and scaled to yield the same welfare loss in order to make the scenarios comparable. | A tax on all fats in foods leads to a reduction in the consumption of all food categories of animal origin, except eggs.<br>If a tax is only directed towards the foods' contents of saturated fats, the reducing effect on the consumption of fats and cheese is 10–15% stronger.<br>A combined regulation has a relatively strong impact on the intake of all the considered components. | Tax is regressive.<br>Subsidies to the consumption of fruits and vegetables, (via reduced VAT) will increase consumption of F&V at the cost of a range of other foods, including dairy products, eggs and fish.<br>A subsidy to the content of fibres in the foods leads to an increase in the consumption of fibre rich foods: flour/bread, potatoes, fruit and vegetables, mainly at the cost of dairy products, eggs and fats. |
| Chouinard et al. 2007 | Tax on fat in dairy products | Demand modelling, US | Weekly city-level aggregates of grocery store scanner data over three years, 1997 - 1999, for 23 US cities. | A 10 percent ad valorem tax on the percentage of fat in 14 dairy product categories. | Consumption of fat reduces by less that 1%. | The tax is regressive.<br>Demand for low-fat products increases and demand for high-fat products lowers. |
| Nordström and Thunström . 2011 | VAT reforms and excise duty reforms relating to fibre, added sugar and saturated fat | Demand modelling, Sweden | Household grain purchases from private market research data from GfK Sweden (2003), combined with household expenditure data from Statistics Sweden (1996) and nutritional information from the SLV nutrition database. | Various scenarios involving excise duty reforms containing a subsidy of fibre content, funded by excise duties on either added sugar or saturated fat. | The revenue-neutral tax scheme that appears to be most efficient in redirecting consumption to healthier levels is a subsidy on fibre, funded either by an excise duty on added sugar or an excise duty on saturated fat.<br>Both the VAT reforms and the excise duty reforms appear to be progressive in income terms. | VAT reforms have a similar impact across all income groups, with increases in fibre intake, but also unwanted increases in the intake of fat, salt and sugar. The impact on dietary quality of the VAT reforms is therefore difficult to evaluate.<br>Excise duty reforms seem to have a positive health effect<br>across all other income groups, except the lowest income group. |
| Kuchler, Tegene and Harris. 2005 | Ad valorem tax on salty snack foods | Demand modelling, US | Nielsen Homescan Panel data, 1999. | 20% ad valorem tax on potato chips.20% ad valorem tax on a broad range of salty snacks. | The tax on potato chips is estimated to reduces purchases by 5.54 ounces per person per year, or 830 calories.Widening the tax base to include all salty snacks yields similar results of reduced purchases in the range of 4–6 ounces per person. | Assuming that no food would be substituted, at 3,500 calories per pound of body weight, the reduction translates into less than a fourth of a pound.Neither tax was found to appreciably affect overall dietary quality of the average consumer. |
| Zhen, et al. 2013 | Excise tax on sugar-sweetened beverages | Demand model, US | Household-based Nielsen Homescan consumer purchase panel data. | Half cent per ounce increase in SSB prices, from an excise tax. | Predicted to reduce total calories but increase sodium and fat intakes by 0.2g and 49.8mg respectively as a result of product substitution. | Tax is regressive.<br>Predicted decline in calories is larger for low-income households than for high-income households. |
| Bonnet and Réquillart. 2013 | Excise tax on soft drinks | Demand model, France | Individual data on food purchases from a representative survey of 19,000 French households in 2005. | Excise tax of EUR 0.0716/litre for soft drinks, approximately equal to a 10% price increase. | Manufacturers and retailers over-transmit excise taxes to consumers with the average pass-through rate varying from 1.16 to 1.22. Prices of regular products increase by 12%, on average. | Considerable heterogeneity exists in price response.<br>There is a delay in the way prices are adjusted. |
| Briggs et al. 2013 | Tax on SSBs | Demand and health modelling, UK | Data on prices and purchasing of drinks from a 2010 representative UK survey using two week food expenditure diaries (5,263 households). | 20% tax on sugar sweetened beverages | The tax is predicted to reduce the prevalence of obesity in the UK by 1.3% (around 180 000 people). | The greatest effects may occur in young people, with no significant differences between income groups. |

| Study and year | Study focus | Study type and country | Data | Taxation change | Key Findings | Additional findings |
|---|---|---|---|---|---|---|
| Lin et al. 2011 | Tax on SSBs | Demand and health modelling, US | Nielsen National Consumer Panel 1998–2007. Data from National Health and Nutrition Examination Survey 2003–2006 used to estimate changes in calorie intake, weight loss, and body weight status. | 20% effective tax rate (or about 0.5 cent per ounce) on SSBs | An average daily reduction of 34–47 calories among adults and 40–51 calories among children. | Estimated reductions in body weight and obesity prevalence from reduced calorie intakes can differ greatly between two prediction models (static and dynamic). Tax is regressive, although it represents about 1% of household food and beverage spending. |
| Andreyeva Chaloupka and Brownell. 2011 | Excise tax on SSBs | Demand modelling, US | Industry data on consumption (volume) and total sales for 2008. | Penny per ounce excise tax on sugar sweetened beverages (around 20% price increase) | Estimated 24% reduction in sugar-sweetened beverage consumption, if there is no substitution to other caloric beverages or food. | Could translate into significant losses in average body weight—up to 5 lb/year, assuming linear weight loss from calorie reductions. |
| Dharmasena and Capps. 2012 | Tax on SSBs | Demand modelling, US | Nielsen Homescan Panel data, 1998 to 2003. | 20% tax on sugar sweetened beverages | Consumption of isotonic, regular soft drinks and fruit drinks falls by 129%, 49% and 26%, respectively. Diet soft drinks, high-fat milk and bottled water consumption fall by 6.63, 1.60 and 5.08%, respectively. | Notable increases in the consumption of low-fat milk (11%), fruit juices (29%) and coffee (26%) are evident. Reduction in body weight estimated to be 1.54 to 2.55 lb/year, partially offset by a rise in consumption of fruit juices and coffee. |
| Finkelstein a et al. 2013 | Tax on SSBs | Demand modelling and regression analysis, US | Nielsen Homescan Panel data, 2006 | 20% tax on sugar sweetened beverages | Estimated decrease of 24.3 kcal per day per person, translating into an average weight loss of 1.6 pounds during the first year and a cumulated weight loss of 2.9 pounds in the long run. Substitution to other beverages was limited and only involved fruit juices. | Do not find evidence of substitution to sugary foods and show that complementary foods could contribute to decreasing energy purchases. Despite their significantly lower price elasticity, the tax has a similar effect on calories for the largest purchasers of SSBs. |
| Finkelstein a et al. 2010 | Tax on SSBs | Regression modelling, US | Nielsen Homescan Panel data, 2006 | 20% or 40% tax on (1) carbonated SSBs only or (2) carbonated SSBs, fruit drinks, and sports/energy drinks simultaneously. | A 20% and 40% tax on carbonated SSBs only would reduce beverage purchases by a 4.2 and 7.8 kcal/d per person, respectively. Extending the tax to all SSBs generates mean reductions of 7.0 and 12.4 kcal/d per person, respectively. | Estimated mean weight losses resulting from a 20% and 40% tax on all SSBs are 0.32 and 0.59kg/y per person, respectively. The tax is not regressive in that higher-income households pay the largest share, although they receive no benefit in terms of weight loss. |
| Lock et al. 2010 | Saturated fat intake at 'healthy levels' | Computable general equilibrium, epidemiological and economic modelling, UK | Data from 2004 from the Global Trade Analysis Project database. Health modelling was restricted to pathways leading from consumption of saturated fat to ischaemic heartdisease (did not model obesity). | Assumed a consumption decrease of saturated fat equal to match 'nutritional guidelines'. Did not examine a tax change. | Changes in spending concurrent with healthy eating would dictate which sectors grow, such as fruit and vegetable production. The mobility of resources, particularly labour, from declining to increasing sectors will determine rates of employment and losses to people working in the affected sectors. | Reductions in dietary intake of foods from all animal sources has little effect, whereas changes in dairyproduct consumption have the most substantial effects for health outcomes. In the UK, if diets matched nutritional guidelines, 70 000 premature deaths could be prevented each year |
| Cecchini et al. 2010 | Public health strategies including fiscal measures | Chronic disease prevention modelling, UK | The model simulates the dynamics of a specific country or regional population over a lifetime (set at 100 years). | Public health strategies including fiscal measures, mass-media, regulation and labelling. | Price interventions and regulation can produce the largest health gains in the shortest timeframe. A strategy of several interventions would generate substantially larger health gains than would individual | The least gains were obtained through mass media health-promotion campaigns and the largest gains through regulation of food advertising to children. Food labelling is also cost-saving, but with smaller |

| Study and year | Study focus | Study type and country | Data | Taxation change | Key Findings | Additional findings |
|---|---|---|---|---|---|---|
| | | | | | interventions. | health effects than for fiscal measures. |
| **Grey literature - Modelling** | | | | | | |
| Allais, Etilé and Lecocq. 2012 | Tax on saturated fat in fomages blancs and dessert yoghurts | Demand modelling, France | French household scanner data on fromages blancs and dessert yogurts, 2007. | Ad valorem tax of 10% (5%) on the producer price of full-fat (semi-skimmed) fromages blancs and dessert yoghurts. | Reduction in consumption of the taxed products by 38%, when assuming full pass-through of tax to prices. Reduction in consumption of 9%, when assuming pass-through rate is under 40%. | Producers neutralise up to 96% of the impact of the tax on demand, via large price cuts on products with large ex ante margins. Firm reactions will depend on the market under consideration, specifically on the margins. |
| Kotakorpi et al. 2011 | Excise tax on sugar, reduced VAT for fruit and vegetables | Demand and health modelling, Finland | Finnish Household Budget Survey data from 1995-1996, 1998, 2001 and 2006. | 1) a sugar tax of 1 € /kg (9.2% price ↑ for sweets and sugary foods) 2) abolishment of the current 13% VAT on fruit, vegetables and fish (~11.5% price ↓ price of fish, F&V). 3) a combined scenario of both the sugar tax and VAT abolishment. | The excise tax on sugar could lead to a 3 kg reduction in the average body weight of the adult population. A zero VAT rate on fish, fruit and vegetables would reduce the risk of cardiovascular mortality by approximately 4% and the risk of coronary heart disease by slightly below 1%. | Sugar tax is mildly regressive. The health effects appear to be most pronounced for low-income individuals, and the reforms may therefore reduce health inequality. |
| Kotakorpi and Pirttila. 2010 | Excise tax on sugar, reduced VAT for fruit and vegetables | Demand and health modelling, Finland | Finnish Household Budget Survey data from 1995-1996, 1998, 2001 and 2006. | 1) a sugar tax of 1 € /kg (9.2% price ↑ for sweets and sugary foods) 2) abolishment of the current 13% VAT on fruit, vegetables and fish (~11.5% price ↓ price of fish, F&V). 3) a combined scenario of both the sugar tax and VAT abolishment. | Sugar tax is estimated to decrease demand by 23% for sugar and sweet products and cause large movements towards lower BMI classes. Reduced VAT predicted to increase demand for fish by 11.6% and F&V by 5.4% and have a small positive direct effect on the incidence of coronary heart disease. Similar results in the combined scenario. | The combined policy has a sizable effect on the incidence of obesity and overweight, causing on average an ~13% reduction in the incidence of type 2 diabetes and a smaller reduction in coronary heart disease. Sugar tax is mildly regressive. Weight loss is higher for low-income households, thus the sugar tax is progressive in health terms. |
| Dioikitopoulos, Katsaitiy and Shaw. 2013 | Relationship between economic variables and body weight | General equilibrium growth modelling, US | Historical US economic data over 50 years, combined with BMI data from the 2010 Behavioural Risk Factor Surveillance System database. | A decrease in the tax rate on food from 22% to 15%. | Reducing taxation on food increases food consumption and weight levels, in equilibrium. Labour reallocation towards the less sedentary sector on one hand and higher income on the other function as opposite forces. However, in equilibrium the second effect prevails. | Technological advances in agriculture decrease food prices and increase weight but not necessarily through higher food consumption, but through lower calorie expenditure. |
| Bonnet and Réquillart. 2012 | Excise tax on soft drinks | Demand modelling, France | Consumer panel data from a French representative survey of 19,000 households, 2003-2005, on food purchases (quantity, price, brand, characteristics of goods, store). | Excise tax of EUR 0.0716/litre for soft drinks, approximately equal to a 10% price increase. | Decreases soft drink consumption by more than 3 litres per person per year, or 3.4 litres if the tax is extended to all SSB products (roughly 15% of the initial consumption).Because of strategic pricing, the tax is over-transmitted to consumers with a pass-through rate of 1.14. | Substitutions primarily occur between products in the same categories.For the leading products in each category consumers prefer to switch their retailer to buy the preferred brandrather than switching to another brand sold by the same retailer.This result suggests that some manufacturers have market power in this market. |

| Study and year | Study focus | Study type and country | Data | Taxation change | Key Findings | Additional findings |
|---|---|---|---|---|---|---|
| Bonnet and Réquillart. 2011 | Excise tax and ad valorem tax on sugar sweetened beverages | Demand model, France | Consumer panel data from a French representative survey of 19,000 households, 2003-2005, on food purchases (quantity, price, brand, characteristics of goods, store). | The excise tax ranges from 7.4 euro cents to 11 euro cents per litre of regular soft drink. | SSB consumption decreases by about 33% of initial consumption. Consumption of diet soft drinks increases by about 43% of initial consumption, as does consumption of the outside good by about 10%. Excise tax is overshifted to consumer prices by between 1.07 and 1.33, while ad valorem tax is undershifted. | Excise tax based on sugar content is the most efficient at reducing soft drink consumption. Ignoring strategic pricing by firms leads to misestimate the impact of taxation by 15% to 40% depending on the products and the tax implemented. Price changes significantly affect brand market shares as well as soft drink consumption. |
| Bonnet, Dubois and Orozco. 2008 | Food tax in general | Demand and health modelling, France | Consumer panel data from a French representative survey of 19,000 households, 2003-2005, on food purchases (quantity, price, brand, characteristics of goods, store). | None, the study calculated price elasticities of food categories. | Price elasticities at the individual level are quite significant and taxing high density and cheap energy categories of food like the one usually said as "junk food" appears to be an effective way to change consumption patterns and reduce obesity and overweight. | Taxing the "junk food" category actually reduces the prevalence of overweight and obesity dramatically. A price increase of fat products such as oil and butter would also reduce the total energy intake and thus the population body mass index. The effect of a price increase is not always to decrease total calories consumption because of product substitution. |
| Griffith, Nesheim and O'Connell. 2009 | Tax on saturated fat | Demand modelling, UK | Data on butter and margarine purchases from TNS World Panel 2006, 15,764 households. | A 10p tax on 100g of saturated fat, (price increase of 12.5% on average across all products, 14.9% for butter and 11.1% for margarine). | In general products with high saturated fat intensity lose market share while those with low intensity gain However, there is substantial heterogeneity. | Households in all income bands reduce their demand in response to an increase in price (by choosing smaller pack sizes). Market share of margarine products increases by 2.2% at the expense of butter products. |
| Foodob and Institute for Fiscal Studies. 2012 | Tax on sugar and saturated fat | Demand modelling, France and UK | French and British micro panel data. | Range of scenarios of taxes on sugar and saturated fat. | Taxing SSBs would help combat the obesity epidemic. An excise tax based on sugar content would be the most efficient way to limit the consumption of SSBs. | Price changes as a result of taxation bring about significant substitutions among products. Firms do not perfectly transmit the tax to consumers. |
| The Institute of Public Health in Ireland. 2012 | Tax on SSBs | Demand and health modelling, Ireland | Baseline SSB consumption and obesity prevalence for Ireland were taken from the 2007 Survey on Lifestyle and Attitude to Nutrition. | 10% tax on sugar-sweetened beverages, with tax pass-through rate of 90%. | The tax is estimated to reduced BMI of adults by 1.25%, equal to 10,000 less obese adults 14,000 less obese and overweight adults. | Weight reductions across income groups is similar. The weight reduction would be greater if the study had included children. |

### *2.2.3 Results*

The literature review results are divided into three key question areas on food taxes; consumer behaviour, industry impact and health effects.

*Consumer behaviour* is primarily concerned with the question of whether a tax on an 'unhealthy' product or nutrient, generates a response by consumers to reduce their consumption of that good and by how much. Directly related to this is the question of whether consumers purchase other products to compensate for their reduced consumption of the taxed good, and which products are purchased (product substitution).

*Industry related questions* centre around firm behaviour in response to the implementation of a food tax, as well as the impact of a food tax on industry competitiveness including investment, employment and trade flows.

*Health effects* are critically important as improved nutrition and health are the driving motivations for implementing food taxes. The key question is whether the overall bundle of food purchases made by consumers subsequent to a food tax, which now may include product substitutes, has a more healthy composition and if so, how big is the health benefit. An associated issue is socio-economic effects such as whether food taxes are regressive in terms of income, that is, if low-income households pay a greater proportion of their income on food taxes than high-income households[2].

The findings of the literature review will be presented in line with these three themes and sub questions.

### Consumer behaviour

The empirical (ex post) and modelling/simulation (ex ante) studies generally conclude that a food tax will reduce consumption of the taxed product and increase consumption of substitute products. The following discussion first presents results from the empirical literature and then the modelling/simulation literature.

#### *Empirical evidence*

Of the 9 empirical studies, 7 examined consumer behaviour:

- Bahl, Bird and Walker (2003), Ireland's soft drink taxes;
- Jensen and Smed (2013), Denmark's saturated fat tax;
- National Institute for Health Development (2013), Hungary's public health product tax;
- Fletcher, Frisvold, and Tefft (2010), US soft drink taxes;
- Waterlander et al. (2013) conducted a randomly controlled trial (RCT) in the Netherlands for fruit and vegetable price discounts;
- Block et al. (2010) conducted a RCT in the US for soft drink price increases;
- Lachat et al. (2009) conducted a RCT in Belgium on the effect of providing free fruit and vegetables on total dietary intake.

Jensen and Smed[3] conducted an ex post analysis of the Danish saturated fat tax (introduced in October 2011) for the product categories of butter, butter blends, margarine and oils using weekly household purchasing data. The study found that the tax had caused a 10-15% reduction in the consumed level of fats from the examined product categories. However, these results must be interpreted cautiously because the study observed that hoarding occurred, i.e. consumers purchased large amounts of fat products in the weeks leading up to the introduction of the saturated fat tax and therefore the observed consumption reduction may be overstated. The study found evidence of product substitution, observing that consumers reduced purchases of butter and increased margarine and blend purchases. Substitution within a product category, for example between different butter brands or high and low fat variations, was not examined as brand level data was not available. Another limitation of the Danish study is that the tax had only been in place for a relatively short period at the time the study was conducted, and hence results may not be representative of long run effects.

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2 Nnoaham, Kelechi E., Gary Sacks, Mike Rayner, Oliver Mytton, and Alastair Gray. 2009. "Modelling income group differences in the health and economic impacts of targeted food taxes and subsidies" International Journal of Epidemiology 38 (5):1324-1333. doi: 10.1093/ije/dyp214.

3 Jensen, Jørgen D., and Sinne Smed. 2013. "The Danish tax on saturated fat: Short run effects on consumption, substitution patterns and consumer prices of fats" Food Policy 42: 18 - 31. www.elsevier.com/ locate/foodpol.

An impact assessment[4] of NETA, the Hungarian public health product tax targeting the sugar, salt and caffeine content of food, found that consumption of the tax-affected products decreased by between 25% and 35% in the year following introduction of the tax. The assessment also found that the supply of products containing the targeted ingredients decreased due to manufacturers reformulating products. The impact assessment examined the first year of the NETA tax being in place (September 2011 to August 2012). Therefore, longer term consumption effects are unknown. No mention of consumption changes in non-taxed food categories is made, therefore product substitution is not clear.

An empirical analysis[5] on the response of consumption to changes in soft drink taxes in Ireland found that soft drink consumption increased after the excise tax was abolished in 1992 by a slightly more than proportional amount than the price fall. The increase in consumption being proportionally greater than the price fall was attributed to the existence of product substitutes (other sugar sweetened beverages) which were not subject to the same tax changes.

An empirical study[6] which analysed US soft drink taxes between 1989 and 2006 observed moderate reductions in soft drink consumption by children resulting from a soft drink tax, and found that these reductions were more than offset by increases in fruit juice and milk consumption. However, the authors of the study note that historical soft drink taxes in the US are very small, 5.2% on average, and therefore their study results may not be applicable when evaluating larger soft drink taxes currently being considered in the US, which are closer to 10%-20%. In a randomly controlled trial (RCT)[7] which took place in a US hospital cafeteria, soft drink prices were increased by 35% and this led to a 26% decrease in soft drink sales. The sales of diet soft drinks increased by 20% and no changes were observed in the sale of water or coffee, or in the sale of non-beverage products such as sweets and desserts.

In a six month long RCT[8] involving fruit and vegetable price reductions in a Netherlands supermarket, participants purchased 5.4 kg more fruit and vegetables per two weeks than those without the price reductions. It was observed that participants did not spend the money saved on fruit and vegetable price discounts on other food categories. A Belgian RCT[9] examined the effect of providing free fruit and vegetables in a university lunch canteen on daily dietary intake of canteen customers. The trial found that participants increased consumption of fruit and vegetables with the new intake levels meeting daily recommended fruit and vegetable intake, but the increased fruit and vegetable consumption did not displace other foods.

All of the above-mentioned empirical studies observed that following introduction of a food tax, consumption of the taxed products decreased (or that a reduction/abolishment of a tax caused consumption to increase). Increased consumption of product substitutes is generally found to occur as a result of the taxes. In the case of price subsidies or free provision of fruit and vegetables

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4 National Institute for Health Development 2013. "Impact Assessment of the Hungarian Public Health Product Tax (NETA)" World Health Organisation. www.oefi.hu.

5 Bahl, Roy, Richard, Bird, and Mary Beth Walker. 2003. "The uneasy case against discriminatory excise taxation: soft drink taxes in Ireland " Public Finance Review 31 (5): 510-533. doi: 10.1177/1091142103253753.

6 Fletcher, Jason M., David E. Frisvold, and Nathan Tefft. 2010. "The effects of soft drink taxes on child and adolescent consumption and weight outcomes" Journal of Public Economics 94: 967–974. doi:10.1016/j.jpubeco.2010.09.005

7 Block, Jason P., Amitabh Chandra, Katherine D. McManus, and Walter C. Willett. 2010. "Point-of-purchase price and education intervention to reduce consumption of sugary soft drinks." American Journal of Public Health 100 (8):1427-1433. doi: 10.2105/AJPH.2009.175687.

8 Waterlander W.E., M.R. de Boer, A.J. Schuit, J.C. Seidell, I.H. Steenhuis. 2013. "Price discounts significantly enhance fruit and vegetable purchases when combined with nutrition education: a randomized controlled supermarket trial." American Journal of Clinical Nutrition 97(4):886-95. doi: 10.3945/ajcn.112.041632.

9 Lachat, Carl K., Roosmarijn Verstraeten, Bruno De Meulenaer, Joris Menten, Lieven F. Huybregts, John Van Camp, Dominique Roberfroid and Patrick W. Kolsteren. 2009. "Availability of free fruits and vegetables at canteen lunch improves lunch and daily nutritional profiles: a randomised controlled trial" British Journal of Nutrition 102: 1030–1037. doi:10.1017/S000711450930389X.

(F&V), F&V consumption is found to increase and no product substitution is observed, with consumers maintaining total food intake levels.

*Modelling / simulation research*

Of the 327 modelling /simulation studies, 24 of them examined consumer behaviour (other studies examined industry response or health effects and these will be discussed in the relevant sections). Of these 24 studies, 13 simulated a soft drink or sugar-sweetened beverage (SSB) tax and these will be discussed collectively. The remaining 11 studies which simulated a tax are:

- Chouinard et al. (2007), fat tax on dairy products in the US;
- Jensen and Smed (2007), fat and sugar taxes in Denmark;
- Allais, Etile and Lecocq (2012), fat tax in France for dessert yoghurts and fromage blancs;
- Salois and Tiffin (2011), saturated fat tax and F&V subsidy in the UK;
- Tiffin and Arnoult (2011), saturated fat tax and F&V subsidy in the UK;
- Griffith, Nesheim and O'Connell (2009), saturated fat tax in the UK;
- Nnoaham et al. (2009), saturated fat and F&V subsidy in the UK;
- Katakorpi et al. (2011), sugar tax and F&V subsidy in Finland;
- Katakorpi and Pirttila (2010), sugar tax and F&V subsidy in Finland;
- Nordstrom and Thunstrom (2011), sugar and fat tax and fibre subsidy in Sweden;
- Kuchler, Tegene and Harris (2005), snack food tax in the US.

Chouinard et al (2007) simulated a fat tax on dairy products in the US with the results that a 10% ad valorem tax would decrease consumption by a little less than 1%. This study[10] found that the fat tax on dairy products increased the demand for the low fat items within the dairy product category and reduced demand for high fat products. Jensen and Smed (2007)[11] calculated that a fat tax in Denmark would reduce fluid milk fat consumption by 8-10% as consumers are expected to substitute away from high fat milk to low fat varieties. A modelling study specific to dessert yoghurts and fromage blancs in France[12] simulated a 10% and 5%, fully passed through, ad valorem tax on full fat and half-fat products respectively and found consumption reduced by 38%. These three studies indicate that consumption decreases resulting from a fat tax on dairy may be very different for the different types of dairy products e.g. milk, yoghurt, dessert yoghurt etc. Luxury goods, such as dessert yoghurts, tend to show higher rates of substitution than staple foods like milk.

A number of studies investigated a fat tax in the UK. Nnoaham et al (2009) found that a 17.5% VAT on saturated fat reduced consumption by 3%. In a simulation study of a fat tax combined with a F&V subsidy, Salois and Tiffin (2011)[13] found that the average intake of fat decreased by 6.2%. Sugar consumption also reduced which is attributed to the decrease in consumption of biscuits, cake and pastries that are also high in saturated fat. However, intake of other useful nutrients such as calcium, vitamin D and iron decreased. Another study that simulated a fat tax in the UK, found that the tax reduced fat intake but contrary to the aforementioned study, a slight increase in sugar consumption was observed[14]. A fourth UK study[15] that simulated a fat tax, specifically examined product substitution behaviour for butter and margarine products. The results predicted that all

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10 Chouinard, Hayley H., David E. Davis, Jeffrey T. LaFrance, Jeffrey M. Perloff. 2007. "Fat taxes: big money for small change" Forum for Health Economics & Policy 10(2). doi: 10.2202/1558-9544.1071.

11 Jensen, Jørgen D., and Sinne Smed. 2007. "Cost-effective design of economic instruments in nutrition policy" International Journal of Behavioral Nutrition and Physical Activity 4:10. doi:10.1186/1479-5868-4-10.

12 Allais, Olivier, Fabrice Etilé, and Sébastien Lecocq. 2012. "Mandatory labelling, nutritional taxes and market forces: An empirical evaluation of fat policies in the French fromage blanc and yogurt market" Department of Economics, University of York. york.ac.uk/res/herc/hedgwp.

13 Salois, Matthew J., and Richard J. Tiffin. 2011. "The Impacts of Fat Taxes and Thin Subsidies on Nutrient Intakes" Agricultural Economics Society. http://purl.umn.edu/108789.

14 Tiffin, Richard, and M Arnoult. 2011. "The public health impacts of a fat tax" European Journal of Clinical Nutrition 65: 427-433. doi:10.1038/ejcn.2010.281.

15 Griffith, R., and M. O'Connell. 2010. "Public policy towards food consumption" The Institute for Fiscal Studies. doi: 10.1111/j.1475-5890.2010.00122.x.

households would reduce demand in response to the price increase and that the most likely product substitution would be from high saturated intensity products to lower saturated intensity products, rather than substituting away to an entirely different food product. Indeed, the study estimated that margarine purchases would increase slightly by 2.2%, at the expense of butter purchases.

Two related Finnish modelling studies[16,17] simulated an excise tax on sugar, equivalent to a 10% increase in the price of sugary products. The studies assumed that the tax would be fully passed onto consumers and assumed no product substitution. The studies found that consumption of the targeted products would be reduced by around 1.5%. A Swedish study[18] simulated a revenue neutral tax scenario of a subsidy on high fibre products, funded by an excise tax on added sugar This study concluded that such a policy would result in decreased added sugar consumption and lower overall sugar consumption. In the same study the scenario which examined a tax on saturated fat to fund the fibre subsidy showed that total fat and saturated fat consumption reduced and consumption of sugar also decreased - although not as much as in the sugar excise scenario. However total calorie intake and salt intake increased for the latter scenario. A study[19] on salty foods modelled the effect of a 20% ad valorem tax in the US on chips and other salty snacks and found that the tax is expected to reduce consumption by 4-6 ounces per person.

Those studies which model a sugar-sweetened beverage (SSB) tax in the range of 15% to 40%,, found that a SSB tax will reduce consumption. Briggs et al (2013)[20] modelled a SSB sales tax in the UK of 20% and found consumption reduced by 15%. Andreyeva et al (2011)[21] simulated a 20% SSB tax in the US and found this resulted in a 24% reduction in SSB consumption when diet soft drinks were not taxed, and a 16.3% reduction when the tax included diet drinks. Finkelsteina et al (2013)[22] simulated a 20% tax on SSBs in the US and found consumption decreased by an equivalent 24.3 kcal per day per person, with effects thought to be larger as the study only looked at supermarket purchases and not purchases from restaurants, deli's and other take-away type outlets. Bonnet and Réquillart (2012)[23] modelled a soft drink tax in France and found that a 0.0716 e/litre tax lead to a 10% increase in retail price and as a result, reduced soft drink consumption by 15% of initial soft drink consumption.

In relation to product substitution of SSB taxes, it is generally found that if a tax only affects regular carbonated soft drinks, consumers will substitute to similarly high calorie sports/energy drinks and sugary fruit juices[24] or to diet versions of the carbonated soft drinks. In the 'Food consumption and obesity: Public policy measures' (Foodob) study[25] taxing of all SSBs according to sugar content is

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16 Kotakorpi, Kasia, and Jukka Pirttila. 2010. "Health and distributional effects of differentiated food taxation" University of Tampere. https://editorialexpress.com/cgi-bin/conference/download.cgi?db_name=IIPF67&paper_id=204.

17 Kotakorpi, Kasia, Tommi Härkänen, Pirjo Pietinen, Heli Reinivuo, Ilpo Suoniemi, and Jukka Pirttilä. 2011. "Health-based Food Tax Policy" Labour Institute for Economic Research. http://www.labour.fi/tutkimusjulkaisut/tyopaperit/sel271.pdf.

18 Nordström, L.J., and L Thunström. 2011. "Can targeted food taxes and subsidies improve the diet?: Distributional effects among income groups" Food Policy 36(2): 259-271. http://dx.doi.org/10.1016/j.foodpol.2010.11.023.

19 Kuchler, Fred, Abebayehu Tegene, and James M. Harris. 2005. "Taxing Snack Foods: Manipulating Diet Quality Or Financing Information Programs?" Review of Agricultural Economics 27(1): 4-20. http://ssrn.com/abstract=876691.

20 Briggs, Adam D. M., Oliver T. Mytton, Ariane Kehlbacher, Richard Tiffin, Mike Rayner, and Peter Scarborough 2013. "Overall and income specific effect on prevalence of overweight and obesity of 20% sugar sweetened drink tax in UK: econometric and comparative risk assessment modelling study" BMJ Publishing Group. doi: 10.1136/bmj.f6189.

21 Andreyeva T, F.J. Chaloupka, and K.D. Brownell. 2011. "Estimating the potential of taxes on sugar-sweetened beverages to reduce consumption and generate revenue" Prev Med 52: 413-6. doi: 10.1016/j.ypmed.2011.03.013.

22 Finkelsteina, Eric A., Chen Zhenb, Marcel Bilgera, James Nonnemakerb, Assad M. Farooquia, and Jessica E. Todd 2013. "Implications of a sugar-sweetened beverage (SSB) tax when substitutions to non-beverage items are considered" Journal of Health Economics 32 (1):219–239. http://dx.doi.org/10.1016/j.jhealeco.2012.10.005".

23 Bonnet, Céline, and Vincent Réquillart. 2013. "Impact of Cost Shocks on Consumer Prices in Vertically-Related Markets: The Case of The French Soft Drink Market" American Journal of Agricultural Economics 95 (5). doi: 10.1093/ajae/aat055".

24 Zhen, Chen, Eric A. Finkelstein, James M. Nonnemaker, Shawn A. Karns and Jessica E. Todd. 2013. "Predicting the effects of sugar-sweetened beverage taxes on food and beverage demand in a large demand system" American Journal of Agricultural Economics 1(25). doi: 10.1093/ajae/aat049.

25 Foodob and Institute for Fiscal Studies 2012. "Food consumption and obesity: public policy measures" European Commission. http://cordis.europa.eu/result/report/rcn/51329_en.html.

recommended specifically to prevent product substitution to other high sugar beverages. If the whole SSB category is taxed, product substitution outside the SSB product category is however uncertain. Briggs et al (2013) argues that as SSBs are a non-essential food item with no beneficial nutrients, a reduction in consumption of SSBs will not cause any detrimental health effects as the product substitutes are most likely to be healthier options, for example diet drinks, water, low-fat milk and low-sugar fruit juice. Indeed, Dharmasena and Capps (2012)[26] found that the consumption of fruit juices, low-fat milk, coffee and tea increased when a SSB tax of 20% was simulated in the US. However, neither of these two studies considered foods as a substitute for SSBs. Zhen et al. (2013), discussed above, did consider food as a product substitute and found that one half of the reduction in calories from decreased SSB consumption was substituted with calories from other foods and beverages such as canned soup, bread, cheese, cereals, candy and snacks. In contrast, Finkelsteina et al. (2013), also discussed above, did not find any evidence of substitution to sugary foods, such as ice cream and snacks. The study found product substitution to fruit juices only.

*Conclusions from the literature review on consumer behaviour*

Food is not a single product but a complex bundle of goods with many substitutes, making it quite challenging to predict how consumers will alter their buying behaviour in response not only to the taxed good, but especially with respect to other related goods. Overall however, empirical and modelling results show that an increase in the price of a good, resulting from a tax, reduces consumption of the taxed good. Results also suggest that reduced consumption of the taxed good is generally coupled with increased consumption of substitute goods. There are a wide variety of findings, sometimes contradictory, as to the specific product substitution that occurs. Debate also extends to whether product substitution to more or less 'healthy' alternatives takes place. Results vary depending on the product or the classification of products studied.

There are caveats and limitations to the findings on consumption and product substitution. The empirical studies are limited by the available data which is often at a broader category level, preventing observations of product substitution within a given product category (e.g. moving to cheaper versions of the same product). Empirical studies also include the caveat that the results may not be representative of long term outcomes of food taxes given the short timeframe over which food taxes have been in effect in the EU Member States studied. The modelling studies are limited by the robustness of the demand elasticities that they use to predict consumer purchase behaviour towards the taxed product and product substitutes. There is a wide variety of own price (the taxed product) and cross price (product substitutes) elasticity estimates for any given product category which is being studied. As demand elasticities play a crucial role in simulating the consumption effects of a food tax, the results hinge upon the credibility of the elasticity estimates and assumptions[27]. A significant caveat of the majority of the modelling studies is that the simulated tax is assumed to be passed on fully (one-for-one) to consumer prices. However, in reality this may not be the case, making estimates of consumption reduction less reliable.

### Industry response

From the empirical and modelling/simulation literature, 7 studies examine industry behaviour in response to a food tax:

- Bahl, Bird and Walker (2003), Ireland's soft drink taxes,
- Jensen and Smed (2013), Denmark's saturated fat tax,
- Bergman and Niels (2010), Denmark's sugar tax on soft drinks,
- Berardi et al (2012), France's sugar-sweetened beverage tax,

[26] Dharmasena S, and O Jr. Capps. 2012. "Intended and unintended consequences of a proposed national tax on sugar-sweetened beverages to combat the U.S. obesity problem." Health Economics 21(6):669-94. doi: 10.1002/hec.1738.

[27] Lin B.H., T.A. Smith, J.Y. Lee, and K.D. Hall. 2011. "Measuring weight outcomes for obesity intervention strategies: the case of a sugar-sweetened beverage tax" Econ Hum Biol 9 (4):329-41. doi: 10.1016/j.ehb.2011.08.007.

- Bonnet and Requillart (2013 and 2011), simulated sugar tax on soft drinks in France, and
- Allais, Etile and Lecocq (2012), simulated fat tax in France on dessert yoghurts and fromage blancs.

Additional views are obtained from:

- Oxford Economics and the International Tax and Investment Centre (2013), food taxes in general.

These 7 studies present strong evidence of firms engaging in strategic pricing behaviour in response to tax policy changes, whereby they may undershift (increase prices by less than the tax increase) or overshift (increase prices by more than the tax increase) the tax to consumer prices as well as change prices of substitute products[3,5,12,23, 28, 29]. Factors that influence a tax being over or undershifted are the tax design (ad valorem or excise), whether the policy change is a tax increase or a tax reduction, and the dynamics of the particular industry affected. Bonnet and Requillant (2011) propose that by not taking into account strategic pricing behaviour of firms, the impact of a tax on consumption behaviour may be under or over estimated by 15% to 40%. Understanding how food taxes are likely to be transmitted to consumer prices has significant implications for the impacts on brand market shares and profit for manufacturers and retailers, as well as the total effect on consumption.

Supporting Bonnet and Requillart's claims that a 100% pass through assumption misguides consumption estimates in response to a food tax is the (earlier discussed) study by Allais, Etilé, and Lecocq (2012). This French study found that a 10%, fully passed through, ad valorem tax on full fat yoghurt and fromage blanc products reduced consumption by 38%. However this reduction significantly lowered to 9% when it was assumed the tax was undershifted. This research found that large undershifting was possible due to the high ex ante margins in these product categories.

In their 2013 modelling study on the effects of the French sugar tax on the soft drink industry, Bonnet and Requillart found that due to strategic pricing, excise taxes are over-transmitted to consumers and ad valorem taxes are under-transmitted to consumer prices – confirming earlier observations (Bonnet and Requillart 2011). Results from both studies suggest a high heterogeneity in product pricing and indicate a delay of up to six months in price adjustment. A recent empirical study[30] on the French SSB tax (introduced in 2012) confirmed these findings. The results show that prices of the newly taxed beverages increased gradually over time, but not homogenously, with transmission of the tax differing across product categories. Full transmission of the tax occurred for soft drinks six months after the introduction of the tax but prices of flavoured waters and fruit drinks did not reflect an increase. Instead, producers and retailers decided to decrease their profit margins on these beverage categories. This market strategy may be explained by the fact that for these latter two categories of products (flavoured waters and fruit drinks), competition and product substitution are possibly stronger, hence the aim of producers and retailers to maintain their market share might be more dominant.

This empirical analysis on the French SSB tax also found that pricing differed across retailing groups and beverage brands. The data showed that the two largest retailers in France had the lowest average pass-through rate, and that the pass-through was much higher for private labels

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28 Bonnet, Céline, and Vincent Réquillart. 2011. "Strategic pricing and health price policies." Toulouse School of Economics. http://neeo.univ-tlse1.fr/2944/1/strategic_pricing.pdf.

29 Bergman, Michael, and Niels L. Hansen. 2010. "Are Excise Taxes on Beverages Fully Passed Through to Prices? The Danish Evidence" Department of Economics, University of Copenhagen. http://www.econ.ku.dk/okombe/BergmanHansen.pdf.

30 Berardi, Nicoletta, Patrick Sevestre, Marine Tepaut and Alexandre Vigneron. 2012. "The impact of a 'soda tax' on prices. Evidence from French micro data" Banque de France.

than for other brands. This indicates that the bigger retailing groups have a strong bargaining power, even with the large beverage producers, but the large producers have considerable negotiating power with smaller retailers. Supporting the French SSB tax experience are results from the empirical analysis on the Danish saturated fat tax which showed that the various retail stores adopted different pricing strategies. Supermarkets fully passed on the tax to consumers for blends and margarine, but under shifted the tax for butter and oils. Discount stores perfectly transmitted the price of blends and oils to consumer prices, but over shifted the tax for butter and margarines to take advantage of the opportunity to increase margins as a result of consumers switching to discount stores for purchases of the tax-affected products.

In addition to tax design and market dynamics influencing strategic pricing behaviour, the direction of the tax change (increase or reduction) has also been found to have an effect. The empirical study of Ireland's soft drink excise tax that studied the period in which the excise tax was lowered (1990) and then abolished (1992), showed that the price of soft drinks did not fall between 1990 and 1992 despite the tax reduction. This was thought to be because of rising marginal costs of soft drink production. Following the tax abolishment in 1992, soft drink prices fell but not by the full amount of the tax, attributed to the fact that under shifting of tax cuts is likely in imperfectly competitive markets. A study on the Danish sugar tax on soft drinks supports these findings and notes that taxes are more than fully passed through to consumers when there is a tax increase while there is an under shifting when taxes are lowered or abolished. The study has been looking mainly at beverages and has also confirmed heterogeneity across a number of subcategories with liquor producers and retailers acting very much in unity but higher price variations for soft drinks and beers.

#### *Conclusions from the literature review on industry response*

The findings discussed above show that there is no clear and uniform transmission of taxes to consumer prices due to strategic pricing behaviour by manufacturers and retailers. An important implication of this finding, is that firms may be able to neutralise tax policy interventions by reducing prices, or undershifting the tax. A report by Oxford Economics and the International Tax and Investment Centre[31] points out that undershifting of a tax means that firms absorb the tax by reducing margins and therefore profitability lowers. Alternatively if a tax is fully passed or overshifted, then generally sales reduce and profitably is again lowered. However, as some empirical studies highlight, manufacturer's or retailers may taking advantage of increased demand for substitute products by raising prices and thereby increasing margins on those products. The dominant factors in shaping the responses of manufacturers and retailers are the existing margins within the product market in question, the design of the tax and direction of the tax change, the market share and thus bargaining power of individual retailers and producers, and the availability of substitute products.

### Impacts on industry

There is very limited empirical or simulation literature that specifically studies the impact of a food tax on employment and investment. Impacts on industry competitiveness, while not specifically studied, can be inferred from the results of a number of studies which examined product price and market share effects of food taxes. The relevant empirical and modelling studies are listed below with all but the last study having already been introduced in earlier sections:

- Bahl, Bird and Walker (2003), Ireland's soft drink taxes;
- Jensen and Smed (2013), Denmark's saturated fat tax;
- Jensen and Smed (2007), simulated fat tax in Denmark;
- Bergman and Niels (2010), Denmark's sugar tax on soft drinks;

[31] Oxford Economics, International Tax and Investment Centre. 2013. "The impacts of selective food and non-alcoholic beverages taxes" International Tax and Investment Centre. http://www.iticnet.org/publications/studies-and-reports.

- National Institute for Health Development (2013), Hungary's public health product tax;
- Bonnet and Requillart (2012), simulated sugar tax on soft drinks in France;
- Lock et al (2010), computable general equilibrium modelling for adoptions of a healthy diet (related to decreasing saturated fat consumption) in the UK.

Additional views are obtained from:

- Oxford Economics and the International Tax and Investment Centre (2013), food taxes in general.

*Competitiveness*

The food tax effects discussed in the literature that relate to industry competitiveness include administrative burden of taxes, tax-induced price changes that alter market share between producers and tax-induced price changes that cause structural shifts in the retailing sector.

Bahl, Bird and Walker comment on the administrative costs of excise taxes and VAT, stating that Ireland's special excise tax on soft drinks (in place from 1916 to 1992) was easy to assess and collect and did not suffer the same complications and administrative burden as the highly differentiated and complicated VAT rates for soft drinks. Even so, the study concluded that abolishment of the special excise tax on soft drinks reduced overall administrative burden. Jensen and Smed also refer to the potentially high administration costs, in this case, with reference to an excise tax that targets specific nutrients such as saturated fat or sugar. Due to the higher costs associated with documentation and calculation of the tax across a large number of products, this design appears more costly than, for example, a VAT reduction for fruits and vegetables. Even so, this simulation study found the specific taxing of nutrients 10-30% more effective in terms of improving nutrition than broad food category taxes like VAT.

Oxford Economics and ITIC (2013) also discuss the administrative costs of food taxes and specifically with respect to a sugar tax, raise the concern that due to the many kinds of sugar used in products, the government would need to monitor the ingredients of thousands of products in order to calculate the correct tax. It may be possible for manufacturers to reformulate products and lower or remove the ingredients attracting the tax, however this also has associated costs. The impact assessment on the Hungarian public health product tax (NETA), based on a manufacturer's survey, found that 40% of respondents either removed the taxed product completely or decreased the quantity of the taxed ingredient.

With respect to the market power of retailers and manufacturers, Bonnet and Réquillart[32] estimate that for the leading soft drink brands, consumers prefer to buy the same brand from an alternative, lower cost retailer, than to switch between brands sold by the same retailer. Similarly, the results of the empirical Danish fat tax study indicated that structural shifts in the retailing sector occurred as consumers moved their purchasing from supermarkets to discount stores. The Danish empirical analysis is limited by the fact that category level data was used and therefore only shifts between stores could be observed. However, many stores in Denmark offer both brand and discount varieties within the same store and hence switching between high end and discount varieties may be underestimated. Indeed, an earlier mentioned study which estimated product substitution between brands in the same product category found that the most likely substitution resulting from a fat tax on dairy was from a high fat intensity product to a brand that contained half the fat content of its competitor. This study also found increased margarine purchases at the expense of butter purchases.

[32] Bonnet, Céline, and Vincent Réquillart. 2011. "Does the EU sugar policy reform increase added sugar consumption? An empirical evidence on the soft drink market." Health Economics 20 (9): 1012-1024. doi: 10.1002/hec.1721

The results of the above-mentioned studies suggest that food taxes can significantly change consumer preferences towards products (e.g. butter to margarine), brands (high fat/sugar products to low fat/sugar products) and stores (higher-end retailers to lower-end retailers). Such behavioural changes by consumers have the potential to impact on the market share and profitability of product lines, producers and retailers. The extent of this impact is highly variable depending on the products taxed, the available substitutes, as well as the brand and bargaining power of the market players.

### *Trade flows*

A common argument against food taxes is that they raise the price of goods relative to the prices of the same goods in neighbouring countries where no such tax exists and thereby promote cross border shopping. There is however, limited information regarding the actual impact of non-harmonised EU food taxes on trade flows. This might be explained by the fact that trade flows directly relatable to the introduction of such food taxes can prove to be difficult to measure as there are a number of other market, regulatory and economic factors that can result in a change of consumption and export/import flows.

Jensen and Smed briefly mention in their 2007 simulation of a Danish fat tax that food taxes may cause cross-border shopping. In their later 2013 empirical study of the implemented Danish fat tax, the authors comment that the issue of cross border shopping may be valid for those citizens living close to the border, but that for most people the transactions costs to travel outside the border are too high for purchases of oils and fats. They highlight that this is an area for further research.

A study which analysed the reduction of excise taxes for soft drinks and liquor in Denmark in 2003 and for beer in 2005 (tax cuts aimed at reducing cross border shopping), found that the tax cuts did not reduce cross border shopping and in fact, cross border shopping increased for soft drinks and beer. This was predominantly due to firms not passing all of the tax reduction on to consumer prices.

### *Investment and employment*

One macro-economic simulation study[33] comments that changes in food spending which result from a health motivated food tax will cause some sectors to grow (such as fruit and vegetables) and others to decline (such as the animal sector in the case of a tax on saturated fat), and that rates of employment and job loss will depend on the mobility of resources to move from one sector to another. However no studies have been identified, including the aforementioned study, which provide empirical evidence or simulation predictions on sector growth/decline, investment or employment.

The Oxford Economics and ITIC report claims that the respective food taxes in Hungary and Denmark have led to lower profits for the industry and caused job losses however provide no supporting evidence. The impact assessment on the Hungarian NETA analysed balance sheet data of the 35 companies paying the majority of the tax (80-90%) and found that their net sales revenue and number of employees increased and their net loss reduced from 2010 to 2011, the years before and after introduction of the tax. However, there is no detail given as to whether the study controlled for the presence of other factors that may have been impacting on revenue and employment in Hungary.

[33] Lock, Karen, Richard D. Smith, Alan D. Dangour, Marcus Keogh-Brown, Gessuir Pigatto, Corinna Hawkes, Regina Mara Fisberg, Zaid Chalabi. 2010. "Health, agricultural, and economic effects of adoption of healthy diet recommendations" The Lancet 376 (9753): 1699-1709. doi:10.1016/S0140-6736(10)61352-9.

*Conclusions from the literature review on impacts on industry*

From this literature review it is apparent that very limited empirical evidence exists on the impact of food taxes on investment and employment and more research is needed on trade flows effects. It is likely that food taxes impact competitiveness of the agri-food industry in the form of increased administrative costs and costs associated with product reformulation. They are also expected to cause changes in consumer demand between product categories, brands and retailing outlets – which creates in turn both winners and losers. We expect to gather more information on industry impacts directly from stakeholders through the interview and case study phases.

### Health effects

No empirical studies on the health effects of EU food taxes were found. Within the modelling/simulation literature that examines health effects of food taxes, there is no definitive consensus as to the question of whether food taxes improve public health. From the 27 modelling studies, 23 examined health effects of food taxes. As with the consumer behaviour discussion, SSB taxes will be discussed collectively, the remaining 11 studies are:

- Salois and Tiffin (2011), simulate a fat tax and F&V subsidy in the UK;
- Jensen and Smed (2007), fat and sugar taxes and fibre and F&V subsidies in Denmark;
- Nnoaham et al (2009), various tax scenarios for fat, sugar and salt in the US;
- Tiffin and Arnoult (2011), fat tax and F&V subsidy in the UK;
- Nordstrom and Thunstrom (2011), sugar and fat tax and fibre subsidy in Sweden;
- Katakorpi et al. (2011), sugar tax and F&V subsidy in Finland;
- Katakorpi and Pirttila (2010), sugar tax and F&V subsidy in Finland;
- Bonnet, Dubois, and Orozco (2008), general food tax in France;
- Lock et al (2010), computable general equilibrium modelling for adoptions of a healthy diet (related to decreasing saturated fat consumption) in the UK;
- Cecchini et al (2010), general food tax in the UK and various non-EU countries;
- Dioikitopoulos Katsaitiy and Shaw (2013), general food tax in the US.

Two related Finish modelling studies[16, 17] simulated an excise tax on sugar and estimated large shifts towards lower BMI with an average reduction in body weight of 3.2 kg. The resultant body weight loss, as well as the changes in nutritional intake, is estimated to bring about an average 13% reduction in the prevalence of type 2 diabetes and a 3.0% average reduction in incidence of coronary heart disease. However, this study did not consider product substitution.

A study which did consider product substitution and simulated a fat tax in the UK, found that the modelled fat tax was successful in decreasing fat and sugar intake, but the overall health benefit was unclear because other useful nutrients in dairy products such as calcium, iron and vitamin D also declined, suggesting unintended health repercussions. A more recent UK study simulating a tax on saturated fat combined with a 15% fruit and vegetable subsidy, found that the F&V subsidy did succeed in bringing average F&V intake levels in line with dietary recommends but the fat tax failed to reach this goal and sugar consumption increased slightly. The study concluded that a substantial amount of the population continues to consume an unhealthy diet and thus, the combined tax and subsidy policy had a negligible effect on the risks of disease. The use of fiscal policies in combination with other interventions was promoted as a better tool to achieve improvements in diet.

A third UK study predicts that taxes in the UK on saturated fat, sugar or salt are all unlikely to prevent deaths from obesity related diseases unless combined with a fruit and vegetable subsidy and even then the effect is small. Similarly, Jensen and Smed (2007) found a combination policy of taxes on fat and sugar and subsidies on fibre and F&Vs to be most effective in producing an overall healthy diet intake (although the study ignored product substitution). In Nordstom and Thunstrom's

(2011) Swedish study that simulated various tax scenarios combining fibre subsidies with fat or sugar excise duties, health effects were deemed difficult to evaluate as while fibre increased as a result of the subsidy, fat, salt and sugar consumption also increased for some segments of the population.

A number of empirical studies examine the health effects of SSB taxes in the US. This is possible due to the fact that a majority of states in the US have had taxes on SSBs, usually in the form of a sales tax, for many years[34]. A systematic review of all US literature on SSB taxes up to 2006, concluded that studies that analyse existing soft drinks taxes in the US to determine consumption and body weight effects, find little to no relationship between SSB taxes and weight. However, Zhen et al. (2013) points out that this is not an unexpected result given that the current state level SSB taxes in the US are very low (between 1% - 7%).

In contrast to the empirical studies on US SSB taxes, modelling studies which simulate a SSB tax in the US and estimated body weight losses generally find positive health effects[21, 22,26, 35]. Finkelsteina et al (2013) found a 20% SSB tax resulted in average weight loss of 1.6 pounds during the first year and a cumulative weight reduction of 2.9 pounds in the longer term. Another study that simulated a 20% SSB tax in the US estimated between 1.54 and 2.55 pounds per year weight loss. Andreyeva, Chaloupka and Brownell (2011) calculated an average weight loss of 5 pounds per year from a penny-per-ounce SSB tax, roughly equivalent to a 20% SSB tax (assuming full pass through).

However Lin et al (2011) warns that static models (as used by the three studies discussed above) that calculate body weight losses and reductions in obesity prevalence based on reductions in SSB calorie intake can largely overestimate the effects. In comparison to the dynamic model used by Lin et al (2011), the static model estimates 7.6 times more weight loss than the dynamic model that accounts for the fact that a constant calorie reduction does and cause the same weight loss over time, but that weight loss slows and plateaus.

Another variable to consider in the health results of SSB modelling studies is highlighted by an earlier study[35] that simulated a 20% and 40% tax on SSBs. The study compared two simulations, one assumed only carbonated soft drinks were taxed and one assumed all SSBs attracted the tax. The study observed that the health effects depend not only on the size of the tax but on the selection of products which attract the tax. The study estimates the health benefits are 60% greater when the tax applies to all SSBs, as product substitution is more difficult. Furthermore, most SSB studies assume no product substitution outside the beverage category. Zhen et al (2013) considered food as a product substitute to SSBs and found that weight losses were predicted, however increases in sodium and fat from product substitution offset about one half of the calculated calorie reductions.

In addition to the US studies, Briggs et al (2013) investigated the impact of a 20% sales tax on sugar sweetened beverages in the UK on weight, measured in terms of BMI, and predicted the prevalence of obesity in adults would reduce by 1.3%, around 180 000 citizens, and 0.9% for overweight, around 285 000 people. Briggs noted that this increase is smaller than those estimated in US studies because the consumption of SSBs is much smaller in the UK than in the US to start with. A modelling exercise which supported a Health Impact Assessment of Ireland's proposed 10%

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[34] Brownell K.D., T. Farley, W.C. Willett, B.M. Popkin, F.J. Chaloupka, J.W. Thompson, et al. 2009. "The public health and economic benefits of taxing sugar-sweetened beverages" New England Journal of Medicine 361: 1599-605. doi: 10.1056/NEJMhpr0905723.

[35] Finkelsteina, Eric A., Chen Zhenb, James Nonnemakerb, and Jessica E. Todd 2010. "Impact of targeted beverage taxes on higher- and lower-income households" Archives of International Medicine 170 (22):2028-34. doi: 10.1001/archinternmed.2010.449.

SSB tax, estimated that the tax would reduce obesity in adults by 1.25%. The Foodob study which simulated soft drink taxes in the UK and France concluded that SSB taxes are an effective policy tool to help lower obesity.

A number of studies didn't simulate a food tax, but instead investigated more generally the effectiveness of reducing intake of certain nutrients on population health. Bonnet, Dubois and Orozco (2008)[36] used French purchasing data over a two year period and nutrient information on all products to estimate calorie consumption. The study concluded that taxing the "junk food" category would produce significant decreases in the prevalence of obesity due to the high price elasticity of this food category. The fat and oils category is also highlighted as a possible target for taxation to reduce BMI levels. This is proposed with the caveat that a tax incentive to lower consumption of one category of goods, may not always reduce total calories due to product substitution.

Lock et al. (2010) applied epidemiological and economic modelling to a case study of lowering saturated fat consumption in the UK. The study found that targeting reduction of dairy products as opposed to a blanket reduction of all food, had the greatest health effect. A health service saving of GBP 20 million could be achieved and 70 000 premature deaths could be prevented each year if saturated fat consumption matched nutritional guidelines. However, the study did not estimate the size or design of the tax needed to generate the required consumption reduction, and did not consider product substitution.

Another UK study[37] simulated a fruit and vegetable subsidy and compares this fiscal measure to a range of non-tax measures such as labelling, regulation, school programs and mass media campaigns. The study concluded that price interventions and regulation can generate the biggest health benefits in the shortest timeframe, and that a health policy combining a number of interventions is more successful than individual policy measures.

In contrast to the three above-mentioned studies, a US economic modelling study[38] that examined the relationship between food taxes and weight, concluded that reducing taxation on food increased food consumption and body weight levels.

### *Conclusions from the literature review on health effects*

The findings on health effects from modelling / simulation literature is not conclusive. There are two key reasons for this: 1) product substitution and 2) calculation method of health effects. Firstly, product substitution has important implications for the total health effects of food taxes because a food tax aimed at reducing one product or ingredient, may increase consumption of other products. Depending on whether the product substitutes have a more or less healthy nutrient composition, this may enhance or undermine the intended health outcomes of the tax. Food taxes can therefore have unintended health consequences.

Secondly, modelling studies generally determine health effects by simulating a food tax, predicting consumer response (including assumptions about product substitution), calculating the overall nutrient or calorie reduction/increase for a population and then translating the increases/reductions to weight loss and/or disease prevalence. This methodology assumes a linear connection between these "variables", of which the size and sign is in itself not undisputed. Each of these steps is highly

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36 Bonnet, Céline, Pierre Dubois, and Valérie Orozco. 2008. "Food Consumption and Obesity in France: Identification of Causal Effects and Price Elasticities" Toulouse School of Economics. http://www.eea-esem.com.

37 Cecchini, Michele, Franco Sassi, Jeremy A. Lauer, Yong Y. Lee, Veronica Guajardo-Barron, and Daniel Chisholm. 2010. "Tackling of unhealthy diets, physical inactivity, and obesity: health effects and cost-effectiveness" The Lancet 376 (9754): 1775-1784. doi:10.1016/S0140-6736(10)61514-0.

38 Dioikitopoulos, Evangelos V., Marina-Selini Katsaitiy, and Philip Shaw. 2013. "A Growth Model of Weight Preferences, Food Consumption and Public Policy" Brunel University London. http://www.brunel.ac.uk/__data/assets/pdf_file/0007/331693/1325.pdf.

complex and the credibility of the final conclusions relies on the quality of data and robustness of methodological approach. No empirical research has to our knowledge been done to verify findings of simulation studies.

#### Socio-economic effects

A common criticism of food taxes is that they are regressive, meaning that low-income households pay a greater proportion of their income on food taxes than high-income households. The consistent finding in the literature is that food taxes are regressive[2, 10,11, 16, 17, 20, 24, 27]. However, the actual income impact is predicted to be very low[20,27]. It is also argued that food taxes will benefit the low-income population the most in terms of improving nutrition and hence be progressive from a health perspective[16, 24].

A simulation study of SSB taxes in the US predicted that due to the fact that low-income households purchase more sugar sweetened beverages, the welfare loss resulting from the SSB tax would be greater than high-income households however, the calorie reductions would be higher for low-income households. Another simulation study, found an excise tax on sugar in Finland would be mildly regressive however, predicted the health benefits to be greatest for low-income households as they are more sensitive to changes in price of sugary and sweet products.

A UK study which specifically examined health and economic impacts for different income groups of a range of tax (fat, salt and sugar) and subsidy (fruit and vegetables) scenarios, estimated no health benefit for low-income populations. However, this finding is not necessarily robust and health benefits for the poor may be underestimated as, unlike the two earlier mentioned studies, this study did not account for low income households having an existing higher prevalence of obesity related diseases or for differences in price elasticity across income groups. Another UK simulation study also found no evidence that low-income groups would experience larger health benefits, rather the study concluded that the modelled 20% SSB sales tax would be most beneficial for those adults below 30 years of age as this is the highest group of SSB consumers.

Contrary to the numerous studies supporting the argument that food taxes are regressive, a simulation study on the impact of a SSB tax on low and high-income households in the US found the SSB tax not to be regressive. Instead, high-income households were found to pay the largest share of the tax because they are least likely to change purchasing behaviour in response to higher prices and because they generally pay a higher price for SSBs, unlike low-income households who buy from discount stores, buy in bulk or buy when the products are on sale.

*Conclusions from the literature review on socio-economic effects*

Certainly, the majority of studies find food taxes to be regressive. There are suggestions that food taxes may be progressive in terms of health benefits, however the findings are contradictory and inconclusive.

### *2.2.4 Conclusions from the literature review*

Based on the literature review, we conclude that:

- A food tax is expected to reduce consumption of the taxed product/nutrient, however the extent of the decrease will depend on the pass-through rate, the tax design, the size of the tax and the availability of product substitutes;
- Product substitution is a likely outcome of a food tax, and the extent of substitution will vary based on the tax design, more specifically the product category / nutrient which is taxed;
- Firms may not necessarily transmit the tax one-to-one to consumer prices. An ad valorem tax and situation of high ex ante margins will likely result in undershifting with firms bearing part of

the tax through reduction of margins, while an excise tax, strong brand power and a highly competitive market will likely result in full transmission;

- Food taxes may impact industry competitiveness in terms of administrative burden, market share and profitability. Investment and employment effects have so far received only little attention in empirical research. As a result robust conclusions in this field are still lacking. The same holds true for the impact on trade flows, where the lack of empirical research can be explained by measurement issues and data limitations;
- Health effects are uncertain, primarily due to uncertainties and disparate views on product substitution, as well as due to the linear methods used in translating calorie reductions to weight loss which have been criticised as overstating weight reductions;
- Food taxes are regressive in terms of income. There are suggestions that food taxes could be progressive, by bringing most benefit to low-income population segments, however there are contradictory findings on this.

Clearly the effects of a food tax can depend on many elements and therefore food taxes must be very carefully considered with respect to the:

- choice of food to tax (nutrient or product category) and inclusions or exclusions,
- choice of tax base (sales, ad valorem, excise),
- size of the tax rate,
- likely product substitutes and their comparative ‘healthiness’,
- expected under or over shifting by firms of the tax to retail prices,
- possible trade flow effects,
- administrative complexities of the tax,
- overall health benefit as a result of consumer response, including product substitution,
- combination policies such as subsidies for fruits and vegetables or fibre, and
- assessment of the effects on competitiveness.

# 3 Data Collection and Analysis

In this chapter, we present the analytical results of quantitative data on the impact of food taxes on consumption and industry competitiveness. In this analysis we focus on the most important anticipated effect of the taxes: retail prices, manufacturing prices and demand. In the sections below we describe our first impression of the effects for a multitude of taxes that were changed, abolished or introduced in European countries. We assess the direct effect of the prices and demand of the taxed products and the effect of that taxes on prices and demand of non-taxed products.

We also investigate the effect of taxes on the competitiveness of the sector. We provide below a first assessment of the profit margin retailers, and to a lesser extent, also to the profit margin of manufacturers. We are still looking for additional detailed information on sector employment (which also feeds into calculation of labour productivity), sector investments and trade flows.

These analyses are predominantly based on data from the Passport system, provided by Euromonitor. It provides information on total consumer demand for various food sectors in all European countries from 1999 onward. In addition, we also included information in our analyses on the various taxes, as described in the previous chapter. The specific methodology for the analysis is described in Annex 3.

## 3.1 Visual inspection of individual taxes

For each selected tax, we describe the tax and present the information found on prices, consumption, demand and retail margins.

### *3.1.1 Tax on chocolate and confectionery – Denmark*

**Description of tax**

In 1968, an excise tax was introduced in Denmark on Chocolate and chocolate products, liquorice products, marzipan, sweets, effervescent products, chewing gum, cakes with a certain sugar, cacao or chocolate content etc. Certain products that can be used for the production of chocolate and sweets, such as almonds, nuts and cocoa nuts, are subject to raw materials tax.

In 2010, the tax was increased from DKK 14.20 (1.90 euro) to DKK 17.75 (2.38 euro) per kilo and a reduced rate of DKK 14.20 (1.9 euro) for products containing less than 5 grams of sugar per kilo. In 2012 it was raised again to DKK 23.75 (3.18 euros) and 20.2 (2.71 euros) for low-sugar products.

In 2013 it was raised again to DKK 24.61 (3.57 euro) and 20.93 (2.81 euros) for low-sugar products.

**Data inspection**

*Prices*

We investigated the effect of the tax being imposed on two types of products: chocolate and the product group sugar confectionery.

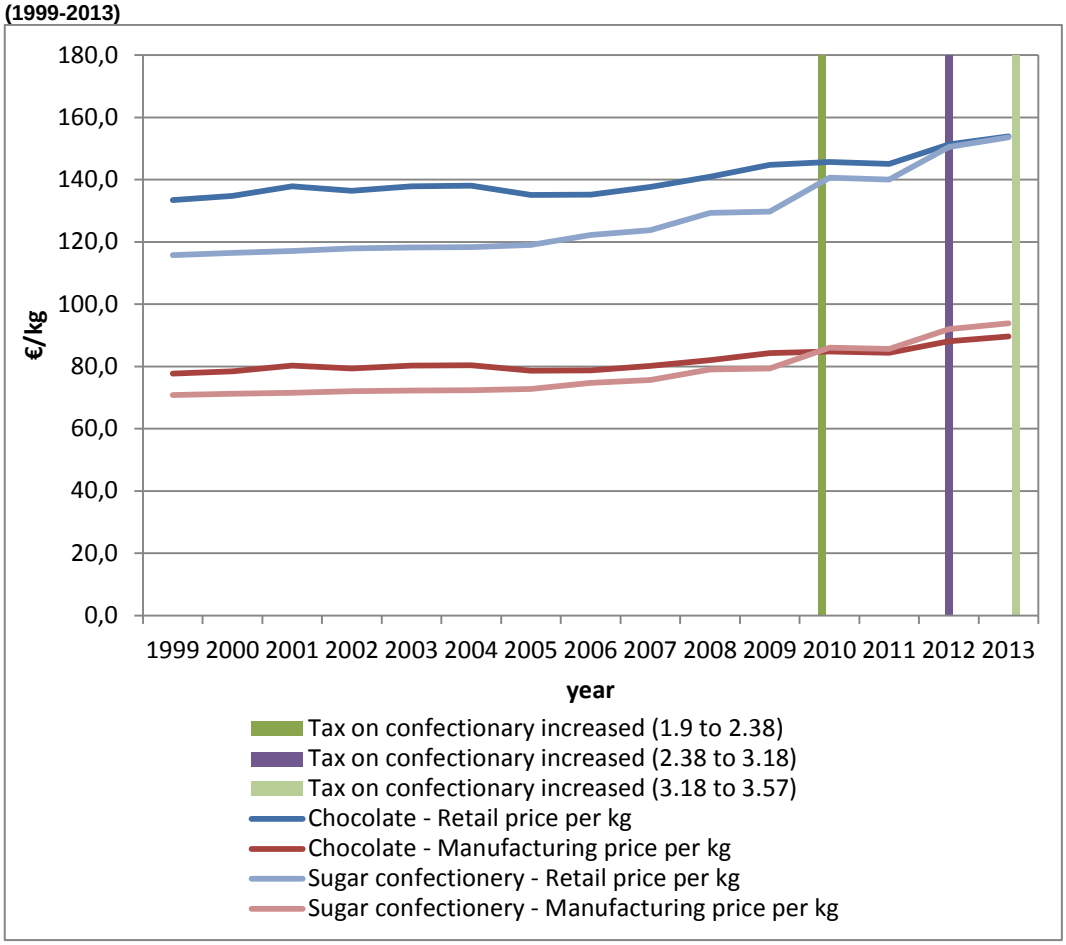
Over the observed period, prices remain relatively stable, although a small increase is visible for all products. In absolute term, the price for gum is most volatile of all prices of the observed products,

with price change of around DKK 20. However, in relative terms prices of sugar confectionery fluctuated the most with rapid price increases and decreases of more than five percent.

It is interesting to note that the relative price margin for the retailer changes slightly. This means that all price changes from the manufacturer side are directly transferred to the consumers.

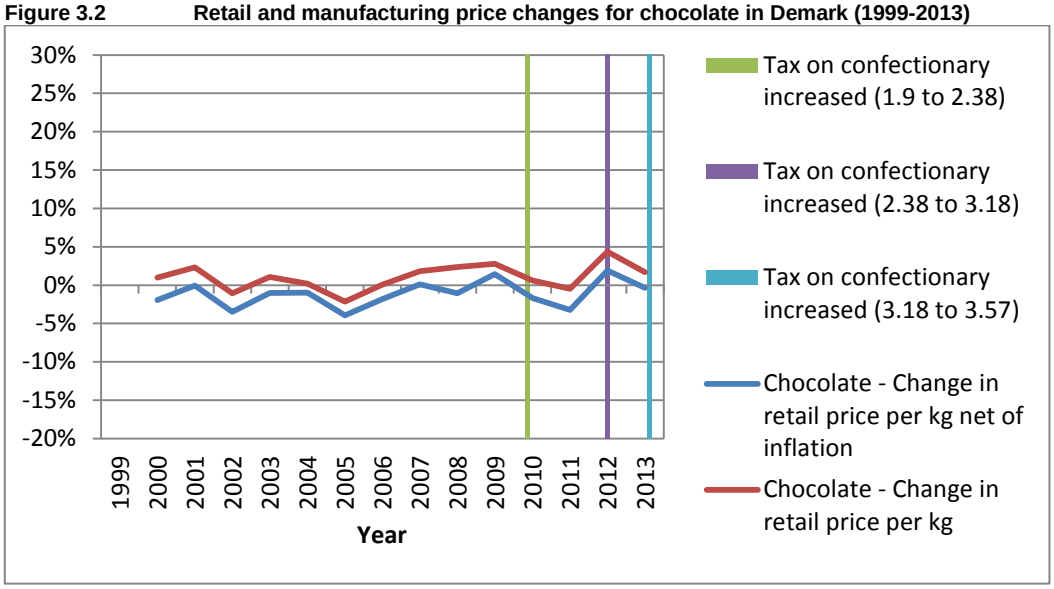
The change most strongly visible in the price development is the second increase due to the change in the tax rate (from DKK 14.20 to DKK 23.75, and from DKK 14.20 to DKK 20.20 for low sugar products). Consumers buying chocolate or sugar confectionery faced a sharp increase in the prices in 2012. The first tax increase is only clearly visible in the prices for sugar confectionery. The effect of the last tax increase is not clearly distinguishable for any of the products.

**Figure 3.1 Retail and manufacturing prices of chocolate and sugar confectionery in Denmark (1999-2013)**



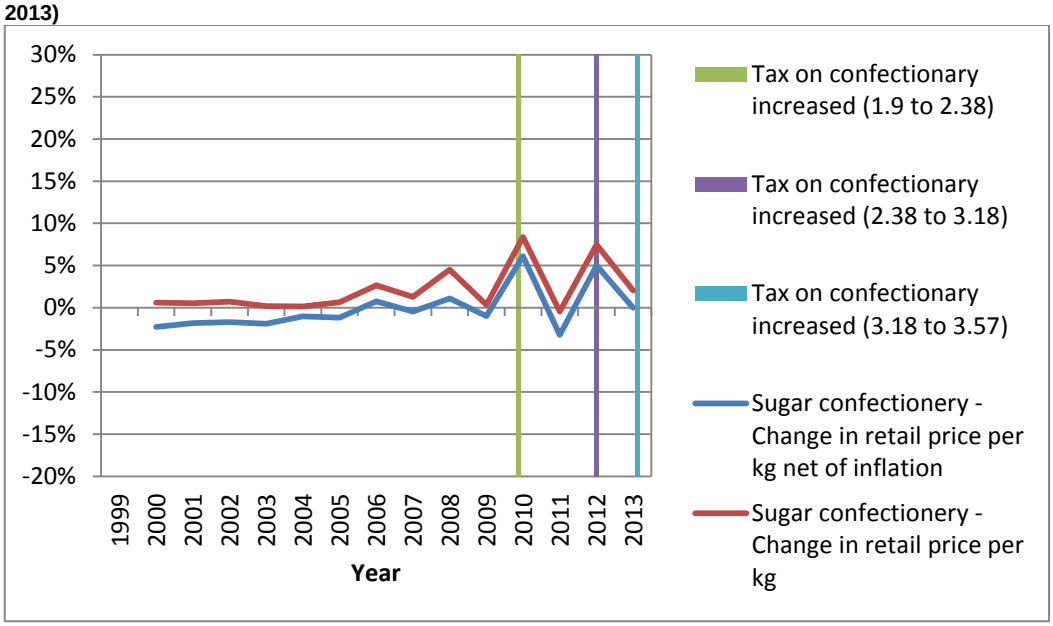

**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.2 Retail and manufacturing price changes for chocolate in Demark (1999-2013)**




**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.3 Retail and manufacturing price changes for sugar confectionery in Demark (1999-2013)**



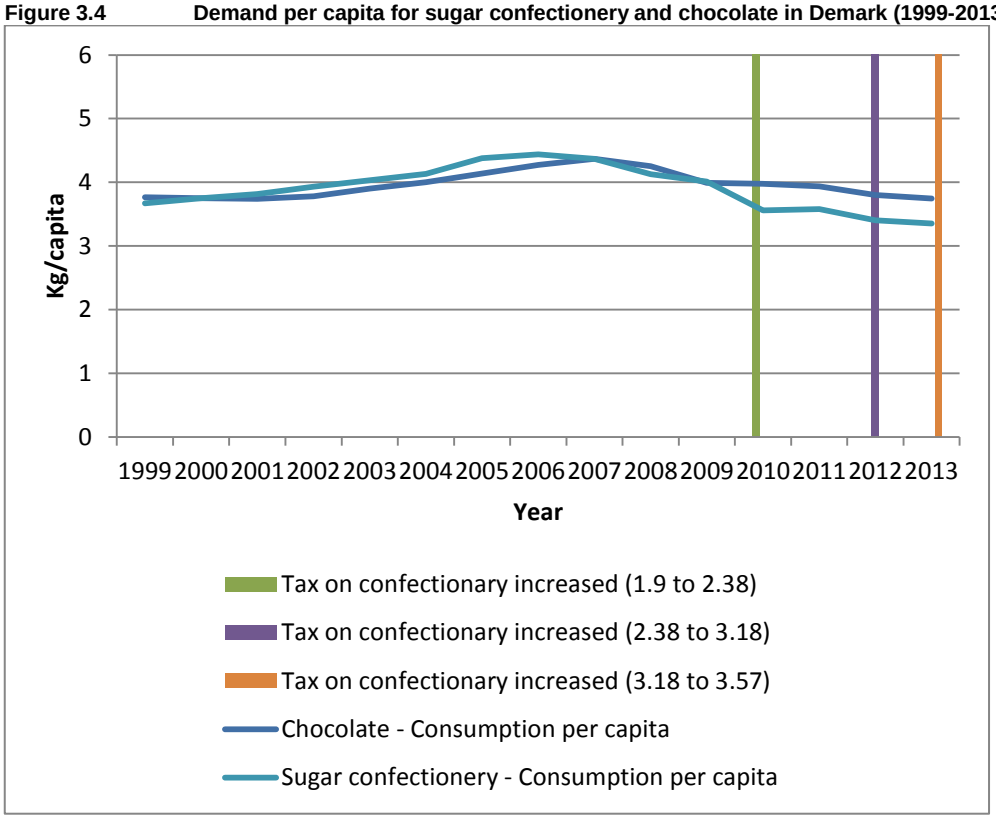

**Source: Ecorys based on data from Euromonitor/Passport**

### *Demand*

Until 2007 we observe an increase in the consumption per capita per year. After that the consumption steadily decreases from more than 4 kg of sugar confectionery and 4kg of chocolate to less than 3.5 kg per capita per year in 2013.

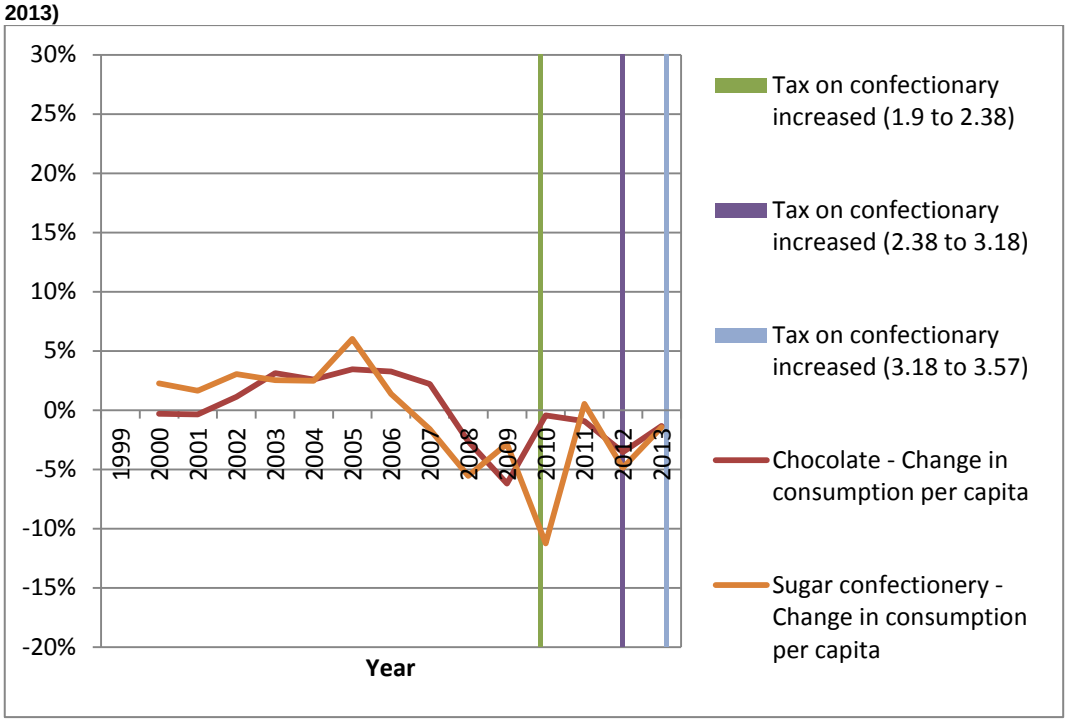
Corresponding to the findings of the effect of the tax of the chocolate and confectionery products increase on prices, we also see a decrease in consumption of those products that show a price increase - at the same time as the tax is increased. In addition, those drops in demand are not visible when the introduction of the tax has no effect on the prices.

**Figure 3.4 Demand per capita for sugar confectionery and chocolate in Demark (1999-2013)**




**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.5 Change in demand per capita for sugar confectionery and chocolate in Demark (1999-2013)**




**Source: Ecorys based on data from Euromonitor/Passport**

### *3.1.2 Tax on saturated fat – Denmark*

### Description of tax

In October 2011, a tax was introduced on food products such as meat, dairy products, animal fats and vegetable oils which contain more than 2.3 % saturated fat. It applies to food producers with a yearly turnover of more than DKK 50,000 (EUR 6,700) of the corresponding food products in Denmark.

The tax was levied on the saturated fat in products, and constituted DKK16 per kg of saturated fat.

In January 2013, the tax was abolished because it was blamed for raising the inflation, reducing consumers' purchasing power.

### Data inspection

We investigate milk, fats and oils to see what effect the taxes have on the retail and manufacturing prices and the consumption of the respective products. Full fat milk contains more saturated fats than semi skimmed or fat free milk does. Correspondingly, vegetable oils and fats, such as olive oil, contain less saturated fats than for instance butters and cooking fats.

According to this reasoning, the products with less saturated fat should be taxed less than the products with more saturated fat.

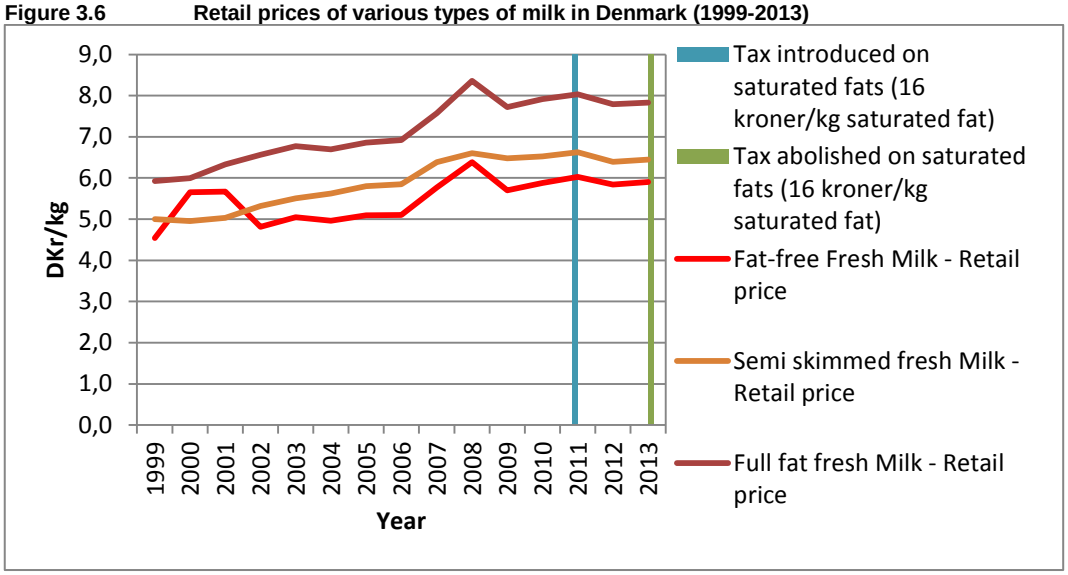
#### *Prices – milk*

Prices of milk have slowly increased over the observed period, with a notable spike in the price for fat-free and full fat fresh milk in 2007 and 2008. Full fat milk is the most expensive, followed by semi skimmed milk and fat free milk respectively.

Introduction and abolishment seem at first sight to have relatively little impact on the prices of the milk products. Prices for all milk products remain stable. Moreover, in the first year after the tax introduction, the prices are decreasing. In addition, in the year of the tax abolishment the price increased.

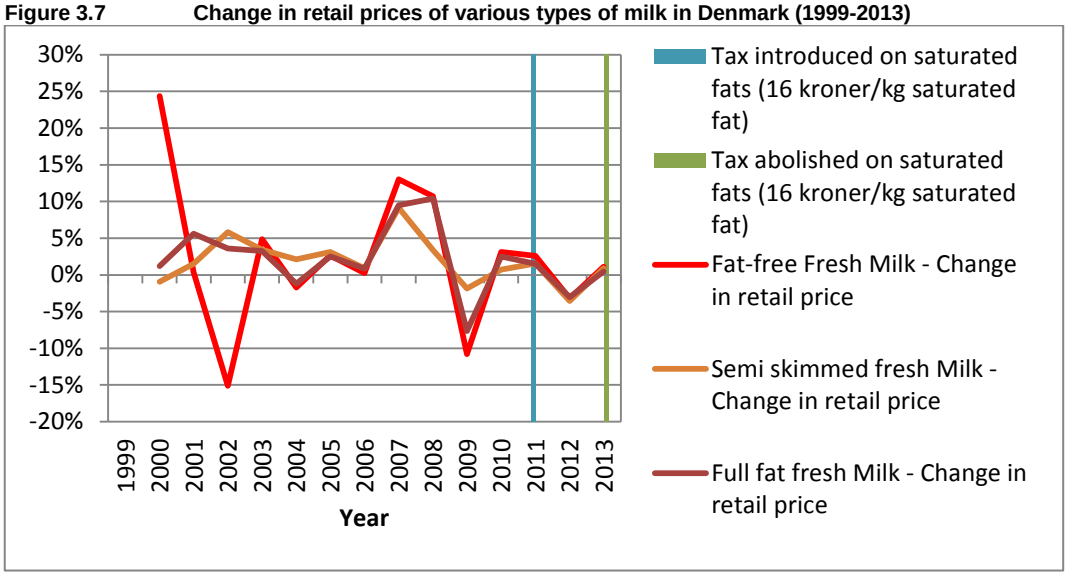
The tax also seems to have little impact on the profit margin retailers make on milk. Price changes are directly charged to consumers, both before and after the tax introduction.

**Figure 3.6 Retail prices of various types of milk in Denmark (1999-2013)**



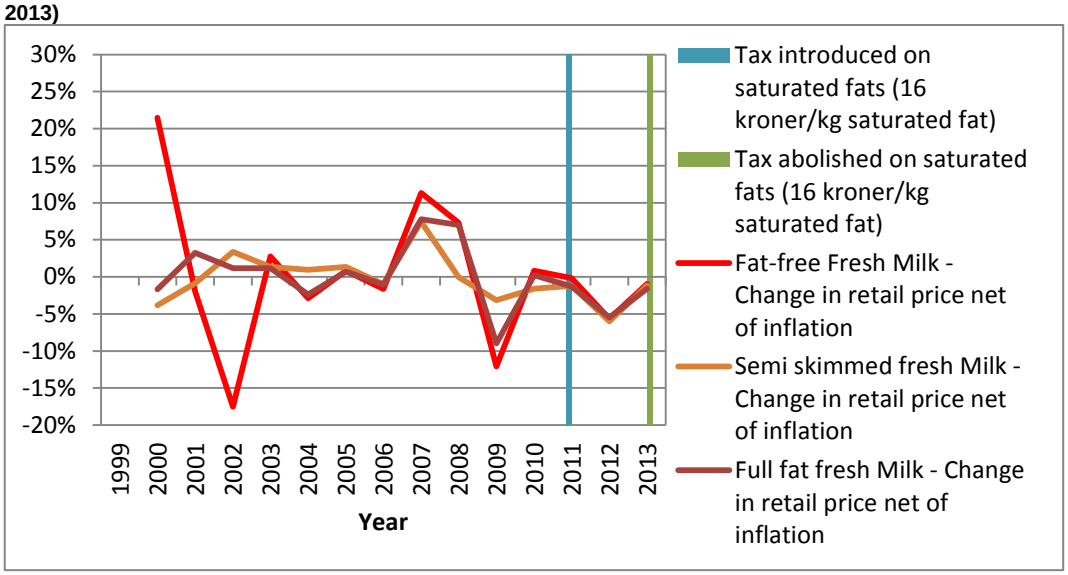

**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.7 Change in retail prices of various types of milk in Denmark (1999-2013)**



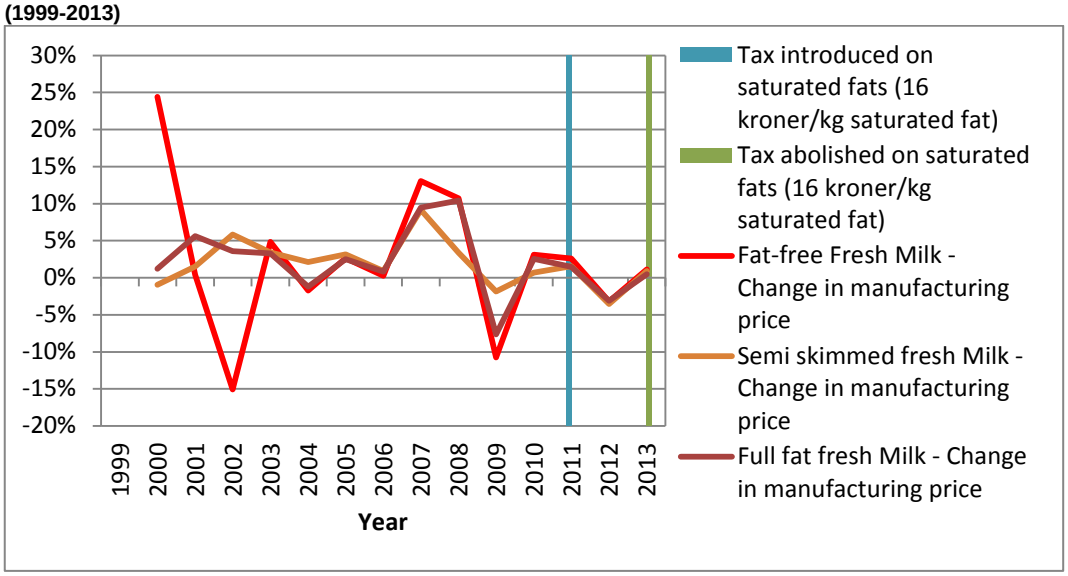

**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.8 Change in retail prices of various types of milk in Denmark, net of inflation (1999-2013)**




**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.9 Change in manufacturing prices of various types of milk in Denmark, net of inflation (1999-2013)**




**Source: Ecorys based on data from Euromonitor/Passport**

### *Prices – Oils and fats*

Of the oils and fats, olive oil is by far the most expensive oil (almost twice as expensive as the second most expensive oil). The vegetable and seed oil is the least expensive fat (almost half the price of the second least expensive oil). This means that the price differences between oils are significant.

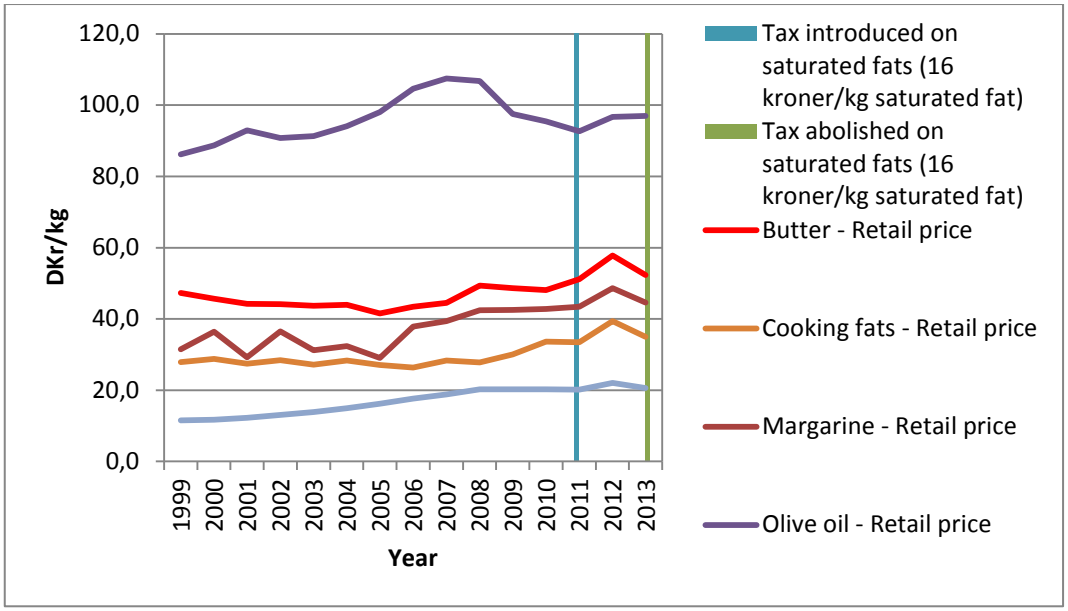
Prices have slightly increased over the observed period, with a notable exception of margarine. This product has shown some very erratic pricing behaviour before 2006, after which it stabilises at a substantially higher level.

For all fats and oils, the tax seems to have had a strong impact on the price. In the first full year the tax was in force (2012), all products show an increase in prices. Cooking fats show the strongest increase with almost 20% price increase. Olive oil shows the smallest price increase of less than 5%, which is confirming the thesis that of all oils and fats, olive oil contains the least saturated fat and is consequently also taxed the least.

Following the abolition of the tax in the beginning of 2013, prices all decrease with about 10%. Olive oil, remains at the same level.

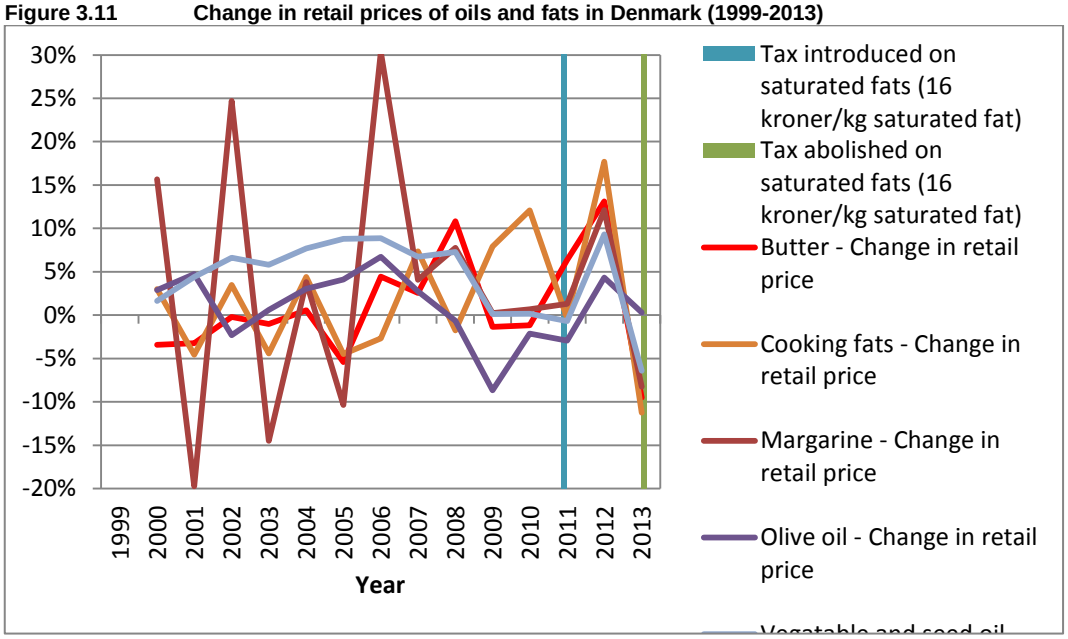
The profit margin for the retailer remains the same over the observed period for all products. All price changes from the manufacturer are directly transferred to the consumer.

**Figure 3.10 Retail prices of oils and fats in Denmark (1999-2013)**



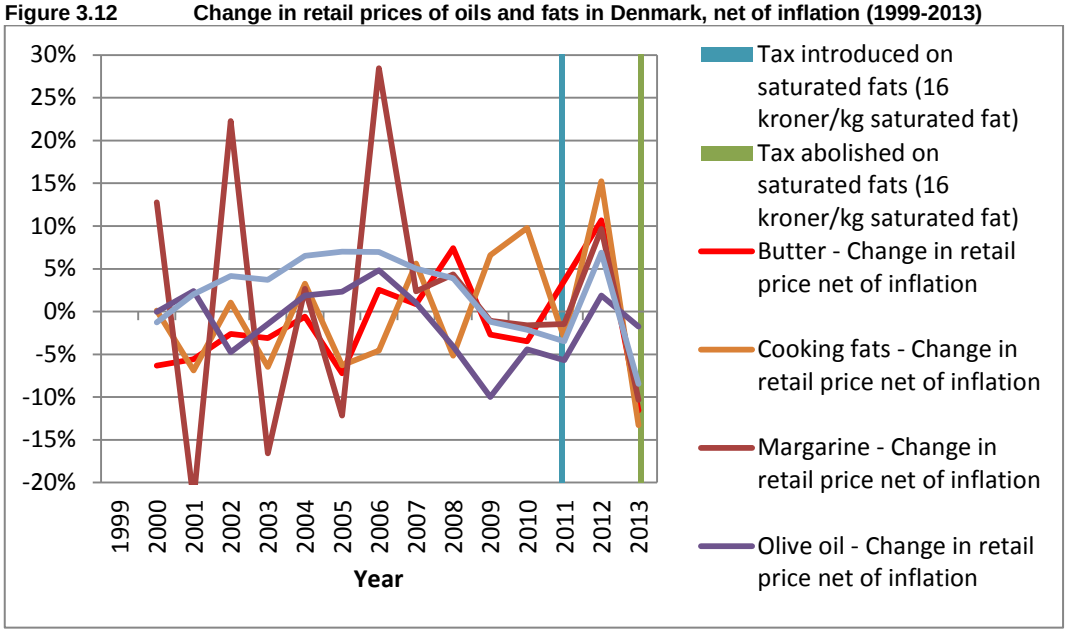

**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.11 Change in retail prices of oils and fats in Denmark (1999-2013)**



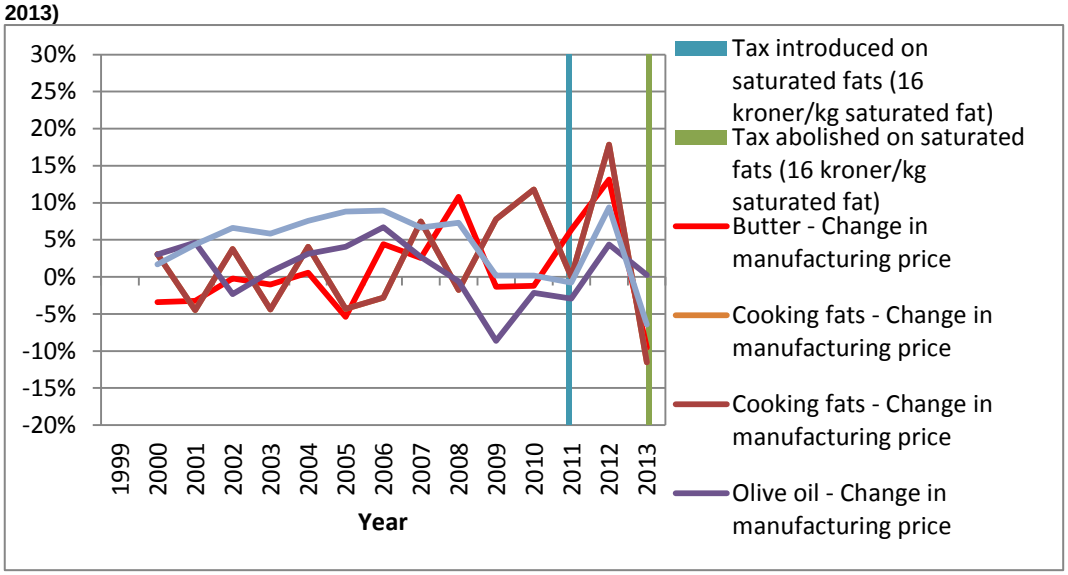

**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.12 Change in retail prices of oils and fats in Denmark, net of inflation (1999-2013)**




**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.13 Change in manufacturing prices of oils and fats in Denmark, net of inflation (1999-2013)**



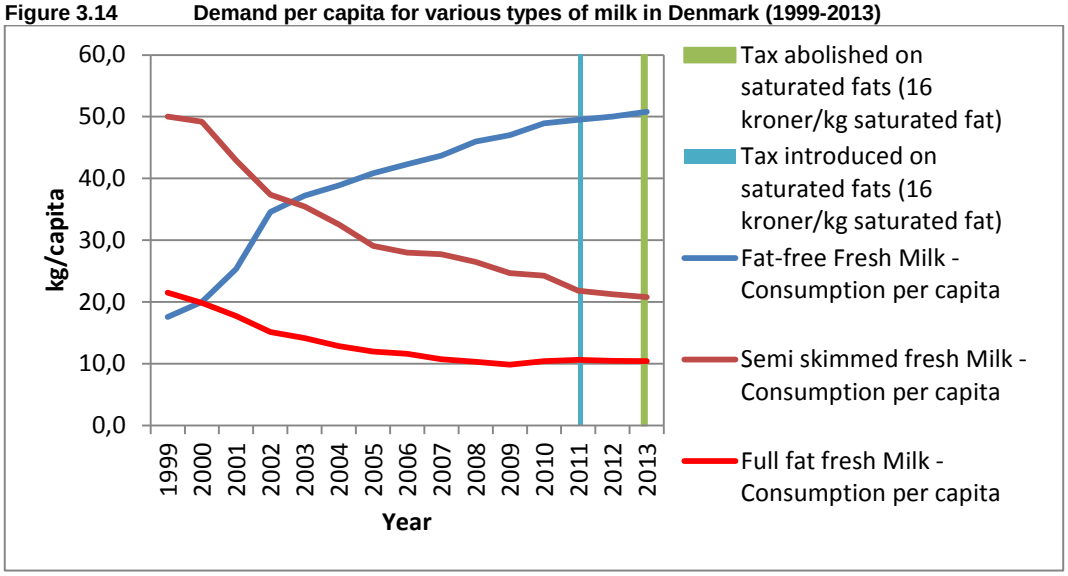

**Source: Ecorys based on data from Euromonitor/Passport**

### *Demand – milk*

For milk products we see a strong substitution in Denmark from full fat and to a lesser extent from semi skimmed milk toward fat free milk. In 1999, consumers bought on average around 18 kg of milk a year, 22 kg of full fat milk, and more than 50kg semi skimmed milk. In 2013, this ranking was completely reversed with a respective consumption per capita of more than 50kg per year for fat free milk, slightly over 10kg per year for full fat milk, and slightly over 20kg per year for semi skimmed milk.

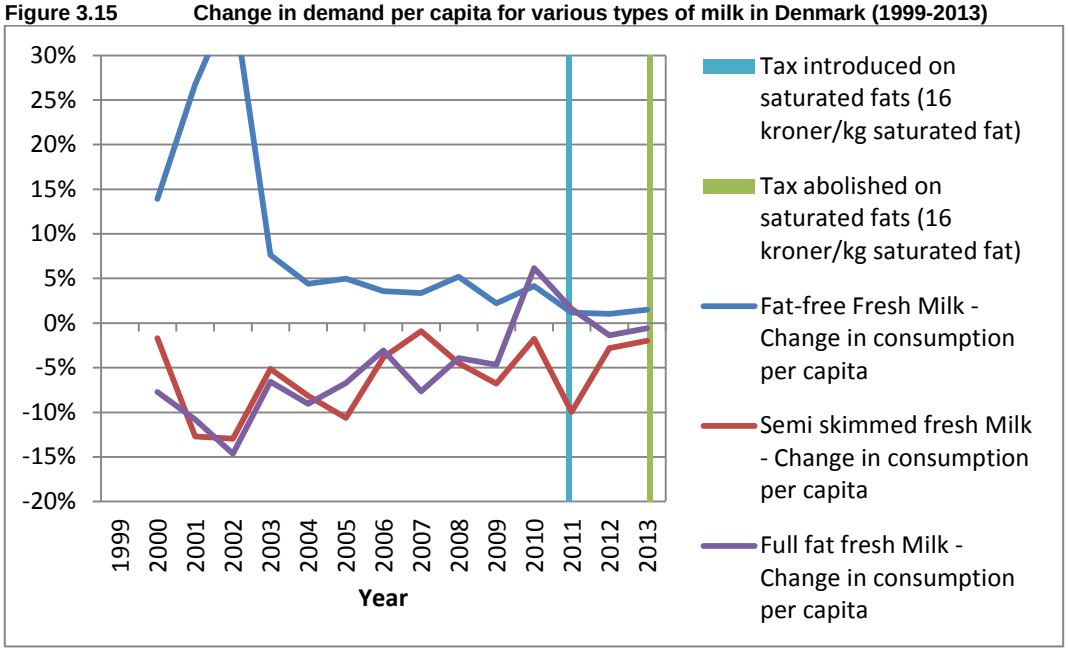
After the introduction of the tax, we see for all types of milk a decline in demand or a slowed pace of growth, at least compared to a previous year. Most notable, for semi skimmed milk we see a sharp decline in demand. However, with the abolition of the tax in 2013, we do not see demand recovering. There is hardly any change at all.

**Figure 3.14 Demand per capita for various types of milk in Denmark (1999-2013)**




**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.15 Change in demand per capita for various types of milk in Denmark (1999-2013)**




**Source: Ecorys based on data from Euromonitor/Passport**

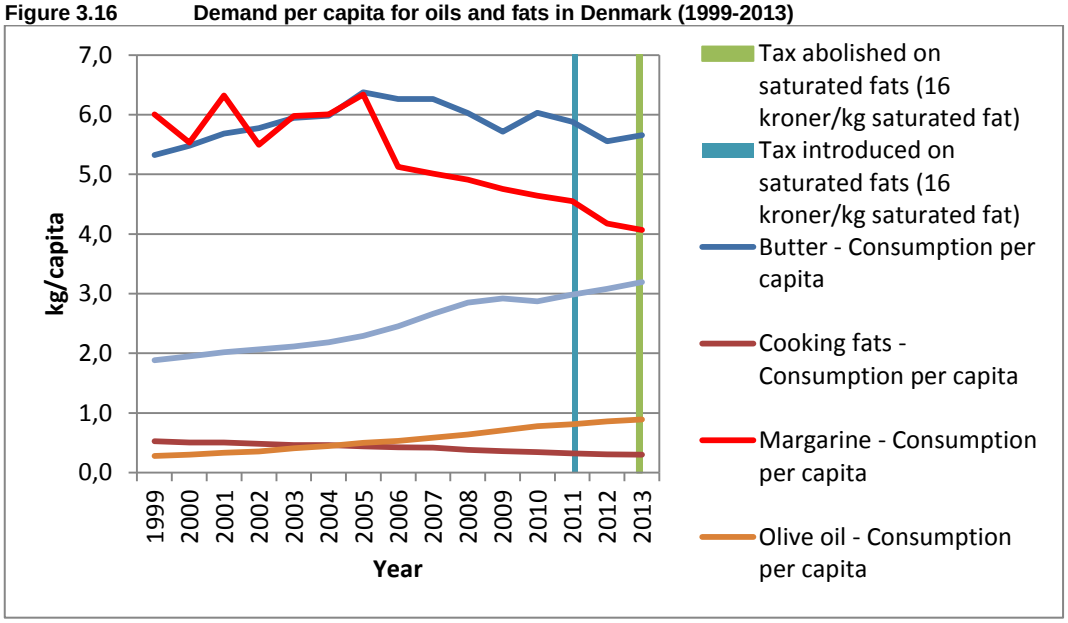
### *Demand – Oil and fats*

In the demand for oil and fats, we see a clear distinction between the popularity of the various types of products under this category. Demand for butter, the most popular fat, is relatively stable, although a slight declining trend is visible in the last years. Margarine was also among the very popular products, but is rapidly losing ground to other types of oils and fats. It is quickly being replaced by vegetable and seed oil. Also olive oil is rapidly becoming more popular, although its market share is still low. Finally, the cooking fats were never consumed a lot, and are on a gliding path downward.

Following the introduction of the tax on saturated fats, only olive oil showed a larger increase in its consumption. The growth rate of vegetable and seed oil also remains relatively stable. All other oils and fats show either a continuing decline in demand or a sudden increased drop in demand.

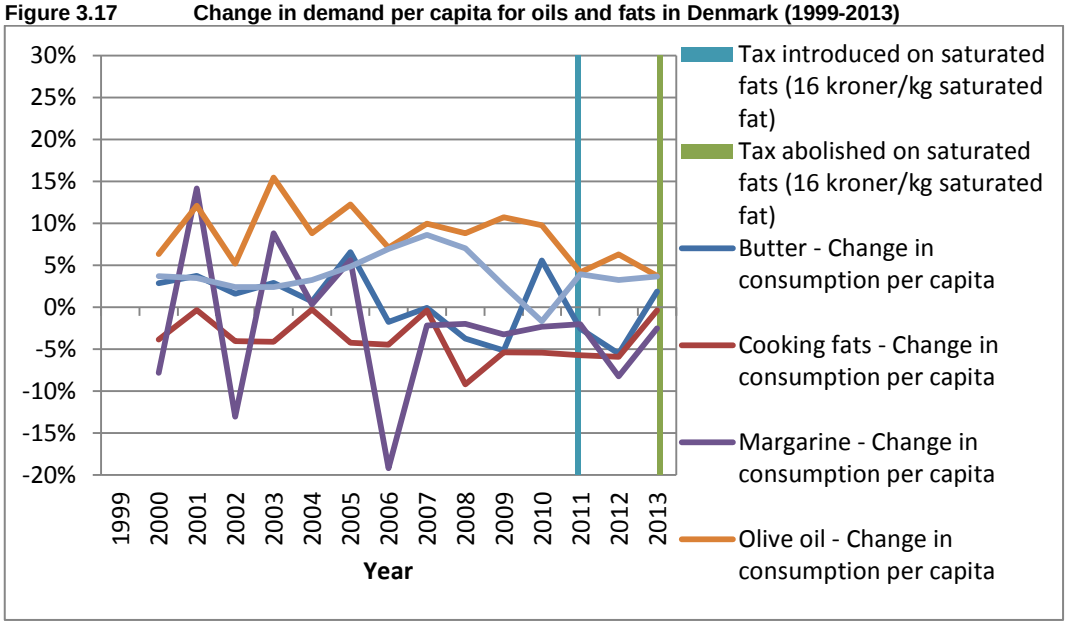
After the abolition of the tax in the beginning of 2013, the demand does not return to the pre-tax levels, but it does stabilize.

**Figure 3.16 Demand per capita for oils and fats in Denmark (1999-2013)**




**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.17 Change in demand per capita for oils and fats in Denmark (1999-2013)**




**Source: Ecorys based on data from Euromonitor/Passport**

### *3.1.3 Tax on sugar sweetened soft drinks – Denmark*

#### Description of tax

In the 1930s Denmark introduced a tax on soft drinks. Before July 2013, the tax was DKK 1.64 (about 0.22 euro) per litre of sugar-sweetened soft drink. As from July 2013, the tax was reduced by 50%, and its complete abolition is planned for 2014.

### Data inspection

We investigate the effects of the decrease in the tax rate by looking at the product types of cola and juices. Both these product types have sugar free (low calorie cola and juices) soft drinks and sugar sweetened soft drinks (regular cola and nectar and juice drinks).

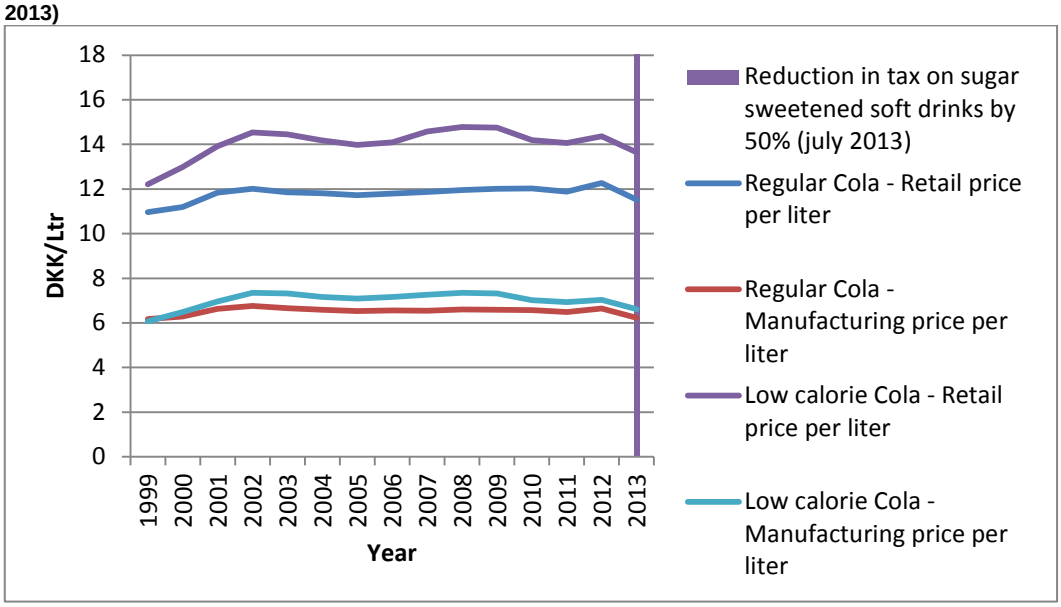
#### *Prices – Cola*

Since 1999 the retail prices of low calorie cola rose from around DKK 12 per litre to around DKK 14 in 2001. After that period, prices remain stable. A similar pattern is visible for the regular cola, although price increases were less pronounced for this beverage.

It is interesting to note that the price development of regular cola, closely follows the price development of low calorie cola. This includes the period when the tax was reduced. Although the tax is presumably only levied on regular cola, also the prices of low calorie cola decreased with around 5%, which is only marginally less than regular cola.

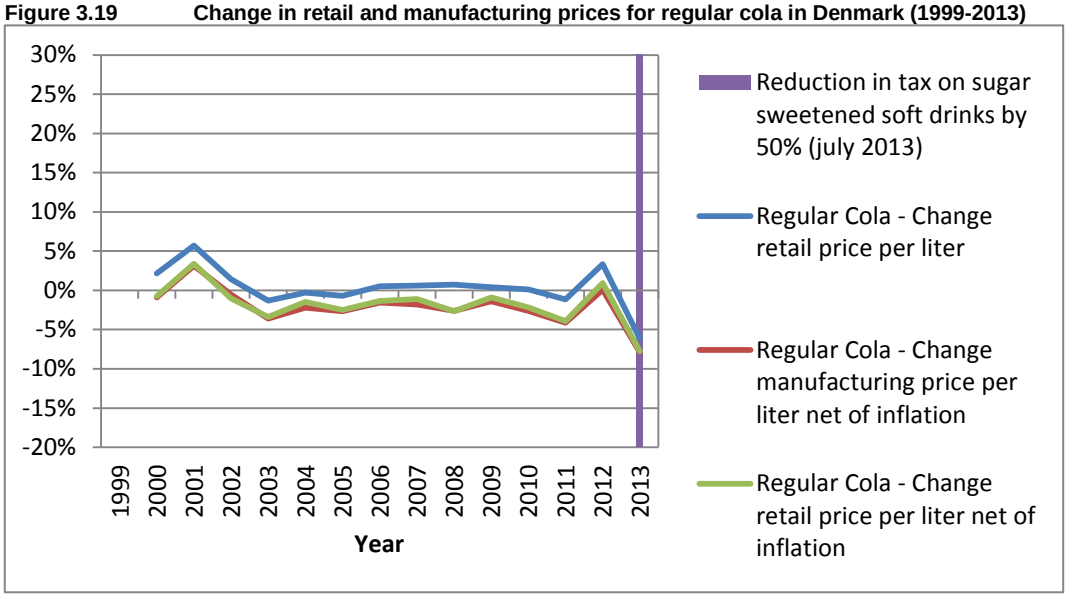
The retailers margin has remained relatively stable throughout the observed period. Nevertheless, in 2004, 2007 and 2012, the retailers were able to charge higher prices to consumers, without being prompted by manufacturing prices, effectively increasing their margin.

**Figure 3.18 Retail and manufacturing prices for regular and low-calorie cola in Denmark (1999-2013)**



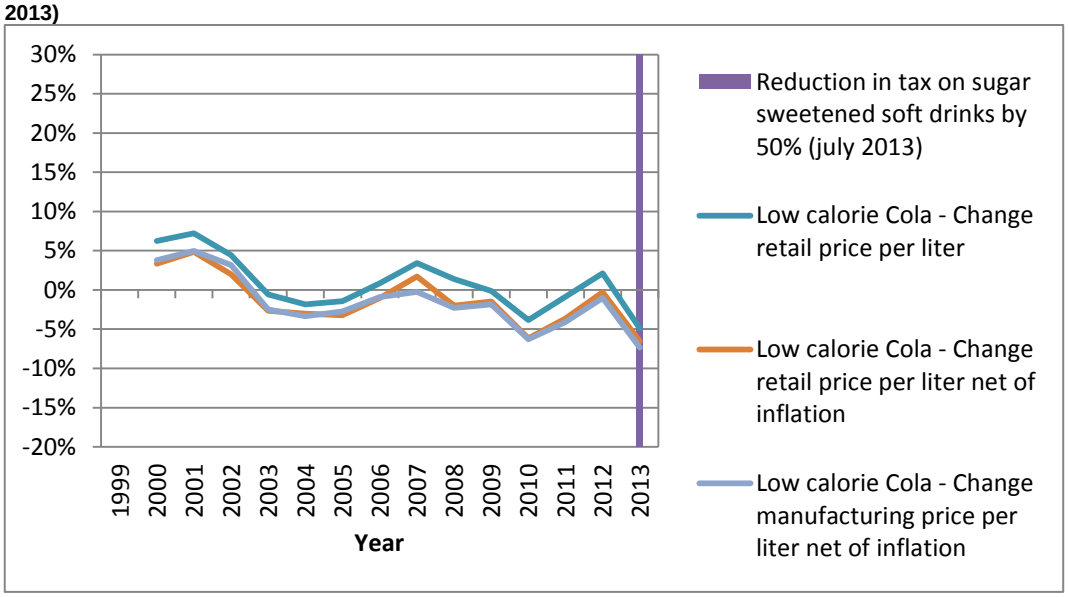

**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.19 Change in retail and manufacturing prices for regular cola in Denmark (1999-2013)**




**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.20 Change in retail and manufacturing prices for low-calorie cola in Denmark (1999-2013)**



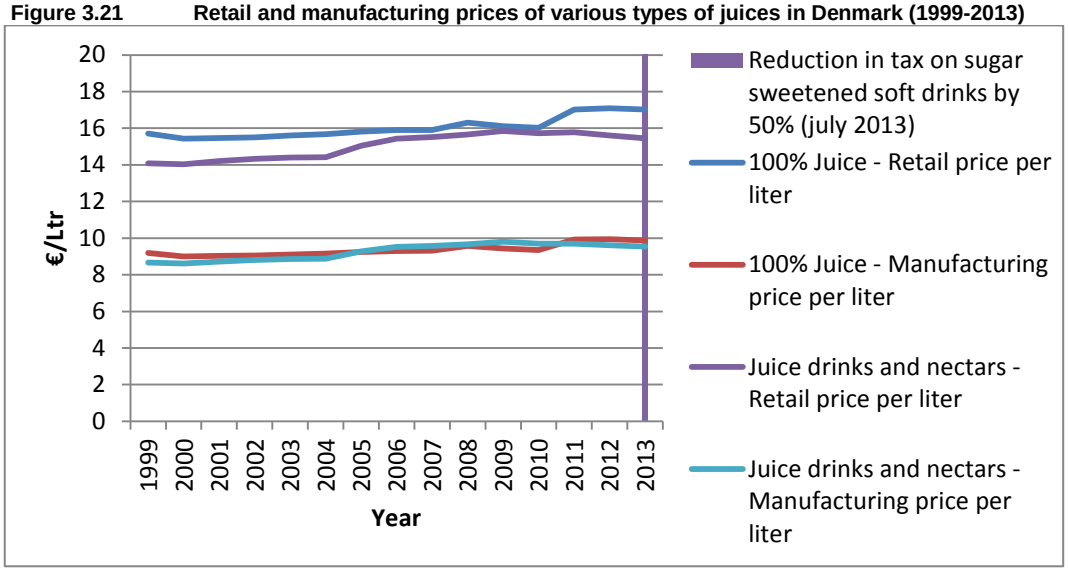

**Source: Ecorys based on data from Euromonitor/Passport**

### *Prices – Juices*

Juices can be distinguished between 100% natural juices and those containing natural juices partially (juice drinks and nectars). Although manufacturing prices for both are very similar, retail prices are not. Retailers realise a higher margin for 100% juices than for the drinks and nectars. Nevertheless, retailers are closely following the changes in the manufacturing prices when they set their own prices.

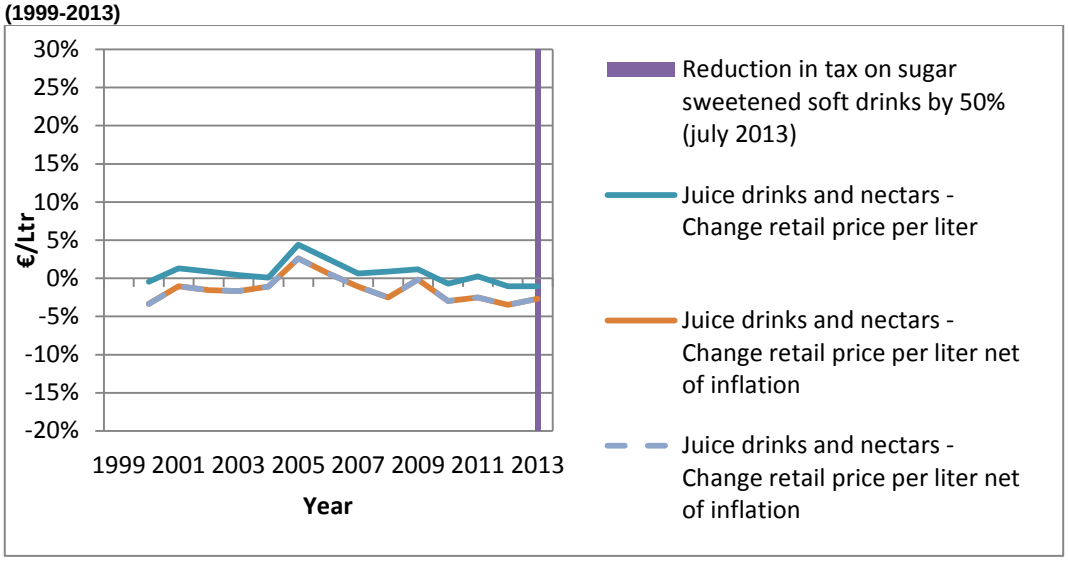
Following the tax reduction, we see only a marginal effect on the prices. As prices have been relatively volatile in the previous years, it is hard to attribute the price decreases to the tax, especially because the prices have often been declining in the previous years.

**Figure 3.21 Retail and manufacturing prices of various types of juices in Denmark (1999-2013)**



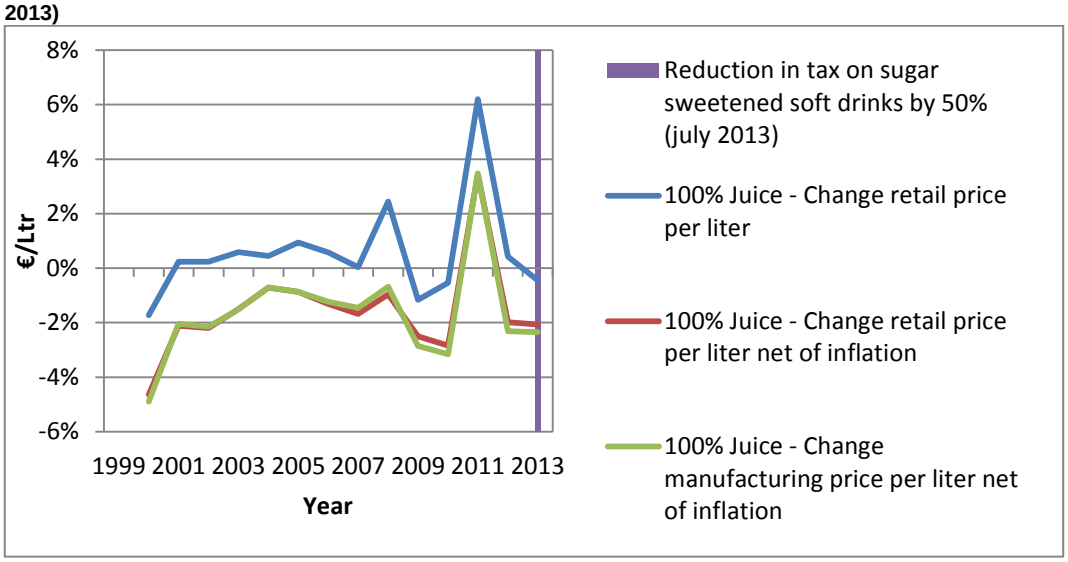

**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.22 Changes in retail and manufacturing prices of juice drinks and nectars in Denmark (1999-2013)**




**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.23 Changes in retail and manufacturing prices of 100% juice drinks in Denmark (1999-2013)**



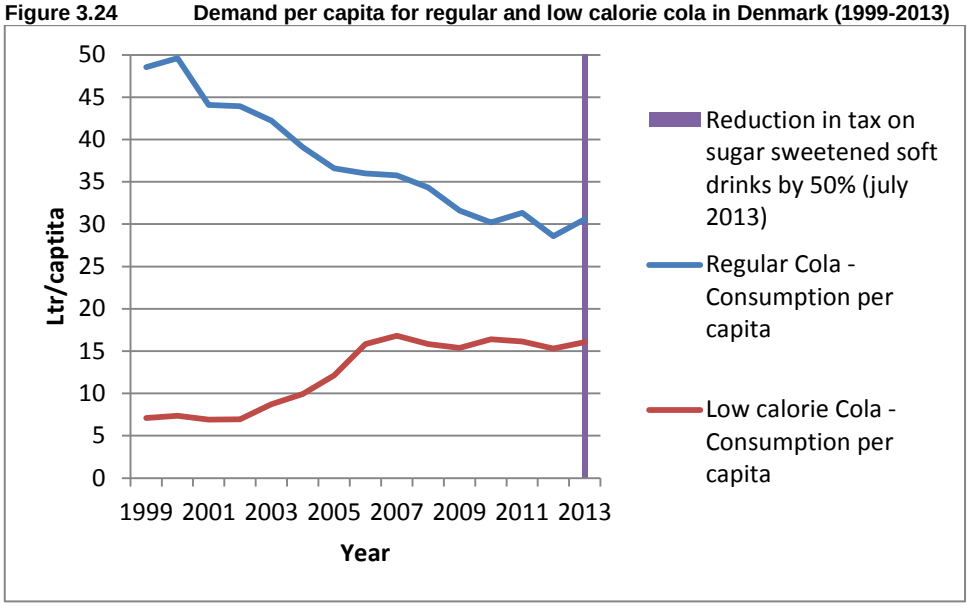

**Source: Ecorys based on data from Euromonitor/Passport**

*Demand cola*

Over the observed period, we see a decline in the consumption of cola by consumers. Whereas in 2001 an average consumer drank almost 50 litres of regular cola a year, this has decreased to around 30 litres a year. Between 2003 and 2007, this reduction involves mostly a substitution effect of consumers switching from regular cola to low calorie cola. However, as from 2007, the demand for low calorie cola has stagnated at the level of around 15 litres per capita a year, while the demand for regular cola continued to decrease.

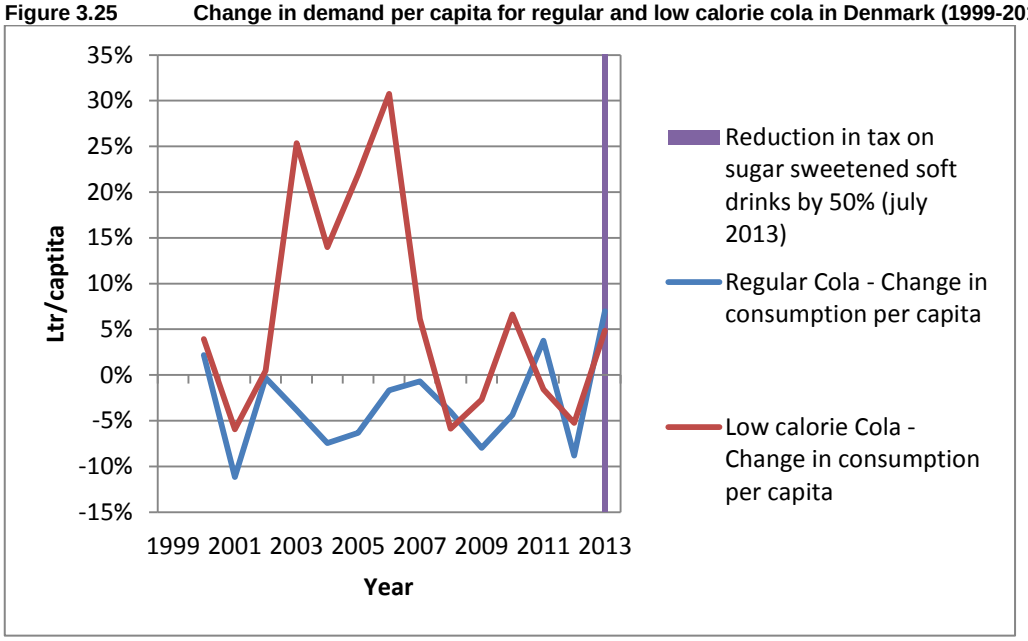
With the tax reduction, we see a slight spike upward in the demand of around 5% a year. However, looking at previous volatility, it is hard to interpret and attribute this demand increase to the tax reduction.

**Figure 3.24 Demand per capita for regular and low calorie cola in Denmark (1999-2013)**




**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.25 Change in demand per capita for regular and low calorie cola in Denmark (1999-2013)**



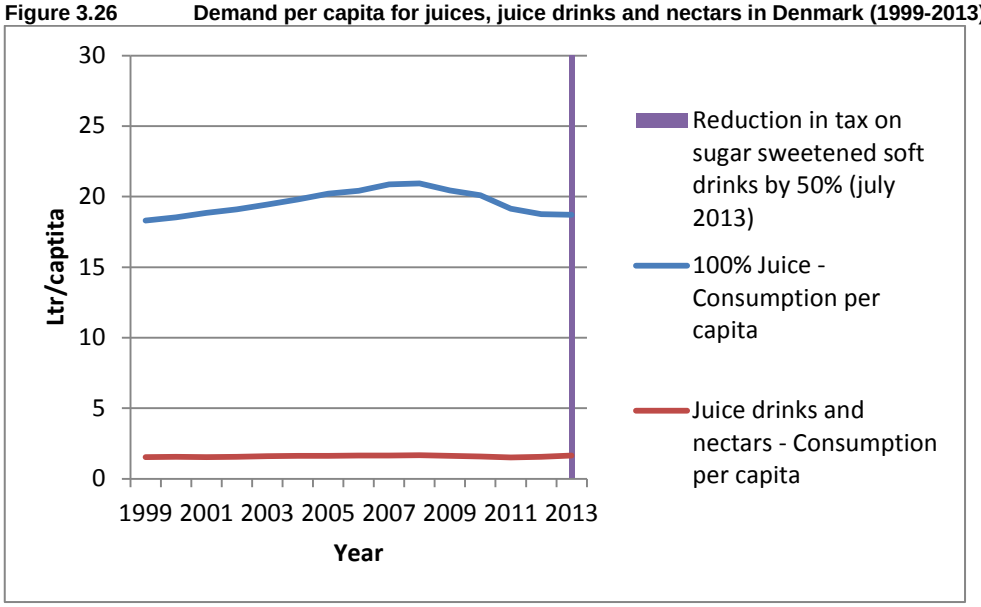

**Source: Ecorys based on data from Euromonitor/Passport**

*Demand – Juices*

The demand for juices has remained stable over the past 14 years. On average, a consumer drinks around 20 litres a year of 100% juices, and around 2 litres of partial juices.

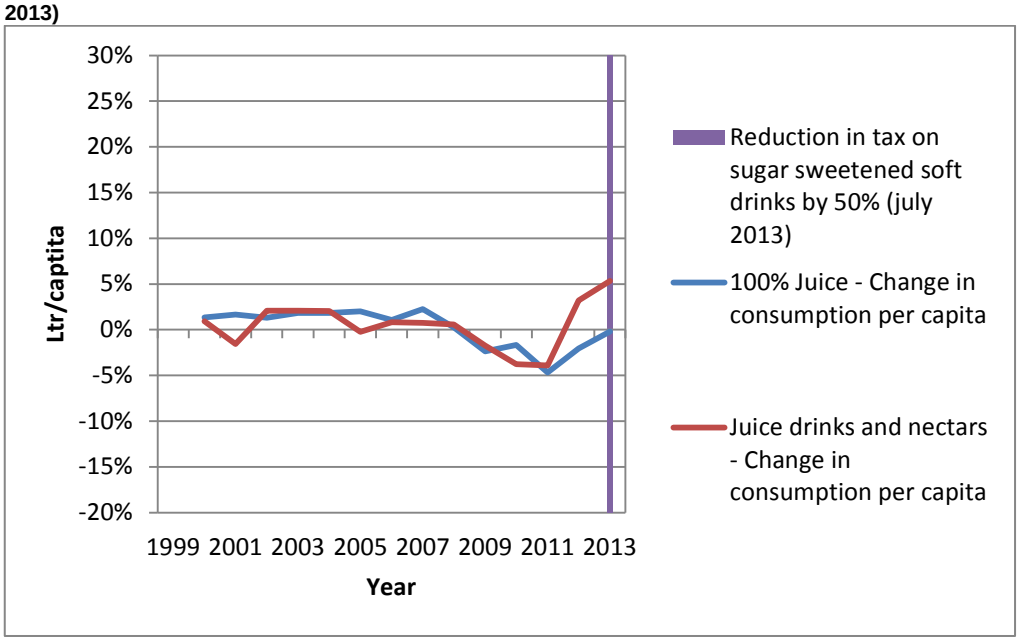
Following the reduction in the tax rate by 50%, we see an increase in demand for the partial juices of around 5%, while the demand for 100% juices stabilizes after it demonstrated a downward trend in the previous years. One point of warning though is that with the relative low demand for partial juices, it is relatively easy in our dataset to generate strong changes, due to rounding errors.

**Figure 3.26 Demand per capita for juices, juice drinks and nectars in Denmark (1999-2013)**




**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.27 Change in Demand per capita for juices, juice drinks and nectars in Denmark (1999-2013)**




**Source: Ecorys based on data from Euromonitor/Passport**

### *3.1.4 Tax on confectionery, chocolate, ice-cream and soft drinks – Finland*

#### Description of tax

In 1999 Finland abolished the tax on sweets and soft drinks, but reintroduced it again in 2011 in order to raise revenue and promote consumer health. The tax is being levied on sweets, chocolate, ice-cream and soft drinks, including fruit juices, mineral water and lemonade that are sold to consumers. Only the small manufacturers are exempted when the amount of products released for consumption does not exceed 10 000 kilogrammes or 50 000 litres.

Initially, the tax was set in 2011 at €0.75/kg or €0.075/ltr. In 2013, the tax was raised to €0.95/kg or €0.11/ltr.

#### Data inspection

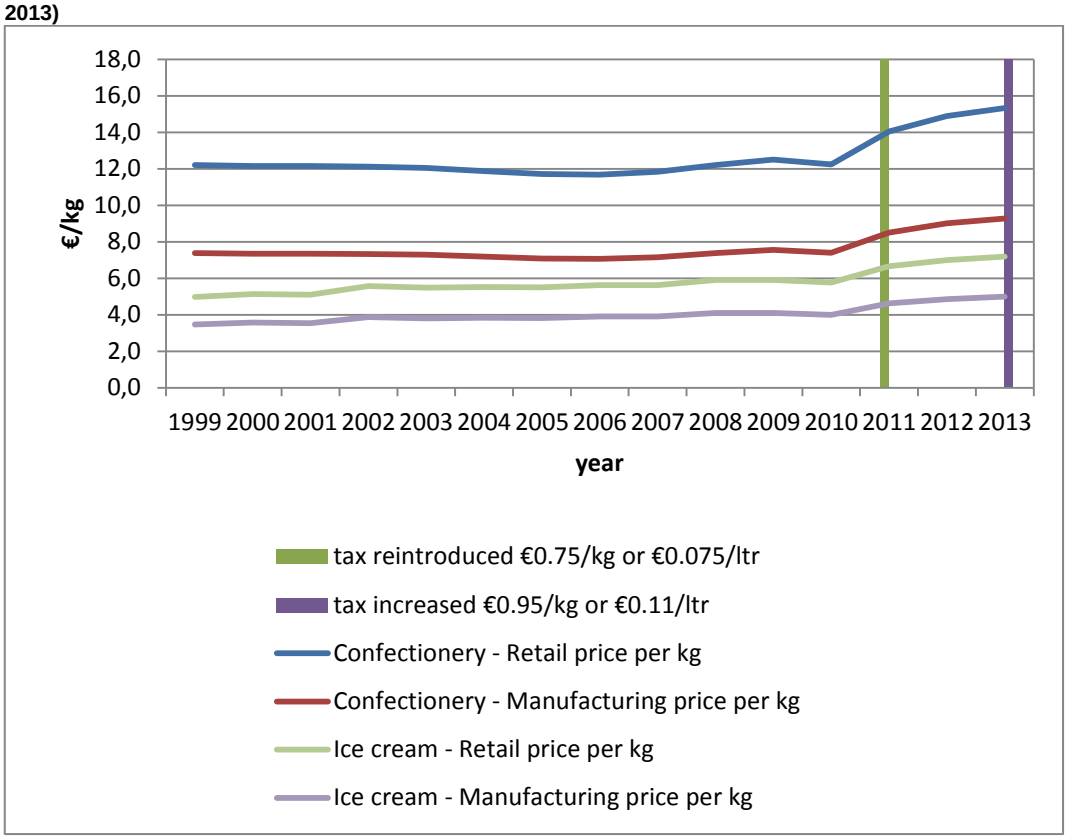
The tax being levied has an extremely broad tax base, compared to food taxes in other countries. We decided to focus on the broad categories of products: confectionery, ice-cream and soft drinks.

*Prices – confectionery and ice-cream*

Prices of both confectionery and ice-cream have remained very stable from 1999 until 2010 at a price level of €12/kg and €6/kg respectively. We see, however, that a price increase for both retailers and consumers coincided with the tax introduction. Also in 2012 a new price increase followed, to stabilise again in 2013 at a significantly higher level than before.

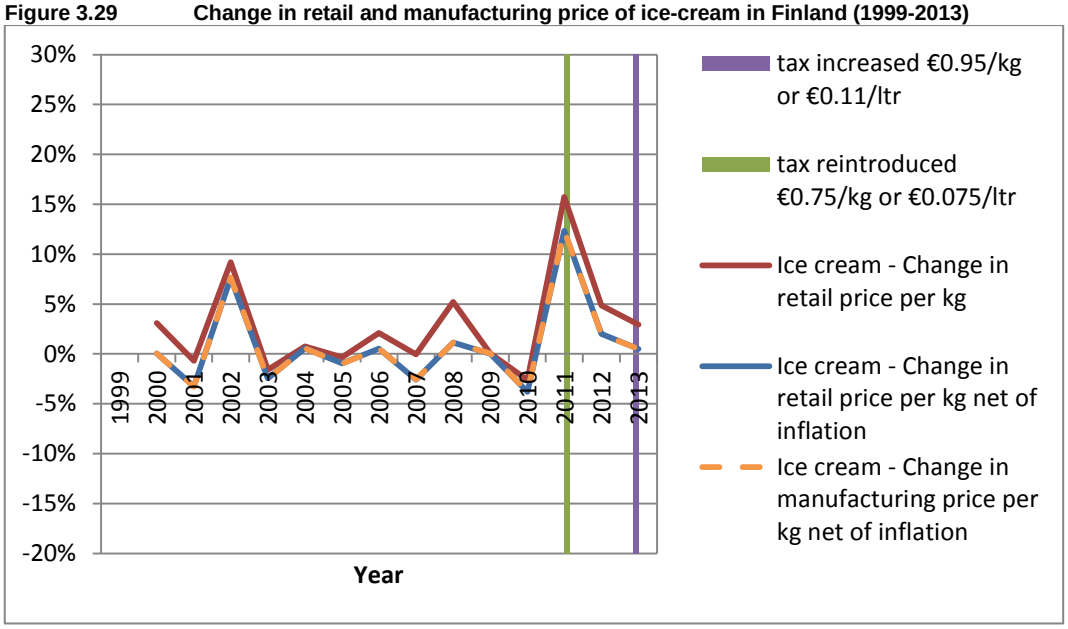
Over the observed period, price margins for retails have not changed. Any adjustment in manufacturing price is directly charged to consumers.

**Figure 3.28 Retail and manufacturing prices of confectionery and ice-cream in Finland (1999-2013)**



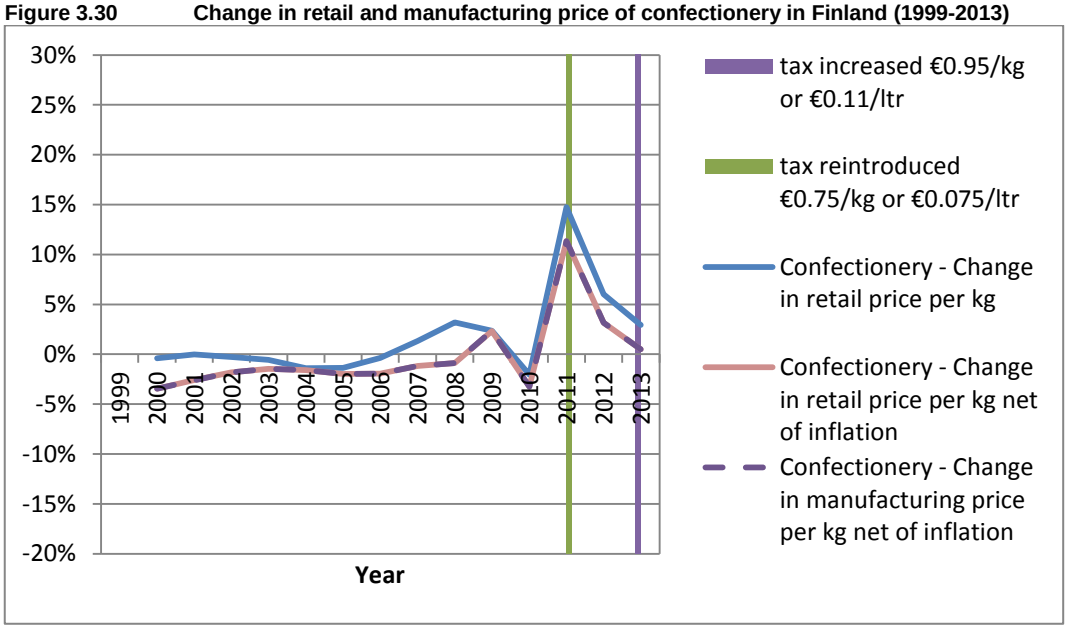

**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.29 Change in retail and manufacturing price of ice-cream in Finland (1999-2013)**




**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.30 Change in retail and manufacturing price of confectionery in Finland (1999-2013)**



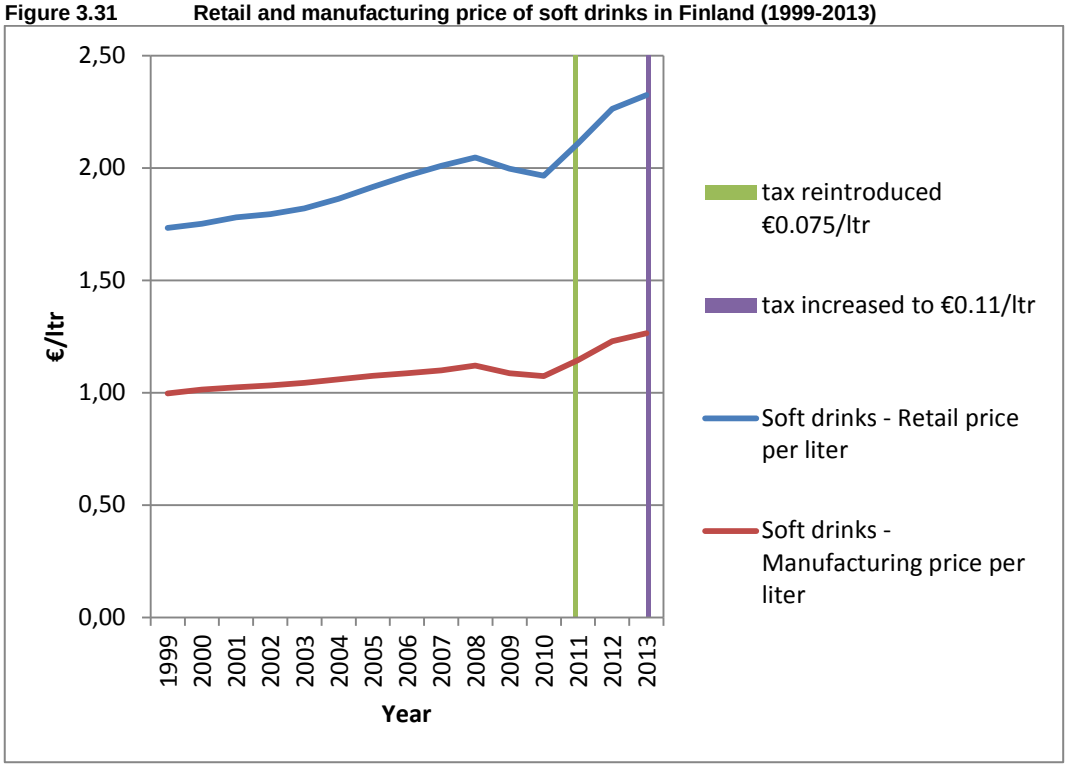

**Source: Ecorys based on data from Euromonitor/Passport**

*Prices – soft drinks*

Soft drink prices have on average risen from €1.75 in 1999 to €2.25 in 2013. However, manufacturing prices have shown a slower growth pace. This means that retailers have been able to increase their profit margin over the observed period, most notably from 2004 until 2007. After 2007, the price increases of the retailer more closely match the price increases of the manufacturer.

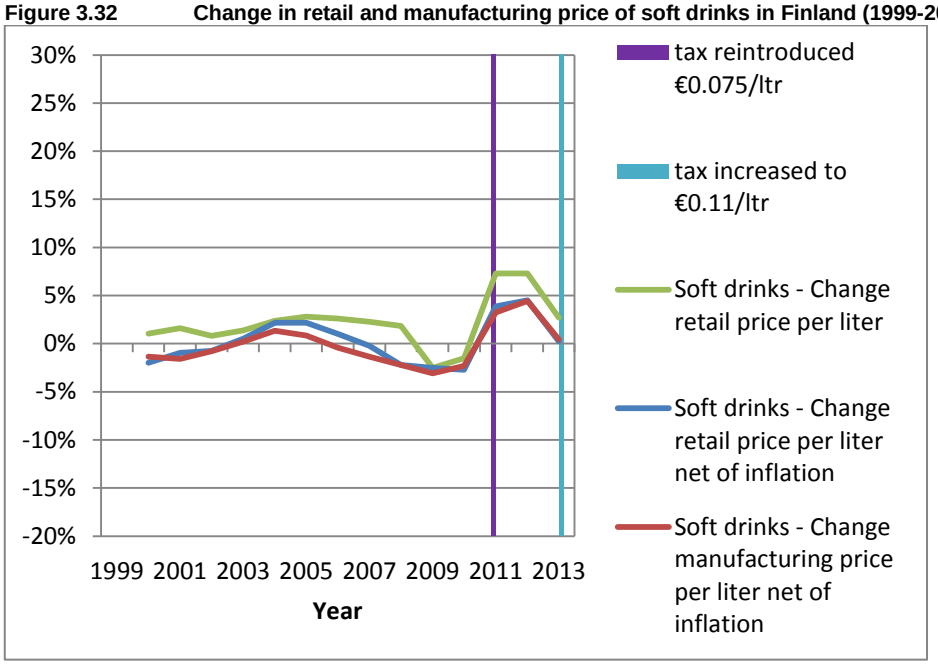
Following the reintroduction of the tax of soft drinks, prices rose sharply, both in 2011 and in 2012. Despite the increase in the tax rate in 2013, prices increased less than in the previous two years.

**Figure 3.31 Retail and manufacturing price of soft drinks in Finland (1999-2013)**




**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.32 Change in retail and manufacturing price of soft drinks in Finland (1999-2013)**



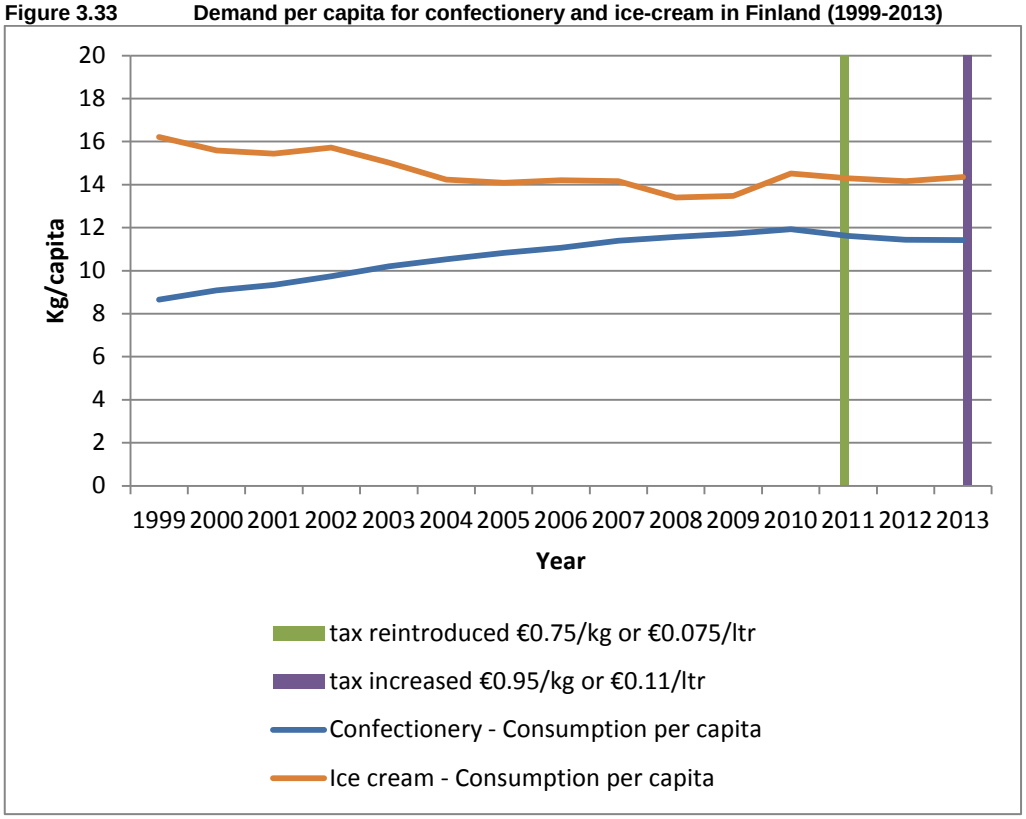

**Source: Ecorys based on data from Euromonitor/Passport**

### *Demand – confectionery and ice cream*

The demand for confectionery and ice-cream shows some opposing patterns. Consumers decreased their ice-cream consumption, while increasing their confectionery consumption. It is unlikely though that this constitutes a substitution effect.

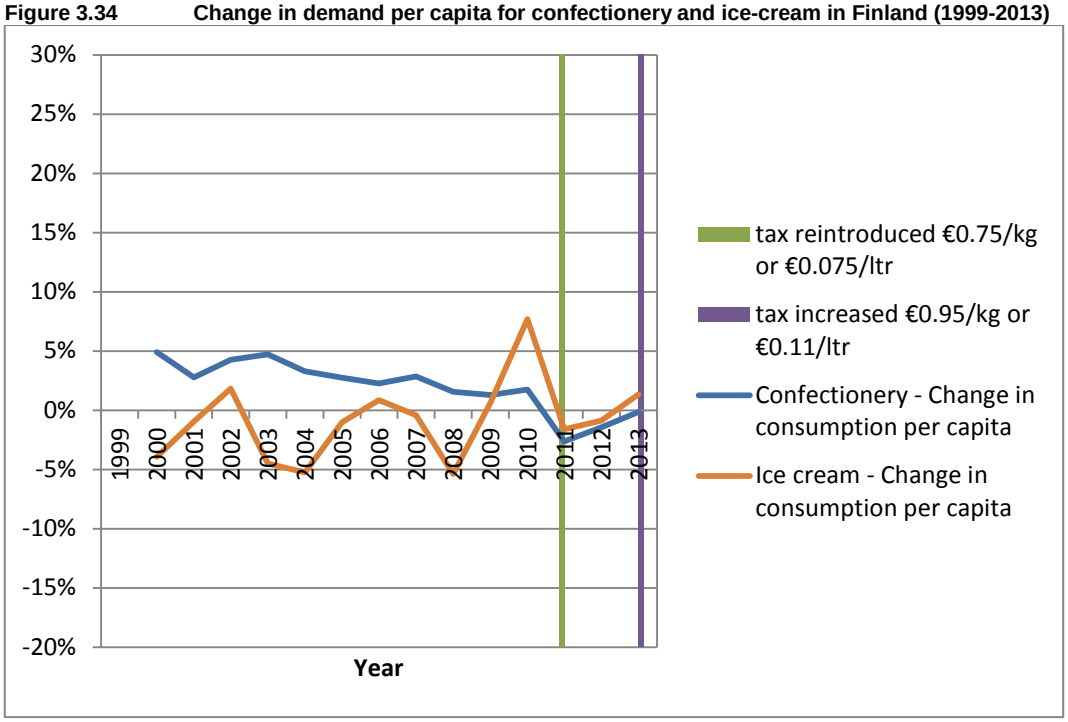
The reintroduction of the tax on confectionery and ice-cream coincides with a relatively sharp drop in the demand for both products. Also in 2012, demand for these product type decreased, and stabilised again in 2013, despite the tax increase in that year.

**Figure 3.33 Demand per capita for confectionery and ice-cream in Finland (1999-2013)**



Source: Ecorys based on data from Euromonitor/Passport

**Figure 3.34 Change in demand per capita for confectionery and ice-cream in Finland (1999-2013)**

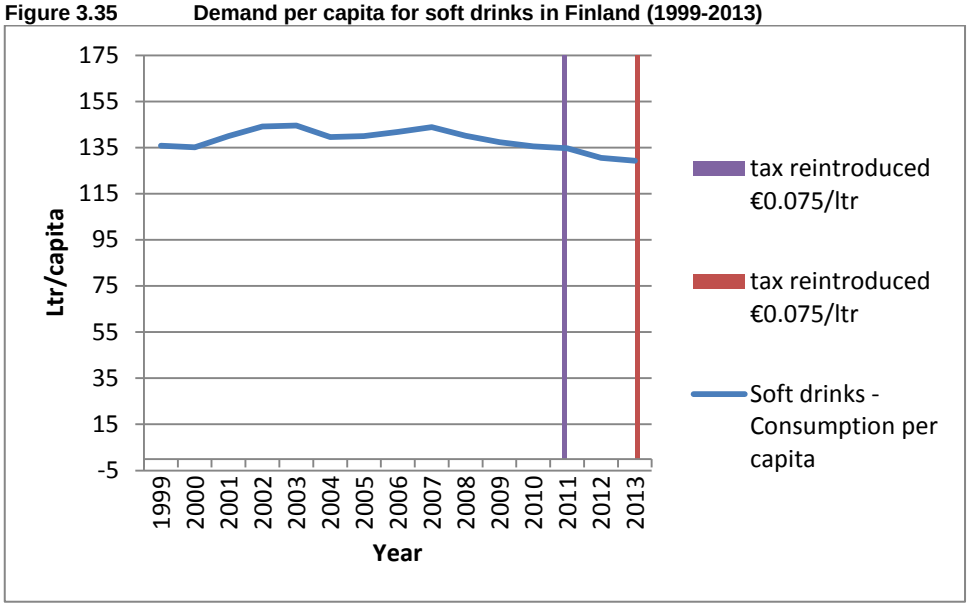



Source: Ecorys based on data from Euromonitor/Passport

### *Demand – soft drinks*

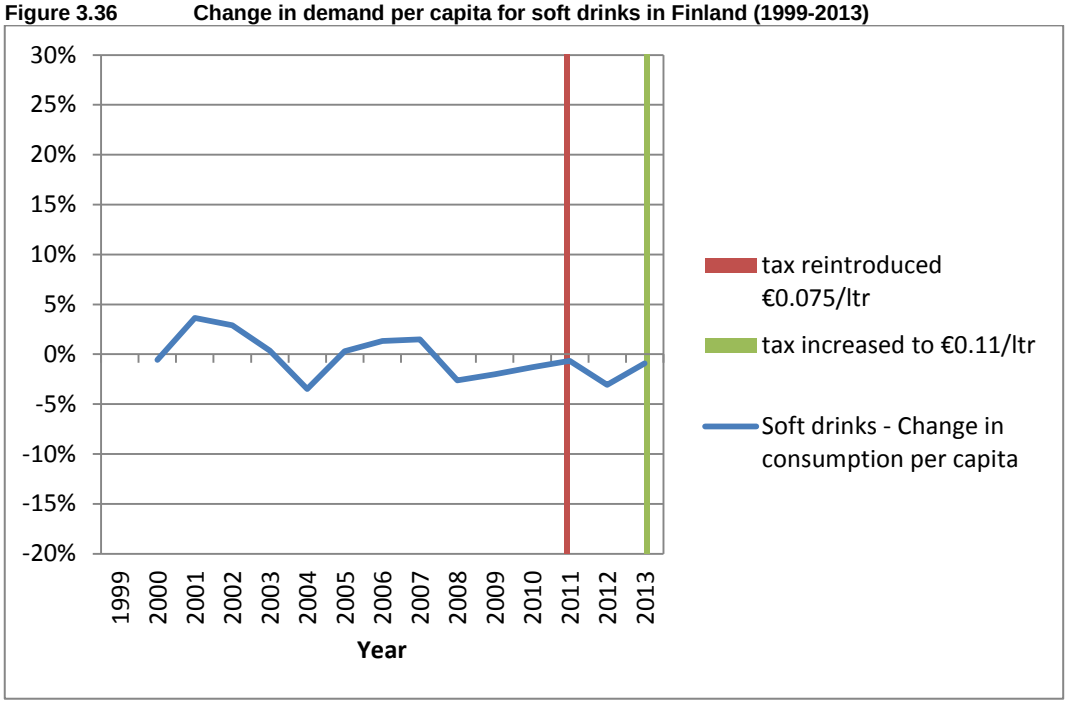
The demand per capita for soft drinks has been slowly declining from a total of 135 litre a year in 1999, to 130 litre a year in 2013. This pattern has been very volatile however, with both relatively sharp increases and relatively sharp declines in the demand. Interestingly, however, the tax reintroduction or increase does not correlate with the relatively sharp declines in demand.

**Figure 3.35 Demand per capita for soft drinks in Finland (1999-2013)**




Source: Ecorys based on data from Euromonitor/Passport

**Figure 3.36 Change in demand per capita for soft drinks in Finland (1999-2013)**




**Source: Ecorys based on data from Euromonitor/Passport**

### *3.1.5 Tax on sugar sweetened soft drinks – France*

#### Description of tax

In 2012, a tax on sugar sweetened beverages was introduced in France in order to raise revenue and combat obesity. The tax rate was set at €7.16/hectolitre, or €0.0716/litre.

#### Data inspection

For the tax on sugar sweetened soft drinks, we take a close look at the prices and demand for cola. Investigating this product allows to investigate the direct effects of the tax, and the substitution effect to a similar drink that is not or less taxed.

*Prices*

Prices have risen over the last years, from €1.30 a litre to €1.70 a litre for regular cola, and from €1.50 a litre to €1.90 a litre of low calorie cola. This increase in price mainly occurred from 1999 to 2003 and from 2010 onward. In the period in between, prices were stable (regular cola) or declining (low calorie cola). This resulted in a smaller difference in price between the regular and low calorie cola.

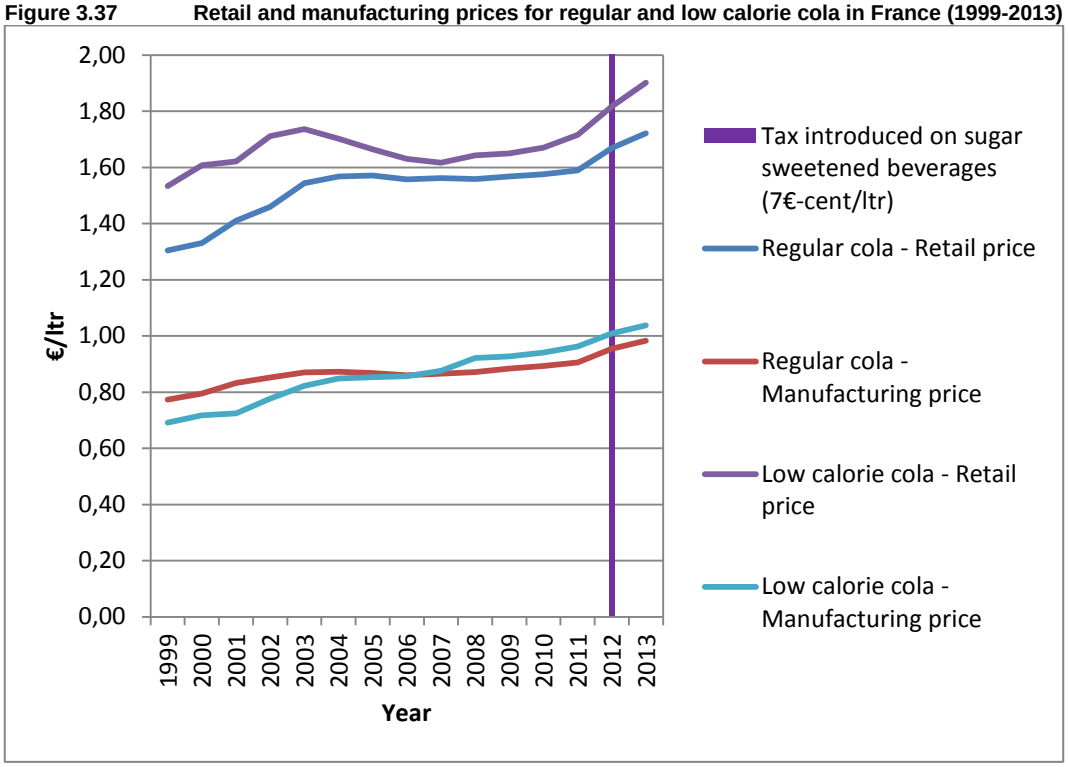
On average, the margin for regular cola has increased, mainly due to price increases by retailers in the beginning of the previous decade that was not solicited for by manufactures. However, in the last years of the previous decade, retailers were unable or unwilling to charge the higher prices of the manufactures to the consumers, resulting in a slightly smaller margin.

For low calorie cola, the margin has actually decreased. Price changes by manufacturing are almost consistently not fully met by retail prices in case of manufacturing price increases. Similarly, in case of a price decrease of manufacturers, the retailers decrease their prices even more.

Following the introduction of the tax, we see a sharp increase in the prices, both at manufacturing and at retailing level. Interestingly however, the price increase for low calorie cola is larger than the

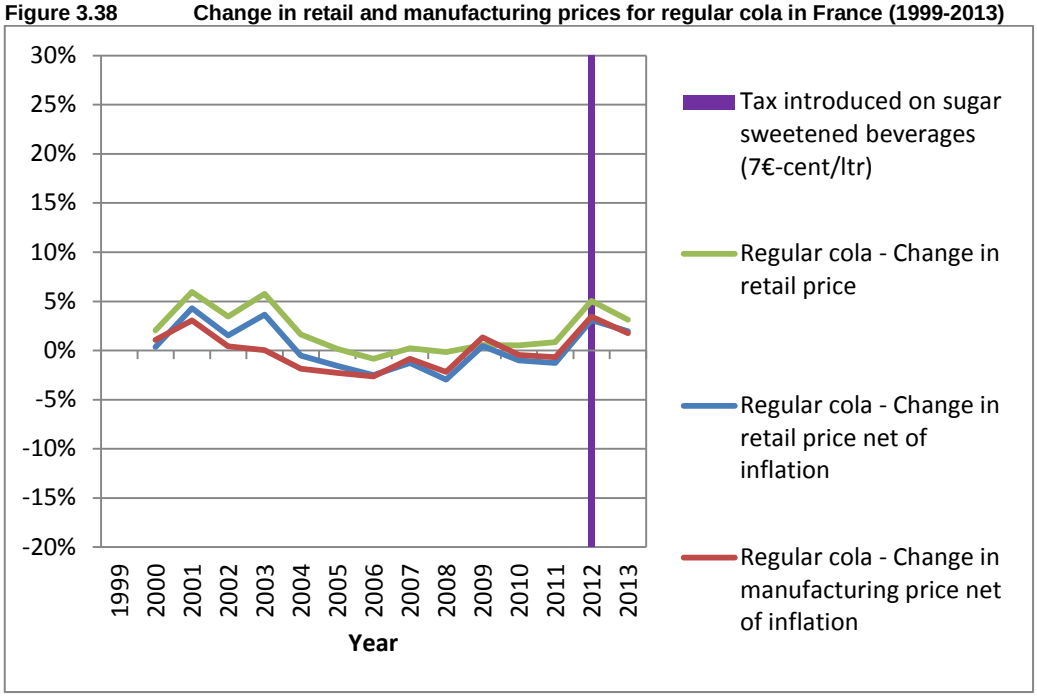
price increase for regular cola. This is not reflected by the increase in manufacturing prices, that is smaller (though marginally) for low calorie cola than for regular cola.

**Figure 3.37 Retail and manufacturing prices for regular and low calorie cola in France (1999-2013)**



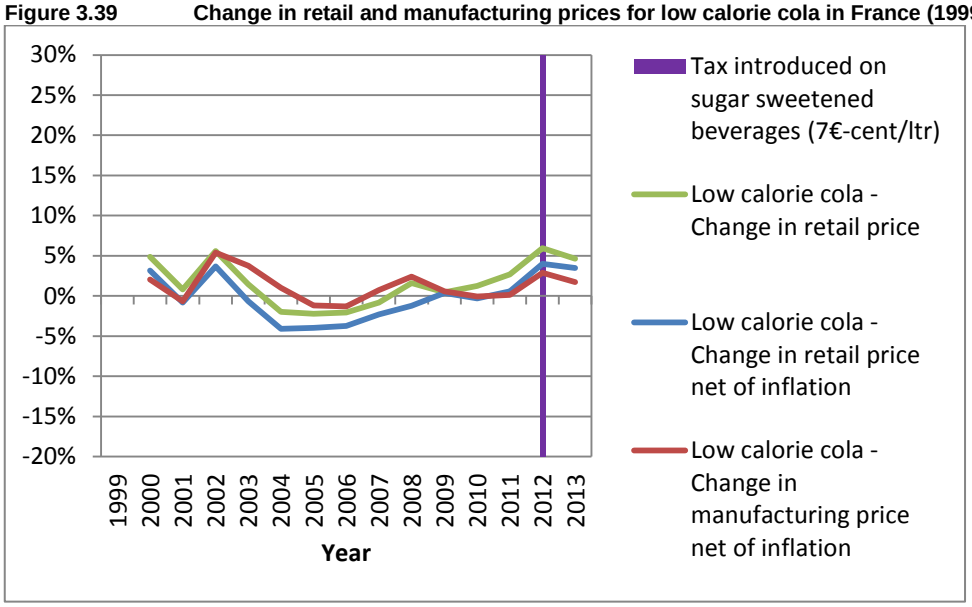

**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.38 Change in retail and manufacturing prices for regular cola in France (1999-2013)**




**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.39 Change in retail and manufacturing prices for low calorie cola in France (1999-2013)**



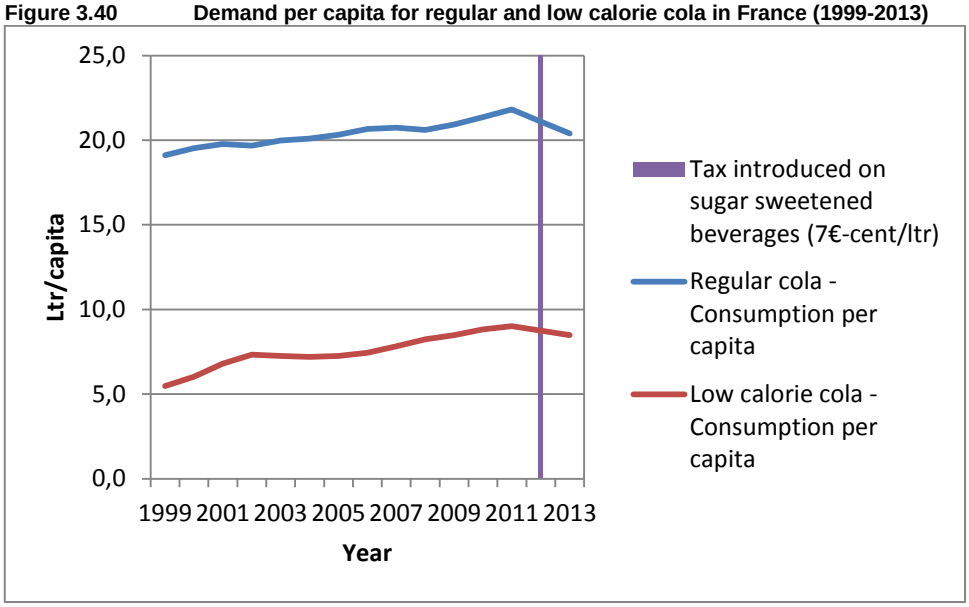

**Source: Ecorys based on data from Euromonitor/Passport**

*Demand*

The demand for both regular cola and low calorie cola has steadily been increasing until 2011. For low calorie cola the increase over those years has been on average 4.3%, and for regular cola 1.1%.

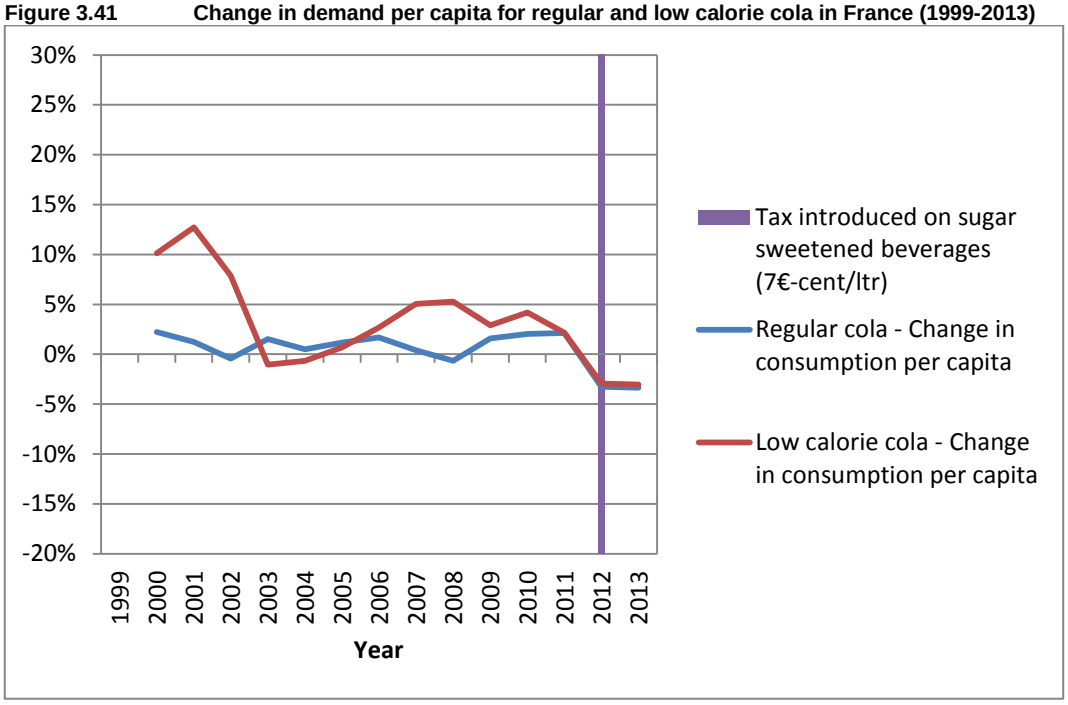
With the introduction of the tax on sugared beverages, this trend seems to have been turned. As from 2011, both beverages show a decline in demand per capita. Both types of cola have been decreasing by 3% annually in the last two years.

**Figure 3.40 Demand per capita for regular and low calorie cola in France (1999-2013)**




**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.41 Change in demand per capita for regular and low calorie cola in France (1999-2013)**




**Source: Ecorys based on data from Euromonitor/Passport**

### *3.1.6 Tax on soft drinks – Hungary*

#### Description of tax

The tax on soft drinks in Hungary was introduced in September 2011 as part of the Public Health Product Tax. This tax was imposed as an indirect tax on pre-packed products in categories where healthy alternatives are available. The tax rate was 5 FT/litre if the content of added sugar was more than 8g/100ml. In 2012, the base of the rate and the rates itself was changed. The tax rate became 200 FT/litre for syrups or concentrates for soft drinks and 7FT/litre for other soft drinks. Drinks that contain more than 25% of fruit are exempted. The tax is payable by volume on products produced in Hungary for the domestic market by manufacturers, and on imported products by the first domestic seller (whether or not this is to the final consumer).

#### Data inspection

To investigate the effects of the tax on soft drinks, we investigate two different product types: cola and juices. Investigating cola allows us to investigate the substitution effect of the tax on only one type of cola. The same is true for juices, where we can distinguish between taxed juices that contain less than 25% and juices that contain more than 25% juices that are not taxed.

*Prices – cola*

Cola prices have steadily been increasing over the observed period. It rose from around HuF 125 in 1999 to more than HuF 250 in 2013 for low calorie cola, and more than HuF 230 for regular cola. Until 2010, the prices for both types of cola were nearly equal. However, after 2010, the prices for low calorie cola continued to increase, while the regular cola prices stabilized.

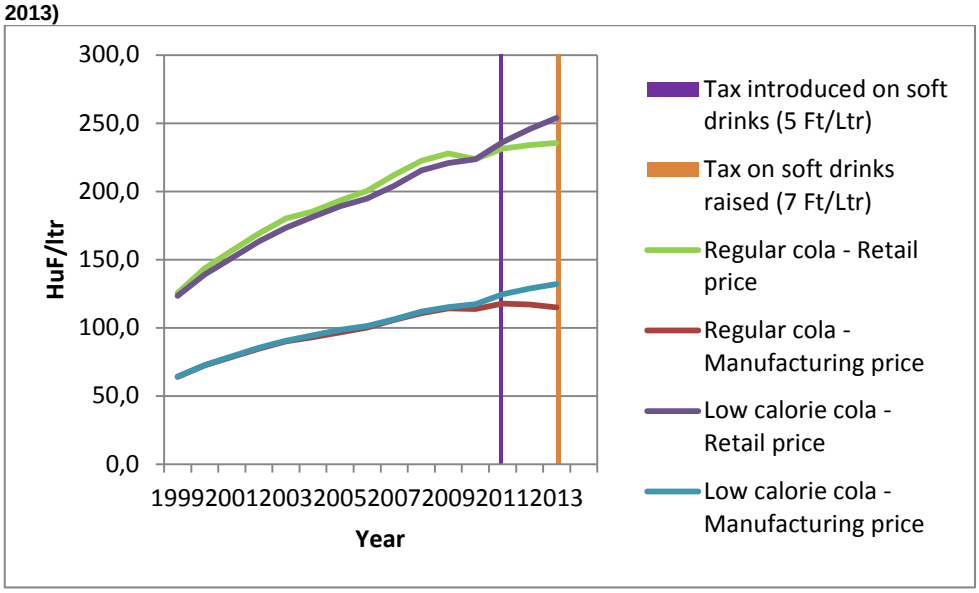
2010 is also the year when the profit margin for retailers started to change. Until 2011, retailers reduced their profit margin for regular and low calorie cola, as indicated by the diverging lines for the retail price change and the manufacturing price change. However, after 2011 retailers more than reclaimed their profit margin by raising their prices more than the manufacturing prices.

In 2011, when the tax was introduced, prices for regular cola increased more than in the previous year and in the year after. However, prices did not rose more than average prices, as indicated by the price change minus the inflation rate.

Also low calorie cola showed a relatively large price increase when the tax was introduced compared to the year before and after. Here, prices rose more than the inflation level.

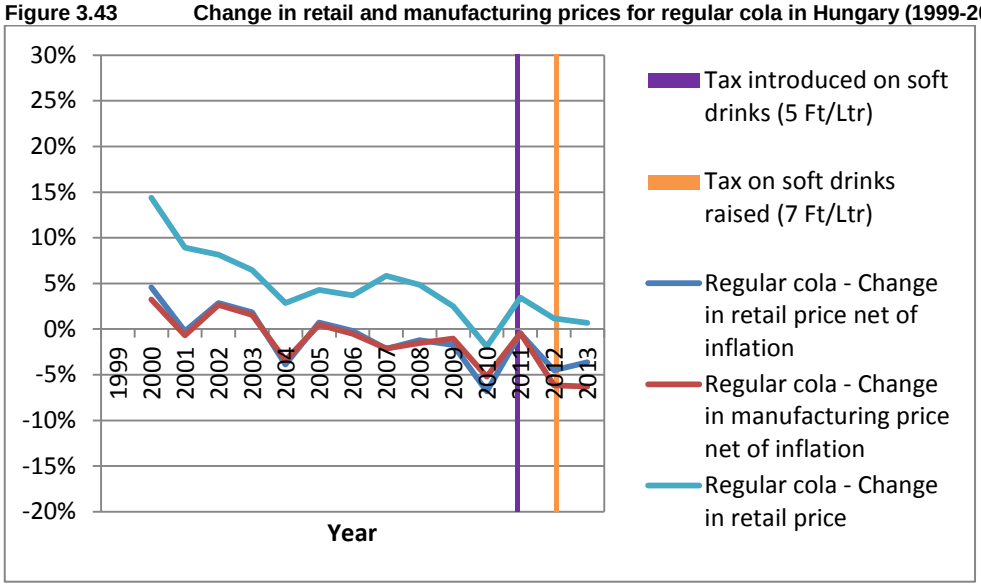
The tax increase of 2HuF per litre is not clearly visible in the prices as the change in price does not stand out from nearby observations in other years.

**Figure 3.42 Retail and manufacturing prices for regular and low calorie cola in Hungary (1999-2013)**



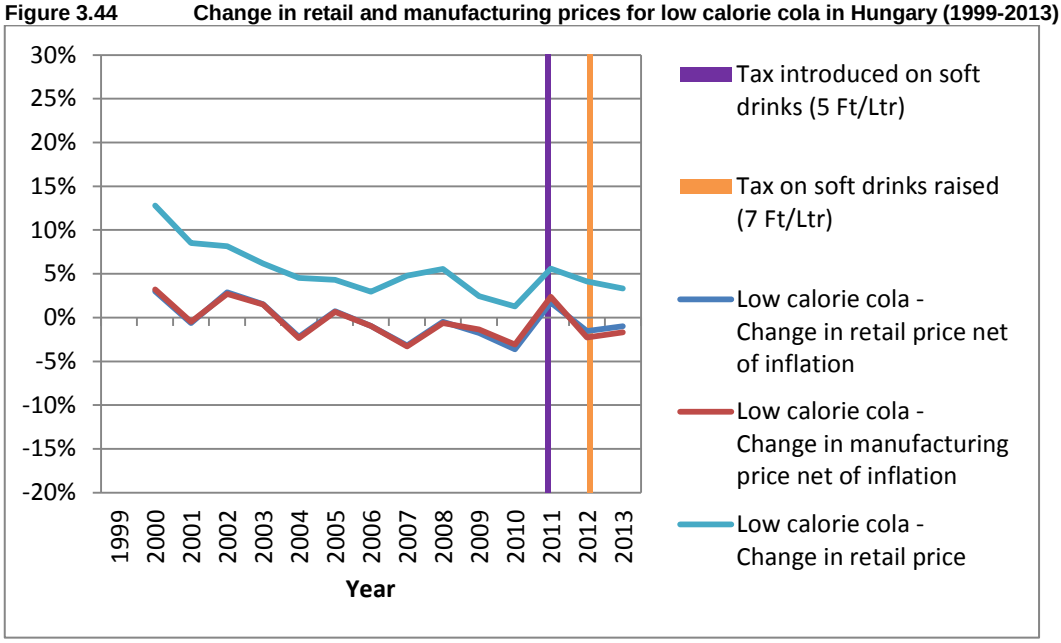

**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.43 Change in retail and manufacturing prices for regular cola in Hungary (1999-2013)**




**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.44 Change in retail and manufacturing prices for low calorie cola in Hungary (1999-2013)**




**Source: Ecorys based on data from Euromonitor/Passport**

*Prices – juices*

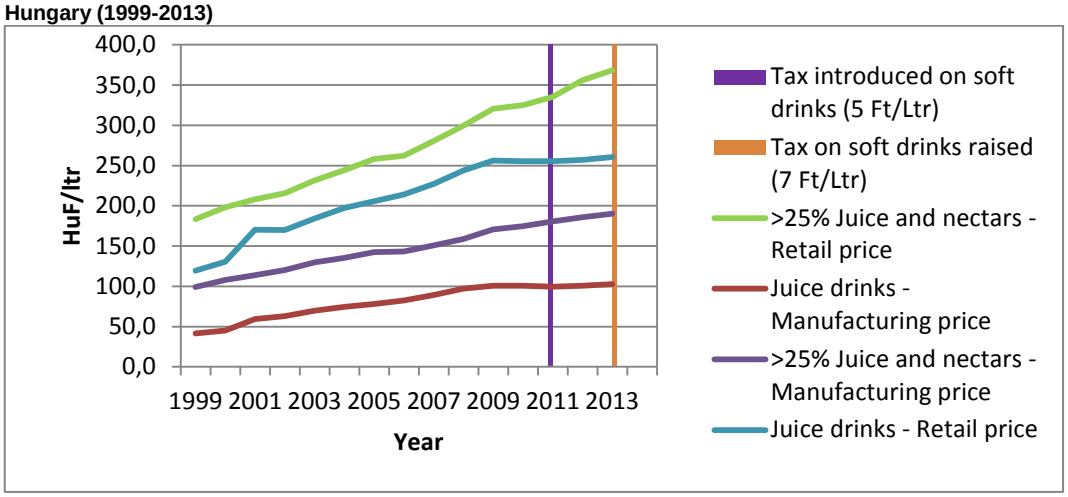
From 1999 to 2009, juice prices have rapidly increased with on average more than 5% per year. In 2009, the trend was interrupted, most notably for juice drinks that stabilised its retail and manufacturing prices at HuF 250 and HuF 100 respectively. This trend interruption is also visible for juices and nectars that contain more than 25% fruit, but to a far lesser extent. In 2009 and 2010 the price increases dropped to 1 and 3 percent respectively, but these growth rates are followed by a price increase of 6%. Although the trend was interrupted in 2009, it seemed that the trend was picked up again two years later.

The profit margins for both juice drinks and juices with more than 25% fruit have changed considerably in the past 14 years. For juice drinks, retailers accepted a decrease in their margins, mostly in the period between 2001 and 2004 and between 2006 and 2008. After these periods, the retailer follows closely the price setting of the manufacturers.

For juices that contain more than 25% fruit, the reverse is true. Retailers more than offset any of the price increases of manufacturers in their price setting and they managed throughout the observed period to expand their profit on juices.

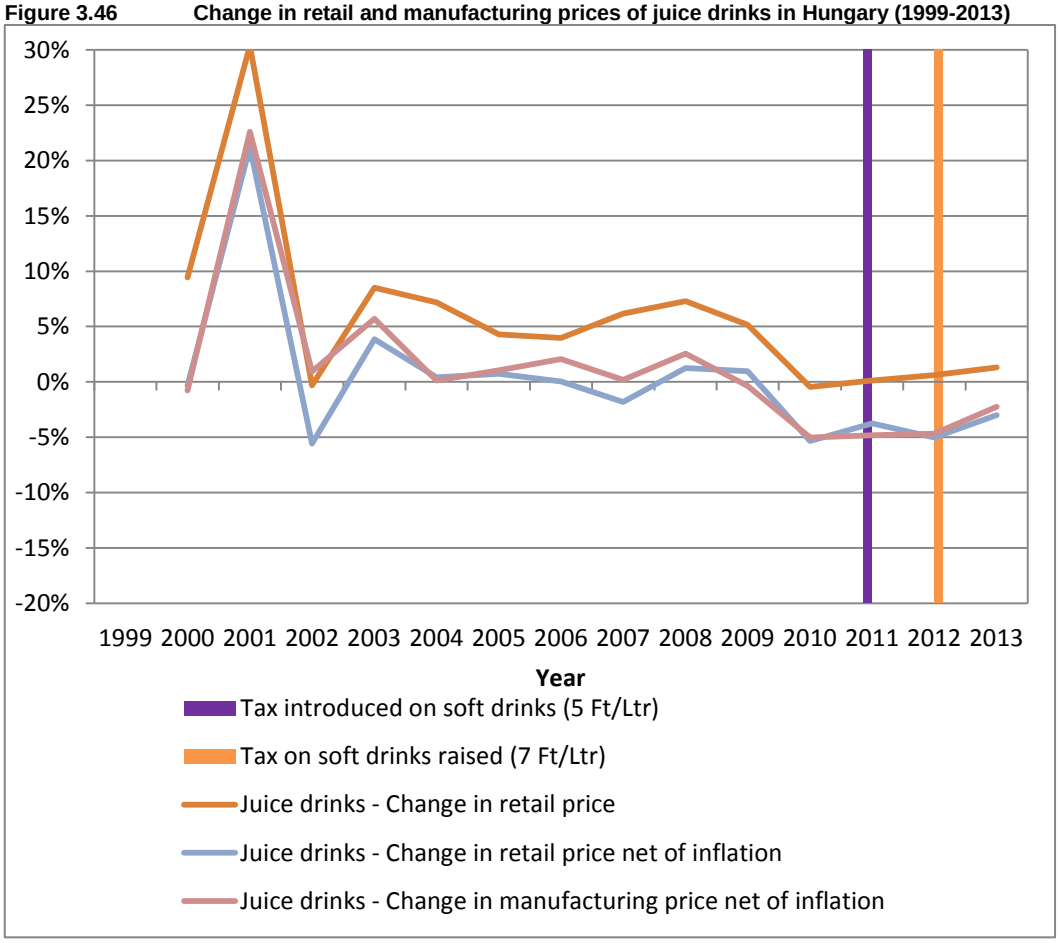
The effects of the tax introduction is barely noticeable in the prices of juice drinks. Prices did not change dramatically following the introduction or the increase of the tax. Also the tax exempted juices and nectars did not show any effect following the introduction of the tax. Interestingly though, at the tax increase, the prices for the juices did increase sharply, while manufacturing prices decreased.

**Figure 3.45 Retail and manufacturing prices of various types of juices and juice drinks in Hungary (1999-2013)**



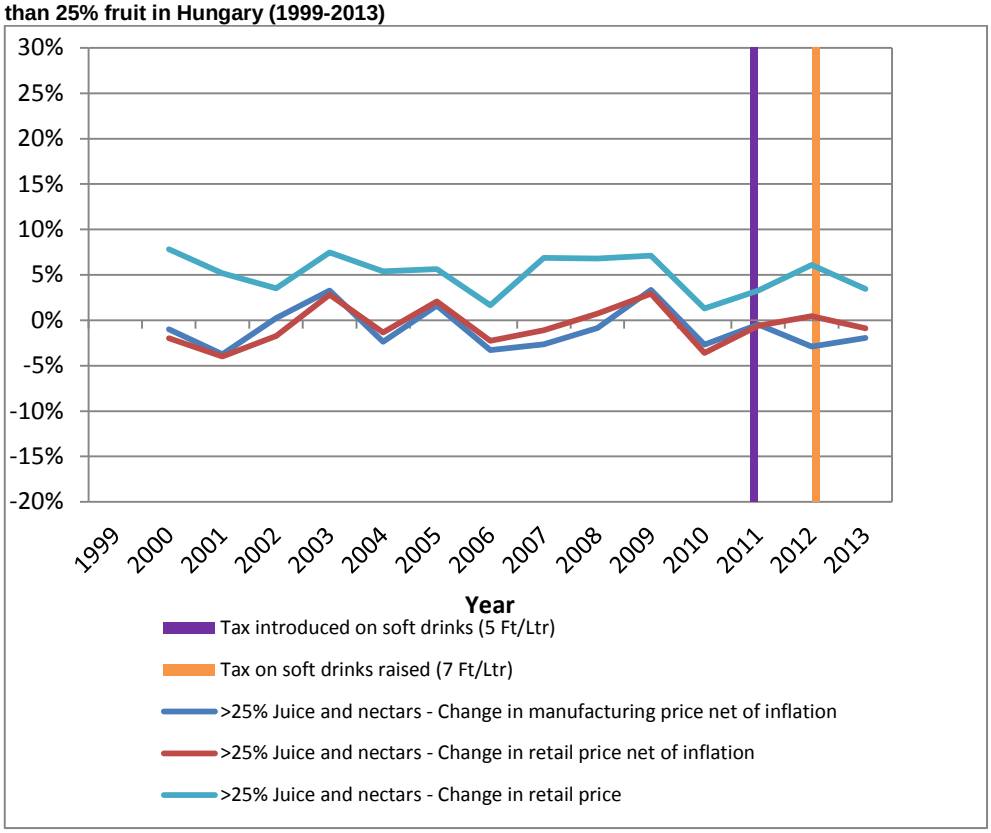

**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.46 Change in retail and manufacturing prices of juice drinks in Hungary (1999-2013)**




**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.47 Change in retail and manufacturing prices of various types of juices containing more than 25% fruit in Hungary (1999-2013)**



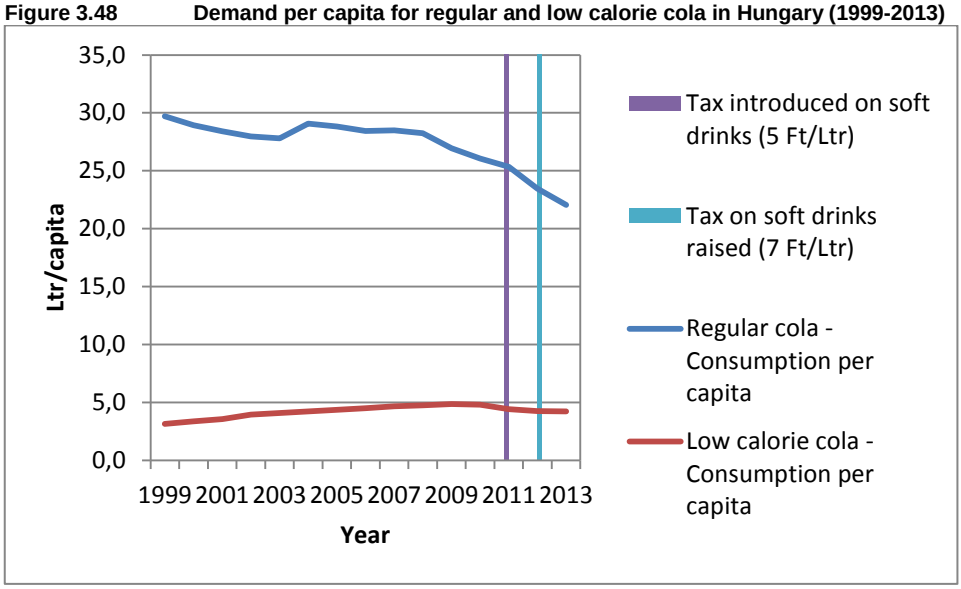

**Source: Ecorys based on data from Euromonitor/Passport**

### *Demand – cola*

In the demand for cola, we see that regular cola is far more popular than low calorie cola. However, that said, we also see the demand for regular cola diminishing, and in the last years at an increasing rate. Whereas consumers bought around 30 litres of regular cola a year per capita at the beginning of the century, in 2013, they only bought 21 litres a year per capita. Over the same period, the low calorie cola has been relatively stable, with a very small increase of 1 litre per capita a year.

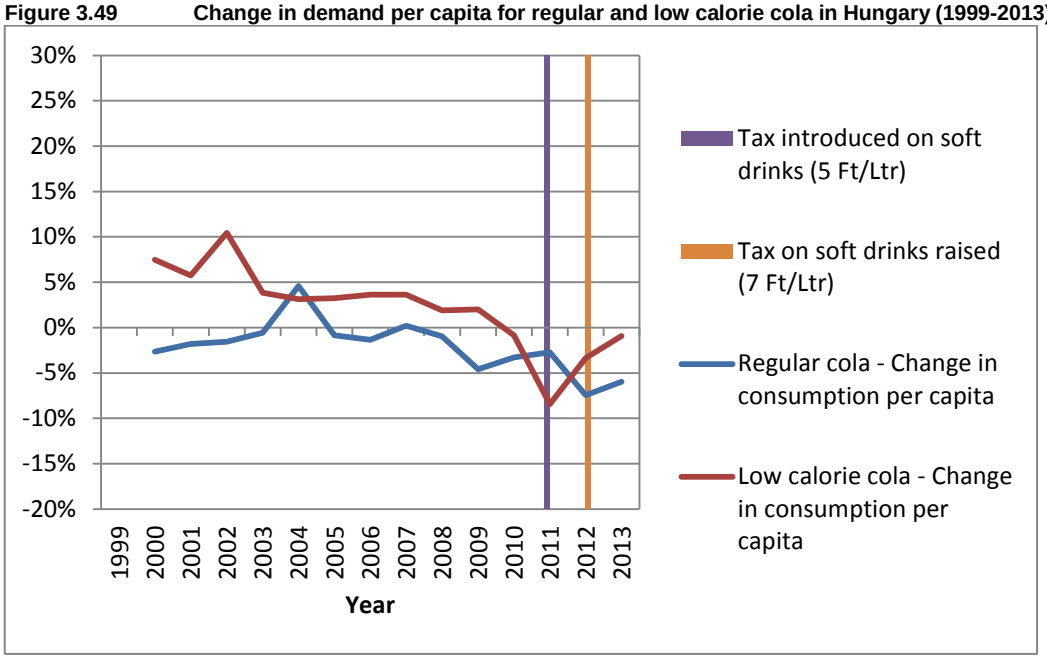
When the tax on soft drinks was introduced, the largest effect was visible for the low calorie cola with an almost 10% decrease in demand. This decrease continued in 2012 and 2013, but at a smaller pace. At first, there is no effect for the regular cola. The sharp decline in demand did not occur until 2012, coinciding with the tax increase.

Figure 3.48 Demand per capita for regular and low calorie cola in Hungary (1999-2013)




**Source: Ecorys based on data from Euromonitor/Passport**

Figure 3.49 Change in demand per capita for regular and low calorie cola in Hungary (1999-2013)




**Source: Ecorys based on data from Euromonitor/Passport**

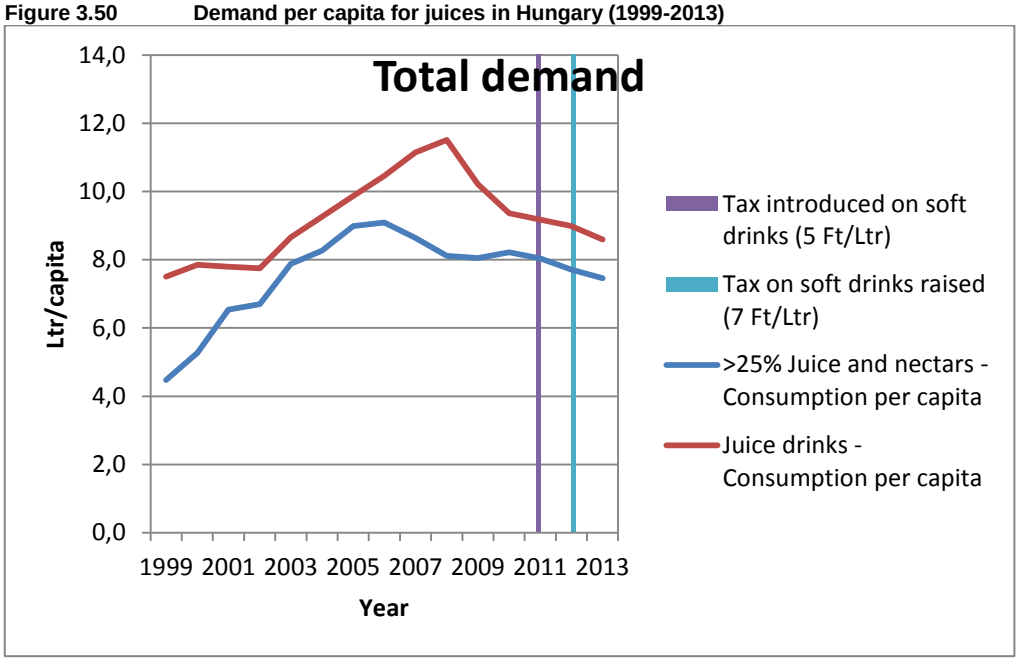
### *Demand – juices*

In the beginning of the century, the demand for juices strongly increased, especially for the juices ad nectars that contained more than 25% fruit. However, since 2006, the demand for these types of juices slowly decreased to a level where the average consumer in Hungary purchased slightly over 7 litre of juice a year.

The demand for juice drinks shows a slightly different pattern. It also, shows a rapid increase in the demand, which lasted until 2008. However, from that year, a sharp decline in the demand occurred. Juice drinks are only slightly more popular than nectars.

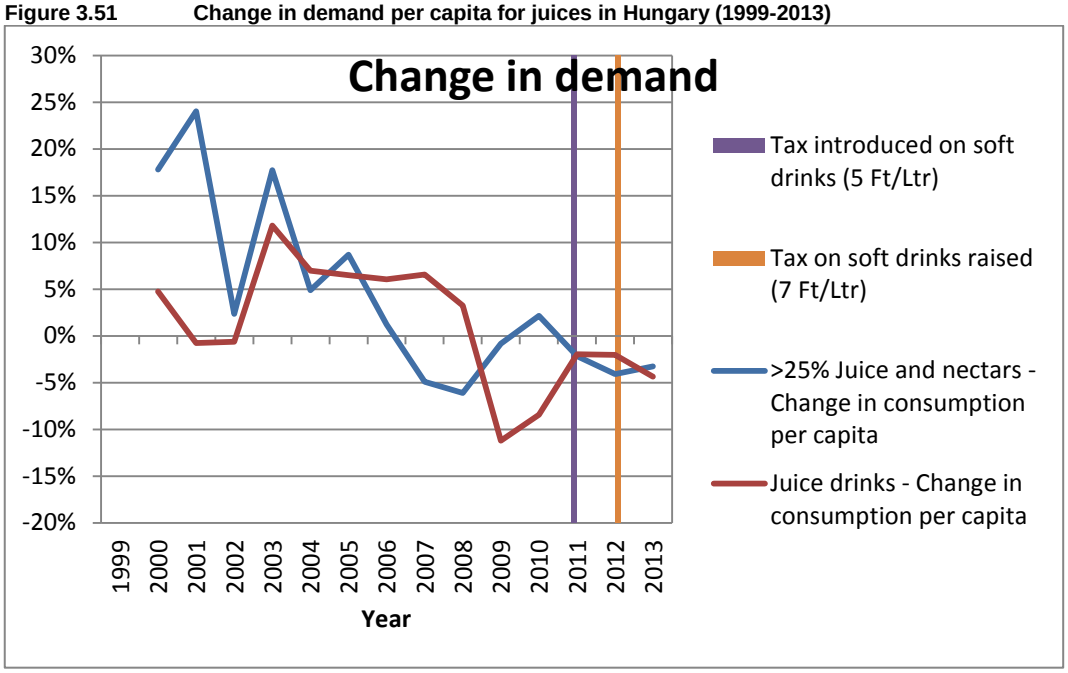
It is hard to distinguish the effect of the tax on the demand for juices. Demand is declining in the years that the tax is introduced and increased, but not at a remarkable rate compared to earlier and later years. Moreover, the effect is relatively similar for both the taxed and tax exempted juice.

Figure 3.50 Demand per capita for juices in Hungary (1999-2013)




Source: Ecorys based on data from Euromonitor/Passport

Figure 3.51 Change in demand per capita for juices in Hungary (1999-2013)




Source: Ecorys based on data from Euromonitor/Passport

### *3.1.7 Tax on energy drinks – Hungary*

#### Description of tax

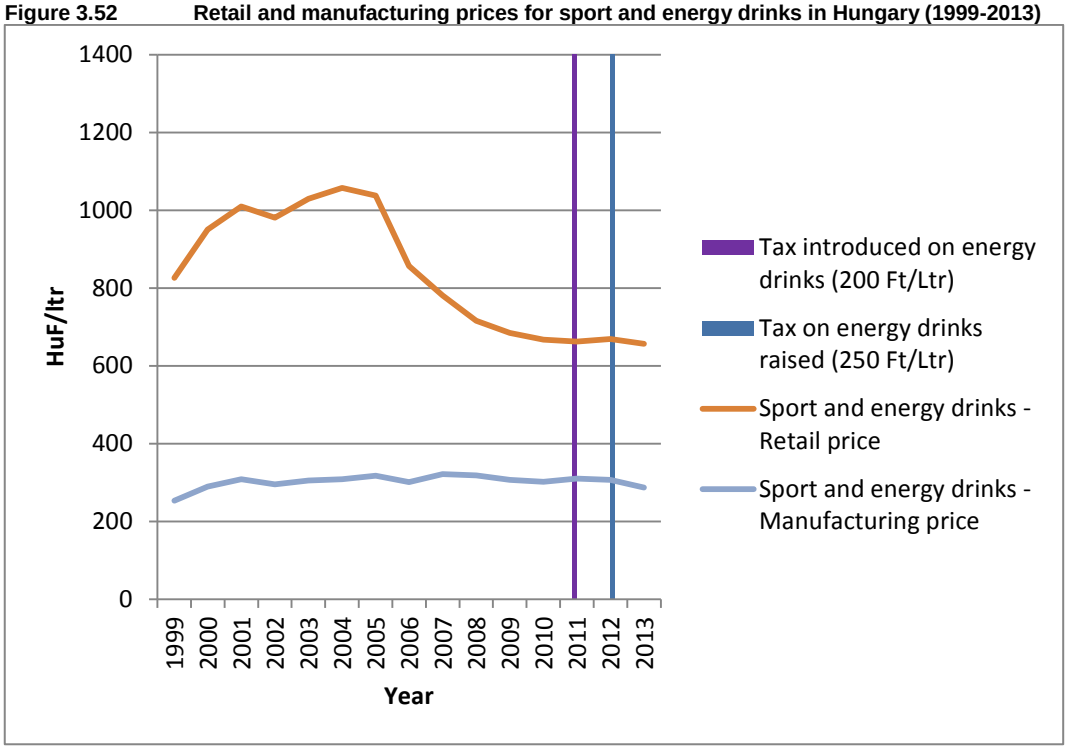
The tax on energy drinks in Hungary was introduced in September of 2011 as part of the Public Health Product Tax. This tax was imposed as an indirect tax on pre-packed products in categories where healthy alternatives are available. The tax rate was 250 FT/litre if the content of added caffeine is more than 10g/100ml. In 2012 the base of the rate was changed: the tax rate became 250 FT/ml if the content of a methylxanthines is more than 1mg/100ml and if the content of taurine is more than 100mg/100ml. The tax is payable by volume on products produced in Hungary for the domestic market by manufacturers, and on imported products by the first domestic seller (whether or not this is to the final consumer).

## Data inspection

*Prices*

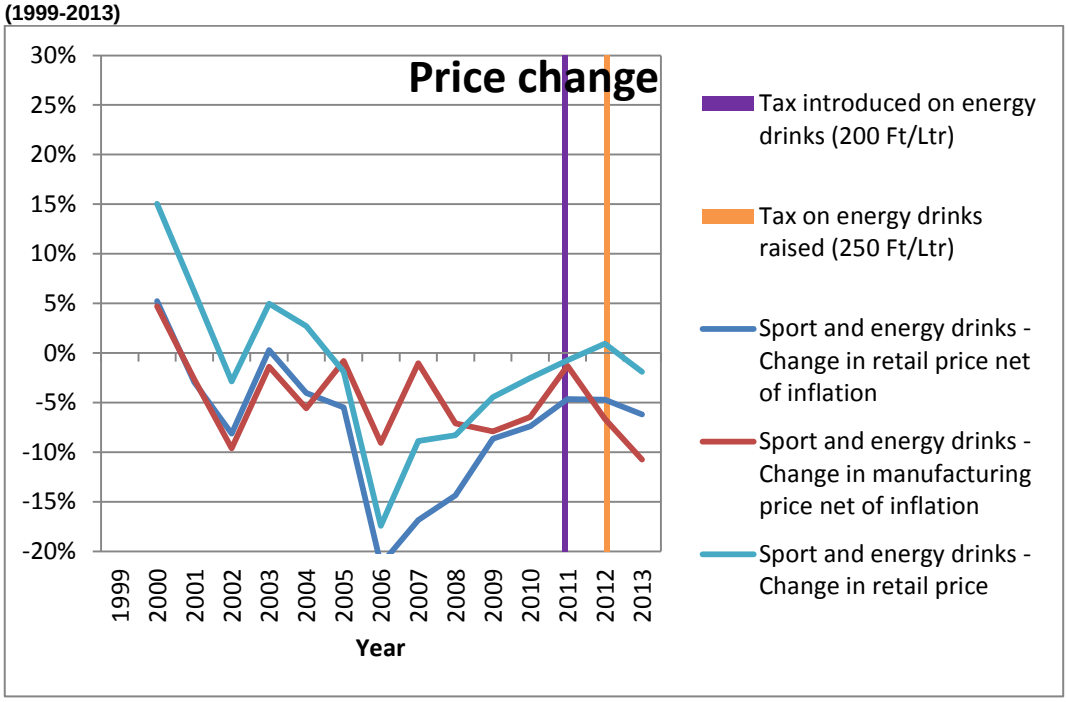
Manufacturing price of sport and energy drinks has been stable on the level of 300 FT per litre. The retail price however was increasing between 1999 and 2004 and then dramatically decreased (by 20% over 5 years when corrected for the presence of inflation) to reach the level of 650 Ft per litre. An introduction of the public health product tax did not change the already occurring trend in the prices, nor did the change in the tax rate in 2012. The prices continued to gradually decline. On average, the margin for sport and energy drinks has decreased, mainly due to retailers price decrease that was not solicited for by manufactures. However, in the last years of the previous decade, retailers were unable or unwilling to charge the higher prices of the manufactures to the consumers, resulting in a slightly smaller margin.

**Figure 3.52 Retail and manufacturing prices for sport and energy drinks in Hungary (1999-2013)**




**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.53 Change in retail and manufacturing prices for sport and energy drinks in Hungary (1999-2013)**

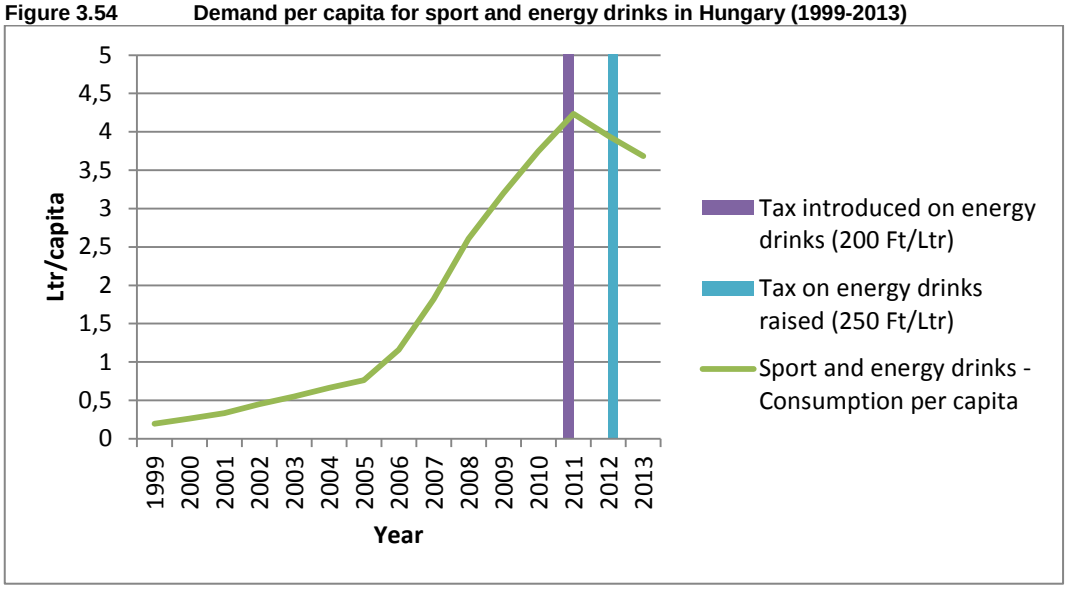



**Source: Ecorys based on data from Euromonitor/Passport**

*Demand*

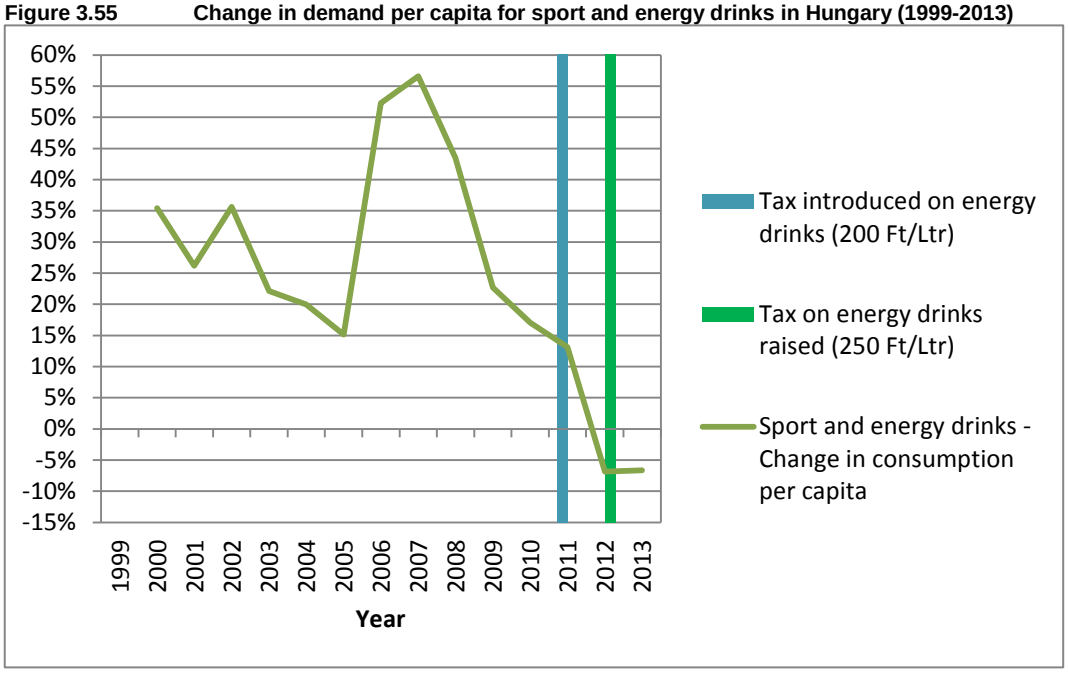
The demand for sport and energy drinks has been increasing until 2011, just before the public health tax was imposed. Between 2005 and 2006 the growth rate of the demand was the highest reaching the level of almost 30%. When the tax was introduced the demand for sport and energy drinks started to decline and the increase in the tax rate in 2012 led to further decrease. In 2013 the growth rate of the demand was -10%.

**Figure 3.54 Demand per capita for sport and energy drinks in Hungary (1999-2013)**




**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.55 Change in demand per capita for sport and energy drinks in Hungary (1999-2013)**




**Source: Ecorys based on data from Euromonitor/Passport**

### *3.1.8 Tax on confectionery – Hungary*

#### Description of tax

The tax on confectionery products in Hungary was introduced in September of 2011 as part of the Public Health Product Tax. This tax was imposed as an indirect tax on pre-packed products in categories where healthy alternatives are available. The tax rate originally was 100 FT/kg if the content of added sugar is more than 25g/100g or the content of chocolate is more than 40g/100g. In 2012 the rate was up to 70 FT/kg for sweetened cocoa powder and to 130 FT/kg for all other products if the content of added sugar is more than 25g/100g, or for chocolate if the content of added and total sugar is more than 40g/100g and cocoa content is less than 40g/100g. The tax is payable by weight on products produced in Hungary for the domestic market by manufacturers, and on imported products by the first domestic seller (whether or not this is to the final consumer). Below we look at different types of confectionery products: chocolate, gum, sugar confectionery, and ice cream.

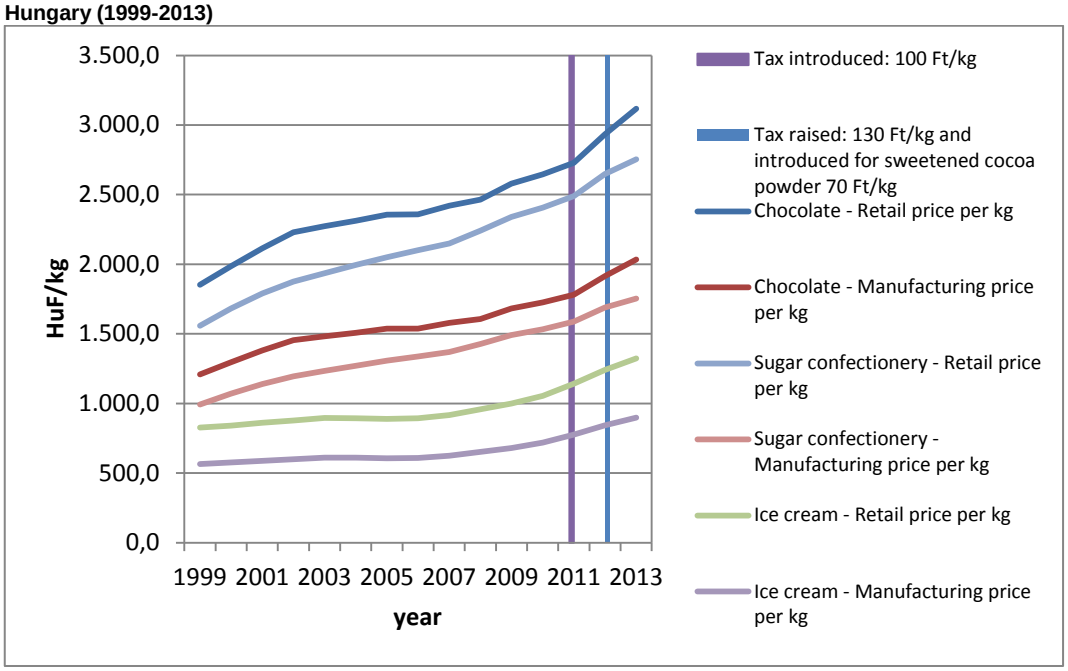
#### Data inspection

*Prices*

Since 1999, the retail prices of the confectionery product are demonstrating an upward trend. Both retail and manufacturing prices are increasing. An introduction of the public health product tax did not change the trend in the prices. As well as the changes in the tax base and tax rate did not result in the changes in the trend. An average annual pace of growth for all types of products is 5% between1999 and 2010. The introduction of the tax boosted the pace of the growth rate of the prices of chocolate and sugar confectionery, but hampered that of ice-cream. After the tax was raised the growth of the prices slowed down.

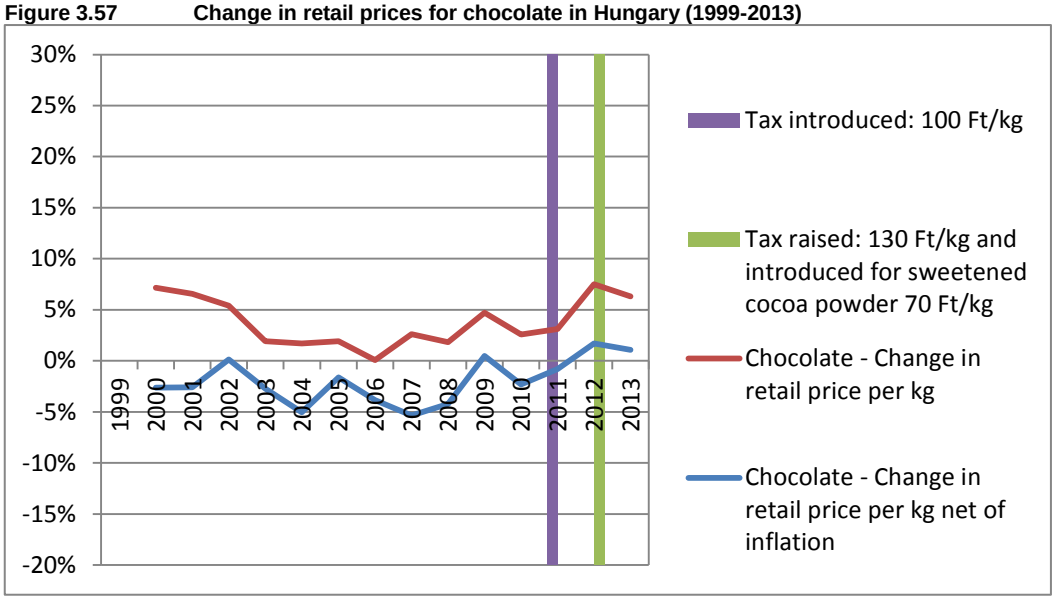
The retailers margin has been increasing throughout the observed period for all type of products.

**Figure 3.56 Retail and manufacturing prices for chocolate, sugar confectionery and ice-cream in Hungary (1999-2013)**



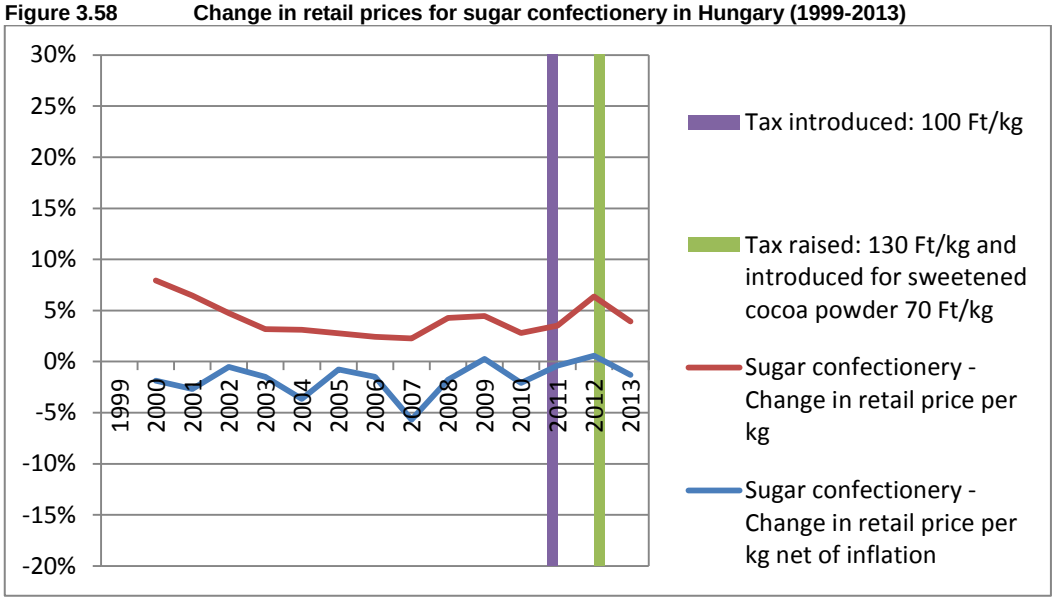

**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.57 Change in retail prices for chocolate in Hungary (1999-2013)**



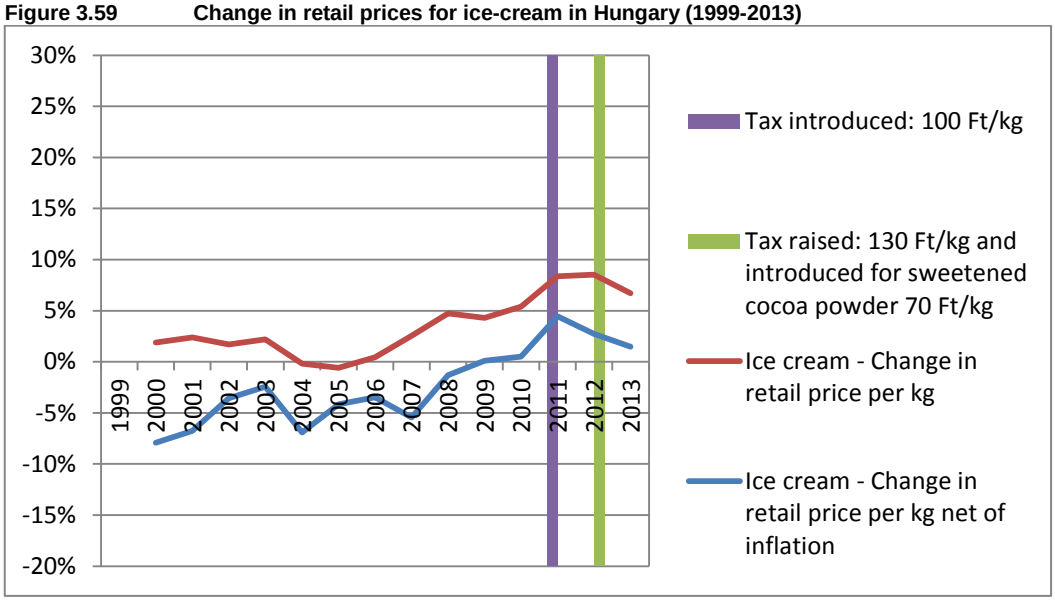

**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.58 Change in retail prices for sugar confectionery in Hungary (1999-2013)**




**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.59 Change in retail prices for ice-cream in Hungary (1999-2013)**



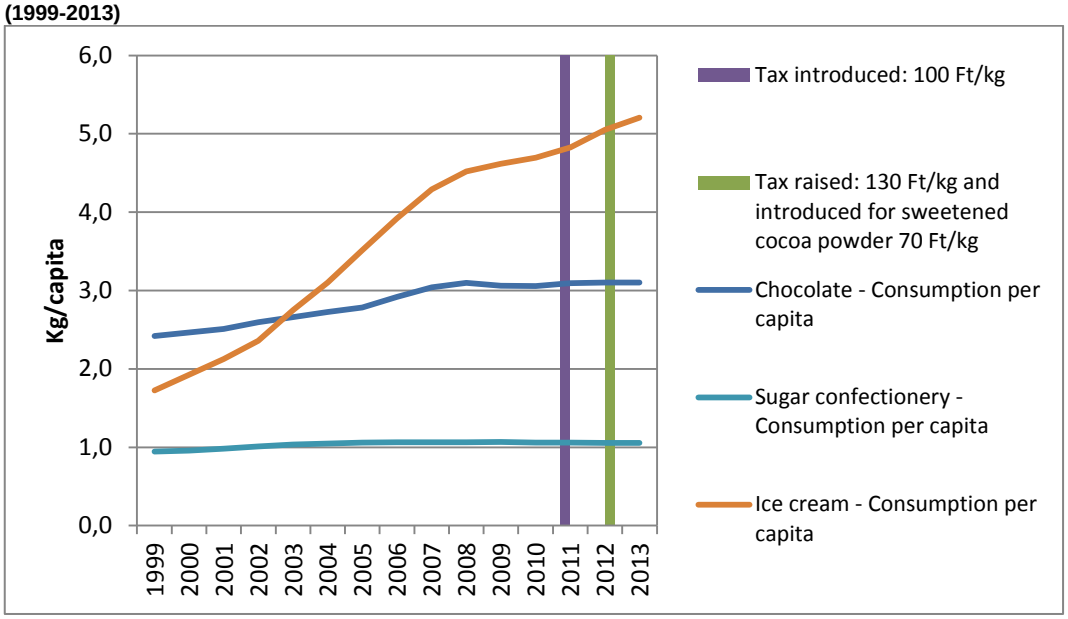

**Source: Ecorys based on data from Euromonitor/Passport**

### *Demand*

The demand for sugar confectionery has been stable over the last 14 years, staying at the level of 1 kg per capita. The introduction of the tax on confectionery products did not influence the demand. The introduction of the tax resulted in the negative growth rate of the consumption per capita, which was anticipated a year in advance (the growth rate became negative a year before the tax was imposed).

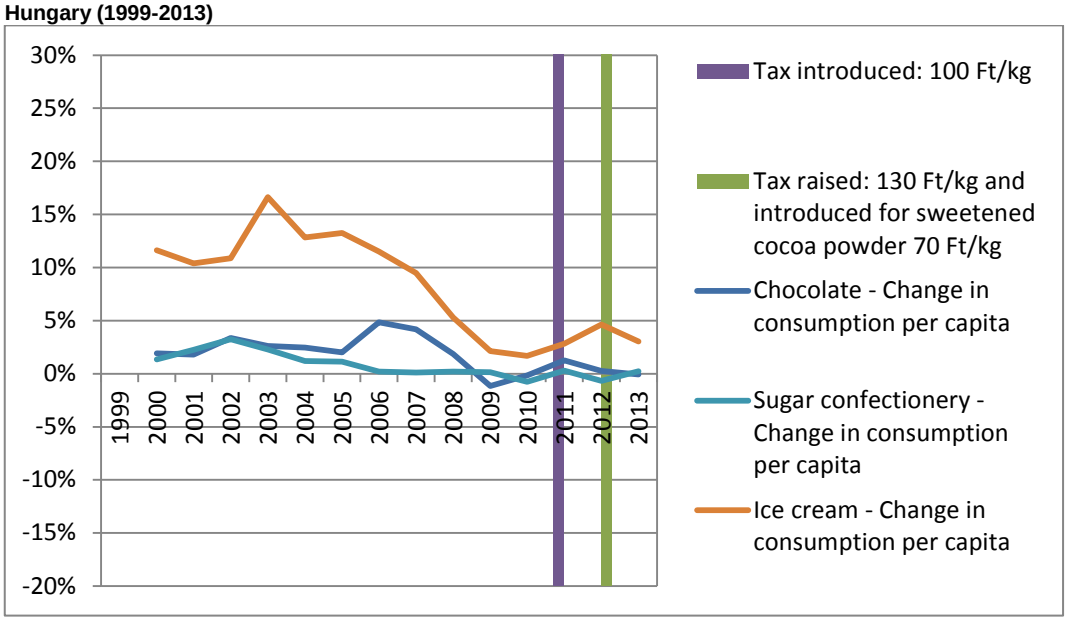
The demand for both ice cream and chocolate has been growing since 1999. The demand for ice cream grew from 1.7 to 5.2 kg per capita while the demand for chocolate – from 2.4 to 3.1 kg per capita. When the tax was imposed the demand for ice cream continued to grow with increasing pace but slowed down after the tax was raised in 2012. While the demand for chocolate started to grow slower straight away after the introduction of the tax.

**Figure 3.60 Demand per capita for chocolate, sugar confectionery and ice-cream in Hungary (1999-2013)**




**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.61 Change in demand per capita for chocolate, sugar confectionery and ice-cream in Hungary (1999-2013)**




**Source: Ecorys based on data from Euromonitor/Passport**

### *3.1.9 Tax on salty snacks – Hungary*

#### Description of tax

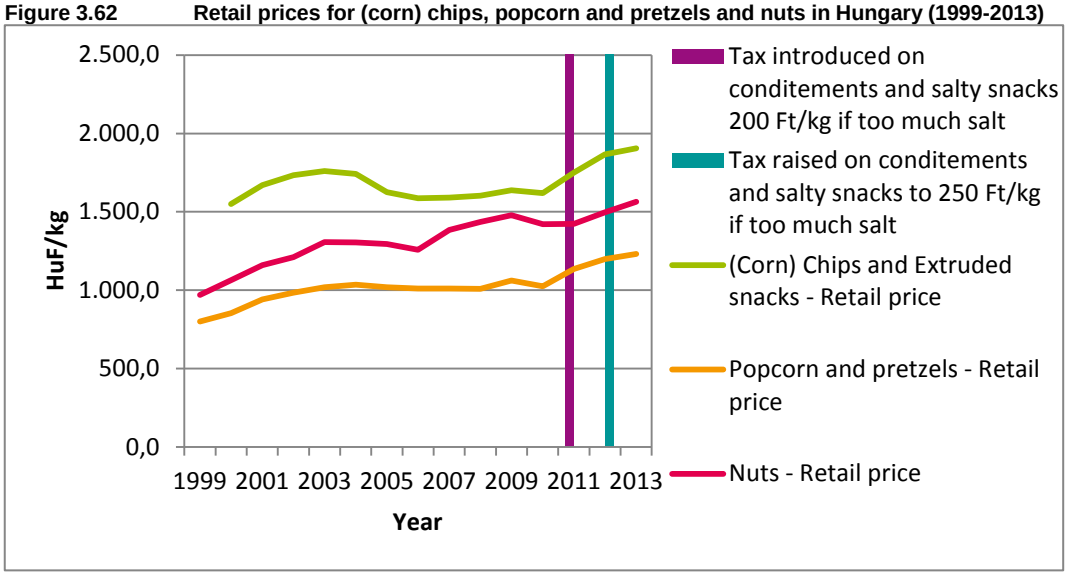
The tax on salty snacks in Hungary was introduced in September of 2011 as part of the Public Health Product Tax. This tax was imposed as an indirect tax on pre-packed products in categories where healthy alternatives are available. The tax rate originally was 200 FT/kg if the content of salt is more than 1g/100g. In 2012 the rate was increased to 250 FT/kg. The tax is payable by weight on products produced in Hungary for the domestic market by manufacturers, and on imported products by the first domestic seller (whether or not this is to the final consumer). Below we look at three different types of salty snacks: chips and extruded snacks, popcorn and pretzels, and nuts.

## Data inspection

*Prices*

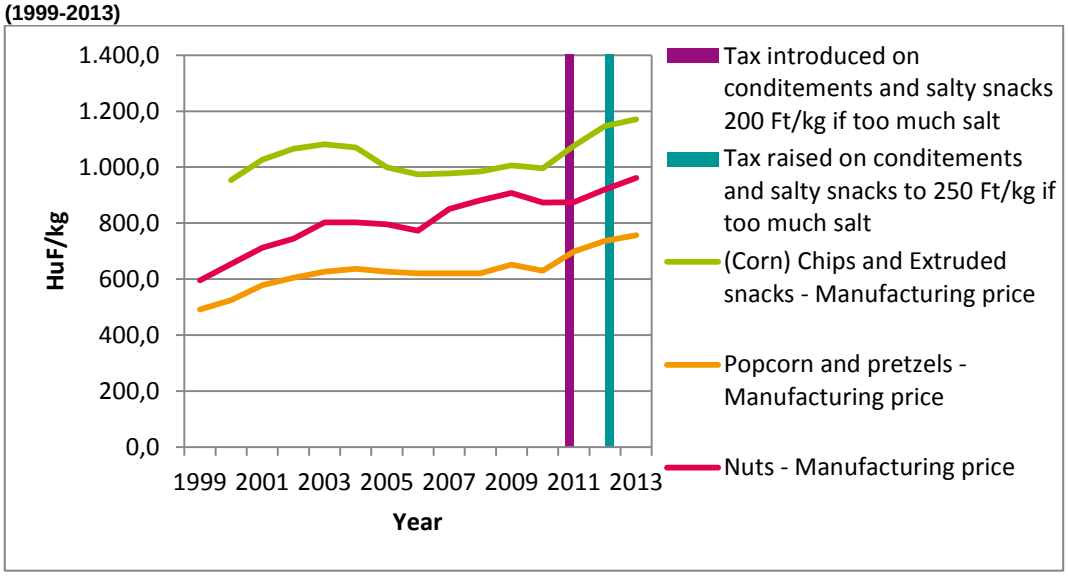
The retail and manufacturing average prices for table sauces has increased since 1999. In addition, both prices demonstrated the same trends and patterns for every type of salty snacks. When the tax on salty products was imposed, the prices for all the types of salty snacks started to increase but with a slower pace. When the tax was raise, the pace decreased slowed down further. The changes in prices demonstrate the same patterns. It is interesting to note that in 2005 the manufacturing and retail prices for chips and extruded snacks experienced the largest decrease in the pace of the growth rate, even turning to negative. The introduction of the tax on salty products affected the most the prices of popcorn and pretzels.

**Figure 3.62 Retail prices for (corn) chips, popcorn and pretzels and nuts in Hungary (1999-2013)**



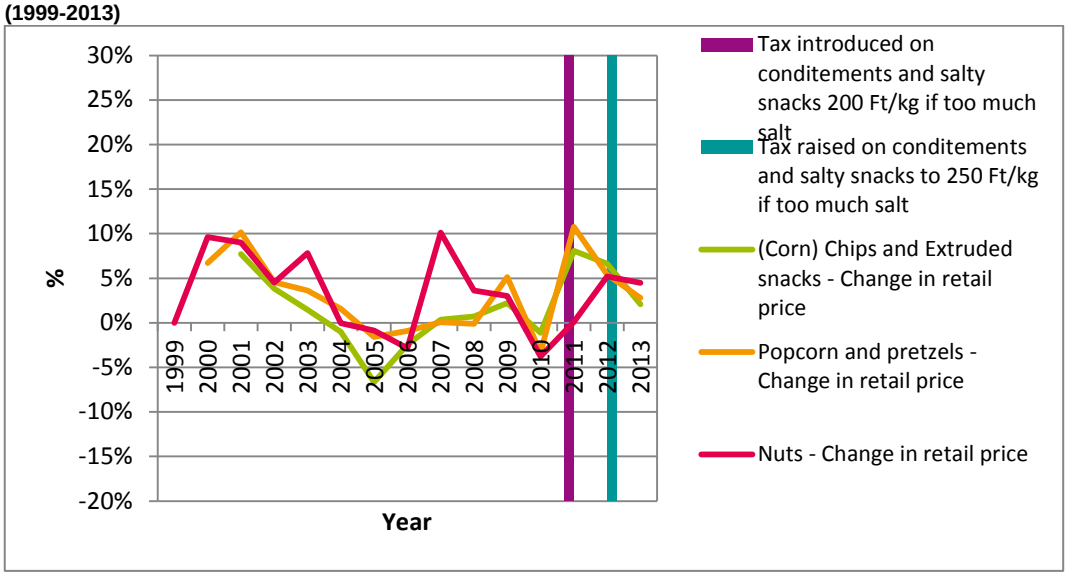

**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.63 Manufacturing prices for (corn) chips, popcorn and pretzels and nuts in Hungary (1999-2013)**



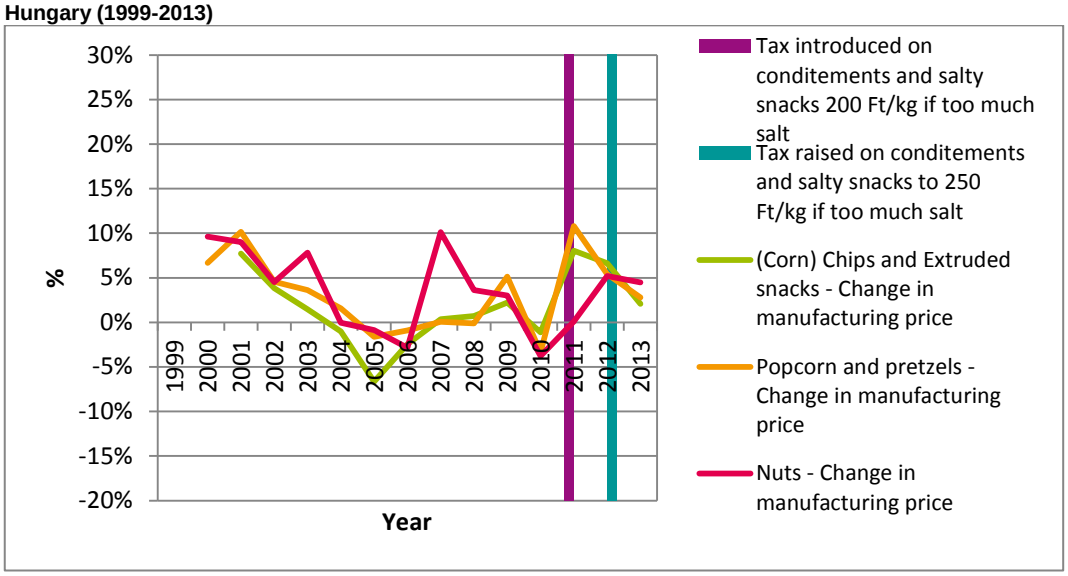

**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.64 Change in retail prices for (corn) chips, popcorn and pretzels and nuts in Hungary (1999-2013)**



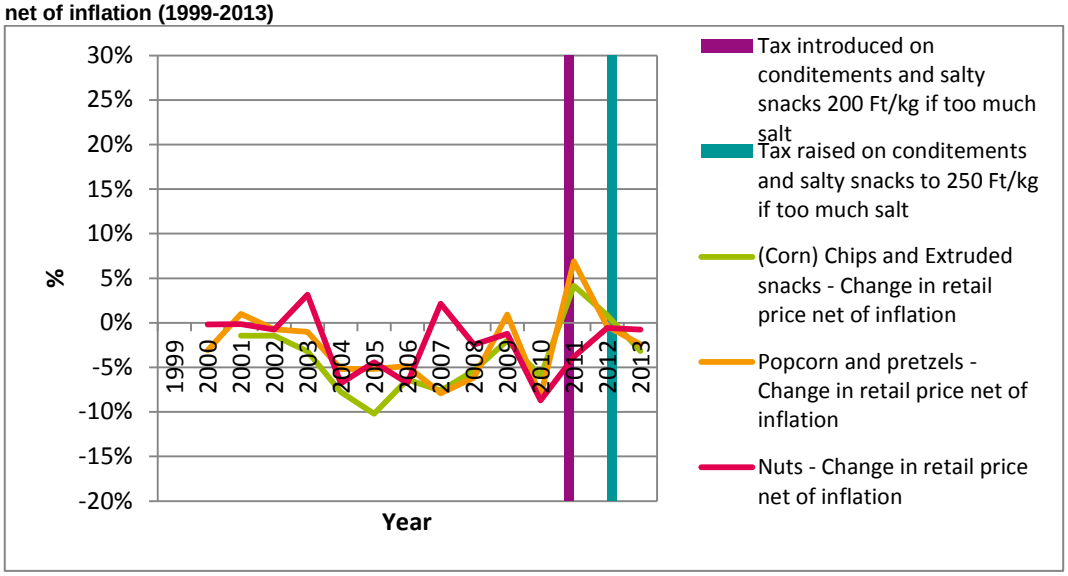

**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.65 Change in manufacturing prices for (corn) chips, popcorn and pretzels and nuts in Hungary (1999-2013)**




**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.66 Change in retail prices for (corn) chips, popcorn and pretzels and nuts in Hungary, net of inflation (1999-2013)**

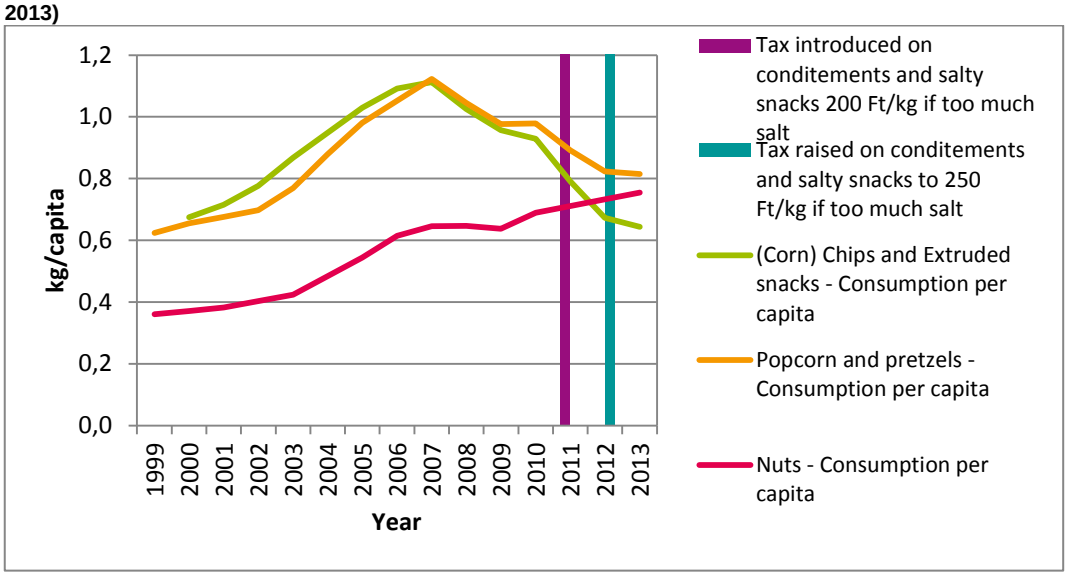



**Source: Ecorys based on data from Euromonitor/Passport**

### *Demand*

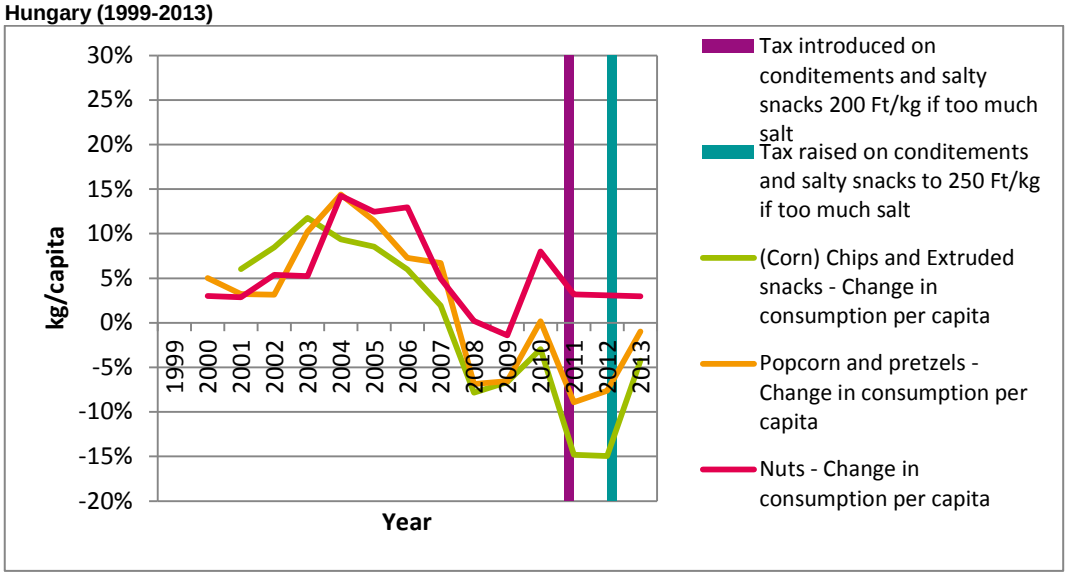
The demand for salty snacks was increasing until 2007 for all three types of salty snacks, regardless of the changes in the tax. In 2007 the trend has changed: the demand for nuts slowed down and was steady for 2 years and then continued to grow, while the demand for chips and extruded snacks and for popcorn and pretzels started to decline and almost returned to the level of 1999. The introduction of tax as well as the changes in the tax did not result in the overall trend. It is interesting to note that the demand for different types of salty snacks is different in absolute terms, the growth rates of the demand is the same.

**Figure 3.67 Demand per capita for (corn) chips, popcorn and pretzels and nuts in Hungary (1999-2013)**




**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.68 Change in demand per capita for (corn) chips, popcorn and pretzels and nuts in Hungary (1999-2013)**




**Source: Ecorys based on data from Euromonitor/Passport**

### *3.1.10 Tax on condiments – Hungary*

#### Description of tax

The tax on condiments (or table sauces) in Hungary was introduced in September of 2011 as part of the Public Health Product Tax. This tax was imposed as an indirect tax on pre-packed products in categories where healthy alternatives are available. The tax rate originally was 200 FT/kg if the content of salt is more than 5g/100g with the exemptions for mustard and ketchup. In 2012 the rate was increased to 250 FT/kg. The tax is payable by weight on products produced in Hungary for the domestic market by manufacturers, and on imported products by the first domestic seller (whether or not this is to the final consumer).

#### Data inspection

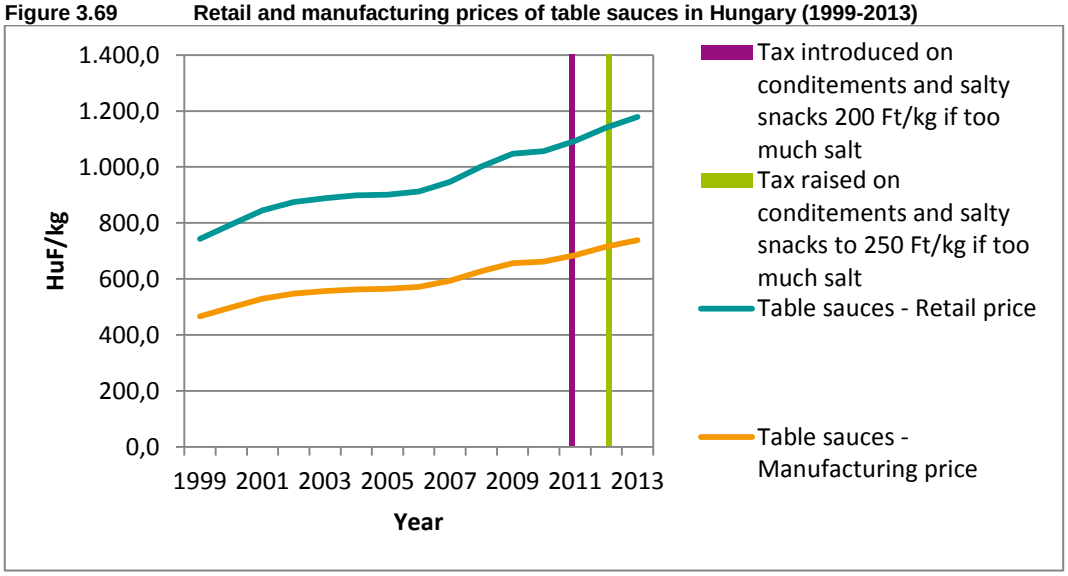
*Prices*

The retail and manufacturing average prices for table sauces was increasing gradually since 1999.

When the relative price change is corrected for inflation, we see that the growth rate of manufacturing price of condiments was declining till 2005 and then the growth rate returned to the level of 2000 in 2008 followed by a dramatic decrease again until 2010. Afterwards the manufacturing price started to grow with a higher pace which then decreased in 2011 when the tax was introduced and further decreased when the tax was raised.

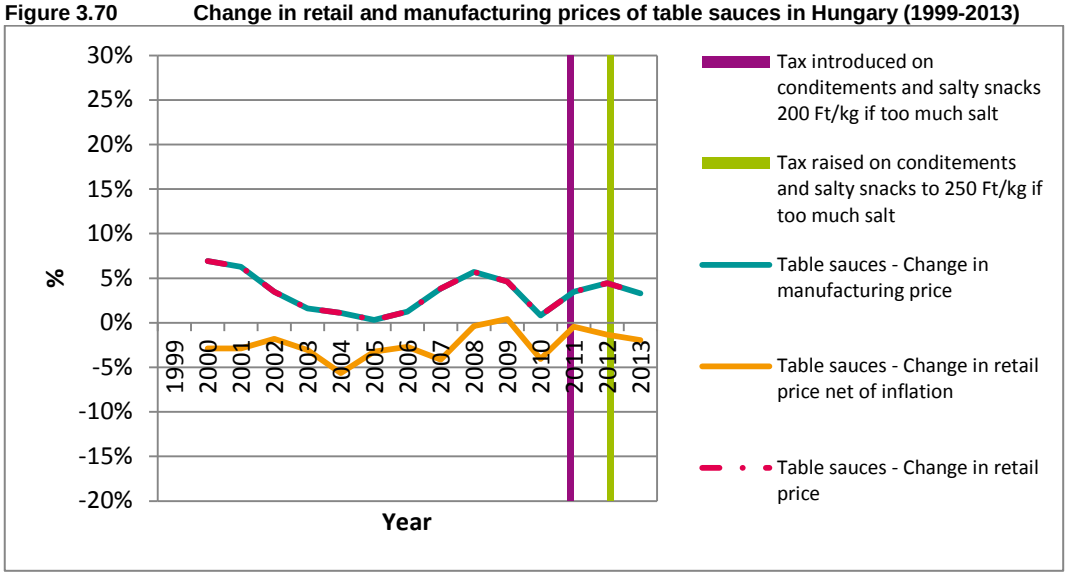
The retail price of condiments was fluctuating much more than the manufacturing price when it was corrected for inflation. Only between 2008 and 2009 the growth rate was positive while for the rest of the period the retail price was declining. Since 2009 the retail and manufacturing prices were moving in the same direction (except for the period between 2011 and 2012). When the tax was introduced, the pace rate of the retail increased in its absolute value and continued the trend after the tax was raised. The margin retailers make in absolute terms remains the same throughout the observed period.

**Figure 3.69 Retail and manufacturing prices of table sauces in Hungary (1999-2013)**




**Source: Ecorys based on data from Euromonitor/Passport**

**Figure 3.70 Change in retail and manufacturing prices of table sauces in Hungary (1999-2013)**

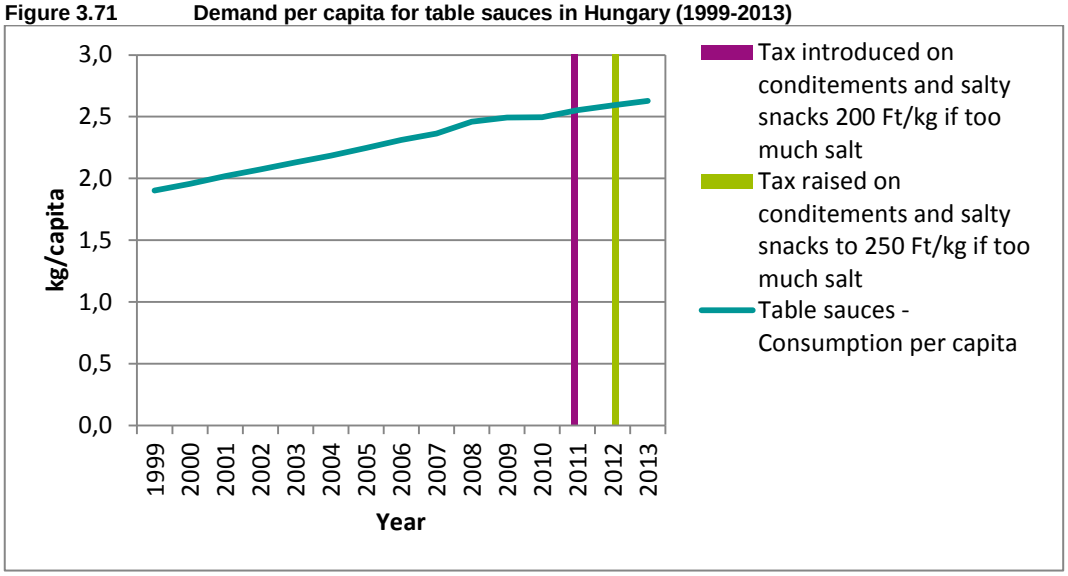



**Source: Ecorys based on data from Euromonitor/Passport**

### *Demand*

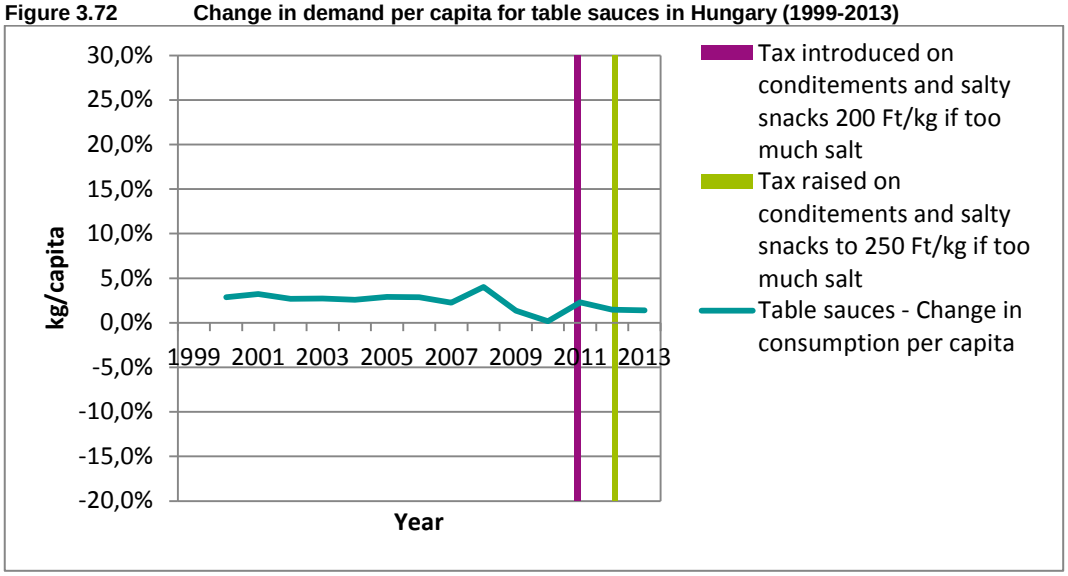
The demand for condiments is increasing over the last 15 years regardless of the changes in the tax. The only change in the pace of the change in the demand occurred in 2008 reducing it to an average of 2% annually. Total consumption increased from 1.9 kg of table sauces per capita per year in 1999 to almost 2.6 kg table sauces per capita per year in 2013.

Figure 3.71 Demand per capita for table sauces in Hungary (1999-2013)




**Source: Ecorys based on data from Euromonitor/Passport**

Figure 3.72 Change in demand per capita for table sauces in Hungary (1999-2013)




**Source: Ecorys based on data from Euromonitor/Passport**

## 3.2 Conclusions

Conclusions on the impact of food faxes on consumption patterns will be drawn when all data collection and analysis has been completed.

# 4 European level interviews

## 4.1 Aims of the interview process

Within the context of the project a limited number (up to 15) of interviewees will be carried out with EU level stakeholders to discuss the impacts of non-harmonised agri-food taxes.

We have identified a number of issues including consumer behaviour, substitute products and price adjustments, as well as national economic conditions, legal and policy frameworks where information exchange with stakeholder groups could supply useful information. The EU level interviews are expected to provide added information to what has already been analysed in the literature research phase. This approach will enable us to thoroughly analyse cross-border and European level characteristics of the agri-food industry.

## 4.2 Identification of interviewees

Drawing on the findings of the literature review – where a number of stakeholders have already been identified - and on the discussion with the European Commission, a shortlist of stakeholders has been compiled.

This shortlist aims to represent a balanced picture of the varied stakeholder groups and hence includes industry associations, research groups, public health associations, consumer organisations as well as a large, EU level food producer. The following table lists the organisations that have so far been contacted for a possible interviewed in Task 3 of the food taxes study.

**Table 4.1 Overview of interviewees contacted**

| Organisation | Category |
|---|---|
| UNESDA (Union of European Soft Drinks Associations) | Industry Associations- producers |
| Nestle | Industry - producers |
| Mondelēz International | Industry - producers |
| FoodDrinkEurope | Industry Association- producers |
| Association of Chocolate, Biscuit and Confectionery Industries of Europe (CAOBISCO) | Industry Association |
| EuroCommerce | Industry Association- Retailers |
| Brewers of Europe | Industry Association- Retailers |
| Independent Retail Europe | Industry Association- Retailers |
| European Snacks Association | Industry Association |
| European Association of Sugar Producers (CEFS) | Industry Association |
| EU Vegetable Oil and Proteinmeal Industry (FEDIOL) | Industry Association |
| European Public Health Alliance | Health |
| World Health Organisation (WHO) | Health |
| British Heart Foundation Health Promotion Research Group (BHFHPRG) | Health / Research |
| The European Consumers' organization (BEUC) | Consumers |
| Euro Coop | Consumers |
| OECD | Research |

| Organisation | Category |
|---|---|
| Institute for Fiscal Studies | Research |
| Oxford Economics and the International Tax and Investment Center | Research |

Stakeholders identified in the above table have been approached by email and at the time of this report`s submission a limited number of interviews have already been agreed upon. The contact emails have included a list of preliminary interview questions, which have been shared and discussed with the Commission beforehand, helping the stakeholders understand the context of the study and allowing the time to prepare for the possible interview. We intend to notify the European Commission on the progress of the interview process.

The interviews are scheduled to run parallel with the case study assessments, optimising the available time and allowing for the comparing and contrasting of findings on the national and the EU level. Information from the interviews and the case studies are expected to feed into the final analysis resulting in a comprehensive overview on the impacts of the non-harmonised food-taxes.

## 4.3 Interview process

The interview questions include focused discussion on the topics of consumer behaviour, industry effects and health impacts. The questions sent to the interviewees are not binding and serve as a semi-structured guide for the interview process. The interviews are conducted in English without the use of a recording device. The interview guideline for interviewees is included in Annex 4 of this report.

The minutes of the interview will be shared with the interviewees who are allowed to label any information as confidential. Outtakes from the interviews might feature in the final report; we will however refrain from direct linkage of quotes to individuals or individual organisations without the express prior consent of the relevant stakeholders.

# 5 Selection of case studies

In order to illustrate concretely the impact of food taxes on industry competitiveness and performance, we will carry out case studies. The case studies include Member States where non-harmonised food taxes have been introduced as well as where food taxes have been proposed but rejected.

## 5.1 Selection of case studies

Selection criteria for the case study countries are (in order of priority):

1. Information availability: in order to make a proper analysis, availability of ample public information is essential;
2. Geographic distribution: used as a proxy for cultural differences, which might be of influence in the effectiveness of food taxes;
3. Size distribution of Member States: including both larger and smaller Member States (in terms of surface area) should allow a better analysis of cross-border effects, which are expected to be more explicit for smaller Member States;
4. Diversity in experiences: Including both countries where non-harmonised food taxes have been introduces as well as those where these taxes have been withdrawn or rejected prior to implementation. Also diversity in the taxed product.

Per country, we cover a single tax, whereby we aim to cover as many different segments of the food industry as possible. Table 5.1 lists the candidate countries.

**Table 5.1 Member states with non-harmonised food taxes**

| Country | Description of tax | Available information | Size of MS | Geographic |
|---|---|---|---|---|
| ***Introduced or abolished taxes*** | | | | |
| Denmark | Duty on saturated fat | Good | Small | North |
| Denmark | Excise duty on chocolate and sweets | Medium | Small | North |
| Denmark | Tax on ice cream | Medium | Small | North |
| Denmark | Tax on soft drinks | Good | Small | North |
| Finland | Excise duty on sweets, ice-cream and soft drinks | Medium | Medium | North |
| France | Tax on sugar-sweetened beverages | Good | Large | West |
| Hungary | Public Health Product Tax | Medium | Medium | East |
| ***Proposed taxes*** | | | | |
| Belgium | Soda tax | Poor | Small | West |
| Italy | General food tax | Poor | Large | South |
| Ireland | Sugar-sweetened beverage tax | Good | Medium | West |
| Estonia | Taxes on fat, sugar, salt | Poor | Small | East |
| Sweden | Taxes on fat and sugar | Poor | Large | North |
| United Kingdom | Taxes on fat, sugar, salt | Good | Large | West |

Note: Amount of available information estimated on basis of the literature review of literature in the English language.

### Evaluating the case studies

Applying the first criterion, availability of information, we find that the most important candidates for the case studies are:

- Denmark: Duty on saturated fat; or soft drink tax;
- France: Sugar-sweetened beverages tax.

We propose to select both countries for the case studies. As France relates to a soft drink tax, we propose to select the duty on saturated fat in Denmark so we cover multiple segments of the food industry.

Moving to the second criterion, geographic distribution, we have already Northern Europe and Western Europe covered with the selection of Denmark and France. For Eastern Europe, the sole candidate offering a fair amount of literature is:

- Hungary: Public Health Product Tax.

For Southern Europe, the sole available candidates is:

- Italy: general food taxes.

With four case studies selected, the prime candidates remaining, taking into account data availability, is:

- Finland: Excise duty on sweets, ice-cream and soft drinks (used to be Excise duty on soft drinks);
- Ireland: Sugar-sweetened beverage tax;
- United Kingdom: taxes on fat, sugar, salt.

We favour Finland due to the fact that it has actually introduced a tax, providing factual information rather than ex-ante studies on hypothetical situations. But also Ireland is particularly interesting as it has abolished a discriminatory tax (on soft drinks) in 1992, potentially providing additional study results. Instead of choosing between these two countries, we have decided to include both of them.

### Final selection of case studies

This means our final list of proposed case studies is:

- Denmark: Duty on saturated fat,
- France: Sugar-sweetened beverage tax,
- Finland: Excise duty on sweets, ice-cream and soft drinks,
- Hungary: Public Health Product Tax,
- Ireland: Proposed sugar-sweetened beverage tax, and
- Italy: general food taxes.

For Denmark, France, Finland and Hungary, the case studies concern recently introduced taxes. With food taxes being implemented in these countries, the case studies will focus on the experienced impact of the introduction of food taxes on consumption, sector competitiveness and, insofar possible in the short time frame between introduction and date of this study, public health effects.

The case studies for Ireland and Italy concern planned food taxes that have been considered, but not implemented. As a result, factual information of the impact of food taxes in Ireland and Italy is not available. The case studies will therefore mainly focus on the consideration and motivations for not implementing the taxes.

# Annex 1 Literature sources

| No. | Title | Author(s) | Year | Peer-reviewed | Grey Literature | Empirical | Modelling | Random controlled trial | Systematic Review | Other | Press release / position paper | Report | Conference abstract | Competitiveness | Investment | Employment | Trade Flows | Product Substitution | Consumption Behaviour | Public Health | Non Tax Measures | Countries | Food / drink category or nutrient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Bibliographical Details | | | Type | | | | Method | | | | | | Topics Addressed | | | | | | | | Geographic focus | Specific food tax |
| 1 | Predicting the effects of sugar-sweetened beverage taxes on food and beverage demand in a large demand system | Chen Zhen, Eric A. Finkelstein, James M. Nonnemaker, Shawn A. Karns and Jessica E. Todd. | 2013 | x | | | x | | | | | | | | | | | x | x | x | | United States | sugar-sweetened beverages |
| 2 | Taxing Food and Beverages: Theory, Evidence, and Policy | Yuqing Zheng, Edward W. McLaughlin and Harry M. Kaiser. | 2013 | x | | | | | | x | | | | | | | | | x | | | United States | general food tax |
| 3 | Impact of Cost Shocks on Consumer Prices in Vertically-Related Markets: The Case of The French Soft Drink Market | Bonnet, Céline, and Vincent Réquillart. | 2013 | x | | | x | | | | | | | x | | | | | | | | France | soft drinks |
| 4 | Health and distributional effects of differentiated food taxation | Kotakorpi, Kasia, and Jukka Pirttila. | 2010 | | x | | x | | | | | | | | | | | | x | x | | Finland | sugar, fruits & vegetables |
| 5 | Priority actions for the non-communicable disease crisis | Beaglehole, Robert, Ruth Bonita, Richard Horton, Cary Adams, George Alleyne, Perviz Asaria, Vanessa Baugh, et al. | 2011 | x | | | | | | x | | | | | | | | | | x | x | non-specific | general food tax |
| 6 | Health, agricultural, and economic effects of adoption of healthy diet recommendations | Lock, Karen, Richard D. Smith, Alan D. Dangour, Marcus Keogh-Brown, Gessuir Pigatto, Corinna Hawkes, Regina Mara Fisberg, Zaid Chalabi. | 2010 | x | | | x | | | | | | | | | | | | | x | | United Kingdom, Brazil | saturated fat |
| 7 | Tackling of unhealthy diets, physical inactivity, and obesity: health effects and cost-effectiveness | Cecchini, Michele, Franco Sassi, Jeremy A. Lauer, Yong Y. Lee, Veronica Guajardo-Barron, and Daniel | 2010 | x | | | x | | | | | | | | | | | | | x | x | Brazil, China, India, Mexico, Russia, South Africa, United Kingdom | general food tax |

| No. | Title | Author(s) | Year | Peer-reviewed | Grey Literature | Empirical | Modelling | Random controlled trial | Systematic Review | Other | Press release / position paper | Report | Conference abstract | Competitiveness | Investment | Employment | Trade Flows | Product Substitution | Consumption Behaviour | Public Health | Non Tax Measures | Countries | Food / drink category or nutrient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Chisholm. | | | | | | | | | | | | | | | | | | | | | |
| 8 | Increased food energy supply is more than sufficient to explain US epidemic of obesity | Swinburn, B, G Sacks, and E Ravussin. | 2009 | x | | | x | | | | | | | | | | | | | x | | United States | none |
| 9 | Frameworks for the major population based policies to prevent childhood obesity | Swinburn, B, J Shill, G Sacks, W Snowdon, C Strugnell, J Herbet, E Gleeson, and R Carter. | 2009 | | x | | | | | | | x | | | | | | | | x | x | Norway, Finland, Sweden, Australia, New Zealand, Bogota, Switzerland, United States, China, Brazil, France | general food tax |
| 10 | The uneasy case against discriminatory excise taxation: soft drink taxes in Ireland | Bahl, Roy, Richard, Bird, and Mary Beth Walker. | 2003 | x | | x | | | | | | | | x | | | | | x | | | Ireland | soft drink tax |
| 11 | Death and premature loss of life caused by overweight and obesity in Australia 2011-2050: Benefits from different intervention scenarios | Gray, V, and C Holman. | 2009 | | x | | x | | | | | | | | | | | | | x | | Australia | none |
| 12 | Obesity prevention: the role of policies, laws and regulation | Swinburn, Boyd. | 2008 | x | | | | | | x | | | | | | | | | | x | | Australia, New Zealand | none |
| 13 | Ounces of prevention – the public policy case for taxes on sugared beverages | Brownell, Kelly D., and Thomas R. Frieden. | 2009 | x | | | | | | x | | | | | | | | | | x | | United States | sugar-sweetened beverages |
| 14 | Epidemiology of obesity and public health strategies for its control in Japan | Yoshiike, N, F Kaneda, and H Takimoto. | 2002 | x | | | x | | | | | | | | | | | | | x | | Japan | none |
| 15 | Personal responsibility and obesity: a constructive approach to a controversial issue | Brownell, Kelly D., Rogan Kersh, David S. Ludwig, Robert C. Post, Rebecca M. Puhl, Marlene B. Schwartz, and Walter C. Willett. | 2010 | x | | | | | | x | | | | | | | | | | x | x | United States | general food tax |

| No. | Title | Author(s) | Year | Peer-reviewed | Grey Literature | Empirical | Modelling | Random controlled trial | Systematic Review | Other | Press release / position paper | Report | Conference abstract | Competitiveness | Investment | Employment | Trade Flows | Product Substitution | Consumption Behaviour | Public Health | Non Tax Measures | Countries | Food / drink category or nutrient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 16 | Sugar-sweetened beverage taxes: an updated policy brief | Friedman, Roberta R., and Kelly D. Brownell. | 2012 | | x | | | | | | | x | | | | | | | x | x | | United States | sugar-sweetened beverages |
| 17 | The impacts of selective food and non-alcoholic beverages taxes | Oxford Economics, International Tax and Investment Centre. | 2013 | | x | | | | | | | x | | | x | x | x | x | x | x | | Denmark, Hungary, Egypt, Finland, France | general food tax |
| 18 | Health in the European Union, trend and analysis: Ch 7, pg 85 - 90 | Mladovsky, Philipa, Sara Allin, Cristina Masseria, Cristina Hernandez-Quevedo, David McDaid, and Elias Mossialos. | 2009 | | x | | | | | | | x | | | | | | | | x | | European Union | none |
| 19 | The 'fat tax': economic incentives to reduce obesity | Leicester, Andrew, and Frank Windmeijer. | 2004 | | x | | | | | | | x | | | | | | | x | x | | United Kingdom | general food tax |
| 20 | Public policy towards food consumption | Griffith, R., and M. O'Connell. | 2010 | | x | | | | | | | x | | | | | | | x | x | x | United Kingdom | general food tax |
| 21 | The role of commodity taxes in health promotion | Belloni, Annalisa. | 2013 | | x | | | | | | | | x | | | | | | x | x | | OECD | general food tax |
| 22 | A Growth Model of Weight Preferences, Food Consumption and Public Policy | Dioikitopoulos, Evangelos V., Marina-Selini Katsaitiy, and Philip Shaw. | 2013 | | x | | x | | | | | | | | | | | | | x | | United States | general food tax |
| 23 | Taxation and regulation of smoking, drinking and gambling in the European Union | Cnossen, Sijbren, David Forrest and Stephen Smith. | 2009 | | x | | | | | | | x | | | | | x | | x | x | x | European Union | tobacco, alcohol, gambling |
| 24 | Global Status Report on Non Communicable Diseases 2010 | World Health Organisation. | 2011 | | x | | | | | | | x | | | | | | | | x | x | European Union | general food tax |
| 25 | The effect of fiscal policy on diet, obesity and chronic disease: a systematic review | Thow, Anne Marie, Stephen Jan, Stephen Leeder, and Boyd Swinburn. | 2010 | x | | | | | x | | | | | | | | | | | x | | non-specific | general food tax |
| 26 | All-of-government approach needed to tackle obesity | James, Phillip, and Fiona Fleck. | 2013 | x | | | | | | x | | | | | | | | | | x | x | non-specific | general food tax |
| 27 | Europe's visible epidemic | Humphreys, Gary, and Catherine Fiankan-Bokonga. | 2013 | x | | | | | | x | | | | | | | | | | | x | France | none |
| 28 | Policy Brief: Overweight and obesity in Australia | Obesity Policy Coalition. | 2012 | | x | | | | | | x | | | | | | | | | x | | Australia | none |

| No. | Title | Author(s) | Year | Peer-reviewed | Grey Literature | Empirical | Modelling | Random controlled trial | Systematic Review | Other | Press release / position paper | Report | Conference abstract | Competitiveness | Investment | Employment | Trade Flows | Product Substitution | Consumption Behaviour | Public Health | Non Tax Measures | Countries | Food / drink category or nutrient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 29 | Weighing it Up: Obesity in Australia | The House of Representatives Standing Committee on Health and Ageing. | 2009 | | x | | | | | | | x | | | | | | | | | x | Australia | none |
| 30 | Strategies to Prevent Obesity and Other Chronic Diseases | Centres for Chronic Disease Prevention. | 2011 | | x | | | | | | | x | | | | | | | | | x | United States | none |
| 31 | F as in Fat: How obesity threatens America's Future | Levi, Jeffrey. Laura M. Segal, Kathryn Thomas, Rebecca St. Laurent, Albert Lang, and Jack Rayburn. | 2013 | | x | | | | | | | x | | | | | | | | x | x | United States | none |
| 32 | Press Release: Smart Snacks in School Regulation in the US | Food and Nutrition Service, USDA. | 2013 | | x | | | | | | x | | | | | | | | | | x | United States | none |
| 33 | Which environmental and policy interventions prevent childhood obesity? | Crum, R. | 2013 | | x | | | | x | | | | | | | | | | | | x | United States | none |
| 34 | Making the economic case for addressing obesity in the United States | Hill, D. | 2012 | | x | | | | x | | | | | | | | | | | | x | United States | none |
| 35 | What is the role of health related food duties | Landon, Jane, and Hannah Graff. | 2012 | | x | | | | | | | | x | | | | | x | x | x | | United Kingdom, France, Denmark, Hungary | general food tax |
| 36 | Policy Brief: OECD Obesity Update 2012 | OECD | 2012 | | x | | | | | | x | | | | | | | | | x | x | OECD | general food tax |
| 37 | The impact of a 'soda tax' on prices. Evidence from French micro data | Berardi, Nicoletta, Patrick Sevestre, Marine Tepaut and Alexandre Vigneron. | 2012 | | x | x | | | | | | | | x | | | | | | | | France | sugar-sweetened beverages |
| 38 | The Danish tax on saturated fat: Short run effects on consumption, substitution patterns and consumer prices of fats | Jensen, Jørgen D., and Sinne Smed. | 2013 | x | | x | | | | | | | | x | | | | x | x | | | Denmark | saturated fat |
| 39 | Nutrition taxes: the costs of Denmark's fat tax | Petkantchin, Valentin. | 2013 | | x | | | | | | | x | | x | | | | | x | | | Denmark | saturated fat |
| 40 | Fiscal and economic impacts of beverage excise taxes imposed by Maine public law 629 | Gabe, Todd. | 2008 | | x | | x | | | | | | | | | x | | | x | | | United States | beer, wine and soft drinks |
| 41 | Joint EFFAT-FoodDrinkEurope position on discriminatory food taxes | FoodDrinkEurope. | 2013 | | x | | | | | | x | | | x | | | | | | | | European Union | general food tax |

| No. | Title | Author(s) | Year | Peer-reviewed | Grey Literature | Empirical | Modelling | Random controlled trial | Systematic Review | Other | Press release / position paper | Report | Conference abstract | Competitiveness | Investment | Employment | Trade Flows | Product Substitution | Consumption Behaviour | Public Health | Non Tax Measures | Countries | Food / drink category or nutrient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 42 | Competitiveness report - Development of EU industrial policy for food | FoodDrinkEurope. | 2012 | | x | | | | | | | x | | x | x | x | | | | | | European Union | none |
| 43 | Data & trends of the European food and drink industry | FoodDrinkEurope. | 2013 | | x | | | | | | | x | | x | x | x | | | x | | | European Union | none |
| 44 | Sugar Policy Reform, Tax Policy and Price Transmission in the Soft Drink Industry | Bonnet, Céline, and Vincent Réquillart. | 2012 | | x | | x | | | | | | | x | | | | x | x | | | European Union | soft drinks |
| 45 | Food Consumption and Obesity in France: Identification of Causal Effects and Price Elasticities | Bonnet, Céline, Pierre Dubois, and Valérie Orozco. | 2008 | | x | | x | | | | | | | | | | | | x | | x | France | general food tax |
| 46 | Food Prices and Obesity: Evidence and Policy Implication for Taxes and Subsidies | Powell, Lisa M., and Frank J. Chaloupka | 2009 | | x | | | | x | | | | | | | | | | x | x | | United States | general food tax |
| 47 | Health Submission of written evidence to the Academy of Medical Royal Colleges Obesity Project | Mytton, Oliver, and Mike Rayner | 2012 | | x | | | | | | | x | | | | | | x | x | x | | United Kingdom | sugar-sweetened beverages, soft drinks, saturated fat |
| 48 | Report on Food Labelling Practices | High Level Forum for a Better Functioning Food Supply Chain. | 2009 | | x | | | | | | | | x | | | | | | | | x | European Union | none |
| 49 | How to Set up an Effective Food Tax? | Bonnet, Céline. | 2013 | x | | | | | | x | | | | | | | | | x | x | | non-specific | general food tax |
| 50 | An Analysis of Asymmetric Consumer Price Responses and Asymmetric Cost Pass-Through in the French Coffee Market | Bonnet, Céline, and Sofia B. Villas Boas | 2013 | | x | | x | | | | | | | x | | | | | | | | France | none |
| 51 | Strategic pricing and health price policies. | Bonnet, Céline, and Vincent Réquillart. | 2011 | | x | | x | | | | | | | x | | | | | x | | | France | sugar-sweetened beverages |
| 52 | Does the EU sugar policy reform increase added sugar consumption? An empirical evidence on the soft drink market. | Bonnet, Céline, and Vincent Réquillart. | 2011 | x | | | x | | | | | | | | | | | x | x | | | France | none |
| 53 | Health-based Food Tax Policy | Kotakorpi, Kasia, Tommi Härkänen, Pirjo Pietinen, Heli Reinivuo, Ilpo Suoniemi, and Jukka Pirttilä. | 2011 | | x | | x | | | | | | | | | | | | x | x | | Finland | sugar, fruit & vegetables |
| 54 | Policy brief: Evidence of food advertising effects on children | Obesity Policy Coalition. | 2011 | | x | | | | | | x | | | | | | | | | x | x | Australia, United States, United | none |

| No. | Title | Author(s) | Year | Peer-reviewed | Grey Literature | Empirical | Modelling | Random controlled trial | Systematic Review | Other | Press release / position paper | Report | Conference abstract | Competitiveness | Investment | Employment | Trade Flows | Product Substitution | Consumption Behaviour | Public Health | Non Tax Measures | Countries | Food / drink category or nutrient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | | | | | | Kingdom | |
| 55 | Policy brief: Food advertising regulation in Australia | Obesity Policy Coalition. | 2011 | | x | | | | | | x | | | | | | | | | | x | Australia | none |
| 56 | Policy brief: Traffic light labelling | Obesity Policy Coalition. | 2011 | | x | | | | | | x | | | | | | | | | | x | Australia, United Kingdom, New Zealand | none |
| 57 | Fat taxes: big money for small change | Chouinard, Hayley H., David E. Davis, Jeffrey T. LaFrance, Jeffrey M. Perloff. | 2007 | x | | | x | | | | | | | | | | | x | x | | | United States | fat in dairy products |
| 58 | The global context for public health nutrition taxation | Thow, Anne Marie, Peter Heywood, Stephen Leeder, and Lee Burns. | 2009 | x | | | | | x | | | | | | | | | | | x | | Poland, US, UK, Ireland, Denmark, Norway, Sweden, France, Australia | general food tax |
| 59 | Fat taxes: can taxing unhealthy food and drink improve health? | Food Ethics Council Business Forum | 2012 | | x | | | | | | | | x | | | | | | | x | | United Kingdom, United States, Ireland | general food tax |
| 60 | EPHA Briefing Paper on Fiscal Measures applied to Food Policy | EPHA | 2011 | | x | | | | | | x | | | | | | | | | x | x | United States, Denmark, Fiji, Hungary, France | general food tax |
| 61 | Taxing unhealthy food and drinks to improve health | Mytton, Oliver, Dushy Clarke, and Mike Rayner | 2012 | x | | | | | | x | | | | | | | | x | x | x | | Denmark, Hungary, France, Peru, Ireland, United Kingdom | general food tax |
| 62 | Emerging evidence on real-world effects of taxation | World Cancer Research Fund International | 2013 | | x | | | | | | x | | | | | | | x | x | x | | France, Hungary, Denmark, Finland, Pacific Islands, United States | general food tax |

| No. | Title | Author(s) | Year | Peer-reviewed | Grey Literature | Empirical | Modelling | Random controlled trial | Systematic Review | Other | Press release / position paper | Report | Conference abstract | Competitiveness | Investment | Employment | Trade Flows | Product Substitution | Consumption Behaviour | Public Health | Non Tax Measures | Countries | Food / drink category or nutrient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 63 | Impact Assessment of the Hungarian Public Health Product Tax (NETA) | National Institute for Health Development | 2013 | | x | x | | | | | | | | x | | | | | x | | | Hungary | sugar, salt, caffeine |
| 64 | Overall and income specific effect on prevalence of overweight and obesity of 20% sugar sweetened drink tax in UK: econometric and comparative risk assessment modelling study | Briggs, Adam D. M., Oliver T. Mytton, Ariane Kehlbacher, Richard Tiffin, Mike Rayner, and Peter Scarborough | 2013 | x | | | x | | | | | | | | | | | | x | x | x | United Kingdom | sugar-sweetened beverages |
| 65 | The public health and economic benefits of taxing sugar-sweetened beverages | Brownell K.D., T. Farley, W.C. Willett, B.M. Popkin, F.J. Chaloupka, J.W. Thompson, et al. | 2009 | x | | | | | x | | | | | | | | | x | x | x | | United States, Mexico | sugar-sweetened beverages |
| 66 | Food taxation and pricing strategies to "thin out" the obesity epidemic | Kim Daniel, and Ichiro Kawachi. | 2006 | x | | | | | | x | | | | | | | | x | x | x | | United States | soft drinks, snack foods, fast foods |
| 67 | Measuring weight outcomes for obesity intervention strategies: the case of a sugar-sweetened beverage tax | Lin B.H., T.A. Smith, J.Y. Lee, and K.D. Hall. | 2011 | x | | | x | | | | | | | | | | | | x | x | | United States | sugar-sweetened beverages |
| 68 | Estimating the potential of taxes on sugar-sweetened beverages to reduce consumption and generate revenue | Andreyeva T, F.J. Chaloupka, and K.D. Brownell. | 2011 | x | | | x | | | | | | | | | | | | x | x | | United States | sugar-sweetened beverages |
| 69 | Intended and unintended consequences of a proposed national tax on sugar-sweetened beverages to combat the U.S. obesity problem. | Dharmasena S, and O Jr. Capps. | 2012 | x | | | x | | | | | | | | | | | x | x | x | | United States | sugar-sweetened beverages |
| 70 | Implications of a sugar-sweetened beverage (SSB) tax when substitutions to non-beverage items are considered | Eric A. Finkelsteina, Chen Zhenb, Marcel Bilgera, James Nonnemakerb, Assad M. Farooquia, and Jessica E. Todd | 2013 | x | | | x | | | | | | | | | | | x | x | x | | United States | sugar-sweetened beverages |
| 71 | Impact of targeted beverage taxes on higher- and lower-income households | Eric A. Finkelsteina, Chen Zhenb, James Nonnemakerb, and Jessica E. Todd | 2010 | x | | | x | | | | | | | | | | | x | x | x | | United States | sugar-sweetened beverages |
| 72 | Food Pricing Strategies, Population Diets, and Non-Communicable Disease: A Systematic Review of Simulation Studies | Eyles, Helen, Cliona Ni Mhurchu, Nhung Nghiem, and Tony Blakely. | 2012 | x | | | | | x | | | | | | | | | x | x | x | | OECD | soft drinks, saturated fat, fruits & vegetables |

| No. | Title | Author(s) | Year | Peer-reviewed | Grey Literature | Empirical | Modelling | Random controlled trial | Systematic Review | Other | Press release / position paper | Report | Conference abstract | Competitiveness | Investment | Employment | Trade Flows | Product Substitution | Consumption Behaviour | Public Health | Non Tax Measures | Countries | Food / drink category or nutrient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 73 | The impact of food prices on consumption: a systematic review of research on the price elasticity of demand for food | Andreyeva T, M.W. Long, and K.D. Brownell. | 2010 | x | | | | | | | | | | | | | | x | x | x | | United States | none |
| 74 | Point-of-purchase price and education intervention to reduce consumption of sugary soft drinks. | Block, Jason P., Amitabh Chandra, Katherine D. McManus, and Walter C. Willett. | 2010 | x | | | | x | | | | | | | | | | x | x | | x | United States | soft drinks |
| 75 | The effect of rising food prices on food consumption: systematic review with meta-regression | Green, Rosemary, Laura Cornelsen, Alan D. Dangour, Rachel Turner, Bhavani Shankar, Mario Mazzocchi, and Richard D. Smith. | 2013 | x | | | | | x | | | | | | | | | | x | | | non-specific | none |
| 76 | Price discounts significantly enhance fruit and vegetable purchases when combined with nutrition education: a randomized controlled supermarket trial. | Waterlander W.E., M.R. de Boer, A.J. Schuit, J.C. Seidell, I.H. Steenhuis. | 2013 | x | | | | x | | | | | | | | | | x | x | | | Netherlands | fruit & vegetables |
| 77 | The Impacts of Fat Taxes and Thin Subsidies on Nutrient Intakes | Salois, Matthew J., and Richard J. Tiffin. | 2011 | x | | | x | | | | | | | | | | | | x | x | | United Kingdom, United States | saturated fat, fruit & vegetables |
| 78 | Cost-effective design of economic instruments in nutrition policy | Jensen, Jørgen D., and Sinne Smed. | 2007 | x | | | x | | | | | | | | | | | x | x | x | | Denmark | fat, sugar |
| 79 | Modelling income group differences in the health and economic impacts of targeted food taxes and subsidies | Nnoaham, Kelechi E., Gary Sacks, Mike Rayner, Oliver Mytton, and Alastair Gray. | 2009 | x | | | x | | | | | | | | | | | x | x | x | | United Kingdom | fat, sugar, salt |
| 80 | 'Fat taxes' in Europe – A Legal and Policy Analysis under EU and WTO Law | Alemanno, Alberto, and Ignacio Carreño. | 2013 | x | | | | | | x | | | | | | | | x | x | x | | Denmark, Hungary, France, United Kingdom, Japan | general food tax |
| 81 | What is known about the effectiveness of economic instruments to reduce consumption of foods high in saturated fats and other energy-dense foods for preventing and treating obesity? | Goodman C, and A. Anise. | 2006 | x | | | | | x | | | | | | | | | x | x | x | | European Union, China | fat, sugar, salt, fibre |
| 82 | Taxing Snack Foods: Manipulating Diet Quality Or Financing Information Programs? | Kuchler, Fred, Abebayehu Tegene, and James M. Harris. | 2005 | x | | | x | | | | | | | | | | | x | x | | | United States | snack foods |

| No. | Title | Author(s) | Year | Peer-reviewed | Grey Literature | Empirical | Modelling | Random controlled trial | Systematic Review | Other | Press release / position paper | Report | Conference abstract | Competitiveness | Investment | Employment | Trade Flows | Product Substitution | Consumption Behaviour | Public Health | Non Tax Measures | Countries | Food / drink category or nutrient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 83 | PFP Position Paper on Food taxes | Primary Food Producers. | 2013 | | x | | | | | | x | | | | | | | | x | x | | Denmark, Hungary, Finland | general food tax |
| 84 | The Proof of the Pudding: Denmark's fat tax fiasco. IEA Current Controversies Paper n 42 | Snowdon, Christopher. | 2013 | | x | | | | | | | x | | x | | | x | x | x | x | | Denmark | saturated fat |
| 85 | Obesity, sugar-sweetened beverages (SSBs) and Taxation - Some perspectives by The Union of European Beverages Associations (UNESDA) | The Union of European Beverages Associations. | 2012 | | x | | | | | | x | | | | | | | x | x | x | x | European Union | sugar-sweetened beverages |
| 86 | Policy Dialogue: Food taxes in the EU – An effective means to economic and health ends? | European Policy Centre. | 2013 | | x | | | | | | | | x | | | | x | | x | x | | European Union | sugar-sweetened beverages, fat, sugar |
| 87 | Mandatory labelling, nutritional taxes and market forces: An empirical evaluation of fat policies in the French fromage blanc and yogurt market | Allais, Olivier, Fabrice Etilé, and Sébastien Lecocq. | 2012 | x | | | x | | | | | | | x | | | | | x | x | x | France | fat in fromages blancs and dessert yoghurts |
| 88 | Are Excise Taxes on Beverages Fully Passed Through to Prices? The Danish Evidence | Bergman, Michael, and Niels L. Hansen. | 2010 | | x | x | | | | | | | | x | | | x | | | | | Denmark | alcohol, soft drinks |
| 89 | The public health impacts of a fat tax | Tiffin, Richard, and M Arnoult. | 2011 | x | | | x | | | | | | | | | | | | x | x | | United Kingdom, United States | saturated fat, fruit & vegetables |
| 90 | The effects of soft drink taxes on child and adolescent consumption and weight outcomes | Fletcher, Jason M., David E. Frisvold, and Nathan Tefft. | 2010 | x | | x | | | | | | | | | | | | x | x | x | | United States | soft drinks |
| 91 | Empirical estimates of the impact of a fat tax | Griffith, Rachel, Lars Nesheim, and Martin O'Connell. | 2009 | | x | | x | | | | | | | | | | | x | x | x | | United Kingdom | saturated fat |
| 92 | Can targeted food taxes and subsidies improve the diet?: Distributional effects among income groups | Nordström, L.J., and L Thunström. | 2011 | x | | | x | | | | | | | | | | | | x | x | x | Sweden | general food tax |
| 93 | Food consumption and obesity: public policy measures | Foodob and Institute for Fiscal Studies | 2012 | | x | | x | | | | | | | | | | | x | x | | | France, United Kingdom | sugar |

| No. | Title | Author(s) | Year | Peer-reviewed | Grey Literature | Empirical | Modelling | Random controlled trial | Systematic Review | Other | Press release / position paper | Report | Conference abstract | Competitiveness | Investment | Employment | Trade Flows | Product Substitution | Consumption Behaviour | Public Health | Non Tax Measures | Countries | Food / drink category or nutrient |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 94 | Availability of free fruits and vegetables at canteen lunch improves lunch and daily nutritional profiles: a randomised controlled trial | Lachat, Carl K., Roosmarijn Verstraeten, Bruno De Meulenaer, Joris Menten, Lieven F. Huybregts, John Van Camp, Dominique Roberfroid and Patrick W. Kolsteren. | 2009 | x | | | | x | | | | | | | | | | | x | | | Belgium | fruit and vegetables |
| 95 | Are Food Taxes the Answer to America's Obesity Problem? | Chang, Dr. Cyril F. | 2012 | | x | | | | x | | | | | | | | | | x | x | | United States | general food tax |
| 96 | When Do Financial Incentives Reduce Intrinsic Motivation? Comparing Behaviours Studied in Psychological and Economic Literatures | Promberger, Marianne, and Theresa M. Marteau | 2013 | x | | | | | | x | | | | | | | | | x | | | non-specific | none |
| 97 | Experimental research on the relation between food price changes and food-purchasing patterns: a targeted review. | Epstein, LH, N. Jankowiak, C. Nederkoorn, HA. Raynor, S.A. French, and E. Finkelstein. | 2012 | x | | | | | x | | | | | | | | | x | x | x | | non-specific | general food tax |
| 98 | Proposed Sugar Sweetened Drinks Tax: Health Impact Assessment | The Institute of Public Health in Ireland | 2012 | | x | | x | | x | | | | | | | | | x | x | x | | Ireland | sugar-sweetened beverages |
| 99 | Sate Aid Complaint Excise Duty in Finland | Finnish Food and Drink Industries' Federation | 2013 | | x | | | | | | x | | | x | | | | | | | | Finland | sweets, ice cream and soft drink tax |
| 100 | The Finnish Food and Drink Industries' Federation (ETL) Filing a Complaint with the Commission about Competition-Skewing Excise Tax | Finnish Food and Drink Industries' Federation | 2013 | | x | | | | | | x | | | x | | | | | | | | Finland | sweets, ice cream and soft drink tax |
| 101 | Position Paper Belgium Food and Drink Federation - health taxes | Belgium Food and Drink Federation | 2013 | | x | | | | | | x | | | x | | | | | | | | Belgium | general food tax |
| 102 | Belgian beer exports to France | Belgium Food and Drink Federation | 2013 | | x | | | | | | x | | | | | | x | | | | | Belgium | alcohol |
| | | | **Totals** | **47** | **55** | **6** | **33** | **3** | **12** | **12** | **15** | **16** | **5** | **17** | **3** | **4** | **5** | **31** | **61** | **64** | **27** | | |

# Annex 2 Literature review process

The objective of the literature review was to gain an overall understanding of the extent of research available on the subject of food taxes and provide a qualitative overview highlighting the key findings, as well as data and information gaps requiring further analysis.

## Process

The literature review was undertaken in three steps:

- collection of literature (identifying literature based only on article titles);
- review and refinement of literature (reading of articles to check relevance of content); and
- analysing and summarising (writing an overview of the evidence and conclusions of the literature).

### Collection of literature

Literature was retrieved via online full-text journal databases and Google Scholar, as well as from various government and institute websites (such as OECD and WHO). The search terms used in the online queries included “tax” along with a combination of “food”, “fat”, “sugar”, “soft drink” and “beverage”, as well as “obesity” combined with either “policy”, “prevention”, “strategy”, “epidemic” or “intervention”. Literature was initially selected based on the title and included only resources in English and with a geographical focus of European Union or OECD countries. Resources published within the last five years were of particular attention, however a small number of pre-2009 resources were also identified as important to include.

These searches yielded a good initial list of articles that was further expanded by scanning the reference lists of the collected articles. Stakeholders from the High Level Forum for a Better Functioning Supply Chain and associated organisations also provided a large number of valuable literature suggestions. At the conclusion of the literature search process, a total of 102 sources were identified.

### Review and refinement

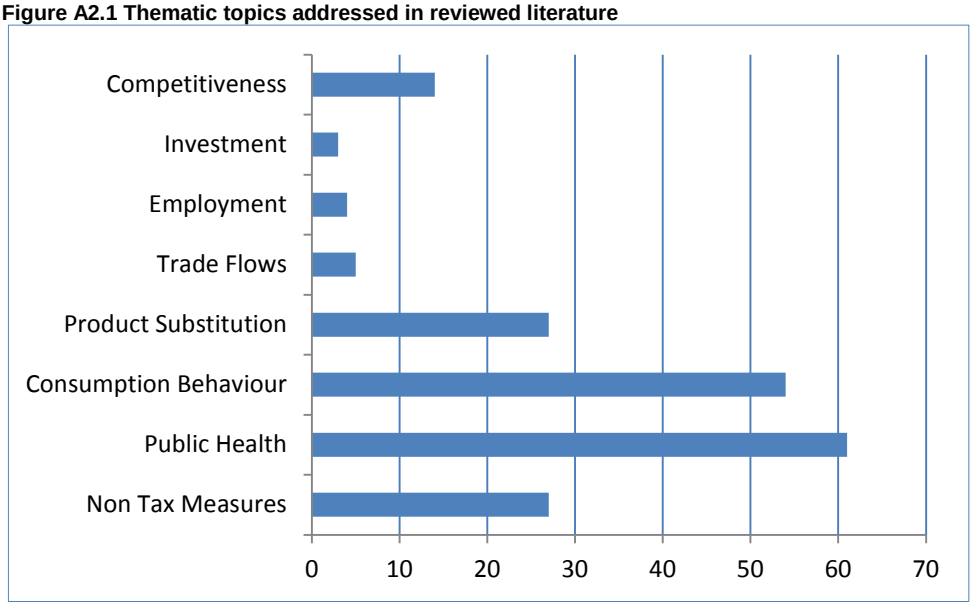
Each literature source was individually reviewed and profiled. The profiling was undertaken using a pre-developed reporting template which allowed key information to be extracted (tax and country examined, study methods used) and findings of the research to be summarised (tax effects observed). By aggregating the information in the individual literature profiles, some general observations of the food tax literature can be made, such as thematic topics addressed, specific tax examined, geographical focus and methodological approach. Where literature had particular relevance or potential added value for subsequent stages of the food taxes study, this was highlighted. A small number of the resources were found to not be of use for the study and this was also noted in the profile.

#### *Thematic topics addressed*

We found rather limited research and analysis that addresses the impact of food taxes on the agri-food industry specifically. The topics of competitiveness, investment, employment and trade flows were among the least studied within the collection of literature. In contrast the topics of consumer behaviour and health effects were more widely studied with the issue of product substitution having been found as a common subtopic of consumer behaviour (though not always). Non-tax measures such as labelling, advertising regulation, mass media education and school programs were policies

commonly discussed in combination with, or in comparison to, food tax policies, although often not in detail. The literature relating to non-tax measures was further expanded subsequent to the literature review and was analysed separately. Figure A2.1 shows the distribution of thematic topics across the literature with sources often addressing more than one thematic area.

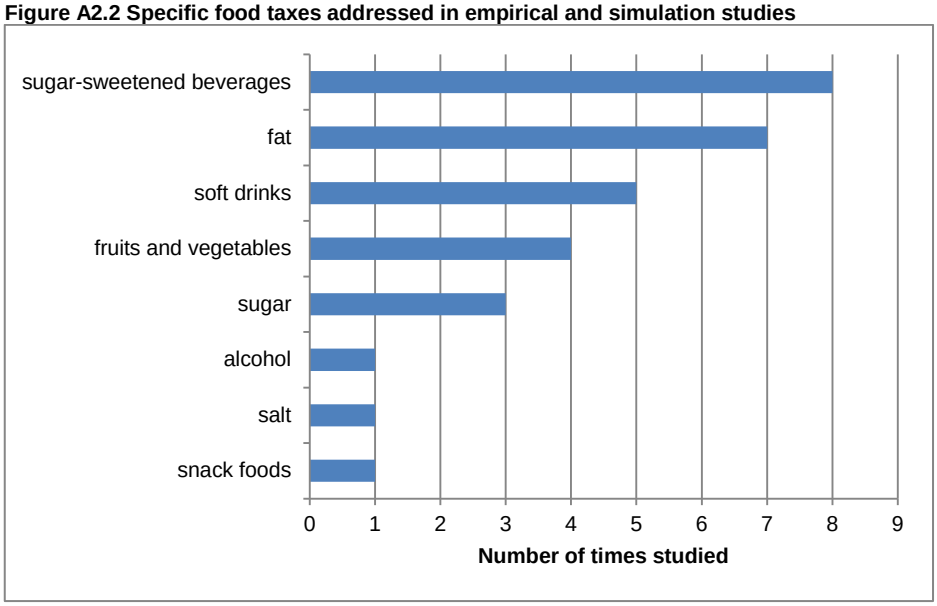
**Figure A2.1 Thematic topics addressed in reviewed literature**




### *Food taxes examined*

The food taxes studied predominantly related to sugar, mostly with respect to sugar in beverages. The sugar-sweetened beverage category, specifically named so as to include juices, flavoured waters, energy drinks and soft drinks (distinctly broader than the soft drinks category), dominated the literature. Saturated fat was also highly studied. A2.2 illustrates the food taxes that were examined noting that some studies examine multiple taxes (for example a subsidy on fruits and vegetables in combination with a tax on fat or sugar).

**Figure A2.2 Specific food taxes addressed in empirical and simulation studies**



### *Geographical focus*

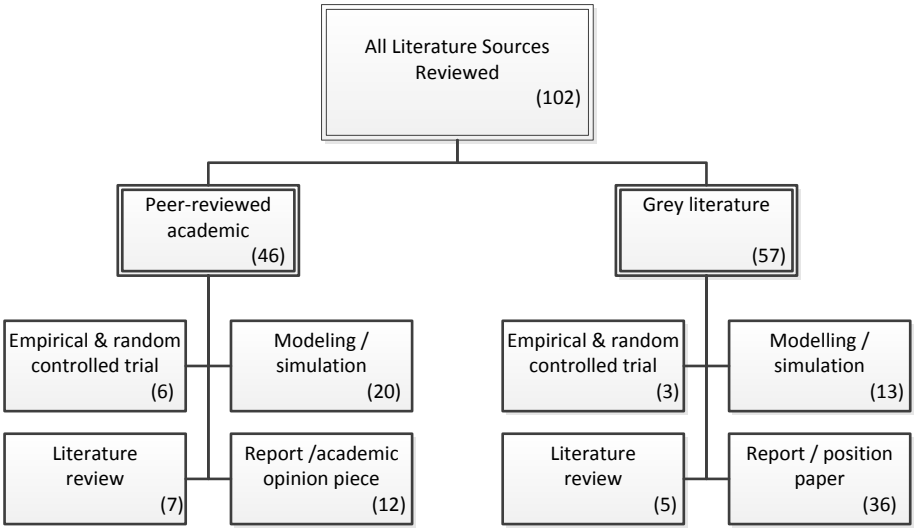
In terms of geographical focus, around one third of the empirical and simulation literature studied a food tax in the US context. Within the EU literary sources, it is not surprising that the countries studied most were those which currently have, or had in the past, a health motivated food tax. The United Kingdom (UK) is the exception with a considerable body of literature on food taxes despite not having implemented such a tax.

### *Methodological approach*

The literature profiling also allowed for a simple quality assessment of the literature. Sources were identified as either peer-reviewed, academic literature or grey literature and further categorised based on methodological approach. Sources were classified as peer-reviewed, academic literature if formally published in a peer-reviewed book or journal. Grey literature was defined as informally published documents[39] such as reports from government agencies, impact assessments, legislation, position papers, working papers from universities or research groups (which may use empirical or modelling / simulation methods) and conference abstracts. Peer-reviewed, academic literature is generally higher quality than the grey literature. Empirical methods are considered the most robust evidence, with modelling / simulation results providing valuable research support.

A2.3 shows the categorisation of the peer-reviewed, academic literature and grey literature according to methodological approach.

**Figure A2.3 Methodological approach of reviewed literature**




### Empirical

Analysing the literature profiles revealed that of the 102 literature sources reviewed, only 9 used empirical methods to examine a food tax (6 were peer-reviewed, academic studies and 3 were from the grey literature). Empirical studies rely on observations from actual experiences and usually use statistical techniques such as regression to analyse the observational data. Included in the empirical category are random controlled trials (RCT) which also rely on observation however do this through controlled experiments. RCTs are "*An experiment in which two or more interventions, possibly including a control intervention or no intervention, are compared by being randomly allocated to participants*". RCTs in the reviewed literature take place in a university canteen, hospital cafeteria and a grocery store and involve free fruit and vegetables at lunch time, a price increase in soft drinks and fruit and vegetable discounts, respectively.

[39] Higgins JPT, Green S (editors). 2011. "Cochrane Handbook for Systematic Reviews of Interventions Version 5.1.0 [updated March 2011]." The Cochrane Collaboration. www.cochrane-handbook.org.

The very low number of empirical studies might be due to the fact that few countries in the EU have had, or currently have, health motivated food taxes and most have been quite recently implemented. Therefore, the number of natural experiments (non controlled, 'real world' cases) and extent of longitudinal data upon which to perform ex post analysis is limited. Even for those countries that provide natural experiments, other factors may be influencing behaviour patterns.

### Modelling / simulation

There is a comparatively larger body of modelling / simulation (ex ante) food tax literature with 20 peer-reviewed, academic studies and 13 grey literature studies. Ex ante analysis involves developing an economic model and simulating a tax in order to predict what the 'real world' effects of a tax may be. The challenge with ex ante modelling studies however, is they are dependent on the availability of data and the robustness of assumptions. The quality of the data and the necessity to make simplifying assumptions is commonly cited by the authors themselves as key limitations and therefore results and conclusions of any modelling / simulation study need to be viewed in conjunction with these limitations.

### Literature review

Literature reviews are "*a review of a clearly formulated question that uses systematic and explicit methods to identify, select, and critically appraise relevant research, and to collect and analyse data from the studies that are included in the review. Statistical methods (meta-analysis) may or may not be used".* Therefore the 12 literature reviews provided a useful check against our own analysis of the empirical and modelling / simulation literature.

### Report, academic opinion piece and position paper

The reports mostly summarise and apply the empirical and modelling / simulation research to the context and interests of specific stakeholder groups, and may also drawn on statistics and trend analysis. These reports are often conducted by researchers who are funded by industry or health associations, or by institutional bodies. Academic opinion pieces present arguments, often for and against, a particular topic based on their own research and the research of peers (usually empirical or modelling / simulation research). Position papers by industry or health organisations generally advocate for or against a particular topic, usually referring only to research that supports their claims.

## Collating and summarising

In collating and summarising the reviewed literature, the evidence from empirical studies and the results of modelling / simulation studies were predominantly used. Literature reviews and reports were drawn upon for supporting views or where there were research gaps. The position papers, mainly from related stakeholder groups, were drawn upon in the Comparative Assessment phase of the study to supplement the EU level interviews.

# Annex 3 Statistical analyses - methodology

In this Annex, we describe the analyses we plan we conducted to answer the research questions from Chapter 3. In essence we estimate the effect of food taxes on consumer demand for those food products, and consequently for the competitiveness of the food industry. The method through which the food tax influences the consumer demand and industry competitiveness is depicted in the diagram below.

First of all, there could be a direct effect from the food tax to consumer demand. The government signalling consumers it would like to see a decrease in consumption of a certain food may induce consumers to adhere to that signal. Alternatively, by signalling a price increase for certain food products may cause consumers to be hyper vigilant on price changes, essentially making them more price elastic. Visa versa when the food tax is abolished.

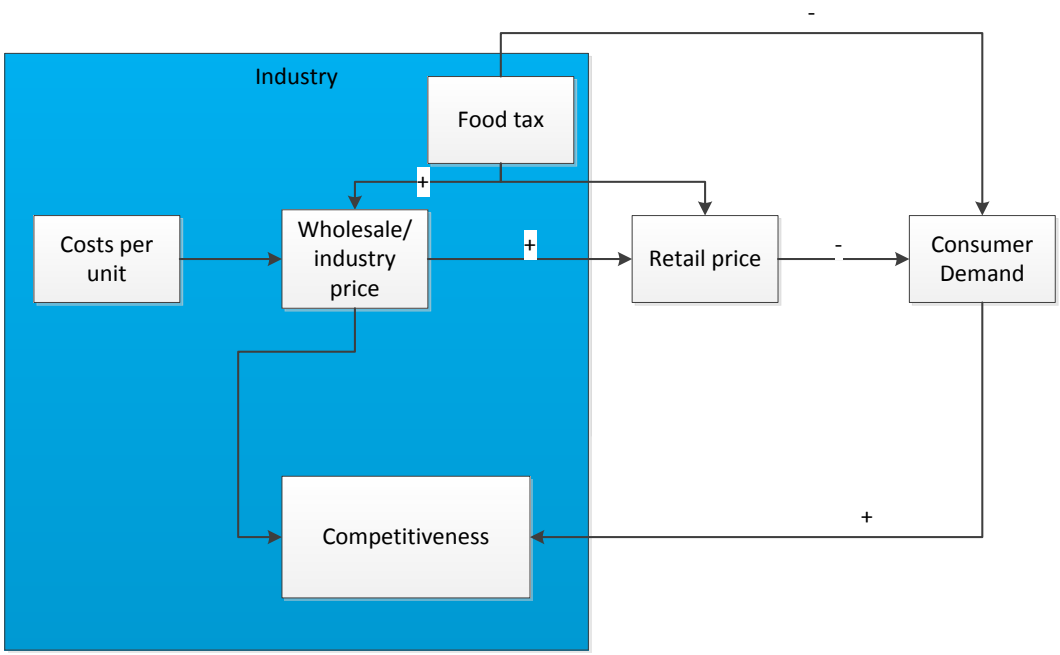
There is also a more indirect, though not necessarily less effective way the food tax could influence consumer demand. It is important to note that theoretically, it does not matter from which part of the production chain the tax is being levied. It depends on the bargaining power of the various players who end up paying what part of the taxes. For instance, if a retailer has to pay the taxes, but also has a lot of bargaining power, it may choose to force the industry to lower its manufacturing price to such an extent that the industry is paying all the costs for the taxes, and the retailer can maintain its current price without lowering its profit margin.

Thus, following the above argument, in general, depending on who pays the tax and what the respective bargaining power is, the prices for retailers, wholesalers and manufacturers could either increase or decrease. However, in case of a tax introduction or increase, the prices at retail level will either increase or remain the same, but are very unlikely to decrease.

Relevant factors that theoretically determine how much of the tax is being charged to the consumers are the bargaining power of the retailer toward the generic consumer, and the tendency of the retailer to price strategically.[40] Any change in price will have an effect on the total demand of consumers. This is captured by the price elasticity.

The change in total demand of consumer consequently affects the competitiveness of the industry that may face a sharp decrease in demand following the introduction of a tax, or a sharp increase in demand following the abolishment of a tax.

[40] I.e. using prices like €4.99 rather than €5.05 or €4.85.




In the section below we detail how we operationalize the concepts depicted in the model for the statistical analyses.

## Operationalization of concepts

For the data analyses we predominantly use information from the passport system, provided by Euromonitor. It provides information on total consumer demand for various food sectors in all European countries from 1999 onward. In addition, for the largest five Western European countries, information on the profitability, employment and costs for various industries active in the food sector.

### Food tax

From public documents, we have assembled a list of food taxes currently being enforced, or recently abolished or modified. To avoid arbitrary choices, we decided to simply look at whether there is a tax in a certain year or not. I.e., we constructed a dummy variable with only two variables.

In addition to this dataset, we also found other data for the analyses from different sources. For instance we built a dataset with food taxes currently enforced, or recently abolished in the European countries.

So far, we have identified 33 changes in 30 food taxes in European countries. Of those 33 changes, we are unable to statistically analyse 18 taxes, due to lack of information in our dataset. This is either caused by a tax base we cannot distinguish in our dataset[41], or implementation or abolishment is far outside the temporal scope of the dataset.[42] Any effects of these taxes are (statistically) impossible to determine.

[41] For instance a tax on flavoured beer in Hungary, introduced in 2011. Flavored beer is as such not distinguished in the dataset. We only have information on the total demand for beers.

[42] For instance a tax on icecream in Denmark that was introduced in 1946.

Of those remaining 15 taxes, four are relatively hard to study, though it is not impossible. A reason for difficulty in studying the effects of these taxes lies in the fact that changes in these taxes are all implemented after 2011, resulting in only one or two observations after this implementation.[43] This means that for these four tax changes, we can only conduct observational inspection of the effects. Statistical analyses can only be performed on the remaining 11 tax changes.

| Country | tax base | tax amount | start | end |
|---|---|---|---|---|
| DK | food products such as meat, dairy products, animal fats and vegetable oils which contain more than 2.3 % saturated fat | 16 kroner (£1.78) per kilogram of saturated fat (besides VAT) | 2011 | 2013 |
| FR | Sugar-sweetened beverages | €7.16 per hectolitre | 2012 | |
| BG | Coffee | | 1994 | 2008 |
| Croatia (CO) | Coffee | | 2005 | |
| DK | Chocolate and chocolate products, liquorice products, marzipan, sweets, effervescent products, chewing gum, cakes with a certain sugar, cacao or chocolate content etc | tax increased (1.9 to 2.38) | 2010 | |
| DK | Chocolate and chocolate products, liquorice products, marzipan, sweets, effervescent products, chewing gum, cakes with a certain sugar, cacao or chocolate content etc | tax increased (2.38 to 3.18) | 2012 | |
| DK | Chocolate and chocolate products, liquorice products, marzipan, sweets, effervescent products, chewing gum, cakes with a certain sugar, cacao or chocolate content etc | tax increased (3.18 to 3.57) | 2013 | |
| DK | Sugar sweetened soft drinks | tarif reduced by 50% | july 2013 | |
| FI | Sweets, chocolade, ice-cream and soft drinks, including fruit juices, mineral water and lemonade. | tax reintroduced EUR 0.75 per kilogram or EUR 0.075 per litre | 2011 | |
| FI | Sweets, chocolade, ice-cream and soft drinks, including fruit juices, mineral water and lemonade. | tax increased EUR 0.95 per kilogram or EUR 0.11 per litre | 2013 | |
| HU | Soft drinks | 5 Ft/litre (1.4p/l) if too much sugar | 2011 | |
| HU | Energy drinks | 250 Ft/l (68p/l) if too much caffeine | 2011 | |
| HU | Confectionery | 100 Ft/kg (27p/kg) if too much sugar or chocolate | 2011 | |
| HU | Salty snacks | 200 Ft/kg (54p/kg) if too much salt | 2011 | |
| HU | Condiments | 200 Ft/kg (54p/kg) if too much salt | 2011 | |

These taxes are implemented in six different countries: Bulgaria, Croatia, Denmark, Finland, France and Hungary. Most of these taxes are levied on Coffee, confectionery and chocolate.

[43] See for instance the tax on sugar sweetened beverages in France in 2012. This means we have only two observations after the tax.

### Costs per unit

PM

### Wholesale or industry price

In the passport dataset, information is provided for all investigated products what the total manufacturing revenue is. This is usually provided for sales through retail, rather than the total consumption (including food service sales).

By dividing this figure through the respectively the total or retail amount sold, we can proxy the average price per product.

### Retail price

In the passport dataset, information is provided for all investigated products what the total retail revenue is and occasionally the total revenue for a type of food. This is usually provided for sales through retail, rather than the total consumption (including food service sales).

By dividing this figure through the respectively the total or retail amount sold, we can proxy the average price per product.

### Consumer demand

The consumer demand consists of the total volume sold of a certain (type of) product. To avoid confounding in the variables, such as population growth, that in itself causes consumption to grow, we divide the total consumer demand by the total number of inhabitants in the country. This results in a total consumption per capita.

### Competitiveness

Competitiveness refers to the ability of a firm or sector in a specific country to provide good or services in comparison to a firm of sector in another country. To analyse the competitiveness at sector level, we use the following indicators:

1. Labour productivity;
2. Growth in employment;
3. Profit margin.

## Data analyses

The first step in the data analyses is the visual inspection of the data. This is extensively being described in Annex 4, and summarized in Chapter 3.

The second step is to conduct statistical testing of the tax effects. We run two series of analyses. The first tries to capture the effect of the tax on consumers' demand. The second tries to capture the effect of the tax on the industries' competitiveness.

Difficulty in the analyses is that most changes in taxes correspond to the credit crunch in 2008/2009 resulting in a recession in the consecutive years. It is hard to distinguish the effects of the tax and the recession. Also, the relatively recent change in tax policy, makes it harder to fully capture any delayed effects.

### Consumer demand

Change in Consumer demand = f($tax_{yes,\ no}$, change production costs per unit, change total consumer consumption).

We will run several alternatives to take into account the lags, and to find what consumers do as an alternative to the taxed product. (e.g. shift to non-taxed alternative, no consumption, or shift to non-taxed other food). We can also run some analyses on cross-border food consumption, but I doubt this will work.

### Competitiveness

Change in competitiveness = f($tax_{yes, no}$, change production costs per unit, change total consumer consumption, Change in Consumer demand).

All alternative operationalizations of competitiveness will be tested. Thereby taking into account some lags.

# Annex 4 Interview guideline

# Food taxes and their impact on competitiveness in the agri-food sector

## Information for interviewees

### Background

The European Commission have engaged the ECSIP consortium to conduct a detailed analysis of the impact of food taxes on competitiveness in the agri-food sector. Selected stakeholder are invited by Ecorys for an interview to share their views on the topic. The purpose of the interviews conducted during the study is to gain in-depth information on the impact of food taxes on consumer behaviour, attitudes and awareness; industry; and public health. This document provides information for interviewees.

#### *Definitions*

**'Food'** is defined in accordance with the definition provided in Regulation (EC) 178/2002, article 2: *"(…) 'food' (or 'foodstuff') means any substance or product, whether processed, partially processed or unprocessed, intended to be, or reasonably expected to be ingested by humans. 'Food' includes drink, chewing gum and any substance, including water, intentionally incorporated into the food during its manufacture, preparation or treatment. It includes water (…)."*

**'Competitiveness'** is defined as: The ability of a firm or a nation to offer products and services that meet the quality standards of the local and world markets at prices that are competitive in relation to the offers of other firms or nations.

Competitiveness is the result of a wide range of drivers and framework conditions.

#### *Research questions*

Key questions in this study are:

1. How do food taxes impact the consumption of foods with a high percentage of fat, salt and sugar additives?
2. How do food taxes impact the competitiveness of the agri-food sector in the country? In particular, the emphasis lies on the impact of food taxes on sector employment, investments and trade flows.
3. Do food taxes impact the competitiveness of European stakeholders in the global market?
4. How do food taxes improve public health (on what timescale are measurable results expected, do taxes fit into a wider national policy approach that can include promotion, awareness raising etc.)?

*Scope of the study*

The sectorial scope of this study is the European food industry, including all the main economic actors along the food supply chain. The study will focus on non-harmonised taxes introduced by EU Member States on food. Besides this, it will also address harmonised taxes, e.g. excise duties on alcoholic beverages if and where such taxes have an objective to reduce the consumption of 'food high in fat, salt and sugar'. In terms of implementation of food taxes, the study will focus on those food taxes (including taxes on alcoholic and non-alcoholic beverages) that are currently in place, have been recently introduced or recently withdrawn.

## On the interview process

This information document contains the questions to be discussed during the interview. The interviewer uses the list of questions as a guideline for the interview, but is not restricted to the questions. Questions may be skipped if deemed less relevant for the interview, or follow-up questions may be posed based on the responses provided during the interview.

Unless agreed otherwise, the interview will take place by phone and in English. During the interview, the interviewer will take notes. No recording devices are used to record the interview.

After the interview, the interviewer will make minutes of the interview and will send these minutes to the interviewee with the invitation to review the minutes. Also, the interviewee may label any information as confidential. The adjusted minutes, excluding the confidential information, will be considered to be the only minutes of the interview.

In the reporting, we generally refrain from direct linkage of quotes to individuals or individual organisations. If we would want to use specific quotes, we would contact you beforehand.

If you would like additional information on the interview process, please feel free to ask the Ecorys team member approaching you.

## Questions

The following questions are intended to provide guidance with respect to the interview process and its thematic structure. For all questions, we invite you to support your answer with examples and, if possible, (reference to) specific studies.

*Consumer behaviour:*

1. How do food taxes impact consumer behaviour? E.g. in terms of consumption levels of taxed products, substitution effects. Is there any variation between different types of products?
2. Do food taxes have different impacts on different types of consumers (e.g. low income versus high income, adults versus children)? How?

*Industry effects:*

3. What is your view on the impact food taxes have on industry competitiveness (as defined above)? What are the main mechanisms behind this?
4. What is the impact of food taxes on employment and investment?
5. Are there any cross-border effects of food taxes, and how does this impact competitiveness?
6. How does altered consumer behaviour, resulting from introduction of food taxes, impact the food industry? E.g. in terms of turnover, profitability, market share;

7. How does industry react to these changes? E.g.:
    a. Price adjustment (of the taxed product or non-taxed, related products);
    b. Adjustment of ingredients of taxed products to reduce the size of taxation;
    c. Introduction of new, non-taxed, products;
    d. No reaction;
    e. Other.
8. Is there any difference in the impact food taxes have depending on the food category, or country?

*Health effects:*

9. Does altered consumer behaviour (if any), resulting from introduction of food taxes, impact public health? If so, how does this work? E.g. reduction in obesity levels or reduction in cardio-vascular-diseases. What do you consider as the key pieces of evidence which support your view?
10. To what extent do consumers switch to other (non-taxed) products following the introduction of a food tax? Are these products less, equally or more healthy?
11. What would be required to maximise the health effect of a food tax?

*Other:*

12. What, based on your experience, determines the effectiveness of a food tax? Are there any other conditions relevant for the impact of food taxes?
13. Do economic conditions influence the impact of food taxes? How?
14. Does the legal framework (acts; government regulation; sector self-regulation) influence the impact of food taxes? How?
15. Does policy (e.g. simultaneous introduction of non-tax measures with tax measures) influence the impact of food taxes? How?
16. Given a specific public health objective, what policy measures are in your opinion the most effective and why?
17. Do you have any suggestions for sources of quantitative data or evaluations of policy measures?
18. Are there any other issues not yet discussed?