

Charles University in Prague

Faculty of Social Sciences
Institute of Economic Studies



BACHELOR THESIS

**The effects of a fat tax on Czech
households and government revenues**

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Declaration of Authorship

I hereby declare that I wrote this thesis on my own under the leadership of my supervisor and using only the listed resources and literature.

I further declare that the thesis has not been used previously for obtaining any university degree.

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Prague, May 5, 2014

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Abstract

Health related food taxes have recently spread over the world as a tool for reducing obesity. Rising number of obese people and increased health care costs due to illnesses caused by unhealthy diet represent a burden to the public sector. Taxation of an unhealthy food seems to be a good solution to this problem, as it is expected to increase the consumer price, thus providing an incentive for the consumer to buy less of this food. I use detailed Czech Statistical Office data to estimate the impact of fat tax on households' expenditures and public budget revenues in the Czech Republic. As I do not take into account the possible change of consumers' behaviour, my estimates form the upper bound of impact of the tax. I simulate three types of excise taxes – ad valorem, specific per kilogram of product and specific per kilogram of fat, so that they all raise the same budget revenues, and I compare their effects on individual products and households.

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Abstrakt

Daně týkající se zdraví se v poslední době rozšířily po celém světě jako nástroj ke snížení výskytu obezity. Rostoucí množství obézních lidí a zvýšené náklady na zdravotní péči kvůli nemocem způsobenými nezdravou stravou představují zátěž pro veřejný sektor. Zdanění nezdravého jídla se zdá být dobrým řešením tohoto problému, protože se očekává, že zvýší spotřebitelské ceny a motivuje tak spotřebitele, aby kupoval méně nezdravého jídla. Používám detailní data z Českého statistického úřadu na odhad dopadu daně z tuku na výdaje domácností a příjem státního rozpočtu v České republice. Jelikož neberu v úvahu možnou změnu spotřebitelského chování, mé odhady tvoří horní hranici dopadu daně. Simuluji tři typy spotřebních daní - ad valorem, specifickou na kilogram produktu a specifickou na kilogram tuku tak, že všechny vyberou stejné příjmy do rozpočtu a porovnám jejich vliv na jednotlivé produkty a domácnosti.

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Klíčová slova	jídlo, obezita, daň z tuku, domácnosti
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Acronyms

CSI	Cholesterol/Saturated fat Index
CSO	Czech Statistical Office
DANE	Model for evaluation of impact of changes in indirect taxes on households and government budget in the Czech Republic (indirect taxes in Czech are DAně Nepřímé)
EU	European Union
HBS	Household Budget Survey
QUAIDS	Quadratic Almost Ideal Demand System
ÚZIS	Ústav zdravotnických informací a statistiky (Institute of Health Information and Statistics of the Czech Republic)
VAT	Value Added Tax
VZP	Všeobecná zdravotní pojišťovna (General Health Care Insurance Company)

Bachelor Thesis Proposal

Author: Tatiana Chudá

Supervisor: Petr Janský, Ph.D.

Proposed topic

The effects of a fat tax on Czech households and government revenues

Preliminary scope of work

Many countries are considering implementation of taxes on unhealthy drinks and food to improve consumers' health and to combat growing levels of obesity. A number of foreign studies based on model simulations have already examined welfare and health effects of these taxes. In this thesis I would like to estimate an impact of fictively imposed fat tax on households in the Czech Republic using a recent Household Budget Survey. I will employ a model for evaluation of impact of changes in indirect taxes on households and government budget. According to the results of my estimation, I should be able to discuss, if it gives any sense to impose this tax in the Czech Republic, either to improve eating habits of the population or as a contribution to the state budget.

Outline

1. Introduction
2. Literature review
3. Obesity problem
4. Fat tax in the world
5. Simulation of fat tax in the Czech Republic
6. Analysis of results and interpretation

Core bibliography

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1 Introduction

Increasing obesity rates have become a greater problem worldwide. There are many countries facing an increased prevalence of health problems including overweight, obesity and a number of associated co-morbidities caused by unhealthy diet. One in three adults in the world (1.46 billion) were overweight or obese in 2008 according to the Overseas Development Institute (2014). What is surprising, in the developing world, the number of overweight or obese adults more than tripled from 250 million in 1980 to 904 million in 2008 as fat and sugar consumption rises. North Africa and the Middle East, and Latin America now have almost the same percentage of overweight or obese people as Europe (58%) what seems alarming.

Factors behind the increase in obesity are mainly rising incomes and urbanisation which tend to lead to diets rich in animal products, fat, salt and sugar but also various influences of globalisation on diets, for example, advertising and the media. If this continues there will be a huge increase in the number of people suffering from cancer, diabetes, strokes and heart attacks which will put an enormous burden on public healthcare systems.

Therefore there is a pressure on politicians to reverse this trend by public regulations. In an attempt to improve the nation's health, policy makers are imposing new taxes on foods or beverages that are considered unhealthy. In France, a tax on sugared soda was introduced in 2012; in Hungary, taxes on various ready-to-eat foods (candies, soft drinks, energy drinks or savory snacks) were introduced in 2011, Finland has in 2011 reintroduced taxes on sweets, which had been abolished since 1999; in Denmark, a highly debated tax on saturated fat in food products was introduced also in 2011, and more countries are considering the use of tax instruments in health promotion policies.

The objective of my study is to quantify the efficiency of a fat tax in the Czech Republic. My goal is to find out what are the impacts of fat tax on household expenditures, how much would such a tax affect household economic welfare in the short term and how much revenue would such a tax raise. The methodology is based on the estimation of new expenditures of households after implementation of fat tax from which we can assess effects of a tax on households' welfare and revenue gained from this tax to the state budget. I can expect welfare losses as fat tax leads to an

increase in food prices, and also changes in the food demand structure or in fat and nutrient supply. This might have a positive effect on the consumers' health and decrease of health care costs.

The thesis is structured as follows: Chapter 2 provides an overview of the foreign and Czech literature related to my topic. Chapter 3 covers the theory for my thesis. Chapter 4 describes the data which I use in my thesis. Chapter 5 shows different types of fat taxes in several countries of the world and problems associated with implementation of fat tax. Chapter 6 gives a closer look on the construction of my model. Chapter 7 provides the results of my research and their interpretation. Chapter 8 summarizes my findings.

2 Literature review

2.1 Microsimulation models

In the literature review I focus on three different areas. In the first part, I introduce the microsimulation models which are used for analysis of tax reforms. In the second one, I provide an overview of Czech indirect taxes and their impact on living standards of households. In the third one, I present papers relating to the fat tax in Denmark and other countries and its short run effects on consumption and consumer prices of fats.

Firstly, microsimulation models are used in many countries by researchers and governments to analyze the impact of tax reforms. They use micro-data on households or other micro units to simulate the changes of various policies on these units. Microsimulation models are dependent on information from micro-data at every stage of the analysis and that is what makes them different from other economic or statistical models. They are often employed for analysis of interactions between policy and economic or social life. Microsimulation models share basic principles - detailed data sample of individuals and households for a simulation on the basis of available information in the data sample and additional assumptions. Ralf Maiterth from Humboldt University in Berlin has developed a tax only microsimulation model and in (Maiterth, 2001) and (Maiterth & Müller, 2003) they analyze the impact of recent tax reform proposals.

(Brůha & Ščasný, 2006) use a microsimulation model to analyse distributional effects of environmental regulation in the Czech Republic. They simulate a 50% increase in the excise duty on fuel and they find it to be slightly regressive. A certified methodology for a microsimulation model DANE in the Czech Republic written by (Janský, 2013c) describes a specific model created for the Czech tax system. It has been already used in two papers. In a short study (Janský, 2012) estimates impacts of changes in VAT rates on households and he compares two different scenarios. The Chamber of Deputies of the Czech Republic approved in November 2012 the proposal for an increase of VAT rates by one percentage point in both reduced and standard rates to 15% and 21% respectively. He forecasts impact of this proposal on households according to their income and compares it to the unification of rates to 17,5%. (Janský, 2013a) estimates a consumer demand system in the Czech Republic and also an impact of changes of indirect taxes on households. Reforms of indirect

taxes, such as changes in value added tax rates (VAT) in the Czech Republic, change prices of products and services and Janský estimates the behavioural response of consumers to these price changes in the Czech Republic.

2.2 Czech indirect taxes

Secondly, the value added tax (VAT) has two rates in the Czech Republic and since 2013 both reduced and standard rates have been increased by one percentage point to 15 % and 21 %, respectively. VAT and its changes in the Czech Republic have been studied by (Schneider, 2004), who analysed tax burden of households and found VAT to be relatively regressive, and more recently by (Klazar et al., 2007) who analysed the impact of harmonisation of VAT rates connected with the entry of the Czech Republic into the EU on the distribution of the tax burden among households. (Klazar & Slintáková, 2010) focused on progressivity of value added tax in the Czech Republic and the results show that the Czech VAT is regressive when annual income is analysed while the lifetime income analysis indicated that VAT is progressive. (Dušek & Janský, 2012a) and (Dušek & Janský, 2012b) used a simple micro-simulator to provide first independent estimates of the impact of the recently proposed VAT rates changes in the Czech Republic on the living standards of households and tax revenues. In addition, (Janský, 2013a) estimated the impact of changes in VAT rates, which were proposed or implemented between 2011 and 2013 on households and government revenues.

Excise duties in the Czech Republic are imposed on mineral oils (motor fuels, petrol and diesel), tobacco products (cigarettes, cigars and other products) and alcoholic beverages (beer, spirits and other alcoholic beverages). (Klazar et al., 2006) is one of the most comprehensive studies of impact of indirect taxes, including excise duties, in the Czech Republic. They developed a microsimulation model for VAT and excise duties, however, it does not account for the potential substitution between goods as prices changes because of changes in taxes. (Janda et al., 2010) contribute to the discussion of excise duties on alcohol in the Czech Republic. They estimated a demand system focused on beer, wine and spirits and found the beer to have the lowest own-price elasticity. (David, 2010) analysed the impact of taxes on cigarettes in the Czech Republic and found that consumers bear 81% of the increased tax burden. (Janský, 2013b) analyzed the impact of changes in excise duties on households in the Czech Republic. He expected that households respond to changes in prices by adjusting their expenditures and therefore he estimated own- and cross-price and income elasticities for individual households to simulate the impact of changes in excise duties on households' demands.

2.3 Fat tax in the world

Thirdly, based on econometrically estimated models of consumer behaviour, (Smed et al., 2007) and (Jensen & Smed, 2007) have investigated the potential effects of health-related food taxes (including a tax on saturated fat, taxes on all fats, tax on sugar) on food consumption. (Mytton et al., 2007) found that taxing the sources of saturated fat may lead to a reduction in the intake of saturated fats. In contrast, (Chouinard et al., 2007) studied the impact of a fat tax on the consumption of dairy products, using econometrically estimated price elasticities, and found a rather inelastic demand for these products suggesting a low impact on consumption, but a high potential to generate revenue. (Cash et al., 2008) made an experimental investigation of the impact of fat taxes. Results from the first round of testing suggest that consumers are less likely to choose a product with a stigmatizing warning label attached to it. A simple analysis gives insight into the relationship between a person's decision of whether to purchase a product and the price of the snack food as well as the different warning labels on the packaging.

(Thiele, 2010) conducted an investigation of overweight reduction using a fat tax in Germany. The results of the empirical analysis of German households support the hypothesis that a fat tax would change household's food purchasing habits. Consumers would alter their food composition in the direction recommended by nutritionists, thus they would buy less animal and more plant products. However, the changed food demand structure is not only connected with a decrease of fat consumption, but also with a decline of important nutrients such as vitamin D and calcium. It is questionable if a fat tax is an appropriate measure to reduce the negative effects of overweight as not only overweight, but also normal weight people must bear the costs of a fat tax. (Allais et al., 2010) found in their study that a fat tax has small and ambiguous effects on nutrients purchased by French households and a slight effect on body weight in the short run with a greater effect in the long run. Such a tax generates substantial tax revenue but is highly regressive. Denmark introduced a new tax on saturated fat in food products with effect from October 2011. (Jensen & Smed, 2012) made an effect assessment of this tax for some of the products most significantly affected by the new tax, namely fats such as butter, margarine and oils. The econometric analysis suggests that the introduction of the tax on saturated fat has had some effects on consumption patterns. The level of consumption of fats dropped by 10 – 20% in the first three months. Furthermore, the analysis points at shifts in demand from high-price supermarkets towards low-price discount stores which utilized the situation and raised the prices of butter and margarine by more than the pure tax increase. (Smed, 2012) summarises the fat tax in Denmark and discusses

some of the consequences of introducing the tax. What is more, this paper discusses the theoretical background and reasoning for imposing a fat tax as well as some of the problems stated, especially by the food industry. The declared aim of the tax was to reduce the consumption of saturated fat among the Danish population in order to decrease the prevalence of diet-related illnesses.

(Mytton et al., 2012) examine the evidence on whether taxes on unhealthy food and drinks really improve health. Existing evidence suggests that taxes tend to shift consumption in the desired direction, although policy makers need to be wary of changes in other important nutrients. Taxing a wide range of unhealthy foods or nutrients is likely to result in greater health benefits, however, the strongest evidence is for a tax on sugar sweetened beverages. Moreover, taxes would need to be at least 20% to have a significant effect on obesity and cardiovascular disease and they should be ideally combined with subsidies on healthy food such as fruit and vegetables. (Franck et al., 2013) examined the advantages and disadvantages of implementing a tax on junk food as an intervention to counter increasing obesity in North America. A modest tax on selected nutrients or snacks would gain substantial revenues to governments, but is unlikely to affect obesity rates. The study of (Madden, 2013) concentrated unlike other studies purely on the economic effects of the fat tax and ignored the potential health benefits. Fat taxes are criticised for their regressivity and potential adverse effect on poverty. This study analyses impact of such taxes on poverty and also examines the effect of combination of a tax on unhealthy food with a subsidy on more healthy food. The results confirm that fat taxes are likely to be regressive, but a tax-subsidy combination can be neutral with respect to poverty.

3 Theory

3.1 Motivation for fat tax

High fat intake and unsuitable composition of its fatty acids are reason of many non-communicable diseases e.g. cardiovascular diseases (Dostálová, 2011). Almost half of the Czech population died of the consequences of cardiovascular diseases in 2011 according to the statistics of ÚZIS (2012). Moreover, 55 % of population in the Czech republic suffers from overweight or obesity problems according to the research of VZP (2011). Those most at risk are the residents of small towns and villages. Increased health care costs, in addition, represent a burden to the public sector. Therefore health is undoubtedly a big incentive for introduction of fat tax or other health related food taxes. Moreover, taxation of unhealthy food has also other benefits. It is expected to increase the consumer price of this food, thus providing an incentive for consumers to buy less of the products and at the same time it generates revenue to the state budget which can be used for financing public expenditures. The aim of this tax might be also to reduce the pressure of income taxation for all people participating in the labour market and instead increase health related or environmental taxes that reduce adverse behaviour.

3.2 Model simulation used in foreign studies

Food taxes have been already examined in a lot of scientific studies e.g. (Chouinard et al., 2007), (Jensen & Smed, 2007) or (Allais et al., 2010). While the use of food taxes in practice has been quite limited, these studies are usually based on model simulations, for example, derived from econometrically estimated price elasticities. Most of the studies use Almost Ideal Demand System (AIDS) developed by (Deaton and Muellbauer, 1980) such as (Smed et al., 2007), (Allais et al., 2010) or (Thiele, 2010). In these studies it is often assumed that the tax rate is perfectly transmitted to the consumer prices.

3.3 Microsimulation model in my study

In my study I will use a model for evaluation of impact of changes in indirect taxes on households and government budget in the Czech Republic. There is a certified methodology by (Janský, 2013c) which describes the model called DANE (indirect taxes in Czech are DANě NEpřímé). This model is a microsimulation model that

estimates distributional and budget impact of indirect taxes, mainly of value added tax (VAT) and to a limited extent also of excise duties. To simulate proposed changes of reforms, it uses information about indirect taxes and about consumption behaviour of a representative sample of Czech households from the national Household budget survey (HBS) of the Czech Statistical Office. The model can take into account behavioural reaction of consumers in a detailed way through elasticities estimated by QUAIDS model (Quadratic Almost Ideal Demand System). Alternatively, the results can be estimated also without taking into account the reaction of consumers and therefore no results of QUAIDS what I am going to do in my model. Then for each household the model calculates the decrease of real income of households. My study is similar e.g. to the one by (Smed et al., 2007), although I do not calculate elasticities, where they compare several types of fat taxes (including ad valorem and specific on the amount of fat) and their impact on the decrease of fat consumption. I will simulate the implementation of fat tax in three forms of an excise tax (ad valorem, specific per kilogram of product and specific per kilogram of fat) and I will quantify how much they would affect households, if they might change their eating habits and improve their health or how much money they could bring to the state budget.

4 Data

4.1 Data used in the thesis

The data used for the analysis in my model are drawn from The Household Budget Survey (HBS) that was conducted by the Czech Statistical Office (CSO). HBS is collected annually according to a standardized methodology for all EU countries. The CSO conducts a nation-wide household survey to obtain information on household earnings and consumption patterns. To evaluate the changes in tax rates I have used the latest available edition of HBS (data for the year 2011, available in the second half of the year 2012) which contains information on 2904 households consisting of 6923 individuals. The Household Budget Survey (HBS) is therefore a representative sample of around 3000 Czech households. It contains basic information about each household and its dwelling (around 60 demographic variables) and economic activity of two main household members. A great amount of information on demographic characteristics of households was collected to control for preference variation, such as household size, number of kids, age of the head of household, education and occupation. Households were required to keep a daily diary for every month about information on their earnings and expenditure. For each of the households, the HBS contains information about how much they spend on various goods and services (around 250 expenditure items) and how they earn their income (around 30 income items). The HBS data is basically a pooled repeated cross-section data.

4.2 Suitability of HBS

For a tax simulation it is essential that HBS provides expenditures according to detailed division and is therefore a unique data set in the Czech Republic, suitable for my model. HBS also reports the amount of social security benefits received by households, income tax, social security and health insurance (for employees) which, unlike the detailed expenditure data, net income or certain demographic variables, I do not use in my model.

HBS is a good source of data for microsimulation of indirect taxes. It is relatively large, representative (specifically it includes weights, the use of which allows the conversion of a representative sample to the whole population) and it contains sufficient data on expenditure and household structure which allow to model the effects of indirect taxes system. Basic unit of the HBS and the following analysis is a

household. Disadvantage of the HBS is a relatively low quality of data on some expenditures, on part of which are levied excise taxes (alcohol or cigarettes). Although these items exist in the file and are used for modelling of indirect taxes, their amount often looks unrealistically low, either for individual households or even more in total for the whole country. Modelling of excise taxes is therefore less accurate and less reliable than modeling of VAT, mainly because of the effects on public budgets.

4.3 HBS files

Statistical Office publishes the HBS annually in the autumn with the data for the previous year together with a detailed description of content and changes from the previous year, the list of variables and questionnaire. The actual data of HBS are issued in the form of two files that must be combined before the data analysis. For the year 2011 there are files with the following names:

- ru2011d (detailed information about cash expenditures of individual households, in some cases physical quantities, such as liters)
- ru2011e (income, demographic and other information about households)

4.4 Unit value

What is more, households reported the quantity of their consumption of food products in their survey diaries. However, prices for food products were not provided by the survey, therefore I derived prices for individual commodities from the purchased quantity and total expenditure data, similarly to (Janda et al., 2010) and (Dybczak et al., 2010), who divided the expenditures by the amount of purchased goods and services. This way they obtained unit values which they used as prices. The price calculated by this method is household specific, representing household purchase decisions. According to (Janský, 2013a), average share of expenditures on food in the total expenditures of households in the Czech Republic in 2011 was 24.4 %.

5 Implementation of fat tax

5.1 Assumptions

In my study I want to examine whether a fat-tax policy can change Czech households' purchases of fats as well as what might be the consequences of such a policy on the expenditures of households. For the functionality of the model assessing the impact of changes in indirect taxes on households and public budgets in the Czech Republic, it is necessary to make a number of assumptions. I use the usual assumption of *ceteris paribus* that other important facts (public policy or relevant economic conditions) do not change. I also assume that data from the past or data from other countries (including information about how consumers responded to price changes and tax reforms) are useful for my simulation and implementation of the fat tax in the Czech Republic. The assumptions for reflecting tax changes in prices and consumer response to these tax changes are essential for assessing the impact of changes in indirect taxation. I expect one hundred per cent reflection of tax changes into prices, so I assume that consumer prices will be increased by the exact amount of the tax and retailers and the food industry will make no other responses. My examination will therefore represent the maximum impact of the tax. Fat tax usually consists in increasing the value added tax or imposing an excise tax on targeted food groups. The VAT rate is assumed to be 15% for all food items in the Czech Republic except for alcohol.

Question is which food categories should be taxed and in what rate. Taxing all food products high in calories is, of course, politically unrealistic. I must therefore determine which food categories will have the highest impact on the number of fats purchased if they are taxed.

5.2 Different types of fat taxes

By and large, tax proposals fall into two categories: taxes on specific nutrients (e.g. fats) and taxes on predefined food (e.g. snack foods) and beverage categories (sugar-sweetened beverages). The reason for targeting nutrients in tax policies is that some energy sources have only little nutritional value and are therefore large contributors to the prevalence of global obesity. For example, fat has a higher energy density than other nutrients. A literal fat tax, like the one in Denmark, could theoretically encourage individuals to buy low-fat or nonfat alternatives. Another approach might

be to tax unhealthy foods according to their composition, for example food that contains more than 30% of fat or 40% sugar would be taxed. Similarly, an ingredient tax could encourage manufacturers to use fewer unhealthy additives and produce healthier foods. However, taxing nutrients or ingredients is quite complicated because not all fats are unhealthy and taxing foods according to their fat content would lead to high taxes for items such as nuts or cheese. It is a problem not only for consumers, but also for retailers who have only limited variety of products that would be disproportionately taxed as in the case of Denmark.

Here I provide a few examples of studies from other countries and a real case of Denmark which have inspired me in simulation of fat tax in my own study.

5.3 France

In France, (Allais et al., 2010) analyzed the contribution of each of the 22 food categories to total energy. They found out that for well-off households, the food with the highest share of energy is the cheese/butter/cream category which provides 14.94% of total energy purchased while for modest income households, the category with the highest share of energy is sugar-fat products, accounting for 16.86% of total energy purchased. The most efficient way to reduce the total energy that households purchase would be in this case to increase the prices of prepared meals, cheese/butter/cream, and sugarfat products. An additional effect of taxing these food categories is that they are the main sources of saturated fats purchased.

5.4 Germany

In German study of (Thiele, 2010), it is assumed that the fat tax applies to saturated fat. It is presumed that prices increase by 0.5 cents per gram of saturated fat. This fat tax implies, for instance, for full cream milk with 21.62 grams of saturated fat per liter, thus a price increase will be approximately 11 cents and for partially skimmed milk with 9.71 grams of saturated fat per liter, an increase will be approximately five cents. Beyond that, it is assumed that consumers bear 100% of taxes.

5.5 Denmark

A new tax on saturated fat in food products was introduced in October 2011 and it distinguished itself from other food taxes by targeting a nutrient instead of specific groups of food. It was the first tax of its kind in the world. The tax was paid on the weight of saturated fat in foods, if the content of saturated fat exceeded 2.3 grams per

100 gram. These included meat, dairy products and animal fats, edible oils, margarine and spreadable blended spreads. Fat tax amounted to additional 3% on minced meat, 14,6% on whipped cream, 13-16% on sunflower oils, and 30% on butter (Smed, 2012). The tax was levied on food manufacturers and food importers, but it was expected to have been transmitted to the consumer prices. It was estimated that the fat tax would bring around €160m a year to the state budget, equivalent to about €74 per household per year, and it would reduce the intake of saturated fats by about 8% (Smed, 2012). However, in November 2012, the Danish Tax Ministry announced it would abolish the fat tax. The controversial tax designed to improve the health of Danes by discouraging their consumption of fatty foods was opposed by farmers and food companies who complained that the tax was a bureaucratic nightmare, increasing administrative costs and putting jobs at risk. It was also unpopular among consumers in Denmark who started making shopping trips to Germany and Sweden to avoid the tax.

5.6 Health effects

Only a few studies have examined the health effects of current food taxes. For example, studies of (Kim & Kawachi, 2006) or (Powell et al., 2009) in the US where many states have introduced small taxes on sweetened drinks. However, neither study found a significant association between taxes and obesity at the taxation level 1-8%. This level might be too low to observe an effect on consumers' health. A study of soft drinks taxes in Ireland during the 1980s by (Bahl et al., 2003) found an 11% decrease in consumption for each 10% increase in price but did not examine the health effects.

According to the American article of (Franck et al., 2013), higher taxes (more than 20%) may lead to measurable decrease in obesity, especially if they are combined with healthy food subsidies or health education. Although politicians may be unwilling to implement them, high taxes would have the greatest impact on adolescents, persons of low socioeconomic status, and populations at risk for obesity. Low-income populations consume more junk food than do high-income ones (Bowman, 1999) and they are generally at higher risk of obesity and chronic diseases (Kim & Kawachi, 2006). Therefore a fat tax might change consumption behaviour of low-income individuals and they could experience long-term health benefits. In addition, revenue generated from such a tax can be used for healthy food subsidies which could help offset the costs that are born by low-income consumers.

Newer techniques for modelling the effect of energy intake on weight predict that a 20% tax on sugary drinks in the US would reduce the prevalence of obesity by 3.5%

(Lin et al., 2011). No state has recently imposed such a high tax. But it seems that the key to a successful health related food tax is probably at least 20% tax that is combined with subsidies on healthy food such as fruit and vegetables.

5.7 Subsidies on healthy food

In most countries there is the highest prevalence of obesity in lower socioeconomic groups and therefore we would see the greatest health benefits in these groups if they reduced saturated fat intake (Robertson et al., 2007). However, lower socioeconomic groups are very responsive to price changes (Jensen & Smed, 2012) and they tend to search for equivalent products which are cheaper or reduce the amount of healthy food they buy. Government could use the revenues from tax to decrease its negative effects and subsidise healthy food. No government has directly subsidised healthy food, there are only a few countries which have policy of zero VAT tax for certain foods. Revenue can also be used to improve health and social security services.

5.8 Problems with fat tax

Fat tax causes price increase of certain products but it does not have to lead to the desired effect. Firstly, consumers may decide to start buying food in the neighbouring countries with lower taxes. What is more, they can substitute their usual product with a cheaper option with the same composition. Desired health effect will be fulfilled only if the healthier option is available. For example, if butter is easily substituted with low fat spread. It might happen that consumers will still want to buy the same food which is now more expensive and therefore they will decrease buying healthy food such as vegetable, fruit or fresh fish.

The implementation of a fat tax has not only health effects but also welfare effects. Low-income households respond more to a change in prices than high-income households and they have to revise their previous optimal consumption. Low-income consumers have to suffer higher welfare losses than high-income consumers as welfare losses count for a higher percentage of their income. Although the fat tax generates a large tax revenue, it is extremely regressive. What is more, fat consumption is not the only reason for being overweight, sugar intake and lack of physical activity are also important, and normal weighted people have to pay higher prices for food, too. Moreover, taxing nutrients or ingredients is highly challenging as not all fats are harmful, some of them are essential for our body and deliver important liposoluble vitamins. In the French study, (Allais et al., 2010) showed that price elasticities and resulting nutrient elasticities are inelastic, and concluded that a fat-tax

policy is unsuitable for a substantial effect on the nutrients purchased by French households. In the German study, (Thiele, 2010) is also sceptic about the fat tax. The changed food demand structure is not only connected with a decrease of energy and fat consumption, but likewise with an insufficient intake of nutrients such as vitamin D and calcium. Both nutrients are responsible for countering the development of osteoporosis.

Here I provide a table with all the important food taxes over past 30 years in various countries of the world.

Table 5.1 Examples of health related food taxes

Country	Date introduced	Foods taxed	Tax rate
US	Various	Sugar sweetened drinks (in 23 states)	1- 8%
Norway	1981	Sugar, chocolate, and sugary drinks	Variable
Samoa	1984	Soft drinks	0.40 tala/L (£0.11; €0.14 \$0.18)
Australia	2000	Soft drinks, confectionary, biscuits, and bakery products	10%
French Polynesia	2002	Sweetened drinks, confectionary, and ice cream	60 franc/L (£0.41; €0.55; \$0.66) for imported drinks
Fiji	2006	Soft drinks	5% on imported drinks
Nauru	2007	Sugar, confectionary, carbonated drinks, cordial, and flavoured milks	30% import levy
Finland	2011	Soft drinks and confectionary	Soft drinks €0.075/L (£0.06; \$0.10); confectionary €0.75/kg
Hungary	2011	Foods high in sugar, fat, or salt and sugary drinks	10 forint (£0.03; €0.04; \$0.05) per item
Denmark	2011	Products with more than 2.3% of saturated fat: meat, dairy products, animal fats, and oils	Kr16/kg (£1.76; €2.15; \$2.84) of saturated fat
France	2012	Drinks containing added sugar or sweetener	€072/L

Source: (Mytton et al., 2012)

6 Model

6.1 Variables

The model describes the incidence of tax reforms on individual households and public budgets. It estimates average values for the Czech households with the possibility of presenting the results for different population groups (for example, divided by revenue or economic activity) on the basis of data on individual households in a representative sample for the following variables:

1. Change in expenditures of households due to the change in indirect taxes.
2. Share of expenditures on new indirect taxes in the net expenditures or the net income of households.
3. Change in expenditures on selected food items due to the change in indirect taxes.
4. Total government revenues from the new indirect taxes.

6.2 Income and expenditures

One of the first steps is a definition of relevant income and expenditures of households for modelling the changes in taxes for certain items. Income, which is mainly used for distribution of households into the groups according to their income, is the net monthly income of households from HBS. Similarly, expenditures that I use in my analysis are the net monthly expenditures of households. Moreover, I focus on food expenditures which are important for my study and their increase after implementation of tax. I divide the households not only according to their income but also according to their economic activity.

6.3 Software

Calculations are performed by the program in a standard statistical application Stata (version 12 and higher). To use this program for my model I need in addition to the methodology:

- HBS Database (available from the Czech Statistical Office)
- Stata Statistical application

Program for my model has the form of a programming file (so called do-file). In the first part it adjusts and connects the data, so that I can work with them. As the input data it takes the files from HBS (a pair of files ru2011d and ru2011e.txt). In my estimation I use the data for the year 2011. Then I set the parameters for the simulation and the program estimates the impact of changes in excise taxes on households according to their income or economic activity. In conclusion it calculates the revenues from a new tax to the public budget.

6.4 Taxed products

Another important step is to decide what tax rates I will use and how will I implement the tax. From the foreign literature and studies or from Denmark case I took a lot of ideas and compared advantages and disadvantages of various methods of implementing a fat tax.

The first question is on which products I will levy a tax. Most of the fats we eat are in the form of hidden fats (meat, milk, cereal or sweet products). Consumers do not see the hidden fat and they often have no idea about how much fat they have eaten. If I want to achieve reduction in fat intake, I need to have sufficient information on the amount of fat in the products. Negative effect of saturated fat on atherosclerosis is already known for a long time. His adverse effect is associated also with high cholesterol. I can find out if the product is healthy by combining data on amount of saturated fats and cholesterol. Therefore a Cholesterol/Saturated fat Index (CSI) was created. I have data on this index from the Food Research Institute, Bratislava (1995) and according to that I evaluate which foodstuff is considered unhealthy because of the highest content of fats and cholesterol. High CSI index have mainly yolk, pork meat, paté, butter, cream, curd, cheese, bacon, sausage and of course animal and vegetable fats. I put it together with the data on expenditures I have from the Czech Statistical Office and I decided to impose a tax on following items:

- pork meat
- smoked products
- canned meat
- butter
- pork fat and bacon
- edible oils
- vegetable fats
- cheese

6.5 Excise duties in the Czech Republic

Now I have the food items on which I want to simulate the effects of fat tax and the next question is what form will the tax have. In the Czech Republic there are excise duties imposed on mineral oils (motor fuels, petrol and diesel) which is the most important excise tax earning the highest government revenue, then on tobacco products (cigarettes, cigars and other products) and on alcoholic beverages (beer, spirits and other alcoholic beverages, still wine is excluded). Excise duty is an indirect consumption tax applied to certain types of goods and it is an important source of government revenue. Excise duties made up 14.3% of the total tax revenue in 2012 (130.1 billion CZK out of 912.3) according to the Ministry of Finance of the Czech Republic (2013). Most excise duties are specific rather than ad valorem. The one on motor fuel is not an exception, it is specified in litres. Excise rate for petrol and diesel is currently 13.71 CZK and 10.95 CZK per litre, respectively. The tobacco excise duty is very complex. There is a specific excise duty for tobacco products with the exception of cigarettes. For cigars and cigarillos the excise duty is 1.30 CZK per piece. Excise duty on cigarettes comprises both ad valorem and specific components due to requirement of the European Union. Excise duty on alcohol is the least important, but the HBS data on alcoholic beverages are on contrary the most detailed. The excise duty rates for beer are currently at 1.6 CZK per half litre of beer of 10 degrees Plato or 1.92 CZK per half a litre of beer of 12 degrees Plato. The excise duty for still wine is currently zero (Janský, 2013b).

6.6 Excise duties in my study

I decided to impose an excise tax on food with high content of fat and that is my fat tax. I suppose that the entire tax is born by consumers and fully reflected into prices and that no other changes (in economic or social policy) are made. I also know the quantities of excise goods available from the HBS, hence I can estimate the increased amount of indirect taxes paid by each household. My motivation is to find out if this excise tax might have a positive influence on the purchases of fats by households and if it might make them change their behaviour in a satisfying way.

In my model, I take the data on food from HBS where I have total yearly expenditures on individual food products and their quantities. When I divide these two numbers, I obtain a unit value for the product. From this value I have to subtract 15% tax to get a price without VAT (15% is currently tax on food in the Czech Republic). Then I will simulate an excise duty on products high in fat.

Assuming that excise duties might be specific as well as ad valorem, I apply both these types. Firstly, for a specific tax, the price of excise good can be written as

$$v_1 = (v_0 + t) * \left(1 + \frac{T}{100}\right)$$

where v_0 stands for unit value of a product without taxes, t is an excise duty and T represents VAT percentage rate, in case of food it is 15%. It means that first an excise duty is imposed on the product and then it is magnified by VAT rate. Thus an increase of expenditures of households is formed not only by excise tax itself, but also by additional increase in VAT amount due to excise tax.

Secondly, for an ad valorem tax, the new price of good can be written as

$$v_2 = v * \left(1 + \frac{t}{100}\right)$$

Where t stands for an excise duty percentage rate and v is the standard price for consumers (unit value).

With these new prices I will calculate expenditures of households if they still buy the same amount of products. By subtracting the old expenditures I will obtain the amount of indirect taxes they will have to pay due to fat tax (amount of excise tax + additional VAT amount in case of specific taxes).

I will simulate more options of taxes - ad valorem, specific per kilogram of product and specific per kilogram of fat to compare their effects from several aspects. I will impose 10% tax which seems to me reasonable and then specific taxes so that they will all raise the same budget revenue and the comparisons between them will make sense.

In the HBS I have data only on final products and for simplification I do not assume taxation of intermediate products, only of selected final products which are available in the data. Hence I do not have to be worried about the double taxation, for example, if I want to impose a tax on pork meat and also on smoked products which are made of pork.

Table 6.1 provides average amount of fat in selected products according to which I calculated specific tax per kilogram of fat.

Table 6.1 Average amount of fat in 100g of products (in grams)

Pork meat (lean)	18.2
Smoked products (Vysočina)	34.1
Canned meat (luncheon meat)	26.6
Butter	81.1
Fat and bacon	99.3
Edible oils	98.2
Vegetable fats (Hera)	82.6
Cheese (eidam 30%)	15.0

Source: Food Research Institute, Bratislava (1995) & (Teplan, 1998)

7 Results

7.1 Three tax forms

In this section I would like to discuss the results of my work. Excise duty is in most cases a specific excise tax, but we know also an ad valorem excise tax, for example, in case of cigarettes. I decided to examine a few options of fat taxes and compare their results to see which one could be best suited either in terms of health, welfare loss of households or state budget revenues.

I estimate three tax possibilities:

- 10% ad valorem tax on selected items
- 8.525 CZK specific tax per kilogram of selected items
- 20.68 CZK tax per kilogram of fat

All these scenarios are scaled equally in the sense that the aggregate consumers' welfare loss (or contribution to the state budget) is identical across scenarios, in order for comparisons to make sense. Specific tax is similar to the one in Hungary where there is 10 forint tax (€ 0.04) per items high in fat, sugar and salt, tax per kilogram of saturated fat was implemented in Denmark (€2.15/kg) on products with more than 2.3% of saturated fat, and ad valorem taxes are, for example, in the US (in 23 states) on sugar sweetened drinks with tax rate between 1-8%.

I divided households according to their monthly income into income quintiles or deciles. I can compare households' incomes thanks to the OECD adjustments for the size of a household, where the first adult of the household receives the weight 1, other over 13-year-old members receive the weight 0.7 and children receive 0.5. My goal is to find out if the fat tax is regressive or progressive and how it influences different income groups.

7.2 Households divided according to income

Table 7.1 shows the impact of 8.525 CZK fat tax on expenditures of households, share of the tax in net monthly income and expenditures of households which are divided to deciles based on income. In tables 7.3 and 7.5 it is the same but with 10% tax and 20.6 CZK/kg of fat. In tables 7.2, 7.4 and 7.6 there are monthly fat tax expenditures on individual food items of households divided into income. In case of

specific taxes, amount of fat tax paid by households is formed not only by excise tax itself, but also by additional increase of VAT.

Table 7.1 Income and expenditure shares of 8.525 CZK fat tax (in %)

Income decile	Fat tax per month in CZK	Expenditure share	Income share
1 (poorest)	99.3	0.66	0.67
2	105.2	0.58	0.54
3	101.9	0.56	0.50
4	122.4	0.57	0.50
5	120.1	0.53	0.46
6	117.8	0.50	0.43
7	115.0	0.44	0.38
8	110.8	0.41	0.34
9	109.4	0.38	0.31
10 (richest)	110.0	0.31	0.24
Average	111.2	0.49	0.44

Table 7.2 Monthly expenditures on individual food items due to 8.525 CZK fat tax (in CZK)

Income decile	Pork meat	Smoked products	Canned meat	Butter	Fat and bacon	Edible oils	Vegetable fats	Cheese
1 (poorest)	20.49	30.98	5.56	6.78	1.00	13.91	6.17	14.40
2	25.21	31.16	5.90	6.86	1.68	12.58	6.69	15.10
3	23.98	30.20	5.33	8.39	1.39	11.92	5.77	14.93
4	29.17	38.54	7.87	8.32	1.94	12.86	6.77	16.94
5	25.37	39.57	6.63	8.80	1.86	12.66	6.93	18.26
6	26.01	37.53	5.97	8.33	1.96	12.20	7.29	18.50
7	26.25	35.74	6.92	8.32	2.08	11.93	5.65	18.14
8	23.78	36.31	6.48	8.63	1.68	10.32	5.25	18.32
9	25.12	33.51	6.90	7.47	1.37	10.08	5.55	19.40
10 (richest)	24.54	35.74	5.97	8.01	2.07	9.36	4.58	19.68
Average	24.99	34.93	6.35	7.99	1.70	11.78	6.07	17.37

Table 7.3 Income and expenditure shares of 10% fat tax (in %)

Income decile	Fat tax per month in CZK	Expenditure share	Income share
1 (poorest)	92.0	0.61	0.62
2	100.5	0.55	0.51
3	99.4	0.54	0.49
4	120.7	0.55	0.49
5	120.3	0.52	0.46
6	118.1	0.49	0.43
7	115.2	0.43	0.37
8	117.1	0.43	0.36
9	117.1	0.41	0.33
10 (richest)	120.1	0.34	0.26
Average	112.0	0.49	0.43

Table 7.4 Monthly expenditures on individual food items due to 10% fat tax (in CZK)

Income decile	Pork meat	Smoked products	Canned meat	Butter	Fat and bacon	Edible oils	Vegetable fats	Cheese
1 (poorest)	19.06	31.04	5.24	6.97	0.60	4.83	3.94	20.30
2	22.82	32.96	5.73	7.16	0.88	4.54	4.62	21.81
3	21.35	32.81	5.09	9.03	0.74	4.29	4.03	22.07
4	26.99	41.70	7.75	8.76	1.13	4.64	4.75	25.02
5	23.79	43.48	6.55	9.37	1.10	4.52	4.81	26.68
6	23.39	42.13	5.90	8.78	0.95	4.40	4.88	27.69
7	22.88	40.35	6.79	8.99	1.00	4.40	3.92	26.87
8	22.49	42.14	6.61	9.45	0.89	3.77	3.89	27.86
9	24.05	39.69	6.87	8.34	0.76	3.70	3.97	29.70
10 (richest)	22.59	43.12	6.35	8.95	1.09	3.67	3.33	30.99
Average	22.94	38.94	6.29	8.58	0.91	4.28	4.21	25.90

Table 7.5 Income and expenditure shares of 20.68 CZK tax per kilogram of fat (in %)

Income decile	Fat tax per month in CZK	Expenditure share	Income share
1 (poorest)	104.7	0.71	0.72
2	107.1	0.59	0.55
3	104.2	0.58	0.52
4	121.2	0.57	0.50
5	120.7	0.53	0.47
6	117.9	0.50	0.43
7	113.3	0.43	0.37
8	107.5	0.41	0.33
9	103.4	0.36	0.29
10 (richest)	103.6	0.29	0.22
Average	110.4	0.50	0.44

Table 7.6 Monthly expenditures on individual food items due to 20.68 CZK tax/kg of fat (in CZK)

Income decile	Pork meat	Smoked products	Canned meat	Butter	Fat and bacon	Edible oils	Vegetable fats	Cheese
1 (poorest)	9.04	25.62	3.58	13.34	2.41	33.15	12.36	5.24
2	11.12	25.77	3.81	13.49	4.4	29.98	13.40	5.49
3	10.58	24.97	3.44	16.51	3.34	28.39	11.56	5.43
4	12.86	31.87	5.08	16.36	4.67	30.65	13.57	6.16
5	11.19	32.72	4.27	17.32	4.48	30.17	13.88	6.64
6	11.47	31.03	3.85	16.38	4.72	29.07	14.61	6.73
7	11.58	29.56	4.46	16.37	5.01	28.42	11.32	6.60
8	10.49	30.03	4.18	16.98	4.06	24.59	10.52	6.66
9	11.08	27.71	4.45	14.69	3.30	24.01	11.13	7.06
10 (richest)	10.82	29.55	3.85	15.76	4.99	22.30	9.18	7.16
Average	11.02	28.88	4.10	15.72	4.10	28.07	12.15	6.32

The results in tables confirm the theory of foreign studies that fat tax is extremely regressive. We can see that average households with higher income would have significantly lower shares of expenditures on fat tax in their total expenditures or income.

Differences between ad valorem and specific taxes consist mainly in their various impacts on individual food products, but also in their impact on different income groups. As specific taxes increase the price of expensive and cheap products by the

same amount, price of cheap products increases relatively more and those who suffer most are mainly low-income consumers who are forced to pay this disproportionate increase of price. Therefore specific taxes have bigger impact on low-income households than ad valorem tax, especially the one per kilogram of fat which very significantly increases the price of products with highest content of fat. Ad valorem tax increases the price of cheap and expensive products proportionately, thus low-income households who probably buy cheaper products, do not suffer so much. From the amounts in Czech crowns that households would pay due to fat tax, we can infer that if the tax is specific, the biggest amount would pay middle-income families. This probably suggests that the middle-class households have bad eating habits and their diet is unhealthy which might cause overweight and obesity problems. Higher-income households presumably have enough money to afford high quality products and more healthy food. This might be the reason why they would pay high amounts of tax when the tax is ad valorem. As they buy more expensive food, its price will also increase by higher amount.

The results for individual food items suggest that from the health perspective the most effective fat tax is the one with specific amount on kilogram of fat. Households would have to pay most money on products with the highest content of fat such as edible oils, butter, vegetable fats and also smoked products. If this made them change their purchasing behaviour, their fat intake could be much lower.

Ad valorem tax would increase the expenditures of households mainly on smoked products, pork meat and cheese, i.e. on products with high unit value and relatively high consumption. This could lead to lower consumption of pork meat and its products and possible transition to white meat or fish what might have positive health results, too.

Specific tax on products with higher content of fat has similar impact as ad valorem tax. The highest fat tax expenditures would households have on pork meat and smoked products but compared to ad valorem tax they would have lower expenditures on cheese and higher expenditures on edible oils and vegetable fats. Therefore, it could also be a suitable type of fat tax that would probably result in decrease of fat consumption by consumers.

7.3 Households divided according to economic activity

When I look at the results according to the type of households, I see that the biggest amount of fat tax would pay households of inactive persons with economically active members, employees with lower education and self-employed. However, the biggest expenditure share fat tax forms at unemployed and retired people which is related to their low income. The unemployed would be most negatively affected by fat tax as they already have problem to cover their expenditures and fat tax would only worsen their situation. On the other hand, employees with higher education have the smallest share of expenditures on fat tax in their total expenditures, probably because of their better-paid job and better information on healthy food.

Table 7.7 Income and expenditure shares of 8.525 CZK tax for different household groups

Household	Fat tax per month in CZK	Expenditure share	Income share
Employees with lower education	123.0	0.53	0.44
Self-employed	122.8	0.45	0.43
Employees with higher education	104.3	0.39	0.32
Households of inactive persons with EA members	133.1	0.52	0.45
Retired (not working) without EA	97.7	0.62	0.56
Unemployed	92.7	0.63	0.65
Other households without EA	69.4	0.54	0.53
Average	111.2	0.49	0.44

Table 7.8 Income and expenditure shares of 10% fat tax for different household groups

Household	Fat tax per month in CZK	Expenditure share	Income share
Employees with lower education	120.6	0.51	0.43
Self-employed	129.6	0.47	0.45
Employees with higher education	111.4	0.41	0.34
Households of inactive persons with EA members	126.8	0.48	0.42
Retired (not working) without EA	92.4	0.59	0.54
Unemployed	83.9	0.56	0.57
Other households without EA	67.6	0.53	0.52
Average	112.0	0.49	0.43

Table 7.9 Income and expenditure shares of 20.68 CZK tax per kilogram of fat for different household groups

Household	Fat tax per month in CZK	Expenditure share	Income share
Employees with lower education	122.7	0.53	0.45
Self-employed	118.3	0.44	0.41
Employees with higher education	100.3	0.38	0.32
Households of inactive persons with EA members	135.2	0.53	0.45
Retired (not working) without EA	102.4	0.65	0.59
Unemployed	96.4	0.67	0.70
Other households without EA	71.5	0.55	0.53
Average	110.4	0.50	0.44

7.4 State budget revenues

It is obvious that fat tax would have a negative impact on real income of households, but positive effect on public budget revenues that would increase by a significant amount. I calculated approximated revenues that would government raise by implementing the fat tax if the behaviour of households did not change. In order to compare different types of fat taxes, public budget revenues are very similar, in this case around 6.1 billion of Czech crowns.

Table 7.10 Yearly revenue to the state budget from individual food items and different types of fat taxes (in millions of CZK)

	8.525 CZK	10%	20.68 CZK/kg of fat
Pork meat	1376.92	1255.31	607.30
Smoked products	1920.62	2126.90	1588.32
Canned meat	348.18	342.08	224.63
Butter	445.23	477.11	875.84
Fat and bacon	100.41	54.17	241.92
Edible oils	648.39	235.36	1544.72
Vegetable fats	344.54	240.31	690.29
Cheese	925.71	1377.97	336.62
Total	6109.99	6109.20	6109.64

Although the total revenues to the state budget are almost the same, revenues from individual products are very different across three types of fat taxes. First two taxes are aimed mainly on pork meat, smoked products and cheese, while the third one, probably the most optimal for health, is focused besides smoked products on edible oils, butter and vegetable fats. However, the first two taxes are easier to implement than the third one, which could cause a lot of bureaucratic problems like in Denmark. Moreover, if I take into account an impact on households, ad valorem tax affects the poorest households at least of all three fat taxes.

8 Conclusion

In this thesis I have used detailed data of Czech Statistical Office on expenditures of households and their demographic variables to estimate an impact of simulated fat tax on households and state budget. Excise duties are an important source of government revenues and therefore analysis of their impact is of great significance. I have presented the results of three types of fat taxes – ad valorem and specific excise tax on products with high content of fat and specific excise tax per kilogram of fat in products high in fat.

Health related food taxes are becoming popular in the whole world. There is a pressure on politicians to start solving a problem of increasing obesity and associated health care costs. Hence they implement various taxes on unhealthy food such as sugary drinks or fatty products. In the Czech Republic there has not been a serious intention to implement such a tax yet, although some political parties have proposed such an idea.

My goal in this thesis was to give a prime quantification of how would such a tax influence households and government revenues. Computations for the whole Czech republic show that without the change of consumers' behaviour, contribution of fat tax to the state budget would be several billion of Czech crowns, in case of 10 per cent tax around 6 billion, which is undoubtedly a significant amount that could help the state budget. However, I did not examine elasticities and thus a possible change of behaviour, therefore I expect that the estimated tax revenue after allowing for behaviour to adjust would be much lower but still important enough.

I expected the fat tax to be very regressive what I already confirmed by specific numbers in my computations. This is certainly a disadvantage of the fat tax, as it affects most the poorest households and the richest pay the smallest share of their expenditures. From the distribution of households according to their economic activity it is evident that it would be the unemployed and retired who would suffer most from fat tax. Decrease of real income of families would be on average around 0.5% (111 CZK). At this tax level we could expect at least small adjustment of behaviour, for example, households could buy lower amounts of products with high content of fat.

However, experience from Denmark show that consumers' habits change due to fat tax, but maybe not in a very satisfying way concerning to health. People can always switch to an alternative that is less expensive, for example, they can cross the border to neighbouring countries where the prices are lower or they can start shopping in low-price discount stores instead of high-price supermarkets. Therefore if the government want to achieve positive health results, decrease of fat consumption and transition to healthier food, the money raised by fat tax should be used as a support for households to buy healthy food, for instance, in the form of subsidies for healthy food or zero taxes for some foodstuffs. What is more, there are also other ways to get people to take more care about their health e.g. increased health care insurance for obese people or bonuses for those who follow medical advice.

The current analysis is quite limited, partly because of insufficient data (on content of fat in products in HBS) and also because I did not estimate the own- and cross-price and income elasticities that would indicate more precisely how could the consumers' behaviour change. Future research can include these estimates and there will be more accurate results.

Fat tax is not a typical excise duty as food is an essential part of our lives which complicates the situation. Some kinds of fats are important for proper functioning of the body, the others are on the contrary harmful for us. Another question is, if the government can command people what to eat or not. But what is obvious is that obesity has become a worldwide problem that should be solved and I believe that fat tax together with subsidies on healthy food might be a right step how to start solving this problem.

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