THE IMPACT OF A FAT TAX: PROGRESSIVE IN HEALTH, BUT REGRESSIVE IN INCOME?

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Abstract
Health-motivated taxes have spread over the world to reduce increasing obesity and corresponding health care costs. These taxes have not yet been implemented in the Czech Republic, in contrast to some other, mainly European countries. However, the introduction of a fat tax has been discussed frequently in the Czech Republic during the last few years; here, we provide empirical evidence in order for this public debate to be better informed. We use detailed microeconomic data to estimate the impact of potential fat taxes on household expenditure and government revenues in the Czech Republic. We evaluate the impact of three types of fat taxes: *ad valorem*, specific *per* kilogram of product and specific *per* kilogram of fat. We simulate these in such a way that they all raise the same budget revenues as a 10% *ad valorem* tax on fat-rich products. Accounting for higher food expenditures in the aggregate national accounts than in the detailed microeconomic data results into higher budget revenues, 7.3 and 6.1 billion Czech korunas, respectively. Overall we find, and thus confirm the overwhelming evidence from other countries, that fat taxes are regressive in income.

Keywords: fat tax, tax policy, food, health, obesity, households, government revenues, Czech Republic
JEL Classification: D12, H20, I18

1. Introduction

Many countries are facing an increasingly overweight population, with a growing prevalence of obesity and other health problems caused by an unhealthy diet and lifestyle. One in three adults in the world was overweight or obese in 2008, according to the Overseas Development Institute (2014). A high fat intake and unsuitable composition of fatty acids in the diet are the underlying cause of many non-communicable diseases such as cardiovascular diseases (Dostálová, 2011). The Czech Republic is no exception, with 55% of its population suffering from excess weight or obesity problems according to VZP (2011). Almost half of the deaths in the Czech population in 2011 were the consequence of cardiovascular diseases according to ÚZIS (2012). If the recent trends continue, there will be a significant increase in the number of sick people in future and health care systems will need to expand to meet the increasing demand.

In an attempt to reverse these trends, policy makers (especially in Europe) have introduced taxes on foods and beverages that are considered unhealthy. In France, a tax on sugared soda

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was introduced in 2012; in Hungary, taxes on various ready-to-eat foods were introduced in 2011; in Finland there were reintroduced taxes on sweets in 2011, which had been abolished since 1999; in Denmark, a tax on saturated fat in food products was introduced in 2011.

Other countries, including the Czech Republic, are considering the use of tax to promote health. The potential introduction of a fat tax in the Czech Republic has been discussed frequently by politicians and the media in recent years and, if only because of the continuing pressure on public budgets, it is bound to stay in Czech policy debates in the years to come. These debates have so far suffered from a lack of empirical evidence of the effects such a fat tax would have, and our aim here is to partly fill that gap.

Our objective is to quantify the distributional effects of a fat tax in the Czech Republic. We aim to find out what the impact of a fat tax is on households' expenditures and how much revenue such a new tax could raise. We hypothesise, in line with existing international evidence, that the fat tax is regressive in income. Our methodology is based on an estimation of households' expenditures after implementation of a fat tax, from which we can assess the effects of the tax and the revenue that would be gained from this tax for the state budget.

The paper is structured in the following way: Section 2 reviews the relevant literature, both Czech and international; Section 3 outlines the methodology and the data used. Section 4 discusses the results. Section 5 concludes.

2. Literature Review

In the literature review, we first discuss existing evaluation and simulation studies of fat taxes in different countries, before discussing some of the risks associated with a fat tax. Finally, we provide a short overview of literature on indirect taxes in the Czech Republic. Although this is the first empirical article focussed on fat tax in the Czech Republic, food taxes have been examined in a number of studies for other countries. Most of them use microsimulation models to analyse the impact of fat tax reforms on the basis of household-level data. Whereas Mytton *et al*. (2012) provide an overview of all important food taxes over the past 30 years, we discuss only a few selected studies below.

Smed *et al*. (2007) and Jensen, Smed (2007) used models of consumer behaviour to investigate the potential effects of health-related food taxes, including a tax on saturated fat, on all fats, and on sugar. Mytton *et al*. (2007) found that taxing sources of saturated fat may lead to a reduction in the intake of saturated fats. By contrast, Chouinard *et al*. (2007) studied the impact of a fat tax on the consumption of dairy products using 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 into the impact of fat taxes, and their findings suggest that consumers are less likely to choose a product with a stigmatizing warning label attached to it.

Mytton *et al*. (2012) examined 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 associated changes in consumption of other important nutrients. Taxing a wide range of unhealthy foods or nutrients is likely to result in greater health benefits, however, the strongest evidence supports a tax on sugar-sweetened beverages. In their study of the US states that introduced taxes of around 1–8% on sweetened drinks, neither Kim, Kawachi (2006) nor Powell *et al*. (2009) found a significant association between taxes and obesity, which might be due to the taxes being too low to observe any effect on consumers' health. Lin *et al*. (2011) predict

that a 20% tax on sugary drinks in the US would reduce the prevalence of obesity by 3.5%, but no state has yet imposed such a high tax. 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, and found that a modest tax on selected nutrients or snacks would result in substantial revenue gains for governments, but would be unlikely to affect obesity rates. According to them, only higher taxes (more than 20%) would be likely to lead to a measurable decrease in obesity. 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. Madden (2013) focussed on the economic effects of fat taxes and confirmed that fat taxes are likely to be regressive, although a tax-subsidy combination can be neutral with respect to poverty.

For France, Allais *et al*. (2010) found that a fat tax has small and ambiguous effects on nutrients purchased and a slight effect on body weight in the short run, with a greater effect in the long run. They found that such a tax generates substantial tax revenue but is highly regressive.[1] Thiele (2010) conducted an investigation of excess weight reduction using a fat tax in Germany. The results support the hypothesis that a fat tax would change households' food purchasing habits.[2]

Denmark introduced a new tax on saturated fat in food products in October 2011. It was the first tax of its kind in the world targeting a single nutrient rather than specific groups of food.[3] 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 that 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 was opposed by farmers and food companies who complained that the tax was increasing their administrative costs. Not surprisingly, it was also unpopular among consumers in Denmark, who started making shopping trips to Germany and Sweden to avoid the tax. Jensen, Smed (2012) made an impact assessment of this tax for some of the products most significantly affected by the new tax, namely fats such as butter, margarine and oils. Their analysis suggests that the introduction of the tax on saturated fat had some effects on consumption patterns with consumption of fats dropping by 10 to 20% in the first three months.[4]

1 Allais *et al*. (2010) also analysed the contribution of 22 food categories to total energy and found that the food category with the highest share of energy differs for well-off and modest income households (cheese/butter/cream and sugar-fat products, respectively). They concluded that the most efficient way to reduce the total energy that households purchase would be to increase the prices of prepared meals, cheese/butter/cream, and sugar-fat products.

2 Thiele (2010) assumes that the fat tax applies to saturated fat and that prices increase by 0.5 cents *per* gram of saturated fat. This fat tax implies, for instance, that for a litre of full cream milk with 21.62 grams of saturated fat the price increase will be approximately by 11 cents, and for a litre of semi-skimmed milk with 9.71 grams of saturated fat, the increase will be approximately five cents. It is assumed that consumers bear 100% of taxes.

3 The tax was paid on the weight of saturated fat in foods, if the content of saturated fat exceeded 2.3 grams *per* 100 grams. These included meat, dairy products and animal fats, edible oils, margarine and spreadable blended spreads. Fat tax amounted to an 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 consumer prices.

4 Their analysis also points at shifts in demand from high-price supermarkets towards low-price discount stores, which took advantage of the situation and raised the prices of butter and margarine by more than the pure tax increase.

Secondly, a fat tax causes price increases for certain products, but it may not lead to the desired effect. Lower socioeconomic groups are very responsive to price changes (Jensen, Smed, 2012), and they tend to search for cheaper, equivalent products, or reduce the amount of healthy food they buy, to compensate for the change. Low-income populations consume more junk food than high-income ones (Bowman, 1999) and are generally at higher risk of obesity and chronic diseases (Kim, Kawachi, 2006). In most countries the highest prevalence of obesity is in lower socioeconomic groups (Robertson *et al*., 2007). Therefore, we would expect to see the greatest health benefits in these groups, but also the biggest welfare burden. Furthermore, Thiele (2010) is sceptical about the fat tax because the resulting change in food demand structure would not only be connected with a decrease in energy and fat consumption, but also with an insufficient intake of nutrients such as vitamin D and calcium, which are both responsible for countering the development of osteoporosis. Moreover, Allais *et al*. (2010) showed that price elasticities and resulting nutrient elasticities are inelastic, and concluded that a fat-tax policy would be unsuitable for a substantial effect on the nutrients purchased by French households.

Lastly, we review the literature on indirect taxes other than a fat tax, *i.e.* value added tax (VAT) and excise duties, which have already been implemented in the Czech Republic and have been empirically studied. Schneider (2004) found VAT to be regressive. Klazar, Slintáková (2010) confirmed his results for annual income, but found VAT to be progressive for lifetime income. Klazar *et al*. (2007a) is one of the most comprehensive studies of the impact of indirect taxes, whereas Klazar *et al.* (2007b) focussed on the impact of harmonisation of VAT rates within the EU. Brůha, Ščasný (2006) simulated a 50% increase in excise duty on fuel and found it to be slightly regressive. Janda *et al*. (2010) contributed to the discussion of excise duties on alcohol and, using a demand system, found beer to have the lowest own-price elasticity. David (2010) estimated that consumers bear 81% of the increased tax burden on cigarettes. Dušek, Janský (2012a) and Dušek, Janský (2012b) estimated the impact of proposed VAT rate changes on households and tax revenues, while Janský (2014) did so with the help of estimated elasticities.

3. Methodology

To quantify the distributional effects of a fat tax in the Czech Republic, we apply the standard methodology to the best available data. We use the Household Budget Survey (HBS) conducted by the Czech Statistical Office (CSO) for the year 2011, which is a representative sample of around 3,000 households. The HBS includes detailed information about expenditures. The HBS also includes basic information about household's demographic details as well as incomes, although it is in this respect not as detailed as the other CSO data set, the European Union – Statistics on Income and Living Conditions (EU-SILC). The advantage of the HBS are the expenditures data and from this data we know how much each household spends on various goods and services, in total around 250 expenditure items, together with information on quantity consumed for food and some other expenditure. This makes the HBS a unique data set for the Czech Republic and best suited for our purposes.[5] We also use the same data to derive household-specific prices as unit values for individual commodities by dividing

5 A drawback of the HBS is relatively low data quality, as discussed in detail, for example, by Hait and Janský (2015). Furthermore, it includes only household-related consumption and the detailed data for specific food items might not be very reliable in the HBS.

total expenditure by the purchased quantity, in a manner similar to Janda *et al*. (2010) and Dybczak *et al*. (2010).

Similarly to Smed *et al*. (2007), we simulate the implementation of fat tax in three versions: *ad valorem*, specific *per* kilogram of product and specific *per* kilogram of fat. Proposals for the specific food categories to be taxed fall into two categories: taxes on specific nutrients (*e.g*. fats) and taxes on predefined food and beverage categories (*e.g*. snack foods and 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 obesity. However, taxing nutrients or ingredients is 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.

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 how much fat they have eaten. If we want to achieve a reduction in fat intake, we need to have sufficient information about the amount of fat in the products. Therefore we used detailed nutritional information from Food Research Institute, Bratislava (1995), Teplan (1998) to simulate a fat tax on food with high content of fat, specifically on the following items from the HBS: pork meat, smoked meat products, canned meat, butter, pork fat and bacon, edible oils, vegetable fats, cheese. Table 1 provides the average amount of fat in selected products, according to which we calculated a specific tax *per* kilogram of fat.

Table 1 | Average Quantity of Fat in 100g of Product (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)

We make a number of assumptions. Importantly, we assume that the fat tax would be perfectly transmitted to consumer prices. Furthermore, no behavioural change on the part of consumers is assumed. Therefore, our estimates can be considered to represent the upper boundary of the impact such a tax could really have. We also assume that the entire burden of the fat tax is born by consumers and that no other changes, for example in economic or social policy are made. Similarly, we do not simulate changes to the overall economy, agricultural production or international trade.

In the resulting section on budget impacts we make use of the national accounts data in addition to the HBS to improve the precision of the estimates. Here we briefly describe the national accounts methodology. Estimation of the household final

consumption expenditure (HFCE) in national accounts is carried out on the basis of different data sources, model calculations, methodological adjustments and adjustments for exhaustiveness. The surveyed data source for the estimation of HFCE is also the HBS, which is one of the main data sources for the estimation of production and consumption of agricultural products. The data obtained from HBS are expressed in CZK *per capita* and the product structure is based on COICOP classification. These data are multiplied by mid-year population and for each commodity are adjusted by information on 10% of the richest households compensating known reluctance of richer households to take part in the HBS. In addition, alternative data sources for some items which are underestimated or less reliable in the HBS are used as well as data on purchases of Czech tourists and Czech workers abroad (CSO, 2002).

4. Results

We simulate the imposition of a 10% *ad valorem* tax and then specific taxes, both specific *per* kilogram of product and specific *per* kilogram of fat, so that they all raise the same government revenue and so that comparison of their distributional impact makes good sense.[6] Specifically, we simulate the impact of the introduction of the following three fat taxes: 10% *ad valorem* tax on selected items, CZK 8.525 specific tax *per* kilogram of selected items, CZK 20.68 tax *per* kilogram of fat.

Table 2 | Income and Expenditure Shares of 10% Fat Tax (in %)

Income decile	Fat tax *per* month in CZK	Expenditure share	Income share
(poorest) 1	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
(richest) 10	120.1	0.34	0.26
Average	112.0	0.49	0.43

Source: Authors on the basis of the HBS

6 Furthermore, these values are not out of line with the existing fat taxes implemented in other countries. The specific tax is similar to the tax implemented in Hungary, where there is 10 forint tax (€ 0.04) *per* item for products high in fat, sugar and salt. A 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, valid in the USA (in 23 states) on sugar-sweetened drinks, with a tax rate between 1–8%.

Table 3 | Income and Expenditure Shares of 8.525 CZK Fat Tax (in %)

Income decile	Fat tax *per* month in CZK	Expenditure share	Income share
(poorest) 1	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
(richest) 10	110.0	0.31	0.24
Average	**111.2**	**0.49**	**0.44**

Source: Authors on the basis of the HBS

Table 4 | 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
(poorest) 1	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
(richest) 10	103.6	0.29	0.22
Average	**110.4**	**0.50**	**0.44**

Source: Authors on the basis of the HBS

To assess the distributional impact, we divide households into income deciles according to their monthly income.[7] Tables 2, 3 and Table 4 show the impact of 10%, CZK 8.525 *per* kilogram and CZK 20.6 *per* kilogram fat taxes on households' expenditure. We present

7 We compare households' incomes using the OECD adjustments for the size of a household, where the first adult of the household receives weight 1, other members over 13 years old receive weight 0.7, and children receive 0.5.

the results for the share of the tax in households' net monthly income and expenditure, in different household income deciles. We computed the share as the ratio of expected monthly fat tax expenditure of the household and net monthly expenditure or income of the household taken from the HBS data; and we took the mean for individual income deciles. Additionally, Tables 5, 6 and Table 7 show households' fat tax expenditures on individual food items, also categorised according to household income.

Table 5 | 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
(poorest) 1	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
(richest) 10	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**

Source: Authors on the basis of the HBS

Table 6 | Expenditures on Individual Food Items due to 8.525 CZK Fat Tax

Income decile	Pork meat	Smoked products	Canned meat	Butter	Fat and bacon	Edible oils	Vegetable fats	Cheese
(poorest) 1	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
(richest) 10	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**

Source: Authors on the basis of the HBS

Table 7 | 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
(poorest) 1	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
(richest) 10	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**

Source: Authors on the basis of the HBS

The results in these tables confirm the overwhelming evidence from other countries that fat taxes are regressive. We can see that households with higher incomes would on average dedicate a significantly lower share of their total expenditure and income to the fat tax than households with lower incomes.

Differences between *ad valorem* and specific taxes are mainly due to their impact on individual food products, but to a limited extent also their impact on different income groups. Since specific taxes increase the price of all products by the same amount, regardless of the pre-tax value of the product, the prices of cheap products increase relatively more under such a scheme, and those who suffer the most are mainly low-income consumers who are forced to pay this disproportionate increase in prices. Therefore specific taxes have a bigger impact on low-income households than an *ad valorem* tax, in particular the tax *per* kilogram of fat, which very significantly increases the price of products with the highest content of fat. An *ad valorem* tax increases the price of all products proportionately based on their pre-tax price, thus low-income households who buy cheaper products do not suffer so much. From the amounts in Czech korunas that households would pay due to such a fat tax, we can infer that if the tax were to be specific, the biggest amount would be paid by middle-income families. This might suggest that middle-class households have bad eating habits and their diet is unhealthy. Higher-income households, on the other hand, would pay less in tax, presumably because they have enough money to afford higher quality and more healthy food products.

Overall, we found fat taxes to be regressive also for the Czech Republic and we have documented that specific taxes, especially the one tax *per* kilogram of fat, have a bigger impact on low-income households than an *ad valorem* tax. For many, this would seem to be a disadvantage of the fat tax, as it affects the poorest households more than the richest ones. If desired by the policy makers, this could be compensated by a parallel tax or social benefit measure aimed at low-income households or other affected groups. We propose that similar compensating measures are discussed alongside with the fat tax itself.

Not surprisingly, the results for individual food items confirm that, from a health perspective, the most effective fat tax would be one that levies a specific amount *per* kilogram of fat. Households would have to pay the most money on products with the highest fat content, such as edible oils, butter, vegetable fats and smoked meat products. If this made them change their purchasing behaviour, their fat intake would be expected to decrease significantly.

An *ad valorem* tax would increase households' expenditures mainly on smoked meat products, pork meat and cheese, *i.e.* on products with a high unit value and relatively high consumption. This could lead to lower consumption of pork meat and its products and a possible transition in consumer habits towards greater consumption of other types of meat, which might have positive health results, too.

A specific tax on products with high fat content would have a similar impact to that of the *ad valorem* tax. Households would spend the most in fat tax on pork meat and smoked meat products but, compared to an *ad valorem* tax, they would have lower tax expenditures on cheese and higher tax expenditures on edible oils and vegetable fats. Therefore, this could also be a suitable type of fat tax in that it would probably result in a decrease in fat consumption.

In addition to income deciles and product groups, we analysed the impact of a fat tax according to household type (we do not show the detailed results here owing to limited space). The highest amounts in fat tax would be paid by households combining inactive individuals with economically active members, employees with lower levels of education, and the self-employed. However, the biggest fat tax expenditure shares would be paid by the unemployed and retired people, mainly due to their relatively low income. On the other hand, households of employees with higher education would have the smallest share of expenditures on fat tax in their total expenditures, probably because of their better-paid jobs and better information about healthy food.

Table 8 | Revenue to the State Budget from Individual Food Items and Different Types of Fat Taxes (in millions of CZK)

	10%	8.525 CZK/kg	20.68 CZK/kg of fat
Pork meat	1,255	1,377	607
Smoked products	2,127	1,921	1,588
Canned meat	342	348	225
Butter	477	445	876
Fat and bacon	54	100	242
Edible oils	235	648	1,545
Vegetable fats	240	345	690
Cheese	1,378	926	337
Total	**6,109**	**6,110**	**6,110**

Source: Authors on the basis of the HBS

We estimate the revenues that the government could raise by implementing such a fat tax, if the behaviour of households did not change. Since the public budget revenues of

all three fat tax schemes considered are the same by definition at around 6.1 billion Czech korunas, it is more interesting to look at the variation across product groups shown in Table 8.

The first two taxes are aimed mainly at consumption of pork meat, smoked meat products and cheese, while the third one, probably the most optimal for health, is focussed besides smoked meat products on edible oils, butter and vegetable fats.

However, the first two types of tax are easier to implement than the third, which could cause a lot of bureaucratic problems, as it did when implemented in Denmark. Moreover, an *ad valorem* tax might be the preferable option since it affects the poorest households the least of all three fat tax types and, due to its design similarity to the already implemented VAT, the administrative costs associated with its implementation might be the lowest.

Table 9 | Revenue to the State Budget from Individual Food Items and Different Types of Fat Taxes Recalculated according to the National Accounts (in millions of CZK)

	10%	8.525 CZK/kg	20.68 CZK/kg of fat
Pork meat	1,501	1,647	726
Smoked products	2,544	2,298	1,899
Canned meat	409	416	269
Butter	571	532	1,048
Fat and bacon	65	120	289
Edible oils	281	775	1,848
Vegetable fats	287	413	825
Cheese	1,648	1,108	403
Total	**7,305**	**7,308**	**7,308**

Source: Authors on the basis of the HBS and the CSO's national accounts

However, we are aware of the fact that the Household Budget Survey cannot provide complete information about total household expenditures. Our calculation of revenues to the state budget based on HBS data is only as precise as the HBS data itself. Therefore we decided to compare the HBS data with the national accounts data from the Czech Statistical Office. We computed total household expenditure on food from the HBS data with the help of a population number of the Czech Republic as of the end of June 2012 and also obtained data on food expenditure from the national accounts. We found out that household final expenditure on food from the national accounts (in national concept) is approximately 20% higher than our calculation of total household food expenditure. Therefore we add a new Table 9 where we update our estimates of the revenue to the state budget by multiplying the numbers by 1.196 which is the share of national accounts food expenditure and the HBS calculated food expenditure.[8] Not surprisingly, in the table we can see that the impact

8 This adjustment, the multiplication of all the estimates by the same ratio, is very straightforward, but it implicitly requires further assumptions, for example, about the food expenditures not accounted for in the HBS data, but present in the national accounts data, *i.e.* we assume that they consist of the same food items. However, we consider this adjustment as sufficient for our purposes and we leave the related questions – for example, of how these expenditures not accounted for in the HBS data, maybe mostly consumed by high-income households, might influence the distributional impact results – for further research.

on state budget revenue is significantly higher using national accounts approach and for all types of taxes it amounts to approximately 7.3 billion Czech korunas and we consider this a more realistic estimate of the revenue impacts.

5. Conclusion

Health-motivated taxes have spread over the world in an attempt to reduce increasing obesity and corresponding health care costs. In contrast to some other European countries, these taxes are not currently in force in the Czech Republic. However, the introduction of a fat tax has been discussed frequently during the last few years and, for this public debate to be better informed, we have here provided an initial quantification of how such a tax would influence households and government revenues. We applied detailed data from the Czech Statistical Office in order to compare results for three types of fat taxes – *ad valorem* tax, specific tax on products with high fat content, and specific tax *per* kilogram of fat in fat-rich products. A 10 *per cent* value added tax on fat-rich products, or equivalently high specific taxes, could raise around 6–7 billion Czech korunas in additional government revenues.

We have confirmed the overwhelming evidence from other countries that fat taxes are regressive. Furthermore, we have found that specific taxes, especially a tax *per* kilogram of fat, have a bigger impact on low-income households than an *ad valorem* tax. For many, this would seem to be a disadvantage of the fat tax, as it affects the poorest households more than the richest. Nevertheless, this could be compensated by a parallel tax or social benefit measure aimed at low-income households.

Our analysis has some limitations, partly due to insufficient data (it would have been useful to have access to data with more detailed expenditure categories, and more information about fat content) and also because we did not estimate the own- and cross-price and income elasticities for the individual product groups that would allow us to take consumers' behaviour into account. Future research should focus on estimating these elasticities so as to obtain better results. Although we do not take behavioural response into account and our results can thus be considered upper bound estimates, experience from Denmark shows that consumers' habits change due to fat tax and not always in a very satisfying way with regards to health. People can always find 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 wants to achieve positive results for health, including lower consumption of fat and a transition to healthier food, the money raised by a fat tax could be used to support households to buy healthy food, for instance, in the form of subsidies for healthy food products. What is more, there are also other ways to get people to take more care about their health (*e.g.* increased health care insurance premiums for obese people or bonuses for those who follow medical advice) and the benefits and costs of a fat tax should be rigorously compared with these.

Fat tax differs from other targeted taxes, such as excise duty on cigarettes, since food is an essential part of all our lives, and this complicates the situation. Whether a government can (and should) command people what to eat, or not to eat, is less evident than that obesity has become a worldwide problem. A fat tax, possibly combined with subsidies for healthy food such as vegetables, might be a good step to help to solve this problem.

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