Do the V4 Countries Follow the European Deficit?
Evidence of Tobacco Taxes

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Abstract

The average tax rate imposed on tobacco products in the European Union is insufficient if compared with the social costs of smoking, as has been proven by previous research. Does it also uniformly apply to the V4 countries, which are different from the rest of the EU in certain aspects? The conducted research has shown that the social deficit caused by smoking both in the V4 countries and in the EU on average was always in positive numbers during the years 2008 to 2015. This means that the tax imposed on tobacco products fails to cover the social costs of tobacco consumption. The social deficit per unit of manufactured tobacco in the V4 countries is lower than the average value of this indicator within the EU. The social deficit increased in the V4 countries apart from the Czech Republic during the examined period. Although the absolute social deficit as well as the social deficit per capita developed differently in the respective V4 countries, they also reached positive values. This may be legitimately deemed a failure of the state in the application of a remedial tax.

Keywords: *social costs, smoking, tax, V4 countries, European Union*

JEL Classification: H21, H23

Introduction

Smoking may be considered a global issue. Tobacco was first brought to Europe at the end of the 15th century (Kubánek, 2009), when it was used as a medicine for quite a long time (Gilman and Xun, 2004). Today, a negative impact of smoking (in any amount as opposed to often discussed sweets or fats) on human health has been generally acknowledged (Králíková, 2006).

Consequently, the aim of modern societies is primarily to discourage people from this harmful consumption. Besides other means, negative advertising or

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a ban on smoking in certain areas are used to achieve this aim. An important instrument for the reduction of tobacco consumption is also tax imposed on such products (Rabin and Sugarman, 2001). However, the demand for tobacco products shows very low elasticity (David, 2010), which restricts the effectiveness of tax instruments in the process of reducing the consumption of tobacco. This has also been confirmed by Jha and Chaloupka (2000), who state that the elasticity of demand for cigarettes in developed countries most frequently reaches values around –0.4. According to Cnossen (2005), it only applies in the limited sample of young people that the price elasticity of demand may be twofold in comparison with adults. However, Hansen et al. (2017) found that young people cease to be sensitive to the increase in tobacco taxes. From the perspective of the reduction of overall consumption, the tax seems to be a secondary instrument (David, 2009).

The far-reaching significance of taxes becomes apparent when we realize that smoking causes significant costs to society. Tax is a suitable instrument for the transfer of costs of smoking to their generators, i.e. smokers. This is also confirmed by the fact evidenced by David (2012) that taxes imposed on products with low elasticity of demand such as basic foodstuffs, alcohol or tobacco products, although factually settled by producers, are transferred to end consumers through their prices. Therefore, it is essential to quantify the social costs of smoking in order to assess the amount of tax adequately.

Taxation of tobacco products in Visegrad 4 (V4) countries is also a subject of the harmonisation process of the European Union. The key element in this area is the Council Directive 2011/64/EU of 21 June 2011 on the structure and rates of excise duty applied to manufactured tobacco (European Commission, 2011). This Directive contains a set of restrictions applicable in the process of taxation of tobacco products. For cigarettes, it orders the combination of the specific and ad valorem parts of the tax. The specific part must range from 7.5% to 76.5% of the total tax burden. 1,000 cigarettes must be levied with at least EUR 90 tax. The tax must form at least 60% of the weighted average retail selling price of cigarettes. Member States that apply excise duty of EUR 115 or more, however, do not need to comply with the above-mentioned 60% criterion. The Council Directive 2011/64/EU does not set any maximum limits for the taxation of tobacco products apart from the structure and minimum values of tax.

EU Member States, with the exception of certain permitted transitional periods, meet the requirements set out in the directive. Despite the above facts, the taxation of cigarettes in the EU as a whole can be seen as deficient based on the results calculated by David (2017). This situation persists although Member States are allowed to apply a higher tax than the minimum limits set within the determined structure. The question is whether the respective EU countries have the same

attitude towards the issues of social costs and their coverage by tobacco taxes. This research focuses on the Visegrad 4 countries, which show a certain consistency in many respects due to their historical development, cultural customs, economic development and other economic and social aspects. The V4 countries may seem to be simple recipients of EU laws, but sometimes they also demonstrate their own initiative and invention. Our goal is to ascertain whether the V4 countries follow European deficiency in the case of taxation of tobacco products by answering the following research questions. Does the taxation of cigarettes in the V4 countries (Czech Republic, Hungary, Poland, and Slovakia) correspond to the overall situation in the EU? Does tobacco taxation in the V4 countries and the EU cover an even lower or a higher ratio of social costs of smoking? At the same time, it will be determined whether the taxation rates in the V4 countries and EU countries are adequate for the social harm caused by cigarette consumption. In the case that a positive value of the social deficit per manufactured tobacco unit is ascertained, the absolute social deficit and social deficit per capita indicators shall also be calculated in order to illustrate the seriousness of the situation. The aim is to conduct the research over the maximum possible period of availability of input data, so that we can identify also the trends suggesting future developments of the calculated characteristics.

Literature Review in the Area of Social Costs of Smoking

The considerable differences in the results of various studies concerning social costs of smoking may be attributed to different analytical approaches, the time factor, different methods of health cost quantification, various sources of data, range of consequences of smoking taken into account, as well as other factors (Sloan et al., 2004). The social costs of tobacco use are the subject of many calculations whose results most frequently show costs expressed in monetary units, a share in the gross domestic product (GDP) or in total health care costs. The analysis of the costs of smoking may be designed as economic cost-benefit analysis (ECBA), GDP-based social cost analysis (GSCA) or expenditure-based cost analysis (EXBA). For the purposes of this text, it is appropriate to first list the results of synthetic texts dealing with the topic by authors Warner et al. (1999), Jha and Chaloupka (2000), and Sloan et al. (2004); certain own findings of the above-mentioned authors and also other important original research into the social costs of smoking, which is not contained in their works.

Warner et al. (1999) summarize the up-to-date research of the ratio of smoking in health care costs (GSCA). They conclude that the results, with few exceptions, range from 6.00% to 8.00%. Jha and Chaloupka (2000) provide a summary and

results of analyses showing health care costs of tobacco users (EXBA), and their share in the GDP (GSCA) in many countries of the world. This is the reason why the achieved results substantially differ; the direct costs of health care in developed countries range from 0.08% to 1.15% GDP. It should be mentioned that this data does not include external costs of smoking or costs arisen due to productivity loss of smokers and many other relevant and well-known costs related to smoking. The work of Sloan et al. (2004), listing a number of individual and institutional studies quantifying the costs of smoking in the USA is worth mentioning. The studies provide total costs of smoking, which are further classified as health care and other costs. An example of other costs may be loss of productivity loss as a consequence of illness or death. These authors quantify the costs as an absolute amount (EXBA) and also as a share in the GDP (GSCA). Although the study considers amounts recalculated to a common denominator, the results vary considerably. The average costs of smoking per pack of cigarettes were USD 6.82, the maximum calculated amount was USD 18.40, the minimum amount was USD 2.96 and the median was USD 5.75. The ratio of costs of smoking in the GDP ranges from 0.70% to 4.30%, whereas the average value is 1.70% and the median is 1.50%.

Sloan et al. (2004) also provide their own calculations of costs (EXBA) including health care and other costs of smoking, as well as productivity loss resulting from illness and death in consequence of cigarette use. This study involved a long monitored period. An adequate price for a pack of cigarettes was determined at almost USD 40. The amount includes the price of cigarettes as internal costs of producers and does not include potential benefits of tobacco consumption, such as old-age pensions that were not paid out due to premature deaths.

The determination of incomes and expenses of the state budget (ECBA) in view of cigarette consumption in the Czech Republic was examined by Habrová and Hrubá (2007). The authors consider the value added tax, excise duty and customs duty on cigarettes as incomes, as well as old-age pensions that were "saved" as a result of premature deaths caused by active and passive smoking. The expenditures include increased public costs for health care in consequence of cigarette consumption, sickness benefits paid towards illnesses caused by active and passive tobacco consumption and towards industrial injuries caused by fires started by smokers, a partial decrease in the GDP caused by premature deaths and illnesses due to smoking, lost income taxes on the income of persons who died prematurely as a consequence of smoking, disability, widow's, widower's and orphan's pensions paid in the cases of premature deaths as a result of smoking, property damage caused by fires started by smokers, and costs of firefighting. The detailed calculations result in the income from cigarette consumption

amounting to CZK 49.205 billion and losses of CZK 63.845 billion in the Czech Republic in the year 2003. Thus, the loss exceeds the income by CZK 14.639 billion. The authors of the study expect that similar amounts would be recorded in subsequent years.

Sovinová et al. (2007), in the final report of a project analysing the share of smoking in the morbidity and mortality rates in the Czech Republic and quantifying the economic impacts (EXBA) of curing diseases caused by smoking, states that tobacco consumption contributed to public health care costs at 7.3%, i.e. more than CZK 11 billion.

From the somewhat scarce recent research results we can mention e.g. Xu et al. (2015), who identified the ratio of health care costs expended on smoking consequences in the USA in the amount of 8.7% of the total health care costs. The assumption that social costs of tobacco consumption in the EU as a whole are not covered by the collected tax on manufactured tobacco (ECBA) has been confirmed (David, 2017). Moreover, the social costs not only exceed the receipts from taxes on the consumption of tobacco products, but the difference between the two has been increasing.

Different results are offered by Doran et al. (1996), who compare benefits and costs of cigarette consumption (ECBA) from the perspective of the government in Australia in the course of one year. The benefit in this case is the tax on cigarettes paid by consumers; the expense is represented by health care costs arisen as a consequence of tobacco use. The average health care costs per smoker were USD 204 in 1989 and 1990, while the benefits amounted to USD 621. However, the authors admit that in the calculations, they disregarded for instance the costs of anti-smoking policies, monitoring and amendments of tobacco laws, research, raising public awareness, traffic accidents, loss of benefit due to illnesses and deaths caused by smoking or costs of lost opportunity.

The statement of important economic benefits brought about by the tobacco industry was disproved by Warner and Fulton (1994). The additional economic benefits of the tobacco industry, apart from the collected excise taxes, allegedly consist in the creation of primary jobs, but also of secondary jobs e.g. in the health care sector, which are needed for the treatment of the harmful effects of smoking. However, in an American state that does not produce tobacco, the number of jobs would have increased by 1,500 in the year 2005 in the case that tobacco products had not been purchased. This seemingly paradoxical situation means that the funds originally spent on tobacco products would be used towards other goods and the economy would thereby grow without expenditure on tobacco. Jobs in the health care sector would be preserved; in particular if tobacco consumption was reduced gradually, the staff needed for treatment

of smoking-induced diseases would be gradually deployed in other areas, such as in geriatrics. In the case that cigarette consumption was reduced and the income from excise duty on cigarettes decreased, at least 50% of this loss would be covered by additional income following from the reduction of tobacco consumption. The above authors state the costs towards overcoming the addiction to smoking per consumer of cigarettes and per year of life.

The Health Statistics Center (2013) includes the loss of productivity and health care into the costs of smoking (EXBA) and states average costs in the years 2006 and 2010. The costs of one packet of cigarettes in the U.S.A. are USD 9 and the annual amount per smoker is USD 4,676.

The World Health Organization (2008) deals with the health consequences of smoking, their prevention and ways of reduction of cigarette consumption. It also quantifies the loss of productivity caused by deaths due to tobacco use in the USA for one year, amounting to USD 92 billion (EXBA). Koopmanschap et al. (1995) quantify the indirect costs of cigarette consumption (EXBA) in the Netherlands by the friction cost method that includes productivity losses due to disease and death. Parrott et al. (1998) identify the costs of one year of life gained by smoking cessation (EXBA) in England. The results of similar studies mention amounts of GBP 421 to 50,666 for a spared year of life. Jarvis et al. (2012) in the document of the European Commission published the percentage of costs of premature mortality attributable to smoking amounting to 4.60% of the GDP (GSCA).

Cunningham (1996) mentions other social costs caused by the production of cigarettes and other tobacco products, such as paper consumption and deforestation of the landscape, fuel consumption, pesticide and herbicide use, and application of artificial fertilizers. The consequences of the above actions are generally known.

Chaloupka and Warner (2000) point out differences of studies which quantify impacts of tobacco consumption. For instance, they cite a study whose result is a zero or negligible negative impact of cigarette consumption and a study which identifies the need to impose an excise duty of USD 3 to 4 per packet of cigarettes in order to cover the impacts of tobacco use. The differences are attributable to different methods applied and data sources used. The authors also mention other positive and negative aspects of cigarette consumption, which are often missing from the studies. This particularly concerns the costs related to fires started by smokers, costs connected with care for low-birthweight babies, costs of cleaning and maintenance, costs caused by passive smoking of family members and other persons, which, ironically, may be higher than the direct costs that are more easily quantifiable. The often disregarded positive aspects of cigarette consumption, such as unpaid pensions, tobacco corporate income taxes, or employment in the tobacco industry may be identified similarly.

Data and Methods

The suitable type of source data analysis is the GDP-based social cost analysis with regard to the fact that the results of the research must be comparable on an international scale. The crucial starting task is to identify the amount of health care costs of smoking as a share in the GDP. Because the results have to be compared, we shall base the identification on values used in the previous research, see David (2017). The base share is 1.5% of social costs of smoking in the GDP. This value will be subject to further verification in order to support the objectivity of the obtained results and, as the case may be, to express the limits of validity of the research results. The source of the data on the GDP is Eurostat (2017a).

In order to accomplish the goals of the text, the indicator of excise duty receipt from tobacco products and cigarette consumption in the individual countries of the European Union has to be applied. The data was published by the European Commission (2017a; 2017b). The data on consumption used previously (David, 2017) from this source has proven to be somewhat inconsistent over time. Therefore, this data has been partially replaced by data from the company PN Lee Statistics&Computing (2017) across the time series. Their database offers the needed data over a very long time series, which however, ends in 2014 for the Czech Republic and Slovakia, and in 2012 in the case of Hungary and Poland. The missing part of the time series until the year 2015 can be supplemented with the adequate values published by the European Commission (2017b). Where the time series overlap, the data proves to be mutually compatible. The overall duration of the time series that we have chosen is eight years, which is the maximum period where all the data is available, i.e. the period from the year 2008 to 2015.

Because we need individual and objective comparison between the respective V4 countries, we shall use data concerning the population from Eurostat (2017b). The data on health care costs in the V4 countries may be used for the sake of testing calculations, which however, are fully available for all the four countries only for the year 2014 (Eurostat, 2017c).

The obtained data transformed into the necessary format shall be processed in order to identify the difference between the social costs of smoking and the tobacco tax receipts in the V4 countries during the given time series. The data will also be compared with the results in the European Union as a whole, referred to as *ASDP*, i.e. average social deficit calculated in EUR per consumed cigarette during the time series *i*, which includes the period from 2008 to 2015. Partial values of the indicator in the respective V4 countries will be referred to as *SDP*. The indicator will be calculated on the general level as follows:

$$ASDP_{i=1}^n = ASCP_{i=1}^n - ATRP_{i=1}^n \tag{1}$$

- *ASCP* is the average social costs of the EU countries or the V4 countries in EUR per consumed cigarette across the defined time series.
- *ATRP* is the average tax receipts of the EU countries or the V4 countries in EUR per consumed cigarette across the defined time series. Their calculation is on the general level shown below.

$$SDP_i^j = SCP_i^j - TRP_i^j \tag{2}$$

- *SCP* is the average social costs of the V4 countries in EUR per consumed cigarette across the defined time series.
- *TRP* is the average tax receipts of the V4 countries in EUR per consumed cigarette across the defined time series.

$$ATRP_{i=1}^n = \frac{\sum_{j=1}^m TRP}{m} \tag{3}$$

- *TRP* is the tax receipts of the respective EU countries or the V4 countries in EUR within the list *m* per consumed cigarette across the defined time series.
- The characteristic *m* is the number of EU countries included (26) or the value 4 representing the number of the V4 countries. Croatia was excluded from the research, because the data on tobacco tax receipts has only been available since the year 2013 with regard to the date of accession of the country to the European Union.

$$TRP_i^j = \frac{TR_i^j}{CC_i^j} \tag{4}$$

- *TR* is the tax receipts of a particular country in EUR within the *j* list in a specific year from the time series *i*.
- *CC* is cigarette consumption in pieces in a particular country within the *j* list in a specific year from the time series *i*.

$$ASCP_{i=1}^n = \frac{\sum_{j=1}^m SCP}{m} \tag{5}$$

- *SCP* is the social costs in EUR per consumed cigarette in each particular EU country.

$$SCP_i^j = \frac{SC_i^j}{CC_i^j} \tag{6}$$

- *SC* is the social costs expended in connection with the manufactured tobacco consumption in a particular country and a specific year from the defined time series.
- *CC* is cigarette consumption in a particular country and a specific year from the defined time series.

$$SC_i^j = GDP_i^j * 0.015 \tag{7}$$

- *GDP* is the gross domestic product in market prices of the respective *j* countries in individual years of the defined time series *i*.
- The value *0.015* is the selected level of a share of health care costs related to tobacco consumption in the GDP, based on the research conducted so far.

On the basis of the foregoing calculations, the variables with an additional informative value may be quantified. This means the absolute social deficit in V4 countries *SDA* and the social deficit per capita in V4 countries *SDPC*.

$$SDA_i^j = SDP_i^j * CC_i^j \tag{8}$$

$$SDPC_i^j = \frac{SDabs_j^j}{P_i^j} \tag{9}$$

- *P* is the population of a particular V4 country and a specific year from the defined time series.

Assessment of the Indicator of Social Costs of Smoking and Limitations of the Research Results

In order to determine the health care costs (HCC) expended in connection with the manufactured tobacco consumption, it would be undoubtedly appropriate to use the ratio in the total health care costs, similarly to Sovinová et al. (2007) in the case of the Czech Republic or Warner et al. (1999) in the United States. Unfortunately, the database of such costs in the EU countries is somewhat incomplete, containing only about a half of the necessary information. In the V4 group, the complete data is only available for the year 2014 (Eurostat, 2017c). Moreover, part of the information, the direct health care costs, does not cover other significant costs of smoking.

T a b l e 1
Direct Health Care Costs of Smoking (millions of Euro)

GEO/Variable	HCC (2014)[*]	GDP (2014)[**]	7% HCC	1.5% GDP	7% HCC/1.5% GDP
Czech Republic	8,511.46	156,660.00	595.80	2,349.90	25.35%
Hungary	4,307.65	104,953.30	301.54	1,574.30	19.15%
Poland	16,057.99	410,989.70	1,124.06	6,164.85	18.23%
Slovakia	4,006.74	75,946.40	280.47	1,139.20	24.62%

Source: Eurostat (2017c[*]; 2017a[**]); author.

The figures shown in Table 1 below suggest that the direct health care costs of smoking account for an average of 22% of social costs of smoking in the V4

countries. The value of 7% is based on the research results of Sovinová et al. (2007) and Warner et al. (1999) and the figure 1.5% is the median of the results quantifying the ratio of social costs of smoking according to Sloan et al. (2004).

If we try to verify the relevance of this calculation, we can use the absolute amounts published for the Czech Republic by Sovinová et al. (2007), and Habrová and Hrubá (2007). The direct health care costs are CZK 11.277 billion, and social costs are CZK 63.845 billion. The ratio of the direct health care costs of smoking to the social costs is thus 18%. Although this value differs from the calculation in the V4 countries with the average result of 22%, the deviation is only several percent, which is a relatively significant concordance with regard to the diversity of cost items and methodological approaches.

On the other hand, Doran et al. (1996), Health Statistics Center (2013), World Health Organization (2008), and Chaloupka and Warner (2000) determine the social costs in a comprehensive manner; however, the data applies to a different geographical region. Here, it would be problematic and misleading to transfer the absolute amounts of the costs of smoking for the purposes of different economies than those serving as a basis for such calculations. Therefore, we intentionally refrain from using their data.

This work deals with issues related to smoking in EU countries, and if we intend to use comprehensive results of research conducted outside of Europe, we have to apply the cost ratio index in the form of a share of social costs in an objective value representing each of the EU countries. This is the reason why, in the methodology section of the text, we chose the indicator of a share in the GDP, whose amounts are fully available from Eurostat (2016a). The cost ratio is 1.50%, which may be accepted as an objective result of the calculations made by renowned authors and institutions. The value is a median of synthetic results in the unique and comprehensive study by Sloan et al. (2004). The choice of the 1.5% value may further be supported with the upper limit of overall costs of manufactured tobacco consumption according to Jha and Chaloupka (2000), amounting to 1.34% GDP, and with the conversion of results of Habrová and Hrubá (2007) to the cost ratio in the GDP, which amounts to 1.47%.

Within the framework of the present research, we do not consider the results of studies stressing the benefits of tobacco consumption, nor do we take into account studies calculating with the value of a year of human life markedly exceeding the selected level of social costs of smoking. Our choice is certainly not the only correct one; we would label it as a possibility of the conservative approach to the assessment of social costs of smoking. Next to the necessity of determination of health costs, we must point out other potential limitations to this study.

Cigarette consumption may not equal the values applied, because such values have been determined on the basis of tobacco stamps purchased by manufacturers of tobacco products. There may be differences caused by purchasing an advance stock of tobacco stamps by tobacco producers.

The values also do not reflect the consumption of illegal tobacco products or cross-border purchases.

The real ratios of health care costs differ in the respective countries; however, in general they increase with the growth of the gross domestic product per capita. The choice of the sample consisting in the V4 countries, which show many common characteristics, at least partially eliminates this problem.

Unlike the consumption of cigarettes, the indicator of tax receipts from manufactured tobacco also involves other tobacco products besides cigarettes. However, the ratio of other tobacco products to cigarettes is relatively negligible both in terms of consumption and in terms of tax receipts.

Intentionally, we have not included the receipts of general excise duty and we assume that if the consumer had not bought tobacco products, he would not have saved the money anyway; he would have spent it on other goods subject to the same basic rate of value added tax as the tobacco products.

Results

The basic initial data in the methodology section of the text include *GDP*s in the V4 countries, receipts of tax on tobacco products *TR* in the V4 group, cigarette consumption *CC* in the V4 countries and the population *P* in these countries. By processing the above data and applying calculations mentioned in the methodology section of the text, the goals of the work can be met and essential questions can be answered. The questions in particular concern the degree of covering the social costs caused by smoking by the receipts of taxes imposed on manufactured tobacco in the V4 countries and whether the development in these countries corresponds to the development in the European Union as a whole.

The amounts of the *GDP* in the V4 countries (Eurostat, 2017a) correspond to the size and strength of their economies. The negative impact of the financial crisis is clearly visible in the years 2008 to 2015; namely in 2009 the indicator decreased in all the V4 countries. The original values were restored mostly in 2011; in Slovakia this happened a year earlier. The development of the *GDP* somewhat fluctuated in the following years. Growth of the *GDP* in all the V4 countries occurred as late as in 2015. The overall increase of the indicator is apparent in the monitored period, which plays a certain role in further calculations, as will be explained later herein.

The European Commission (2017a) reports tobacco tax receipts TR. This indicator increased in all the countries except for Hungary across the given time series. Its different development in Hungary can be explained by a significant change (decrease) in the consumed volume. The values of tax receipts are determined both by the level of consumption and by the tax rate on a unit of manufactured tobacco. Apart from these primary determinants, we must also mention potential distortions mentioned in the methodology section of the text. These are attributable to tax evasion in the form of consumption of illegal cigarettes and a possible time difference between the purchase of tobacco products by consumers, and their real consumption and tax receipt. This also relates to the time distortion due to purchasing an advance stock of tobacco stamps by tobacco producers.

Due to the absence of real data, the consumption of tobacco products *CC* is represented through data concerning the purchased tobacco stamps. The data comes from the sources PN Lee (2017) and European Commission (2017b), whose use is explained in the methodology section of the text. The consumption of cigarettes more or less decreases in all the V4 countries during the monitored period. We may assume that a part of the decreased consumption is attributable not only to ceased or reduced smoking, but also to the use of tobacco substitutes, i.e. other tobacco products. 2015 shows a clear change in the hitherto trend of cigarette consumption in all the V4 countries except for Poland.

The development of population numbers *P* does not need much comment. No dramatic changes in this characteristic can be expected over such a short period and the data of Eurostat (2017b) testify to this.

Let us look at some simple as well as more complex calculations using the mentioned primary data. At the same time, we shall use data following from the results of analyses conducted by the author and by many previous researchers.

T a b l e 2

Social Costs of Smoking *SC* as 1.5% *GDP* (millions of Euro)

GEO/TIME	2008	2009	2010	2011	2012	2013	2014	2015
Czech Republic	2,414.42	2,225.36	2,345.55	2,460.61	2,421.51	2,366.12	2,349.90	2,504.46
Hungary	1,614.56	1,407.13	1,474.84	1,512.30	1,486.28	1,522.25	1,574.30	1,645.11
Poland	5,492.73	4,756.24	5,427.05	5,703.59	5,840.53	5,920.82	6,164.85	6,450.57
Slovakia	990.04	960.35	1,013.66	1,059.41	1,090.55	1,112.55	1,139.20	1,180.28

Source: Author.

Social costs of smoking *SC* in Table 2 were determined through formula (7) in the methodology section for the respective V4 countries. The increase in this characteristic over the given period is apparent. This development copies the development of the *GDP* because the *SC* were calculated as a simple share in the *GDP*.

T a b l e 3

Social Costs per Single Cigarette *SCP*, *ASCP* (Euro)

GEO/TIME	2008	2009	2010	2011	2012	2013	2014	2015
Czech Republic	0.11	0.10	0.11	0.12	0.12	0.12	0.12	0.12
Hungary	0.10	0.09	0.10	0.11	0.13	0.16	0.21	0.21
Poland	0.09	0.08	0.09	0.10	0.11	0.13	0.14	0.16
Slovakia	0.12	0.12	0.14	0.14	0.15	0.17	0.17	0.17
EU average	0.28	0.28	0.30	0.31	0.36	0.37	0.40	0.43

Source: Author.

Table 3 provides an overview of the social costs per single cigarette (*SCP*). The calculation is based on the formula (6) in the methodology section of the text. In general, we can say that the costs were growing in the V4 group in the given period. The reason is the growth of the GDP and the simultaneous decrease in consumption. A similar development can be seen in the average values of the indicator in the EU countries (*ASCP*), calculated by formula (5). The interpretation of the values within the EU average is similar.

While consumption decreases the growth of costs does not make much sense at first sight. However, it must be realized that only certain cost items from the broad range of social costs of smoking are eliminated as a result of the decrease in consumption. We can mention the example of elimination of costs of fighting fires started by smokers. On the other hand, we cannot consider elimination of health care and most other costs. Health care costs will not amount to zero as of the moment when smoking is dropped nor will they vanish in a short time. The costs of passive smoking and most other items of the social costs may be assessed in the same way. Moreover, it must be noted that in the situation where most of the costs of smoking originate with a time delay, the costs caused by historical consumption must be covered by the current tax receipts from manufactured tobacco. This means that the current drop in the consumption of tobacco products will cause an increase in costs per consumed unit in the future. It logically follows that the measurements of costs of smoking must be made periodically and the share of such costs in the GDP must be adjusted according to the current situation.

T a b l e 4

Tax Receipts per Single Cigarette *TRP*, *ATRP* (Euro)

GEO/TIME	2008	2009	2010	2011	2012	2013	2014	2015
Czech Republic	0.06	0.06	0.07	0.08	0.09	0.09	0.08	0.08
Hungary	0.06	0.07	0.06	0.06	0.08	0.09	0.09	0.09
Poland	0.06	0.06	0.07	0.07	0.09	0.09	0.09	0.10
Slovakia	0.05	0.07	0.08	0.08	0.09	0.10	0.10	0.10
EU average	0.10	0.10	0.11	0.12	0.13	0.13	0.14	0.14

Source: Author.

If we calculate the difference between the costs of smoking per unit of consumption and the receipt of tobacco taxes, we must also calculate the revenue per cigarette (*TRP*) in Table 4 through formula (4) in the methodology section of the text. The collection of tobacco taxes per unit was rising in the V4 countries over the given period. This is attributed to the growing rates of taxes on manufactured tobacco. Such growth may also be caused by the increasing efficiency in the collection of tax or reduction in tax evasion. The amount and changes of indirect taxes are difficult to determine (David and Semerád, 2014). Table 4 shows average tax receipts in EUR per consumed cigarette (*ATRP*) in the EU countries, calculated by means of formula (3). These values are much higher than in the V4 group; the development trend is similar.

T a b l e 5
Social Deficit per Single Cigarette *SDP*, *ASDP* (Euro)

GEO/TIME	2008	2009	2010	2011	2012	2013	2014	2015
Czech Republic	0.04	0.04	0.04	0.03	0.03	0.03	0.04	0.04
Hungary	0.04	0.02	0.05	0.04	0.05	0.07	0.12	0.12
Poland	0.03	0.01	0.02	0.03	0.02	0.03	0.05	0.06
Slovakia	0.07	0.06	0.05	0.06	0.06	0.07	0.08	0.08
V4 Average	0.05	0.03	0.04	0.04	0.04	0.05	0.07	0.07
EU average	0.18	0.18	0.19	0.20	0.23	0.23	0.26	0.29

Source: Author.

The difference between the social costs of smoking and tobacco tax receipts (*SPD*) and the average value of this difference (*ASDP*) per cigarette in the V4 countries during the period of 2008 to 2015 was calculated by formulas (1) and (2) and is shown in Table 5.

The average value of the indicator in the EU countries was calculated using the same formula. Both in the EU as a whole and in all the respective countries of the V4, social costs exceed tobacco tax receipts. The difference is significantly lower in the V4 countries than the average value of the indicator in the EU. This is caused by the prevalence of lower social costs per unit in the V4 group in comparison with a lower tax receipt per unit in the V4 countries. The difference between the social costs of smoking and tobacco tax receipts in the EU within the defined time series of 2008 to 2015 was growing, with the exception of the Czech Republic. However, this growth is lower in all the V4 countries than in the EU as a whole, considering the absolute numbers.

The absolute social deficit in V4 countries (*SDA*) is quantified in Table 6. This social deficit calculated through formula (8) increases with the growing social deficit per single cigarette and growing absolute consumption of cigarettes. In the Czech Republic and Slovakia, the decrease in consumption prevailed over

the slight growth or stagnation of social deficit per single cigarette across the given time series. In Hungary and Poland, the decrease in consumption was outweighed by the increase in social costs per single cigarette, and thus the absolute social deficit grew in the monitored period.

T a b l e 6

Absolute Social Deficit in the V4 Countries *SDA* (millions of Euro)

GEO/TIME	2008	2009	2010	2011	2012	2013	2014	2015
Czech Republic	1,003.81	850.22	769.25	732.27	661.18	606.97	853.10	772.81
Hungary	613.85	351.70	687.10	612.41	576.32	683.59	875.86	933.56
Poland	1,755.16	899.72	1,177.40	1,620.65	1,278.77	1,550.57	2,001.91	2,309.10
Slovakia	601.54	453.02	403.61	436.46	455.74	476.20	504.50	527.66

Source: Author.

Table 7 quantifies the social deficit per capita in the V4 countries (*SDPC*) using formula (9). These costs, similarly to their absolute value *SDA*, grow in Hungary and in Poland and drop in the Czech Republic and Slovakia in the given period. Slovakia manifests the highest amount of all the V4 countries. These costs are significantly high in Hungary towards the end of the monitored period. On the contrary, their value is relatively the lowest in Poland. The most remarkable drop in the social deficit per capita in the years 2008 to 2015 can be seen in the Czech Republic.

T a b l e 7

Social Deficit per capita in V4 Countries *SDPC* (Euro)

GEO/TIME	2008	2009	2010	2011	2012	2013	2014	2015
Czech Republic	97.05	81.55	73.53	69.83	62.94	57.72	81.15	73.33
Hungary	61.11	35.06	68.61	61.33	58.03	68.99	88.67	94.72
Poland	46.05	23.59	30.97	42.58	33.60	40.74	52.66	60.76
Slovakia	111.89	84.17	74.88	80.94	84.33	88.01	93.15	97.33
V4 Average	79.02	56.09	61.99	63.67	59.72	63.86	78.91	81.54

Source: Author.

Conclusion

Although all member states of the European Union, including the V4 countries, comply with the requirement of the minimum rates of excise duties on cigarettes under the Council Directive 2011/64/EU, the taxes currently levied by the EU countries do not suffice to cover the social costs incurred as a consequence of tobacco consumption. Therefore, it is desirable for the respective countries to employ their own initiative and make the consumers of tobacco bear the costs of their harmful consumption.

The social deficit in the V4 group as well as the EU average always reaches positive values in the conducted research, and this means that the tax imposed on tobacco products fails to cover the social costs of tobacco consumption. The research has shown that the social deficit per unit of manufactured tobacco in the V4 countries is lower (EUR 0.07 in 2015) than the average value of this indicator within the framework of the EU (EUR 0.29 in 2015). This is caused by the situation where the effect of lower social costs in the V4 group prevails over the effect of lower tobacco tax revenues. The lower social costs of smoking result from the calculation based on the GDP (GDP is below the EU average in the V4 countries).

This fact is not a distortion of the research: the link between the health care costs and GDP amount is clear and has been evidenced herein. The lower tobacco tax revenues are primarily caused by the lower tobacco tax rates in the V4 countries in comparison with the EU average. The average social deficit per single cigarette in the EU countries in the years 2008 to 2015 was absolutely and relatively growing faster than was the case with the V4 group.

The development and present state of the social deficit indicator seems positive in the V4 countries in comparison with the average values ascertained for the EU. Unfortunately, the social deficit also grew in the V4, apart from in the Czech Republic. The absolute social deficit and the social deficit per capita did not go through a homogeneous development in the V4 countries.

While these indicators decreased in the Czech Republic and Slovakia, they grew in Hungary and Poland due to the growth of the social deficit per single cigarette. It must be stated that although the decrease may be considered a favourable trend, at the same time it holds true that every value except zero must be seen as a failure of the state's role in the application of a remedial tax in the market, which in itself is failing because it is not capable of including externalities into the selling prices and thus influence both consumers and other individuals and entities.

The calculated results of the respective characteristics of the social deficit of smoking slightly differ in the V4 countries from the EU average, but the critical point is more or less identical. It is the insufficient amount of the specific tax rate that fails to cover the social costs of tobacco use. Here, we shall identify with the results of analyses conducted e.g. by Sloan et al. (2004), Habrová and Hrubá (2007), Chaloupka and Warner (2000). Every V4 citizen suffers the consequences of others' or their own harmful consumption; in 2015 each of them had to contribute with an amount between EUR 60 and 100. These amounts, in their summary, express the minimum required increase in tax receipts necessary to cover the social costs of tobacco consumption.

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