

TAX YIELDS OF EXCISE DUTIES APPLIED TO TOBACCO PRODUCTS AND ALCOHOLIC BEVERAGES

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Abstract: *This paper describes the trend of tax yields of food related Czech excise duties since 1993. The goal of the article consists of the relationship between the selected Czech excises duties revenues and their tax rates evaluation. The article covers the tobacco tax, tax on alcohol, duty on wine and tax on beer. Input data will be obtained from the official statistical sources as the Customs Administration of the Czech Republic, the Czech Statistical Office and the Czech Ministry of Finance. The correlation analysis will be used. The outputs of the analysis identify the strength of the boundary between the food related consumption taxes yields and their tax rates. The results potentially enable to make evaluation of the applied Czech tax policy and enable to create the current tax policy corrections proposals in the field of the food related consumption taxes and potential estimate the tax yields of selected consumption taxes in the current economy condition.*

Keywords: *Consumption taxes, Tax yield, Tax rate, Alcohol, Beer, Wine, Tobacco.*

JEL Classification: *H20, H21, H26, H29.*

Introduction

The problematics of the consumption taxes in the Czech Republic is amended with the Act nr. 353/2003 Col., about consumption taxes [20], subsequently amended for more than 30times. The presence of the specific consumption taxes is explained with 3 essential reasons: deterring people from “harmful consumption”, cash flow into exchequer and taxes harmonization in the European Union [11]. Consumption tax rates harmonization within EU is based on minimum rates assessed in Council directives. Obligation of the directives lies in goals which should be obtained; however, it is up to the member countries to decide how they will apply the agreed goals in their national legislation [4]. The rate range of the individual taxes is also influenced with economic, social and geographical distinctions of the EU member countries.

The goal of the article consists of the bindings between the selected consumption taxes yields, their tax rates identification and evaluation under use of the correlation analysis using the parametric Pearson’s correlation coefficient for identification of the binding’s strength. The data of the period 2001 – 2011 were collected from the official sources as the Ministry of Finance and the Czech Statistical Office and used during the study processing.

1 Statement of a problem

The consumption tax rates reflect also other reasons for the taxation like deterring from the consumption and at the same time (paradoxically) gaining stable yield from these taxes. Babor et al. [2] confirms this opinion in the research (Alcohol: No Ordinary Commodity), where he claims that governments have long used excise duties on alcohol to generate tax revenue and to reduce rates of harm from drinking. However, Kubátová [12] says that if the taxes should deter users from the consumption of the rated goods, this tax cannot be stable in yield at the same time. According to Slemrod [15] the consumption

taxation also offers powerful simplicity gains. Some economists also claim that shifting tax collection to consumption would be beneficial for long-term growth [6].

There are many scientific studies and articles that deal with dependencies between the level of consumption of tobacco and alcohol at the rate of consumption taxes for individual commodities. E.g. Bogdanovica, I. et al. [3] compares the smoking prevalence with cigarette prices, overall tax yield and incidence in the EU and the affordability of the EU Most Popular Price Category (MPPC) cigarettes estimated as the number of minutes of labor required to earn the price of 20 cigarettes in the years 2003, 2006 and 2009.

Arslanhan, S. et al. [1] evaluates the costs and benefits of various tobacco elimination policies, specifically, an immediate taxation option and eight tax-combined long-term cessation programs in Turkey. Also Duffy [5] evaluates tobacco policy in the UK, including the scope for using tax increases to achieve reduced consumption and increased revenues. Lee [13] analyses the willingness of current smokers to quit smoking or reduce cigarette consumption in Taiwan when raise the price of cigarettes by 44 %. Impact research of taxation on tobacco consumption was conducted in Mexico. The results indicate that price is a significant factor in household decisions concerning smoking and the number of cigarettes smoked [9].

None of the published studies deal with dependence between individual income of consumption taxes and the tax rate. The usage of the particular consumption taxes and setting of the rate range is part of fiscal policy. The fiscal policy means a group of instruments used by the state to influence the economy through changes of state expenses and state incomes [10].

2 Methods

The goal is to define the potential relevance of the tax rate for tax yields of consumption taxes applied. The preliminary analysis of the individual consumption taxes rates development in the CR shows that the tax on beer and the tax on wine and intermediate products are not suitable to use for the regression model design. The reason is low tax rates variability during the time period. Besides, taxes on tobacco products face the problem in the rate combination of the specific and percentage tax. Thus the correlation analyses are presented in this article. During testing the software GRETL and the software SPSS were used.

At the relationship strength measurement between the tax rate on beer and this tax yield Pearson's correlation coefficient was applied for the selected collection in period from 2001 till 2011. The reason for the data file restriction was the change of the tax base rating in the year 2000.

At the tax rate on sparkling wine there is no variability in the analyzed period, so the correlation coefficient for the relation between the tax rate on sparkling wine and the tax collection cannot be calculated. The coefficients for potential dependence of the other two tax rates on revenue collection have not sufficient validity, mainly with regard to the rates development.

At relationship strength measurement between the tax rate on tobacco products and the tax yield was applied Pearson's correlation coefficient. Correlation coefficients were set differently at taxes on cigarettes, taxes on cigars and cigarillos and on smoking mixture (always for specific and ad valorem tax rate).

3 Problem solving

Examination of the selected consumption tax yields influence in the Czech Republic is performed based on tax rates, yields and other relevant factors in historical time series. For the analysis, the tax on alcohol, tax on beer, duty on wine and the tobacco tax were chosen.

From the point of yield, the **tax on alcohol** is number-three after the petrol tax and the tobacco tax and it covers almost 5 % from the total consumption tax collection in the Czech Republic.

Tab. 1: Overview of the consumption tax on alcohol in the CR (1993 – 2011)

Year	Tax rate (CZK/hl)	Rate change (%)	Tax yield (million CZK)	Yield increase/decrease (%)
1993	18,000			
1994	19,000	5.56		
1995	19,500	2.63	5,007	
1996	19,500	0	5,409	8.03
1997	19,500	0	5,675	4.92
1998	19,500	0	5,999	5.71
1999	23,400	20.00	6,390	6.52
2000	23,400	0	5,842	- 8.58
2001	23,400	0	6,430	10.07
2002	23,400	0	5,903	- 8.20
2003	23,400	0	5,512	- 6.62
2004	26,500	13.25	5,305	- 3.76
2005	26,500	0	5,812	9.56
2006	26,500	0	6,799	16.98
2007	26,500	0	7,122	4.75
2008	26,500	0	7,082	- 0.56
2009	26,500	0	6,965	- 1.65
2010	28,500	7.55	6,528	- 6.27
2011	28,500	0	6,767	3.66

Source: Own elaboration acc. to [7] [14]

In the period 1993 – 1995 the tax rate was increased each year as can be seen in Tab. 1. The tax rate adjustments were related to high inflation rate in this period and also to the need to saturate the increased demands on government expenditures. In 1995, there was recorded the highest level of the tax on alcohol yield rate to GDP in amount 0.33 %. The highest increase of the tax rate was executed in 1999 (Act nr. 129/1999 Coll., amendment to consumption taxes act), the tax rate was increased for 3,900 CZK/head, which constituted annual increase for 20 %. The highest increase of the tax on alcohol in comparison with the former year came in 2006 (approximately for 17 %), this could be explained with legislation amendment consisting in adoption of the act nr. 676/2004 Coll., which prescribed the compulsory marking of the alcohol with a stamp.

Collection of **tax on beer** in the year 2011 was 4.488 billion CZK, which covered 3.21 % from the total consumption taxes yield.

Tab. 2: Overview of the consumption tax on beer in the CR (1993 – 2011)

Year	Tax rate (CZK/hl)	Rate change (%)	Tax yield (million CZK)	Yield increase/ decrease (%)
1993	317			
1994	317	0.00		
1995	320	0.95	3,059	
1996	320	0.00	3,304	8.01
1997	320	0.00	3,467	4.93
1998	320	0.00	3,662	5.62
1999	320	0.00	3,559	- 2.81
2000	320 * 24 *	x	3,405	- 4.33
2001	24	0.00	3,482	2.26
2002	24	0.00	3,498	0.46
2003	24	0.00	3,583	2.43
2004	24	0.00	3,613	0.84
2005	24	0.00	3,520	- 2.57
2006	24	0.00	3,550	0.85
2007	24	0.00	3,657	3.01
2008	24	0.00	3,564	- 2.54
2009	24	0.00	3,439	- 3.51
2010	32	33.33	4,297	24.95
2011	32	0.00	4,488	4.44

Note: *The tax rate on beer is identified in CZK per hl 10-12° beer since 31.3.2000, since 1.4.2000 in CZK per hl for beer in °Plato

Source: Own elaboration acc. to [7] [14]

Since 1.4.2000, due to another amendment of consumption taxes act (Act nr. 22/2000 Coll.) [16], there was adjusted the beer tax base identification from 1 hl of 10 - 12° beer to 1 hl of beer in the grade Plato, and this changed also the procedure for the tax calculation with the help of the great Balling's formula (in the Czech rep. the procedure is amended with Decree nr. 468/2003 Coll.).

The tax rate on beer was adjusted only twice in the analyzed period. Marking increase of the tax rate (for 33.33 %) has come since 2010 from 24 CZK per hl up to 32 CZK per hl beer (°Plato) as can be seen in Table 2. The tax rate increase expressed oneself in the highest annual tax collection increase for about 25 % in the year 2010.

Tax on wine and on intermediate products is not too essential from the view of fiscal gains. The ratio in the total consumption taxes collection made only 0.22 % in the year 2011.

Tab. 3: Overview of the consumption tax on wine and intermediate products in the CR (1993 – 2011)

Year	Rate – still Wine (CZK/hl)	Rate – sparkl. wine (CZK/hl)	Rate - inter. prod. (CZK/hl)	Rate change (%)	Tax yield (mill. CZK)	Yield increase/decrease (%)
1993	780	2,330	0			
1994	600	2,330	0	- 23.08		
1995	550	2,340	0	- 7.09	509	
1996	250	2,340	0	- 54.55	550	8.06
1997	250	2,340	0	0.00	577	4.91
1998	250	2,340	0	0.00	610	5.72
1999	0	2,340	0	- 100.00	541	- 11.31
2000	0	2,340	0	0.00	373	- 31.05
2001	0	2,340	0	0.00	335	- 10.19
2002	0	2,340	0	0.00	298	- 11.04
2003	0	2,340	2,340	100.00	309	3.69
2004	0	2,340	2,340	0.00	236	- 23.62
2005	0	2,340	2,340	0.00	311	31.78
2006	0	2,340	2,340	0.00	320	2.89
2007	0	2,340	2,340	0.00	336	5.00
2008	0	2,340	2,340	0.00	336	0.00
2009	0	2,340	2,340	0.00	326	- 2.98
2010	0	2,340	2,340	0.00	320	- 1.84
2011	0	2,340	2,340	0.00	313	- 2.19

Source: Own elaboration acc. to [7] [15]

Tax rate on sparkling wine was changed only once in the year 1995, when it was increased for 10 CZK. Tax rates on still wine had been gradually decreasing since 1993 from the amount 780 CZK down to zero rate in 1999. For the tax on intermediate products there has been set tax rate 2,340 CZK since 2003 as shows the Table 3. In the column “Rate change on selected products“ there is calculated the summary increase/decrease of the tax rates in percent on sparkling wine, still wine and intermediate products compared to the previous year.

Tax on tobacco products has recorded the highest rate in the total collection of the analyzed consumption taxes. In 2011 the yield made almost 45 billion CZK. The tax yield in 2011 covered 32.13 % of the total collection of all the consumption taxes. Table 4 contains only the most significant products which come under this tax.

Tab. 4: Overview of the consumption tax on tobacco products in the CR (1993 – 2011)

Year	Rate - cigarettes*		Rate – cigars and cigarillos		Rate – smoking mixture		Tax yield (mill.CZK)	Yield increase/decrease (%)
	CZK/pcs	%	CZK/pcs	%	CZK/kg	%		
1993	0.46	0	0.46	0	320	0		
1994	0.50	0	0.46	0	475	0		
1995	0.51	0	0.46	0	475	0	11,272	
1996	0.65	0	0.46	0	690	0	12,175	8.01
1997	0.65	0	0.46	0	690	0	12,778	4.95
1998	0.74	0	0.74	0	803	0	13,499	5.64
1999	0.79	0	0.79	0	855	0	15,316	1.46
2000	0.79	0	0.79	0	855	0	14,939	- 2.46
2001	0.36	22	0.36	5	440	5	13,194	- 11.68
2002	0.36	22	0.36	5	440	5	15,786	19.65
2003	0.36	22	0.36	5	440	5	17,690	12.06
2004	0.48	23	0.44	5	600	7	21,525	21.68
2005	0.60	24	0.79	0	720	0	25,428	18.13
2006	0.73	25	0.79	0	810	0	32,241	26.79
2007	0.88	27	0.90	0	905	0	46,998	45.77
2008	1.03	28	1.15	0	1,280	0	37,507	- 20.19
2009	1.03	28	1.15	0	1,280	0	37,704	0.53
2010	1.07	28	1.15	0	1,340	0	42,467	12.63
2011	1.07	28	1.15	0	1,340	0	44,958	5.87

Note: *Till 30.6.2001 rate for cigarettes above 70 mm.

Source: Own elaboration acc. to [7] [15]

The consumption tax rates on tobacco products are the most frequently changed taxes from all the analyzed ones. An important change was made in the year 2001, as on 1.7.2001 „ad valorem“ tax rate started to be applied (amendment of consumption taxes act nr. 141/2001 Coll.) [18]. Influence of these tax rates adjustments on the final tax yield is very ambiguous and hardly definable, also with regard to the combination of the different type of assessment (specific tax from a defined amount of products vs. percentage from the final retail price) and to application of the minimum tax in monetary units for the given amount.

4 Discussion

The correlation coefficient results calculated for variables data of the tax rates on alcohol and relevant tax yields in the period 1995 till 2011 show the level $r = 0,6171$. On the premise of existing bindings between the tax yield and the tax rate it is possible to explicate this correlation coefficient in a way that variability (r^2) of the tax collection can be explained only from 38 % with the tax rate variability. The found correlation coefficient imply the conclusion, that the bindings between the variable „tax rate“ and the variable „tax yield“ are surprisingly weak. The income range on alcohol then might be bound more with other factors, which can be only very hardly defined precisely. Among others, there can be mentioned as well some almost-not-quantifiable factors such as tax evasion, problematic of forward buying, or individual interest in alcohol consumption.

Correlation coefficient for the tax collection and the tax rate on **beer** for the selected data file in the period 2001 – 2011 is equal to $r = 0,977$ and so it is practically a perfect positive relation. The relationship strength of the variable „tax rate“ compared with variable „tax yield“ (r^2) makes 95 %.

Correlation coefficient for the relation between the tax rate on sparkling wine and the tax collection cannot be calculated, since there is no variability in the tax rate in the analyzed period. Coefficients for dependence of the other two rates on the tax collection have not sufficient validity, mostly from the reason of the rates development.

For estimation of bindings strength between the tax rate and the tax yield for **tax on tobacco products** was applied „Pearson’s correlation coefficient“ with these results shown in Tab. 5.

Tab. 5: Correlation measurement of the tax on tobacco products in the CR

Variable A	Variable B	Testing period	Correl. coeff.
specific tax rate on cigarettes	tax yield	2002 – 2011*	0.9180
ad valorem tax rate on cigarettes	tax yield	2002 – 2011*	0.9237
specific tax rate on cigars and cigarillos	tax yield	1995 – 2011	0.8046
ad valorem tax rate on cigars and cigarillos	tax yield	1995 – 2011	- 0.2836
specific tax rate on smoking mixture	tax yield	1995 – 2011	0.7771
ad valorem tax rate on smoking mixture	tax yield	1995 – 2011	- 0.2019

Note: *The reason for the data file restriction was the change in tax base rating in 2001

Source: Own elaboration acc. to [7] [15]

The level of linkage between the variables „tax yield“ and „tax rate“ takes with tobacco products very divergent values. The correlation coefficients $r = 0,918$ and $0,924$ for the relation between the tax rate on cigarettes and the tax collection imply almost a perfect correlation relation. On the other hand, the correlation coefficients for the ad valorem tax rates on cigars and cigarillos $r = -0,284$ and tax on smoking mixture $r = -0,202$ indicate negative correlation. Consideration of the individual tax rates relevance for the tax yield on tobacco products is, due to the amount of commodities subject to the tax and combination of the two types of rates, rather difficult. Nevertheless, it can be expected that the level of the tax rates applied on cigarettes should be related to the total tax yield. The variability (r^2) of the tax rates can potentially explain 85 % from the tax collection variability just based on the correlation analysis results. The new time series data set enabling the econometric modeling should be used for the consecutive research verifying the hypotheses formulated based on the current research in the future research step and identify the causality.

Conclusion

For the selected consumption taxes applied in the CR the correlation coefficients were estimated. For the tax on alcohol the bindings between the tax yield and the tax rates was quantified with correlation coefficient $r = 0,617$. On premise of the tax rate causal influence on the tax yield it is possible to preliminary estimate this correlation coefficient in a way that variability (r^2) of the tax collection can be explained only from 38 % with the tax rate

variability, which can be considered as really low value comparing to other taxes analyzed in this study. Correlation coefficient for the tax collection and the tax rate on beer for the selected data file in the period 2001 – 2011 is equal to $r = 0,977$ and so it is practically a perfect positive relation. The connection of the variable „tax rate“ compared with variable „tax yield“ (r^2) makes 95 %. The estimated level of bindings between the variables „tax yield“ and „tax rate“ takes at tobacco products very divergent values. The correlation coefficients $r = 0,918$ and $0,924$ for the relation between the tax rate on cigarettes and the tax collection imply almost a perfect correlation relation. On the other hand, the correlation coefficients for the tax rates ad valorem on cigars and cigarillos $r = -0,284$ and tax on smoking mixture $r = -0,202$ indicate negative correlation. Interpretation of the individual tax rates bindings with the tax yield on tobacco products is due to the amount of commodities subject to the tax and combination of the two types of rates, rather difficult. Nevertheless, it can be deduced that the level of the tax rates on cigarettes has the strength link the total tax yield and the variability (r^2) of the tax rates can potentially explain 85 % from the tax collection variability.

The considered factors, particularly the tax rates, were found highly correlated to the tax yields except the tax rate on alcohol.

The updated time series data covering new added factors are being collected and will be used to design consecutive regression models based on research results of correlation analyses presented in this paper.

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