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IES Working Paper: 25/2014



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**Bibliographic information:**

Janský P. (2014). "Impact of Changes in Excise Duties on Households in the Czech Republic" IES Working Paper 25/2014. IES FSV. Charles University.

This paper can be downloaded at: <http://ies.fsv.cuni.cz>

# Impact of Changes in Excise Duties on Households in the Czech Republic

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August 2014

## **Abstract:**

Excise duties are an important source of government revenue and their rates change relatively often in the Czech Republic. Reforms of excise duties change the prices of goods, a change to which households respond by adjusting their expenditures. I use detailed Czech Statistical Office data and estimates of own- and cross-price and income elasticities for individual households to create a microeconomic simulation model that enables me to simulate the impact of changes in excise duties on households' demands. I show the distributional impact of current excise duties and then I simulate the impact of hypothetical increases of 10 per cent in each of them. I further simulate impact of certain approved or proposed changes in excise duties including the unsuccessful 2012 proposal to introduce an excise duty on wine.

**Keywords:** consumer behaviour, excise duties, tax reforms, households  
**JEL:** D12, H20, H31

## **Acknowledgements:**

I thank Michal Bauer, Richard Blundell, Libor Dušek, Kamil Galuščák, Ondřej Schneider for helpful comments and discussions at various stages of the preparation of this paper. Support from the Technology Agency of the Czech Republic (TACR TD010033), the CEFRES Fellowship and the Czech Science Foundation (GACR

403/10/1235) is gratefully acknowledged. The data were collected by the Czech Statistical Office. I have also benefited from institutional support from the Institute for Fiscal Studies, Institute of Economic Studies of the Faculty of Social Sciences at the Charles University and CERGE-EI, a joint workplace of Charles University and the Economics Institute of the Academy of Sciences of the Czech Republic, Politických vězňů 7, 111 21 Prague, Czech Republic. All errors are my own.

# 1 Introduction

Excise duty is an indirect, consumption tax applied to a purchase of certain types of goods. Excise duties are applied in most countries, including the Czech Republic. Excise duty in the Czech Republic is imposed on, in the order of government revenue magnitude: mineral oils (most importantly motor fuels, petrol and diesel), tobacco products (cigarettes, cigars and other products) and alcoholic beverages (beer, spirits and other alcoholic beverages; still wine is excluded).

Excise duties are important for most governments from a macroeconomic point of view, and I here focus on their microeconomic aspects in the Czech Republic. My main motivation is to improve evidence-based policy making through applying appropriate methods for the simulation of changes that are being proposed or implemented in the Czech Republic and also to shed more light on impact of current excise duties. Learning about the impact of the current system and changes in excise duties through microeconomic analysis is one of the first steps on the way to recommending and implementing changes that will improve it.

There is no shortage of recently approved or proposed changes in excise duties and I identify at least two general sources: rising government debts, which incentivise public discussions about raising taxes, including excise duties, and the European Union, to which regulation of excise duties member governments need to respond. Specific examples for the Czech Republic are the unsuccessful 2012 proposal to introduce a new excise duty of 10 Czech crowns per litre on wine (circa 0.4 euro), and the increases of Czech excise duty on cigarettes in 2013 and 2014 (which is in total a circa 7% increase) to comply with minimum rates set by the European Union.

This article aims to answer the following questions: How much households pay in excise duties? What is the impact of various hypothetical, approved or proposed changes in excise duties on the demand of households in the Czech Republic? Are the excise duties progressive or regressive? To answer these questions, I apply methods that are explained in detail, including the fact that I use the previously estimated income and price demand elasticities for Czech households as well as the best available data for the Czech Republic.

The rest of the article proceeds as follows: section 2 briefly reviews the literature; section 3 explains the methodology including the details of excise duties in the Czech Republic and the available data; section 4 discusses the results; section 5 presents conclusions.

## 2 Literature review

In the following discussion of the economic literature, I briefly review two areas: works that asked similar questions in other countries, and literature specifically studying the situation in the Czech Republic.

Crawford et al. (2010) provide an excellent introduction to indirect taxation generally as well as excise duties on alcohol and tobacco specifically. Although their discussion is centred on the United Kingdom, their reviewed literature and most of their arguments are relevant for other European Union countries, as well as the Czech Republic specifically. Crawford et al. (2010) also provide empirical results on income and expenditure shares of excises and find that tobacco taxes are highly regressive on the basis of income but less so on the basis of expenditure, and indicate similar trends for alcoholic drinks. These observations lead me to apply a similar distributional analysis in this current article.

For some countries demand systems have been estimated specifically for the analysis of excises such as Jones and Mazzi (1996) for an Italian tobacco market. They find that quadratic Engel curves in their QUAIDS model are important, and discuss the implications of their demand system estimates for indirect tax policy. For Mexico, Abramovsky et al. (2012) applied the QUAIDS model and simulated changes in VAT as well as excise rates and they present results of distributional impact for the evaluated overall tax reforms rather than for changes in excise rates separately. Gruber et al. (2003) manages to estimate price elasticities of cigarettes in the presence of smuggling using detailed data from Canada and provides a very good literature review on this important problem that I am currently unable to empirically address for the Czech Republic due to insufficient data.

Methodologically similar studies for the Czech Republic have not often studied indirect taxation. For example, Večerník (2006) used the Czech Microcensus survey in 1988, 1996, and 2002 to describe the redistribution via the tax-and-benefit system at the household level, but his analysis did not include excise. Schneider & Jelínek (2005) used the household budget surveys in 1999-2002 to analyse the distributive impacts of particular welfare benefits and tax allowances, however, their analysis did not include excise. Therefore, Klazar et al. (2006), and related publications such as Klazar & Zelený (2008), is likely the most comprehensive, although somewhat outdated, study of impact of indirect taxes, including excise duties, in the Czech Republic. They develop a microeconomic simulation model for VAT and excise

duties, which, however, does not account for the potential for consumers to substitute between goods as relative prices changes due to changes in taxes.

There are also a number of more recent studies that simulate the impacts of changes in indirect taxation in the Czech Republic. Dušek & Janský (2012a) and Dušek & Janský (2012c) provided results for a static simulation of the impact of changes in value added tax (VAT) rates on households' demands and government revenues, without specifically modelling the behavioural response of households. This behavioural response was later estimated by (Janský 2014), who applied a consumer demand model of the quadratic almost ideal system (QUAIDS) on the basis of Banks et al. (1997).

Since it is not the objective of this section to review all the articles studying various excise duties, let me discuss just four that are very relevant for this current work: two on tobacco, the third and fourth one on fuel and alcohol, respectively. David (2010) analyses the incidence of cigarette taxation in the Czech Republic using the data on prices and changes in excise duties between 2004 and 2009 and finds that consumers bear 81% of the increased tax burden, which corresponds with the often assumed incidence between 80 and 100%. Shirane et al. (2012) discuss the tobacco industry and tobacco taxation in the Czech Republic and conclude that there is substantial scope for tobacco tax increases in the Czech Republic.

Brůha & Ščasný (2006) use a microsimulation model to analyse distributional effects of environmental regulation in the Czech Republic. For example, they simulate a 50% increase in the excise duty on fuel and they find this excise duty to be slightly regressive. Janda et al. (2010) is a relevant contribution to the discussion of excise duties on alcohol in the Czech Republic. They estimated a Czech demand system focused on alcoholic beverages: beer, wine and spirits. They find that beer has the lowest own-price elasticity and suggest that from the fiscal perspective, taxing beer should be relatively more efficient than levying taxes on the other two beverage types. By contrast, they find income elasticity for beer to be relatively high.

The existing research on simulating the impact of excise duties in the Czech Republic is somewhat limited in both its scope and in the methods used and my objective is to fill in this gap in two dimensions. First, and in contrast to Klazar et al. (2006), I take into account behavioural response through the inclusion of elasticities in my microeconomic simulation model. Second, and in comparison to David (2010) or Janda et al. (2010), I study all types of excises together, which has obviously its disadvantages since I cannot take into account all

the detailed characteristics of individual excise duties, but on the other hand it enables me to directly compare their distributional impact.

### **3 Methodology**

This section describes methodology and it also provides an overview of excise duties for the Czech Republic and connects them with the available data. Excise duties form an important part of government revenues for all European Union members and in the Czech Republic they made up 14.3% of the total tax revenue of the central government in 2012 (130.1 billion CZK out of the total tax revenue of 912.3 CZK) according to Ministry of Finance of the Czech Republic (2013). As shown by Crawford et al. (2010), the Czech Republic ranks below average but not at the bottom in terms of the amount of excise duties when compared to other European Union members. Excise duties are obviously important for the Czech government and to study their microeconomic aspects I need both detailed data and in-depth knowledge of what excise rates apply.

#### **3.1 Data**

The most suitable data for the Czech Republic are the Household Budget Survey (HBS) from the Czech Statistical Office (CZSO), but as I explain below, these are quite limited in some respects. The HBS provides detailed information on households' expenditures and characteristics in a representative sample collected on a yearly basis of around 3000 Czech households. For each of them, the HBS contains information on how much they spend on various goods and services (around 250 expenditure items), who they are (around 60 demographic variables) and how they earn their income (around 30 income items). In addition to concerns discussed, for example, in (Janský 2014), there are issues specific to excise goods, discussed to some extent in Janda et al. (2010), mainly that the expenditures on alcohol or tobacco might be misreported and not representative of the population. I use the last available year of the data as of mid-2013, which is 2011.

For prices I also employ the HBS. For some goods, the HBS includes not only expenditures but also the quantity of purchased goods and services. It is then possible to divide expenditures by the quantity to derive unit values, and used these as prices. This has the advantage of relatively easily obtaining very detailed expenditure- and household-specific prices, but it can in some cases be inaccurate, as discussed in (Janský 2014). Since I focus



here on narrowly defined expenditure categories similarly to Janda et al. (2010), it seems reasonable to use the HBS data on prices instead of the price data gathered for the purpose of the Consumer price Index.

Table 1 below provides an overview of the extent of information available from the HBS on excises. This Czech data seem of average quality in international comparison and the detail of available data could be improved – especially as far as the quantities of goods are concerned since these are only available for alcoholic drinks. In the table and the text below I discuss excise rates as applied in the Czech Republic according to the current law, Law on excise duty (2013), or as being implemented or discussed in the case of future changes or proposals, respectively. Also, I provide a more detailed description of data relevant for excise duties and I discuss solutions to problems posed by the unavailability or low detail of data.

### **3.2 Excise duty on motor fuels**

Excise duty on motor fuel is the most important for government revenues, but is very difficult to model because of the low quality of data. There are a number of specific problems. First, the HBS does not include information on quantity of motor fuel, but only on the relevant expenditure. The other problem is that the HBS expenditure item includes not only fuels, but also oil and lubricants for personal transport. Furthermore, the expenditure is not divided between petrol and diesel (gas oil), which are subject to different excise rates.

As is the case with most other excise duties, the one on motor fuel is specific, specified in litres in this case, rather than ad valorem. The excise rate for petrol and diesel is currently 13.71 CZK and 10.95 CZK per litre, respectively.<sup>1</sup> In the absence of the quantity of fuel consumed from the HBS, I estimate the excise duty on fuels paid as a percentage of expenditure on fuels on the basis of information that is available. In the process I make a few other assumptions to deal with some other data insufficiencies.

I begin with estimating the quantity consumed from the expenditure data in the HBS in the following way. I assume that the HBS expenditure item does include only fuels, either petrol or diesel, but not oils or any other lubricants. I then employ the shares and prices of petrol and diesel in the Czech Republic during 2011 from Ministry of Transport (2012). Most passenger cars used petrol (71.25%, 3 260 905 out of the total of 4 577 007) rather than diesel

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<sup>1</sup> These excise rates for the two motor fuels are in a group of eight excise goods including other mineral fuels that I assume here to be irrelevant for households.

(28.75%, 1 316 102). I use this ratio, assuming that it is representative for Czech households and that it will remain the same in the future. The average price of the most popular petrol (i.e. Unleaded Petrol 95 Natural) was almost the same as the average price of diesel (34.58 CZK and 34.25 CZK, around 1.4 euro, per litre, respectively). I further combine this information with excise rate for petrol and diesel in 2013. On the basis of these assumptions and information, I estimate the weighted average excise duty of 12.30 CZK per litre. That is equivalent with a weighted average of excise duty paid in each CZK spent on motor fuels, jointly petrol and diesel, to be around 37.44% of the overall expenditure on motor fuels.

With this approach I can deal with some of the problems posed by the data to a certain extent, but I cannot very well take into account the following four issues, which represent limitations for the estimates not only for fuel, but also other excises. First, the HBS does not distinguish whether the fuel was bought in the Czech Republic or abroad. Similarly, purchases of fuel by foreign households are not included in the HBS. One further problem of the data is that tourists are not taken into account in the data, yet their consumption and excise duties paid might be important (probably more so in the case of alcohol beverages and tobacco). I assume for simplicity that the fuel was bought in the Czech Republic. Second, I ignore the tax competition and resulting price differences that influence the decisions of drivers as to where to purchase motor fuel, when travelling abroad or living close to the border. This holds also for the other excises. These cross-border effects were partially modelled for the Czech Republic by Dušek & Janský (2012b), but more specialised research is warranted for the Czech Republic and its neighbours for example along the lines of approach developed by Leal et al. (2009), who provide evidence on these effects for Spanish regions. Third, similarly I am currently unable to take into account the problem of smuggling, which requires further research, for example, along the lines of Gruber et al. (2003). Fourth, the HBS provides the best representative sample of households and their expenditures in the Czech Republic, but the data does not include sectors other than the household sector. This fact holds also for other excise goods and this is an important limitation of the available data that implies that I do not simulate impact on government revenues.<sup>2</sup>

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<sup>2</sup> Some preliminary estimates suggest that this issue varies in importance across the various excise duties. One possible measure of the extent of this issue is to compare the government revenues from excise duties and the sum of the excise duties implied by the expenditures on excise goods that are observed in the representative sample and extrapolated for the whole population. The implied revenues from the HBS are not more than a half of the government revenues for 2011. These differences warrant further research using other data sources than the HBS. One of their implications for this work is that I do not estimate the total excise duty paid by households in the Czech Republic on the basis of the representative sample and its extrapolation for the whole

### 3.3 Excise duty on tobacco

The quality of data for the second most important excise duty in terms of the government revenue, tobacco, is, if anything, worse than with motor fuels. Not only does the HBS not include information on the quantity of the tobacco products consumed, but the computation – and therefore also the simulation – of the tobacco excise duty is very complex.<sup>3</sup> 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. The excise duty levied per kilogram of tobacco for smoking increased from 1400 CZK in 2012 to 1635 CZK in 2013 and should further increase to 1800 CZK in 2014.<sup>4</sup>

For cigarettes, the European Union requires that the excise duty on cigarettes comprises both ad valorem and specific components and it is computed as the following sum: Excise duty on cigarettes =  $\left(\frac{\text{Excise duty percentage rate} * \text{Price for the consumer}}{100}\right) + (\text{Excise duty fixed rate} * \text{Number of cigarettes})$ , where excise duty percentage rate was 28% in 2012 and decreased to 27% in 2013 and where excise duty fixed rate was 1.12 CZK (around 5 euro cents) per cigarette in 2012 and increased to 1.16 CZK in 2013. Importantly, there is an additional minimum excise duty rate per cigarette that was 2.10 CZK (almost 10 euro cents) in 2012 and is 2.18 CZK in 2013 and will be 2.25 in 2014. Because this minimum excise duty applies to a large number of cigarettes sold and there is no additional information from the HBS on the price of the cigarettes purchased, I assume this minimum excise duty to be the excise rate applied in the data.

Since the HBS only includes information on the expenditures and not on the quantity consumed, I employ the average price in 2012 as 69.72 CZK per cigarette pack of 20 and I assume the prices of 50 CZK per cigar and 1000 CZK per kilogram of tobacco. In contrast to motor fuels, there is a substantial price variation across the various specific types and brands of tobacco products. Therefore the simulation estimates are likely to be less precise.

### 3.4 Excise duty on alcohol drinks

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population. However, I assume that, even in the presence of underreporting of consumption and other data problems discussed earlier, the data is suitable for study of distributional differences across households.

<sup>3</sup> On a more optimistic note, let me note that the CZSO is, since 2010, now providing information on three different groups of tobacco products (cigarettes, cigars, other tobacco) rather than only one, as until then. This is a substantial improvement for our purposes, because a different excise duty rate is levied on each of these groups.

<sup>4</sup> This is around 72 euros, which is substantially more than the minimum 42 euros set by the EU; the government is implementing this change to increase its revenues, not to comply with the EU regulations.

Excise duty on alcohol is the least important of the three groups from the point of view of government revenues, but the HBS data on alcoholic beverages are comparatively the most detailed. The HBS provides information both on expenditures and on the quantities of alcoholic beverages consumed (wine, beer, spirits). I therefore employ the excise duty rates directly and link them with the consumption for each household. The excise duty rates for beer are currently at 1.6 CZK per half litre of beer of 10 degrees Plato (most popular type of beer in the Czech Republic) or 1.92 CZK per half a litre of beer of 12 degrees Plato.<sup>5</sup> The excise duty for still wine is currently zero.<sup>6</sup> The combination of available quantities in the HBS and straightforward excise rates enables a relatively reliable simulation of the changes in excise duties for beer and wine. The excise rate for other alcohol is 285 CZK per litre of ethanol. This implies 57 CZK for spirits per half litre at 40%, but the HBS does not provide information on the alcohol-content of the alcoholic drinks and this hampers the simulation.

### 3.5 Elasticities

As shown by Banks et al. (1996), elasticities play an important role in simulating the impact of tax reform.<sup>7</sup> I use income and own- as well as cross-price elasticities, as estimated and presented in the results of consumer demand model of the quadratic almost ideal system (QUAIDS) in (Janský 2014), originally for the purpose of simulating impact of changes in other indirect taxation, value added tax.<sup>8</sup>

In using these, I assume that the elasticities estimated for wider expenditure groups apply also for the more narrowly defined commodities. Specifically, on the basis that the sixth group Transport and recreation, here usually shortened as transport, includes expenditures on motor fuels and that the second group Eating out and other luxuries, here usually shortened as “Eating out etc.”, includes all other excise duties, I assume that they share the same

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<sup>5</sup> Degrees Plato indicate the strength of the beer, and beers of 10 degrees Plato are the most popular in the Czech Republic. Also, I do not take into account lower rates for small independent breweries.

<sup>6</sup> I assume that there is no excise duty imposed on any wine, although sparkling wines are already subject to excise duty (24.4 CZK per litre), because the data lack sufficient detail to differentiate between these two categories of wine. I might therefore overestimate the impact of the new excise duty on wine.

<sup>7</sup> The Czech Ministry of Finance seems to agree in the case of changes in excise duties. The government budget for 2013, Ministry of Finance of the Czech Republic (2012), notes that “Due to the low elasticity of excise goods, we expect no significant changes in the overall government revenues from excise duties.” Translated from the original text, Ministry of Finance of the Czech Republic (2012), page 13.

<sup>8</sup> A drawback of using QUAIDS results is that the QUAIDS model does not allow for positive or negative externalities from expenditure on certain goods. Prominent among these goods are excises studied here including fuel, alcohol and tobacco. The assumption of no externalities can be neither altered nor tested and is a limitation on the usefulness of QUAIDS, for example, when looking at the impact of excise duties on goods with negative externalities as I am doing here.

elasticities as estimated in (Janský 2014) for these respective groups. To say that these elasticities estimated for broad expenditure groups apply to the individual expenditure items is a rather strong assumption.<sup>9</sup>

The empirical evidence contradicts this assumption to some extent. From the existing research on the Czech Republic it seems that, for example, the assumed own-price (income, respectively) elasticity for tobacco and alcohol, which is -1.202 (1.100) on the basis of (Janský 2014), is, if anything, slightly overestimating the reaction of the consumers. (Janda et al. 2010) estimated elasticities separately for beer, wine and spirits and found the own-price elasticities to be -0.9715, -1.0880, -1.2104, respectively (0.9829, 0.5609 and 0.3458 for income elasticities). Similarly, David (2010) discusses tobacco elasticities and considers those between 0 and -1 to be more likely. The assumption is least likely to be in line with the reality in the case of fuel, where I am not aware of rigorous evidence for the Czech Republic, but using meta-analysis methods for the international evidence, Havranek et al. (2012) found that after correction for publication bias the average long-run elasticity reaches -0.31 and the average short-run elasticity only -0.09.

### **3.6 Simulation**

This subsection describes the process of simulation, which is similar to Klazar et al. (2006) or Brůha & Ščasný (2006). I first estimate the excise duty paid by each household. When quantities of an excise good are available from the HBS (alcoholic beverages), I apply the above assumed excise rate to them to estimate the excise duty paid by each household. When quantities are not directly available from the HBS (the other excises), I divide the household-specific expenditures on excise goods by the above-derived average prices to arrive at quantities for each household, to which I apply the assumed excise rate to estimate the excise duty paid by each household.

On the basis of these estimates of excise duties paid by each household, I model changes in excise duties as changes in prices. I simulate changes in excise duties through their influence on prices on household level. Similarly to Abramovsky et al. (2012), I simulate changes in excise rates as changes in the prices of the expenditure groups used for the estimation of the demand system. Specifically, I assume that changes in excise duties are fully reflected in

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<sup>9</sup> The assumption implies the same behavioural response of consumers to rises of both alcohol drinks and cigarettes, although they are likely to differ. Also, (Janský 2014) estimated the eating out expenditure group to be a luxury, but both alcoholic drinks and cigarettes are likely necessities at least for people addicted to those drugs.

prices of the products.<sup>10</sup> Because I rely on expenditure groups of which the excise good is a part of, I assume that changes in prices of excise duties are proportionately reflected in the price indices of the expenditure groups according to their shares in group expenditures.

Assuming that all excise duties are specific (which is true with the partial exception of cigarettes, which I however model as an exclusively specific excise duty), the price of excise good can be written as  $(\text{What the seller receives} + \text{Excise duty}) \times (1 + \text{VAT})$ . Since VAT is levied on the price of the product including the excise duty, a change in excise duty that changes a product's price will be magnified by the VAT rate.<sup>11</sup> Percentage change in price of excise good can be derived as  $\frac{(\text{Change in excise duty}) \times (1 + \text{VAT})}{\text{Price of excise good}}$ . I subsequently derive percentage change in price of the expenditure group, of which excise good is a part of, by weighting the percentage change in price of excise good with its share in the expenditures of the respective expenditure group.

I then model how households respond to the estimated changes in prices resulting from changes in excise duties. I assume that households respond in line with their estimated elasticities. As explained above, I do not have estimates of elasticities for every excise good and therefore I need to rely on elasticities of expenditure groups of which the excise good is a part.

Table 1 sums up some of the methodology discussed in this section including the data available in the HBS for excise goods as well as the related excise rates and how I deal with some of the deficiencies of the data and complexities of excise rates.

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<sup>10</sup> This assumption is more likely to be fulfilled in the long term rather than the short term, and this should be taken into account when interpreting the results. Furthermore, there is some empirical support for this assumption in David (2010), who found that consumers bear 81% of the increased tax burden on cigarettes.

<sup>11</sup> The last year for which the data is available is 2011. Over the years, VAT rate changed quite significantly, but in order to avoid the contamination of the simulation of excise duties with the impact of VAT changes, I assume and simulate the impact as if the VAT rates were the same for the whole period as in 2013, that is 21% for the standard and 15% for the reduced VAT rate. VAT thus magnifies the direct impact of a change in excise duties by 17.36% (21/121).

**Table 1. Excise duties and the HBS information on excise goods in the Czech Republic**

Excise good	HBS name (code)	Data on quantity available (units)	Price	Excise duty rate	Elasticity used
Petrol and diesel	Fuels and lubricants for personal transport equipment (3640)	No	The average price of the most popular petrol (i.e. Unleaded Petrol 95 Natural) of 34,58 and of diesel of 34,25 CZK per litre (Ministry of Transport 2012)	13.71 CZK per litre for petrol and 10.95 CZK per litre for diesel. I assume that all expenditures are on either petrol (71.25% according to (Ministry of Transport 2012)) or diesel and a weighted average excise duty of 12.30 CZK per litre.	Transport from (Janský 2014)
Cigarettes	Cigarettes (3901)	No	Assumed to be 69.72 CZK per cigarette pack of 20 on the basis of (European Commission 2013)	28, 27 and 27 % as an ad valorem part, 1.12, 1.16 and 1.19 CZK per piece as a specific part with a required minimum, which I assume to be the excise rate, of 2.10, 2.18 and 2.25 in CZK per piece in 2012, 2013 and 2014, respectively.	Eating out etc. from (Janský 2014)
Cigars	Cigars (3902)	No	Assumed to be 30 CZK per piece on the basis of author's market research	1.25, 1.30 and 1.34 CZK per piece in 2012, 2013 and 2014, respectively.	Eating out etc. from (Janský 2014)
Other tobacco	Other tobacco (3903)	No	Assumed to be 3000 CZK per kilogram on the basis of author's market research	1400, 1635 and 1800 CZK per kilogram in 2012, 2013 and 2014, respectively.	Eating out etc. from (Janský 2014)
Wine	Wine from grapes and other fruit, other, consumed in restaurants, cafes, bars (2841, 2842, 2941, 2942)	Yes (litre)	Estimated as household-specific unit values from the HBS	No excise duty currently levied on (still) wine	Eating out etc. from (Janský 2014)
Beer	Beer, Beer consumed in restaurants, Beer consumed in cafes, bars and similar establishments (2830, 2931, 2932)	Yes (litre)	Estimated as household-specific unit values from the HBS	1.6 CZK per half litre of beer of 10 degrees Plato (most popular and assumed as the excise rate), with higher rates for higher degrees and lower rates for small independent breweries.	Eating out etc. from (Janský 2014)
Spirits and other alcohol	Spirits, Other alcoholic beverages consumed in restaurants, cafes, bars (2850, 2951, 2952)	Yes (litre).	Estimated as household-specific unit values from the HBS	285 CZK per litre of ethanol (this implies 114 CZK for spirits per litre at 40%). I assume the average excise rate is 57 CZK per litre.	Eating out etc. from (Janský 2014)

## 4 Results

In this section I first discuss the importance of distributional aspects of excise duties and look at who currently pays excise duties. I then proceed to simulate hypothetical changes in excise duties and then changes that are either forthcoming or discussed.

There are good reasons in favour as well as against the importance of distributional aspects of excise duties in the Czech Republic. The main argument against is that excise duties have different objectives than social policy and should be used for these as discussed in Crawford et al. (2010). Although there are better policies such as direct taxation or social benefits to achieve redistributive policy objectives, there are at least three arguments for studying these in detail. The introduction of new excise duties is usually not compensated by the other redistributive instruments and therefore the immediate impact is actually important. Furthermore, excise goods are often consumed by specific groups in high quantities and therefore these selected households cannot in fact be well compensated through the general tools of welfare state even if that was the intention. Last but not least, in order to know the redistributive impact of the overall welfare system, we need to know the distributional impact of individual taxes including excise duties even if these were used only as one component for assessing the overall impact. Therefore I consider it important to study distributional aspects of excise duties and I do so below for current excise duties and their changes.

### 4.1 Current excise duties

In an answer to the question of who currently pays the excise duties, Table 2 shows the results for distributional impact of fuel, alcohol and tobacco excise duties.<sup>12</sup> I present results for five groups of excise duties: fuel, beer, spirit, cigarettes, and other tobacco.<sup>13</sup>

I use four different approaches to examine the distributional incidence, because the previous research, such as Crawford et al. (2010), highlighted the sensitivity of the results to the approach chosen. All of these approaches are defined on a household level with the OECD adjustments for the size of a household.<sup>14</sup> The first part of Table 2 shows the results of excise

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<sup>12</sup> For these results I use the estimates of excise duties paid rather than the expenditure on excise goods. I believe this more directly corresponds with what I am interested in, the distributional impact of current excise duties. Since excise duties are specific, their shares per expenditures on excises differ across households.

<sup>13</sup> Wine is not included, because no excise duty levied on it currently, and results for cigars are not presented, because of only tiny expenditures on these.

<sup>14</sup> The OECD's adjusted consumption unit scale recommended by Eurostat, the Statistical Office of the European Communities, implies that the first adult of the household receives the weight 1, other over 13-year-olds receive the weight 0.5, children receive the weight 0.3 (0 to 13-year-olds).



duties paid per income according to quintiles based on income, a measure that is often used for discussion of distributional impact. The second part shows the results of excise duties shares of income according to quintiles based on expenditures. The third part shows the results of excise duties shares of expenditure according to quintiles based on incomes. The fourth part shows the results of excise duties paid as a share in total expenditure according to expenditure quintiles. These quintiles are arguably more consistent with life-cycle hypothesis, because there is a higher variation in incomes than in expenditures over the lifetime.

The results of all approaches share some lessons for the distributional impact of excise duties, although there is a high variation in the results. Excise duties generally seem to be progressive, i.e. on average households with higher incomes or expenditures seem to pay a higher share of their incomes or expenditures in excise duties. There are many exceptions to this general observation. The fourth quintile mostly seems to be paying higher shares than the fifth quintile. Other tobacco includes tobacco for smoking that is mostly seen as a cheaper alternative to cigarettes, and this is in line with mostly progressive excise duties on cigarettes and regressive excise duties on other tobacco. Excise duties on alcohol seem to be paid most heavily by the middle quintiles, which is partly due to their higher expenditure on alcohol, and partly due to lower prices and therefore proportionally higher duties paid per drink.

The prevailing progressivity contrast with, for example, some of the results for the United Kingdom by Crawford et al. (2010), who found tobacco to be regressive using the equivalents of both the first and fourth approaches applied here. The progressivity of excise duty on fuel also contrasts with Brůha & Ščasný (2006), who found it to be to be slightly regressive.

**Table 2. Income and expenditure shares of excise duties (in %), 2011.**

**Income quintiles and income shares**

	Fuel	Beer	Spirit	Cigarettes	Other tobacco
1 (poorest)	1.1	0.09	0.08	0.75	0.07
2	1.05	0.13	0.1	0.55	0.03
3	1.41	0.13	0.1	0.77	0.01
4	1.38	0.11	0.07	0.9	0.02
5 (richest)	1.33	0.09	0.08	0.63	0.01
Average	1.25	0.11	0.08	0.72	0.03

**Income quintiles and expenditure shares**

	Fuel	Beer	Spirit	Cigarettes	Other tobacco
1 (poorest)	1.28	0.11	0.09	0.9	0.1
2	1.39	0.18	0.12	0.74	0.03
3	1.85	0.18	0.13	1	0.01
4	1.96	0.17	0.1	1.29	0.03
5 (richest)	2.1	0.14	0.12	1.01	0.01
Average	1.72	0.15	0.11	0.99	0.04

### **Expenditure quintiles and income shares**

	Fuel	Beer	Spirit	Cigarettes	Other tobacco
1 (poorest)	0.85	0.08	0.05	0.54	0.06
2	1.06	0.12	0.09	0.63	0.03
3	1.25	0.13	0.09	0.8	0.02
4	1.47	0.13	0.1	0.88	0.01
5 (richest)	1.63	0.11	0.09	0.75	0.02
Average	1.25	0.11	0.08	0.72	0.03

### **Expenditure quintiles and expenditures shares**

	Fuel	Beer	Spirit	Cigarettes	Other tobacco
1 (poorest)	1.37	0.13	0.09	0.88	0.08
2	1.56	0.17	0.13	0.91	0.04
3	1.74	0.18	0.12	1.11	0.03
4	1.97	0.17	0.12	1.16	0.01
5 (richest)	1.93	0.13	0.11	0.89	0.02
Average	1.72	0.15	0.11	0.99	0.04

Table 2 shows the sensitivity of the results of distributional impact according to the approach taken. For example, the first part of Table 2 based on income quintiles and income shares shows the same values for the first and the fifth quintiles for beer and spirits, whereas most other results show progressivity for these excise duties. I thus confirm the sensitivity of the results to the approach to examine the distributional incidence chosen for the Czech Republic. However, for brevity I rely solely on the fourth approach in the presentation of the results below and therefore I show only results as a share in total expenditure for quintiles based on total expenditure. It is reasonable to assume that the results presented below would differ across the three approaches in a similar way to these presented in Table 2.

## **4.2 Impact of hypothetical 10 per cent increase in currently paid excise duties**

This section answers the question of who will pay the excise duties if they are increased. I evaluate the impact of hypothetical changes in each of the existing excise duties. I chose to simulate 10 per cent increase in each of the currently paid excise duties as a good yardstick for any potential increases that can indicate the current incidence of excise duties and potentially suggest the dynamic for some other, more realistic proposals. In contrast to the static results in the previous section, these are based on simulation methodology that, as discussed above, has a number of limitations and, but reflects the elasticities estimated for each household and can capture the impact of change on other goods than excises.

I present the results for the estimated impact of that increase on households' demands by presenting the percentage changes in the quantity demanded. Table 3 presents the estimated impact on households' real demands (in percentage change with respect to overall

expenditures) according to the eight expenditure groups as defined in (Janský 2014) and according to their OECD income quintiles for motor fuel, beer, wine, spirits, cigarettes and other tobacco, respectively.

**Table 3. The simulated impact on households of the 10 percentage point increase in each of the excise duty, changes in the quantity demanded (%)**

**Motor fuel**

	Food	Eating out and other luxuries	Household g.	Clothing	Other services	Transportation	Energy	Other goods	Total
1 (poorest)	-0.19	-0.04	0.6	0.39	-0.12	-0.67	-0.15	-0.19	-0.15
2	-0.23	-0.04	0.59	0.45	-0.14	-0.01	-0.18	-0.2	-0.12
3	-0.24	-0.04	0.48	0.41	-0.14	-0.83	-0.18	-0.19	-0.17
4	-0.26	-0.04	0.41	0.39	-0.15	-1.01	-0.18	-0.18	-0.2
5 (richest)	-0.23	-0.02	0.27	0.29	-0.12	-0.99	-0.17	-0.15	-0.2
Average	-0.23	-0.03	0.46	0.39	-0.13	-0.71	-0.17	-0.18	-0.17

**Beer**

	Food	Eating out and other luxuries	Household g.	Clothing	Other services	Transportation	Energy	Other goods	Total
1 (poorest)	0.02	-0.5	0.1	-0.14	0.13	-0.04	-0.06	-0.03	-0.05
2	0.02	-0.55	0.09	-0.17	0.15	-0.06	-0.06	-0.03	-0.05
3	0.02	-0.53	0.07	-0.15	0.15	-0.05	-0.06	-0.03	-0.06
4	0.02	-0.49	0.05	-0.13	0.16	-0.04	-0.06	-0.02	-0.06
5 (richest)	0.03	-0.42	0.04	-0.13	0.17	-0.02	-0.06	-0.02	-0.04
Average	0.02	-0.5	0.07	-0.14	0.15	-0.04	-0.06	-0.03	-0.05

**Spirit**

	Food	Eating out and other luxuries	Household g.	Clothing	Other services	Transportation	Energy	Other goods	Total
1 (poorest)	0.01	-0.39	0.07	-0.1	0.1	-0.04	-0.05	-0.02	-0.04
2	0.01	-0.43	0.06	-0.12	0.12	-0.04	-0.05	-0.02	-0.04
3	0.02	-0.46	0.06	-0.13	0.13	-0.04	-0.06	-0.02	-0.06
4	0.02	-0.4	0.04	-0.1	0.13	-0.03	-0.05	-0.02	-0.05
5 (richest)	0.02	-0.39	0.04	-0.14	0.16	-0.02	-0.06	-0.02	-0.05
Average	0.02	-0.41	0.05	-0.12	0.13	-0.04	-0.05	-0.02	-0.05

**Cigarettes**

	Food	Eating out and other luxuries	Household g.	Clothing	Other services	Transportation	Energy	Other goods	Total
1 (poorest)	0.03	-0.84	0.19	-0.22	0.22	-0.09	-0.1	-0.05	-0.1
2	0.03	-0.72	0.1	-0.2	0.21	-0.07	-0.09	-0.04	-0.1
3	0.04	-0.84	0.1	-0.22	0.25	-0.08	-0.11	-0.04	-0.12
4	0.04	-0.76	0.08	-0.2	0.24	-0.07	-0.1	-0.04	-0.12
5 (richest)	0.05	-0.7	0.07	-0.32	0.29	-0.05	-0.11	-0.04	-0.12
Average	0.04	-0.77	0.1	-0.23	0.24	-0.07	-0.1	-0.04	-0.11

### Other tobacco

	Food	Eating out and other luxuries	Household g.	Clothing	Other services	Transportation	Energy	Other goods	Total
1 (poorest)	0	-0.09	0.03	-0.02	0.02	-0.01	-0.01	-0.01	-0.01
2	0	-0.04	0	-0.01	0.01	0	-0.01	0	0
3	0	-0.03	0	-0.01	0.01	0	0	0	0
4	0	-0.01	0	0	0	0	0	0	0
5 (richest)	0	-0.02	0	-0.01	0.04	0	0	0	0
Average	0	-0.04	0.01	-0.01	0.02	0	0	0	0

As presented in Table 3, there is a great variety in the impact of the changes in excise duties, across the different excise goods as well as income groups, but this variation seems to be mostly in line with the results from the previous section. Still, there are some interesting observations to be drawn from the results in Table 3. The cross-effects seem to be relatively important, that is, a change in excise that is included in one of the eight expenditure groups has impact on the demand for the other seven expenditure group through cross-price elasticities. Although these cross-effects are less important than own-effects and are largely statistically insignificant at the standard levels, they together contribute to the overall impact of the changes that is relatively substantial, with the exception of other tobacco, and ranges from a decrease of 0.05% for beer and spirits to a decrease of 0.11% and 0.17% for cigarettes and motor fuel.

### 4.3 Impact of forthcoming and proposed changes in excise duties

I simulate the impact of changes in two excise duties. They are approved, partly implemented and partly forthcoming, changes in excise duties for tobacco products. They have the same, two-year timescale for implementation, but the government used different arguments in proposing them. The increase in excise duty on cigarettes was motivated by the minimum rates set by the European Union. The minimum excise duty on cigarettes increases from 2.10 to 2.18 and to 2.25 CZK per cigarette from 2012 to 2013 and to 2014. Table 4 shows the simulated changes in quantity demanded. The second change affects other tobacco products, and the government argued for this increase on the basis of the need for additional government revenues in the light of increasing government deficits. Excise duty on other tobacco increases from 2012 to 2013 and to 2014 from 1400 to 1635 and to 1800 CZK per kilogram. Table 5 shows the simulated changes in quantity demanded.

The results of distributional impact in Tables 4 and 5 correspond with the results for current excise duties above. An increase in cigarettes excise duties hits the third and fourth quintiles most hardly, whereas an increase in excise duties on other tobacco is borne much more by the poorer rather than the richer quintiles.

**Table 4. Excise duty on cigarettes from 2012 to 2013 (from 2.10 to 2.18 CZK per cigarette) , changes in the quantity demanded (%)**

	Food	Eating out etc.	Household g.	Clothing	Other services	Transportation	Energy	Other goods	Total
1 (poorest)	0.01	-0.33	0.08	-0.09	0.09	-0.03	-0.04	-0.02	-0.04
2	0.01	-0.28	0.04	-0.08	0.08	-0.03	-0.03	-0.02	-0.04
3	0.01	-0.32	0.04	-0.08	0.09	-0.03	-0.04	-0.02	-0.05
4	0.01	-0.29	0.03	-0.08	0.09	-0.03	-0.04	-0.02	-0.05
5 (richest)	0.02	-0.27	0.03	-0.12	0.11	-0.02	-0.04	-0.01	-0.04
Average	0.01	-0.3	0.04	-0.09	0.09	-0.03	-0.04	-0.02	-0.04

**Excise duty on cigarettes from 2012 to 2014 (from 2.10 to 2.25 CZK per cigarette) , changes in the quantity demanded (%)**

	Food	Luxuries	Household g.	Clothing	Other services	Transportation	Energy	Other goods	Total
1 (poorest)	0.02	-0.62	0.14	-0.16	0.16	-0.06	-0.07	-0.04	-0.07
2	0.02	-0.53	0.07	-0.15	0.15	-0.05	-0.06	-0.03	-0.07
3	0.03	-0.6	0.07	-0.16	0.18	-0.06	-0.08	-0.03	-0.09
4	0.03	-0.55	0.06	-0.15	0.17	-0.05	-0.07	-0.03	-0.09
5 (richest)	0.03	-0.5	0.05	-0.23	0.21	-0.03	-0.08	-0.03	-0.08
Average	0.03	-0.56	0.08	-0.17	0.18	-0.05	-0.07	-0.03	-0.08

**Table 5. Excise duty on other tobacco from 2012 to 2013 (from 1400 to 1635 CZK per kilogram) , changes in the quantity demanded (%)**

	Food	Luxuries	Household g.	Clothing	Other services	Transportation	Energy	Other goods	Total
1 (poorest)	0	-0.16	0.05	-0.04	0.04	-0.02	-0.02	-0.01	-0.01
2	0	-0.06	0.01	-0.01	0.02	0	-0.01	0	-0.01
3	0	-0.05	0.01	-0.02	0.01	-0.01	-0.01	0	-0.01
4	0	-0.02	0	-0.01	0.01	0	0	0	0
5 (richest)	0	-0.04	0	-0.01	0.07	0	-0.01	0	0
Average	0	-0.06	0.01	-0.02	0.03	-0.01	-0.01	0	-0.01

**Excise duty on other tobacco from 2012 to 2014 (from 1400 to 1800 CZK per kilogram) , changes in the quantity demanded (%)**

	Food	Luxuries	Household g.	Clothing	Other services	Transportation	Energy	Other goods	Total
1 (poorest)	0.01	-0.27	0.09	-0.07	0.07	-0.03	-0.03	-0.02	-0.02
2	0	-0.1	0.01	-0.02	0.03	-0.01	-0.02	-0.01	-0.01
3	0	-0.09	0.01	-0.03	0.02	-0.01	-0.01	0	-0.01
4	0	-0.03	0	-0.01	0.01	0	0	0	0
5 (richest)	0	-0.07	0.01	-0.02	0.11	0	-0.01	0	0
Average	0	-0.11	0.02	-0.03	0.05	-0.01	-0.01	-0.01	-0.01

The majority of the European Union members (16 out of 27) levy a zero excise duty tax on wine, and the Czech Republic is one of them. When compared with the often heavy taxes on other alcoholic beverages, it is not surprising that proposals to levy a non-zero excise duty on still wine (in contrast to sparkling wine, on which excise duty is levied) are regularly put forward.

Most recently, there was a proposal to introduce an excise duty of 10 Czech crowns per litre on wine in 2012, which, once again, proved unsuccessful. The proposal was rather complex in the sense that it had a number of exceptions, which I, however, ignore below when simulating the impact of this proposal; I assume instead that it would be levied on all wine consumed. I therefore simulate the impact of the introduction of an excise duty of 10 CZK per litre of wine. Table 6 shows the resulting impact on households by their income quintiles.

The results show that a new excise duty on wine would have a similar distributional impact as existing duties on other alcohol: highest impact on the third and fourth quintiles and a lower and similar impact on both the poorest and richest quintiles.<sup>15</sup>

**Table 6. Excise duty on wine of 10 CZK per litre, changes in quantity demanded (%)**

	Food	Luxur- ies	House- hold g.	Cloth- ing	Other services	Transp- ortation	Energy	Other goods	Total
1 (poorest)	0.11	-3.58	0.69	-1	0.92	-0.35	-0.41	-0.21	-0.34
2	0.11	-3.46	0.53	-1.01	0.96	-0.37	-0.41	-0.18	-0.32
3	0.14	-3.63	0.47	-1	1.04	-0.35	-0.46	-0.19	-0.43
4	0.15	-3.11	0.33	-0.82	1	-0.26	-0.39	-0.16	-0.4
5 (richest)	0.18	-2.82	0.26	-0.9	1.06	-0.18	-0.43	-0.15	-0.32
Average	0.14	-3.31	0.45	-0.94	1	-0.3	-0.42	-0.18	-0.36

The information in Table 7 about wine consumption sheds some additional light on the reasons behind the results in Table 6. Table 7 indicates that richer household consume more litres of wine, spend more on wine in absolute as well as relative terms, and buy more expensive wine. So the estimated regressive impact of excise duty on wine in Table 6 stems from the higher prices paid by richer households and their overall higher expenditure. It also follows that any ad valorem excise duty would have a more progressive impact on Czech households than a specific excise duty on wine.

<sup>15</sup> In fact, when we compare only the poorest quintile (-0.34) with the richest quintile (-0.32), the impact seems slightly regressive, but the difference is not significant at the standard significance levels.

**Table 7. Litres, unit value prices and other details of monthly average wine consumption**

	Litres consumed	Expenditures on wine (CZK)	Share of expenditures on wine in total expenditures (%)	Unit value price of a litre of wine (CZK)
1 (poorest)	0.76	49.35	0.45	80.84
2	1.15	83.52	0.58	91.04
3	1.52	110.29	0.64	93.19
4	1.75	140.7	0.67	96.39
5 (richest)	2.37	216.65	0.72	107.11
Average	1.51	120.07	0.61	94.24

## 5 Conclusion

As long as excise duties remain an important source of government revenues, the analysis of their impact will remain an important area of applied research. In this article, I have used Czech Statistical Office data and the previous estimates of own- and cross-price and income elasticities for individual households to estimate the impact of changes in excise duties on households' demands in the Czech Republic. I have presented the estimated impacts of hypothetical 10 percentage point increases to each of the main excise duties. I have also evaluated a few forthcoming or proposed changes including the unsuccessful 2012 proposal to introduce an excise duty of 10 Czech crowns per litre on wine in the Czech Republic.

Although I expect increases in excise duties in the light of current pressure on sustainability of public finances, the implication of this article is not to propose any changes to excise duties, but rather to recommend the evaluation of the impacts of any proposed changes in as a rigorous a manner as possible. The use of detailed microeconomic data and relevant elasticities, as applied in this article, should be considered a minimum for such evaluations.

Simulating all major excise duties together, as I have attempted, has a number of advantages such as a direct comparison of impact of various excise duties, but future research should be more selective and provide Czech policy makers with more focused analytical tools, for example, for the simulation of each of the excise goods separately. The current analysis is very limited due to low quality of data and when this is improved, the future research should include the simulation of changes in government revenues. Areas for further research also include demand systems estimated specifically for excise duties in the Czech Republic. Demand systems with more narrowly defined expenditure categories would result into estimates of more detailed elasticities. These would enable the policy makers to reflect not

only the price elasticity in a theoretically consistent way, but also with respect to individual characteristics of each of the excise goods. Further research on simulations of government revenue should also answer questions such as how much do excise duties yield for the government directly from excise duties, and how much indirectly from VAT revenues.

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