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MORAL DILEMMA IN DECIDING ON THE AMOUNT OF EXCISE TAX ON TOBACCO PRODUCTS IN THE CZECH REPUBLIC

Vendula Simotová [1], Martin Votava [2]

[1,2] *Institute of Technology and Business in České Budějovice, Okružní 517/10, 37001 České Budějovice, Czech Republic*

E-mails:[1] simotova@mail.vstecb.cz; [2] 27949@mail.vstecb.cz

Abstract. The goal of the paper is to identify the relationship between the amount of excise tax (ET) on tobacco products in the Czech Republic and the collection of excise tax on tobacco products into the state budget of the Czech Republic between 2013 and 2021. The development of the tax rate and the method of determining the amount of excise tax on tobacco products in the CR is illustrated using the comparison method. The relationship between the revenue for the state budget from tobacco products and the amount of excise tax on tobacco products in the CR is expressed using a regression model. Development trends of illegal tobacco products in the territory of the CR are represented using time series regression. The net revenues from the excise tax on tobacco products are calculated using the difference-in-difference method. The amount of costs incurred by the state associated with smoking is defined based on an in-depth analysis of literary resources on the Web of Science portal, where a calculation based on a percentage share of the GDP is used. The results indicate that the excise tax rates in individual years show a growing trend except for one year where there was no change in the excise tax rate. On the other hand, the results show that an increased excise tax does not automatically result in higher revenue for the state budget. Other factors influence the collection of the excise tax on tobacco products, such as illicit trade in tobacco products. It is possible to use other research methods and data sources to determine the development of illegal trade in tobacco products to calculate the amount of smoking-related costs to the state.

Keywords: Excise tax on tobacco products; Customs Administration of the Czech Republic; illegal tobacco products; Gross Domestic Product; smoking-related costs to the state

1. Introduction

The harmful effects of cigarettes have been long known and pose a particular threat to people suffering from asthma. Exposure to passive inhalation of tobacco smoke, as well as active smoking, can lead to disease exacerbation, wheezing, cough, and shortness of breath (Bednárová et al. 2023; Nowak, Pawliczak, 2021). Tobacco products contain thousands of chemicals, including additives and toxic ones. It is believed that more than 1,200 chemicals are identified in tobacco products with mutagenic potential, with 900 potential mutagens being contained in tobacco smoke (Goel, Valerio, 2020). Cigarette buts are the most common form of litter in the world, and their impact on

the environment is related to both persistence and potential toxic effects on chemical composition (Caridi et al., 2020).

Cross-sectional, longitudinal, and experimental studies have identified a relationship between the exposure of young people to cigarette marketing and their initiation of smoking (Illésová et al. 2023; Dobrovolná et al. 2022). These research findings have led to the regulation of cigarette marketing targeted at young people, including bans on radio or TV commercials, bans on cartoons, transit or billboard advertisements, and bands on sponsoring sporting events or concerts by tobacco brands (Biglau, Van Ryzin, Westling, 2019). According to the EU's Tobacco Products Directive (2014/40/EU/TPD), manufacturers and importers of tobacco products are obliged to report information on products intended to be placed on the market to the European Commission and Member States (Carnicer-Pont et al., 2022). Tobacco products show rapid development. Since 2005, when the WHO Framework Convention on Tobacco Control (WHO FCTC) came into force, the parties to this convention have focused on tobacco use control. Moreover, the social norm of smoking has changed as well (Lee, Kim, 2020). These changes have prompted the tobacco industry to change their products and business model.

Based on a KPMG study in 2021, it was concluded that in countries with a high excise tax on cigarettes, there is an increase in the consumption of illegal tobacco products instead of a decrease in the number of smokers. Given the rising prices of staple products, there is a high risk that lower-income smokers will turn to illegal products (Echo24.cz, 2022). The illicit tobacco market is a significant socioeconomic and criminal-fiscal problem every modern state and its institutions need to deal with. High taxes, duties, and excise taxes that affect the price of legal tobacco and tobacco products are the main motivations for consumers to purchase illegal and cheaper tobacco products and tobacco (Kojic, Orlovic, 2016). Taxes effectively curb tobacco consumption (Freitas–Lemos, Keith, Tegge et al., 2021). Tobacco tax avoidance and evasion undermine the effectiveness of tobacco tax policies, which leads to lower prices and increased tobacco consumption (Papadaki et al., 2022; McDonell, McCansland et al., 2021). Tobacco tax evasion undermines the goal of tobacco taxes as a measure of tobacco consumption control concerning lower affordability of tobacco products increased health risks for smokers, and reduced government revenue (Vladisavljevic, Zubovic, Jovanovic, et al., 2022). Koch (2018) argues that tobacco taxes reduce tobacco consumption and are regressive.

The policy of tobacco control can thus have a preserve effect and harm the poor. However, if tobacco consumption decreases faster amongst the poor rather than the rich, the policy of tobacco control can have a progressive effect. Nargis, Hussain et al. (2020) state that the effectiveness of increasing taxes in reducing tobacco consumption depends on the extent to which the industry passes the tax on the consumers. Evidence suggests that the tobacco industry can absorb or increase prices more than a tax increase depending on the price segment of tobacco products. Based on the conducted study, Maldonado, Llorente et al. (2022) argue that tobacco tax increases reduce the number of smokers and intensity of smoking, which results in a decline in the number of cigarettes smoked. This decline is expected to decrease premature mortality, costs of health care, and poverty, improve health, increase income, and strengthen gender equality and mobilization of domestic resources for people who have to face catastrophic health care costs as well as in the case of illegal tobacco products (Soltes, Gavurova, 2015; Gavurova, Megyesiova, 2022). Tobacco taxes are an effective public health intervention and a powerful tool for advancing the 2030 Agenda for Sustainable Development. One of the most significant barriers to tax reform and increased tax rates is the threat of illicit trade promoted by the tobacco industry. The tobacco industry argues that higher taxes will encourage smuggling, undermining tax policy objectives and disrupting domestic tobacco production (Nguyen, 2020). Multinational tobacco companies intensively promote their argument that standardized tobacco packaging will increase illicit tobacco trade (Evans-Reeves, Hatchard et al., 2020).

The goal of the paper is to identify the relationship between determining the amount of the excise tax on tobacco products (cigarettes, cigars/cigarillos, and smoking tobacco) in the Czech Republic between 2013 – 2021 and the

collection of the excise tax on tobacco products (cigarettes, cigars/cigarillos, smoking tobacco) into the state budget of the CR in the period 2013-2021.

An appropriate increase in taxes and tobacco prices is an essential component of complex tobacco control strategies (Golestan, Kalan, Ben Taleb, et al., 2021). This leads to the formulation of research questions 1, 2, and 3 presented below:

RQ1: What was the development of the tax rate and the method of setting excise tax on tobacco products in the CR between 2013 and 2021?

RQ2: What is the relationship between the volume of excise tax collected on tobacco products in the CR and the tax rate in the period 2013-2021?

RQ3: What is the trend of illegal tobacco products in the CR between 2013 and 2021?

An increase in the excise tax on cigarettes can help some people stop smoking, but some can avoid the higher tax by buying cigarettes in another country (Bishop, 2018). Lower affordability of legal products, accessibility of cheaper cigarettes, higher national income inequality, higher population density, and the number of illegal cigarettes in neighboring regions are associated with higher illegal consumption (Aziani, Calderoni, Dugato, 2021). This leads to the formulation of research question 4 below:

RQ4: What is the net tax revenue from the excise tax on tobacco products in the CR?

2. Literature Review

Unlike a value-added tax, excise tax is limited to excisable goods. The list of excisable goods is compiled and taxed on, or, in the case of resale, using tax deductions, which meets the requirements of indirect taxation (Mamrukova, Bloskhina, 2020). Increasing the price of tobacco products via higher taxation is considered the most efficient tool to control tobacco consumption and its negative externalities (Putri, Murwendah, 2019). Increasing tobacco taxes is one of the most cost-effective interventions in the area of public health; however, many opponents often mention regressivity as an argument against tobacco taxation (Postolovska et al., 2018). Linegar, Van Walbeek (2018) state that the effectiveness of excise tax increases to reduce tobacco consumption largely depends on how the increased tax influences the retail price. The degree of excise tax pass-through and the effect of a discretionary increase in cigarette prices are largely determined by the competition in the cigarette market. According to Adenijj (2019), tobacco consumption remains a global threat to the population and public health. Increasing tobacco taxation is an efficient tool for its control. However, only 13 % of the global population lives in countries that impose adequate taxation on tobacco (Felsinger, Groman, 2022). Olesinski, Rozkrut, Toroj (2020) state that the differences between the actual and optimal tax policy in the case of tobacco products were marginal in the Polish market in the period 2014-2018. Valek (2019) states that excise taxes on tobacco products are highly harmonized in the EU, as there are the same types of products, regimes in intra-communitarian trading, and the same bans are applied in terms of selling these products to minors, advertising in media, or sponsorship.

Tax bases for excise tax on cigarettes are interrelated; any modification thus influences the collection of other taxes (Gonzalez-Rozada, 2020). Excessive consumption of tobacco products contributes to higher costs of health care and reduction of productivity. In the past, tobacco product taxation was motivated by generating revenue. Governments are increasingly using taxation to reduce unhealthy consumption of tobacco products (Chaloupka, Powell, Warner, 2019). Tobacco product consumption is associated with adverse health effects on consumers, often leading to premature deaths, which, in turn, impose additional costs and reduce a country's productivity (Valek,

2019; Gavurova et al. 2021b). Although excise tax is primarily levied on products that negatively affect our health and environment, the tax burden must be increased with caution by governments. For most of these products, it is impossible to find suitable substitutes, which makes the elasticity of demand very low (Hajdikova, Janak, Oberreiterova, 2019). Kukalova et al. (2018) state that excise tax is an important source of revenue for state budgets globally, and excise tax revenues from tobacco products do not reach the level of costs of health care for tobacco-related diseases for most of the analyzed period; this gap grows with the length of consumption, which can be interpreted e.g. as current excise tax revenues potentially implying public health expenditures that cumulatively exceed the revenues from relevant excise taxes. David (2018) also argues that the average tax rate imposed on tobacco products in the EU is insufficient compared to the social costs of smoking, as confirmed by previous research. Zhang and Zheng (2020) conclude that an increase in the excise tax on cigarettes hurt the likelihood of regular alcohol consumption among smokers, and the excise tax on cigarettes thus reduced smokers' average daily consumption of cigarettes.

Gibson and Kim (2019) argue that higher taxes shift demand to lower-quality tobacco products. The existence of an illicit tobacco market negatively affects public health and revenues from cigarette taxes by making cheaper, untaxed cigarettes more available (Gavurova et al. 2021a; Lavares et al., 2021). The illicit tobacco trade undermines the effectiveness of tax increases as a measure to control public health and a fiscal measure by introducing cheaper alternatives to full-priced legal cigarettes (Rigelsky et al., 2020; Vallios, van Walbeek, Ross, 2020). Cigarette packs are considered illegal if there is evidence that the tax has not been paid. This is inferred from the absence of an excise stamp (glue residue) (Ross et al., 2020). Smoking is considered a cause of one in five deaths worldwide. Therefore, governments try to reduce the number of active smokers by increasing taxes on tobacco products, which increases the consumption of illegal cigarettes, which are often seized and analyzed by police forces (Jurisch, de Paula, Augusti, 2020). According to Schafferer et al. (2018), illicit trade with cigarettes increases both the demand and affordability of tobacco products. Verguet, Kearns, Rees (2021) challenge the doctrine that in terms of standard accounting revenue share, tobacco taxes are uniformly regressive and point to the importance of the specific features of tax policy for shaping a progressive approach to tobacco taxes. In addition, the authors state that the threat of tax evasion and avoidance is the most frequently mentioned argument against increasing tax on tobacco products. The tobacco industry commonly overestimates the size of the illicit market to reinforce the idea of its direct relationship to the efforts of increasing taxes by the Internal Revenue Administration (Szklo, Iglesias, 2020). Sheikh, Branston, Gilmore (2021) concluded that although there is limited evidence to fully ascertain the response of the tobacco industry to the excise tax increase, the tobacco industry widely uses many sophisticated pricing strategies across various environments in the world to undermine the tax policy, hereby increasing tobacco consumption and maximizing their profits. The main pricing strategies include differentially shifting taxes between products, the introduction of new brands or products as ways for downtrading, product promotion and different prices of the same products for different customers, smoothing of prices, and changes in product attributes such as length or size of cigarettes or production processes. Balwicki et al. (2020) mention that farmers and intermediaries can only trade tobacco products if registered with the government. Farmers are obliged to report the size of their fields and the weight of the crop to the government authorities; any purchase within the supply chain is reported by a seller and a buyer for cross-validation to prevent manipulation within the system. Spivak, Givel, Monnat (2018) conclude that smokers consider their pocketbooks but both current and former smokers are ideologically motivated to oppose health initiatives; therefore, public health policymakers should emphasize the importance of public education and social norms in gaining support for tobacco control policies. Illegal cigarettes cause governments a significant revenue loss (Kasri et al., 2021). Moldonado et al. (2020) state that illegal cigarettes account for 3.5 % of overall cigarette consumption in five Colombian towns, which is a much lower estimate than the data provided by the industry. Aziani, Calderoni, Dugato (2021) believe that both price and non-price factors influence the consumption of illegal cigarettes. There is no empirical evidence on the role of two usual factors that are believed to have a significant impact, specifically corruption, and the shadow economy. Both supply and demand shape the illicit cigarette market. Prieger, Kulick (2018) state that there are differences in the estimates of the global illicit tobacco trade scale, but in general, estimates in the order of USD 40 billion in annual tax losses are cited. The illicit trade

in tobacco products accounts for approx. 10 % of the global retail market, with shares varying widely across countries.

The main input resources for comparing the development of the excise tax on tobacco products, the amount of collected excise tax from tobacco products, the volume of illegal tobacco products, and revenues from the tobacco product excise tax in the CR are data obtained from relevant official resources, especially data provided by the Ministry of Health of the Czech Republic, the Institute of Health, the Customs Administration of the Czech Republic, the Ministry of Finance of the Czech Republic, and the Czech Statistical Office (Kukalova et al., 2021). Linegar, Van Walbeek (2018) used data on excise tax on tobacco products from the Ministry of Finance and disaggregated data on cigarette prices used to calculate the consumer price index provided by the Czech Statistical Office. Olesinski, Rozkrut, Toroj (2020) used data on retail sales volumes and weighted average retail prices of cigarettes in two market segments: low-price (LOW) and high-price (HIGH) segments defined based on information obtained from BAT on the price position of each brand. Another source of retail price data is Nielsen. The Euromonitor International Passport database was a source of data on legal and total cigarette use and legal cigarette prices in the monitored period. World Bank data (the Atlas method) were used for the calculation of gross national income (GNI) per capita for each country (Schafferer et al., 2018). Data on cigarette consumption (i.e., smoking prevalence and average daily consumption of cigarettes) were obtained from published reports of the Ministry of Health (e.g., Basic Health Surveys and the Global Adult Tobacco Survey) and statistics (e.g., the National Socioeconomic Survey). Data on cigarette production (i.e., orders of cigarette industry stamps) were obtained from the Ministry of Finance (Office of Fiscal Policy). The assumption is that the market absorbed all cigarettes in the year of their production. Data on population estimates were based on population estimates provided by the Bureau of Statistics (Kasri et al., 2021).

The statistical methods for hypothesis testing were the most suitable methods for assessing the importance of tax rates. The main tool was the Gretl software (Kukalova et al., 2018). According to Dunbar, Nicosia, Kilmar (2021), logistic and Poisson regression analysis show the cross-sectional associations between the excise tax on cigarettes and smoking behaviors, specifically current cigarette smoking, smoking frequency, the intensity of consumption, and cigarette cessation among individuals smoking at the current installation. Olesinski, Rozkrut, Toroj (2020) developed a methodological framework for estimating time-varying elasticities of demand in a state model estimated using a maximum likelihood based on the Kalman filter. Schafferer et al. (2018) used panel data for legal and illegal cigarette consumption and fixed-effect regression models for different income groups. Kasri et al. (2021) estimate the illicit cigarette trade in terms of its volume and revenue loss. Illicit trade was estimated as a difference between legal cigarette sales and domestic consumption recorded by national representative surveys.

3. Methodological approach

3.1. Data

The source of the data is the information published by the Customs Administration of the Czech Republic, specifically the Overview of excise tax rates for tobacco products according to the Act No. 353 / 2003 Coll. (effective from 1 January 2004), Determination of the weighted average price of cigarettes for the years 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, the Calculation of the amount of excise tax on tobacco products, as well as data published by the Ministry of Finance of the Czech Republic in the Report on the activities of the Financial Administration of the Czech Republic, and the Customs Administration of the Czech Republic for the years 2017 and 2021, Tax and Customs Revenue as of 31 December 2021. Other sources of information include data published by the Ministry of Health of the Czech Republic, data published by the World Health Organization (WHO), data published by the Zdravotnický deník and Sociální politika. Another data source is data published by the Czech Statistical Office, specifically data on gross domestic product (GDP) for the years 2013-2021 from the main macroeconomic indicators. Other data sources include data published in a study by the Consultancy KPMG, which

estimates the extent and the development of the illicit cigarette market in the EU. This report was prepared for the multinational tobacco manufacturer, Philip Morris International. The input data are also obtained from available literary resources on the Web of Science, with the selection parameter being the last five years, i.e., the years 2018, 2019, 2020, 2021, and 2022.

3.2. Methods

The calculation of the excise duty on tobacco products: the amount of tax on cigarettes while using a fixed amount and a percentage share of the tax rate is calculated as a sum of the following items:

The product of the percentage share of the tax rate and the price for the final consumer of these cigarettes divided by 100, and The product of the fixed amount of the tax rate and the number of pieces. The tax base for the percentage share is the price for the final consumer, while the base for the fixed amount is the quantity given in pieces. A tobacco string of up to 80 mm is considered 1 cigarette. A tobacco string longer than 80 mm but shorter than 110 mm is considered 2 cigarettes. A tobacco string longer than 110 mm but shorter than 140 mm is considered 3 cigarettes. Each additional 30 mm of tobacco string (even a part of it) is considered another cigarette. If the amount of tax on cigarettes calculated using the fixed and percentage share of the tax rate is lower than the amount of tax calculated using the minimum tax rate, the amount of tax calculated using the minimum tax rate shall be used. The amount of tax on cigars, cigarillos, and smoking tobacco is calculated as a product of the tax base and the fixed tax rate, where the weight of smoking tobacco at the time of the tax is due and payable is decisive for calculating the tax on smoking tobacco. The tax base for cigars and cigarillos is the quantity expressed in pieces; in the case of smoking tobacco, it is the quantity expressed in kilograms (Celní správa ČR, 2022).

The development of the tax rate and the method for setting the excise tax on tobacco products in the CR between 2013 and 2021 is described using the method of difference. Data provided by the Customs Authority of the CR are used to compile tables in Microsoft Excel, which represent the amount of excise tax rate for a given year, consisting of the tax rate – fixed amount, tax rate – percentage share, and the minimum tax rate. If the sum of the fixed amount of the tax rate and the percentage share is lower than the minimum tax rate, the tax rate at the amount of the minimum tax is used. A grouped bar chart in Microsoft Excel is used to describe the development of the minimum excise tax on cigarettes, cigars, cigarillos, smoking tobacco, and heated tobacco products for individual years in the period 2013-2021. These methods are used to answer the first research question. To describe the relationship between the state budget revenues from the excise tax on tobacco products and the amount of the excise tax on tobacco products in the CR between 2013 and 2021 in terms of the linear dependence of the two variables, the regression model is used, which examines the effect of the amount of the excise tax on the state budget revenue from the excise tax on tobacco products in the CR in the monitored period 2013-2021. The amount of excise tax collected and the excise tax rate in individual years are tabulated in Microsoft Excel.

Regression analysis was used to examine the relationship between two variables – the so-called independent (explanatory) variable (the amount of excise tax on cigarettes) and the dependent (response) variable (the amount of the collected excise tax on tobacco products) with the help of statistical function Regression in Microsoft Excel. Using regression, the following values can be obtained: Multiple R (correlation coefficient R), R Square (coefficient of determination R^2), Adjusted R Squared (the value of reliability, adjusted coefficient of determination R^2), Observations (the number of observations), p-value, and other values. To be applicable in practice, regression analysis needs to meet the requirements of serial independence, data normality, and homoskedasticity. The assumption of data normality is verified using the Shapiro-Wilk test of data normality. The null hypothesis is not rejected if the p-value is greater than the level of significance α. To verify the assumption of serial independence, the Durbin-Watson test was used. The null hypothesis is not rejected if the p-value is greater than the level of significance α. These assumptions are verified using the statistical program R.

The equation of the regression line in the graph is expressed using a dot chart in Microsoft Excel. The basis of the simple linear regression is an equation in the following form: $y = b_0 + b_1.x$, where y is a dependent (response) variable, which is, in this case, the amount of the collected excise tax on tobacco products, and x is an independent (explanatory) variable, i.e., the amount of the excise tax rate on cigarettes, b_0 is a constant, b_1 indicates how the amount of excise tax on cigarettes affects the excise tax revenue from tobacco products in the state budget of the CR. The regression equation supplemented by values shows how much CZK on average the excise tax revenue from tobacco products will increase by increasing the excise tax on a 20-cigarette pack by CZK 1. The graph also presents a linear trend line.

The correlation analysis is used to illustrate the relationship between individual variables, i.e., how the amount of the excise tax on tobacco products changes with the change in the amount of the excise tax on cigarettes. The correlation analysis is performed using the statistical correlation function (CORREL) in Microsoft Excel. Based on the calculated correlation coefficient, it was possible to determine the relationship between the collected excise tax on tobacco products and the amount of the excise tax on cigarettes. The correlation coefficient takes the values between -1 and +1. These steps will lead to answering research question 2.

The development trend of illegal tobacco products in the CR between 2013 and 2021 is illustrated using time series regression. Data on the number of illegal tobacco products in the CR within the monitored period are obtained from the KPMG consultancy study conducted for the multinational tobacco producer Philip Morris International. The methodology used to estimate the size of the illicit cigarette market in the context of previous annual studies and the reports of Project Stella was used consistently in this study, with the underlying data sources remaining the same. The methodology is based on the combination of hard data, such as the sales of legal cigarettes in the EU, publicly available data, such as smoking prevalence and average prices of cigarettes, and surveys on empty packs ordered by many tobacco producers, which are conducted by independent market research agencies. It should be noted that external factors, such as the COVID-19 pandemic, influenced the results for the years 2020 and 2021. Using Microsoft Excel, the data obtained are shown in a dot plot, and a trend line is created. The X-axis shows the time (period), while the Y-axis shows the quantity of illegal tobacco products in the CR (in billions of cigarettes). These methods are used to answer research question 3.

The difference-in-difference method is used to calculate the net revenues from the excise tax on tobacco products in the CR. From the collected excise tax on tobacco products for each year in the reference period 2013 - 2021, the costs incurred by the state about smoking for each year of the monitored period were deducted. From an economic perspective, if the difference between the collected excise tax and the costs incurred by smoking was positive, smoking would be economically advantageous for the state. In contrast, if the difference between the collected revenue and the costs incurred from smoking was negative, it would mean that smoking is economically disadvantageous for the state. Given the fact that smokers do not die instantly from smoking but represent a gradual burden of costs for the health system and their life expectancy varies, it is very difficult to calculate the exact costs of smoking. For this reason, in-depth research of scholarly papers dealing with the costs incurred by the state about smoking is available on the Web of Science. Suitable data sources were searched using the following keywords: costs of smoking, and costs of the state with smoking. In addition, a time filter of the date of the publication of scholarly papers was set for the last five years, i.e., for the period 2018 – 2022. Subsequently, an analysis of papers related to the costs of smoking was conducted using other available resources: the World Health Organization, the Government of the Czech Republic, the Ministry of Health of the Czech Republic, Nemocnice Strakonice, a.s., Zdravotnický deník, Tobacconomics. Based on the content analysis, a suitable procedure for calculating smoking-related costs was selected. The data were tabulated using Microsoft Excel, while the net tax revenue/cost for each year was presented in a Microsoft Excel chart. These methods were used to answer research question 4.

4. Results and Discussion

The application part includes the introduction, evaluation of the data obtained, and answering the research questions.

RQ1 Method of setting the excise tax on tobacco products in the CR between 2013 and 2021
The calculation of the excise tax on tobacco products in the CR differs according to the type of the product. The amount of the excise tax on individual tobacco products each year is defined by the Customs Administration of the Czech Republic in the document Tobacco Products – Overview of the excise tax rates for tobacco products under Act No. 353/2003 Coll. (effective since 1 January 2004).

Based on the Overview of the excise tax rates for tobacco products by Act No. 353 / 2003 Coll. (effective since 1 January 2004) published by the Customs Administration of the CR, an overview of the excise tax rates for tobacco products in the CR between 2013 and 2021. The excise tax on cigarettes consists of a fixed amount, a percentage share, and the minimum tax rate. If the sum of the fixed amount and the percentage share is lower than the minimum tax rate, the minimum tax rate applies.
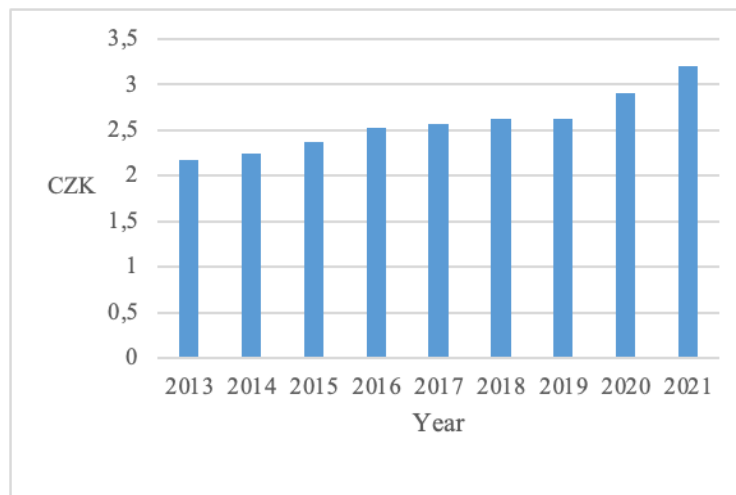

Figure 1. The amount of the minimum excise tax rate on cigarettes in 2013-2021 (CZK/1 piece)
Source: Authors based on data from the Customs Administration of the CR

In Figure 1, there is a clear upward trend of the amount of the minimum excise tax on cigarettes in the monitored period 2013-2021 except the year 2019, where there was no change in the minimum excise tax rate on cigarettes.
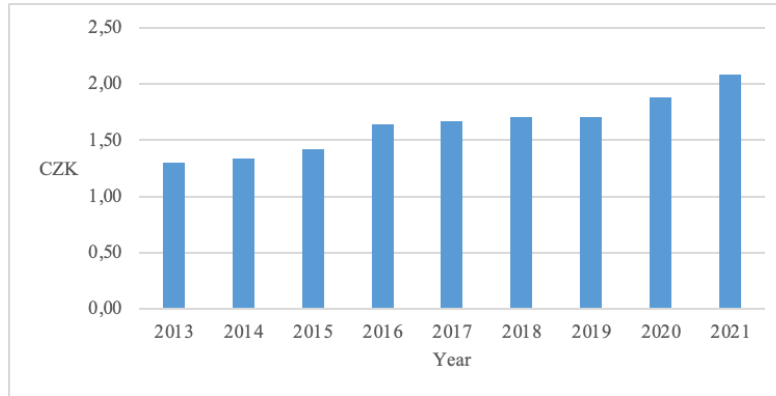
Figure 2. The excise tax rate on cigars and cigarillos in the years 2013-2021 (CZK/1 piece)
Source: Authors based the data from the Customs Administration of the CR

Figure 2 shows a clear upward trend of the fixed amount of the excise tax on cigars and cigarillos in the monitored period 2013-2021. The year 2019 is an exception, as there was no change in the fixed amount of the excise tax rate on cigars and cigarillos.
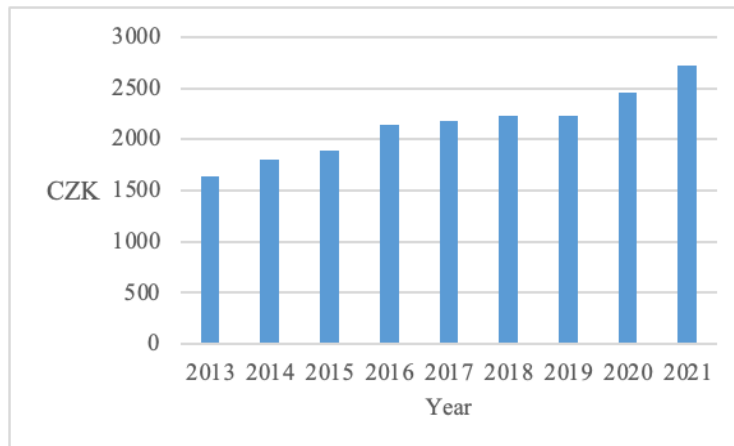

Figure 3. The excise tax rate on smoking tobacco in the years 2013-2021 (CZK/1 kg)
Source: Authors based on the data from the Customs Administration of the CR

Figure 3, there can be seen an upward trend of the excise tax rate on smoking tobacco in the monitored years 2013-2021, except the year 2019, when no change in the excise tax rate on smoking tobacco was recorded.
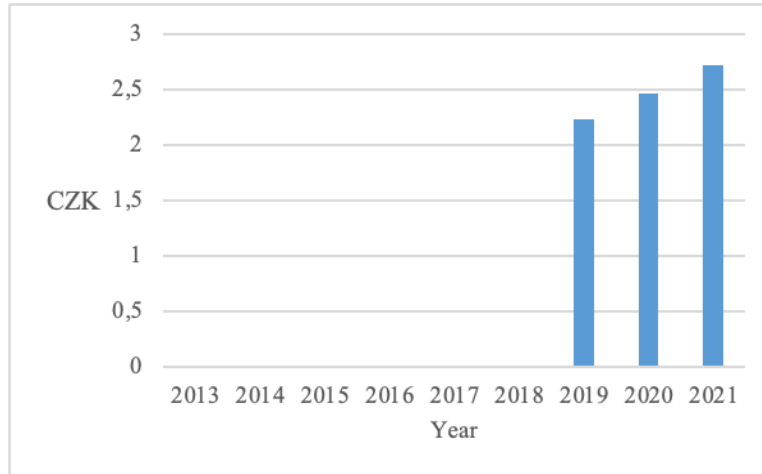
Figure 4. The excise tax rate on heated tobacco products in the years 2013-2021
Source: Authors based on the data from the Customs Administration of the CR

Figure 4 shows an upward trend in the excise tax rate on heated tobacco products in the monitored period. Heated tobacco products are currently the last type of tobacco products on which the excise tax was imposed on 1 April 2019. The fixed amount of the tax on heated tobacco products shows a continuous year-on-year growth.

RQ2 Relationship between the amount of the collected excise tax on tobacco products and the amount of the excise tax rate on tobacco products in the CR in the years 2013-2021.

Table 1. Excise tax rate applied to a 20-cigarette pack.

Excise duty rates on cigarettes in the year	Tax rate fixed part (CZK/1 cigarette)	Tax rate percentage (%)	Minimum tax rate (but at least CZK/1 cigarette in total)	Weighted price average for cigarettes (packs of 20 cigarettes)	Tax rate fixed part + percentage (pack of 20 cigarettes)	Minimum tax rate per 20 pack of cigarettes	The tax rate applied to 20 packs of cigarettes	Excise duty collected on tobacco products (CZK billion)
2013	1.16	27	2.18	69.71	42.02	**43.60**	43.60	46.8
2014	1.19	27	2.25	73.74	43.71	**45.00**	45.00	44.7
2015	1.29	27	2.37	76.48	46.45	**47.40**	47.40	50.9
2016	1.39	27	2.52	80.14	49.44	**50.40**	50.40	54.4
2017	1.42	27	2.57	83.96	51.07	**51.40**	51.40	56.2
2018	1.46	27	2.63	86.00	52.42	**52.60**	52.60	58.8
2019	1.46	27	2.63	89.72	**53.42**	52.60	53.42	55.9
2020	1.61	30	2.90	91.12	**59.54**	58.00	59.54	59.5
2021	1.79	30	3.20	102.38	**66.51**	64.00	66.51	56.2

Source: Authors based on the data from the Customs Administration of the CR and the Ministry of Finance of the CR

The time series presented in Table 1 indicates that except for three years, the minimum tax rate is applied. The exception concerns the years 2019, 2020, and 2021.

Due to the possible application of regression analysis in practice, the assumption of serial independence, data normality, and heteroskedasticity are verified using the statistical program R. The assumption of data normality is

verified using the Shapiro-Wilk test of data normality. The resulting p-value is 0.3816 (38.16 %). 0.3816 > 0.05, i.e., the p-value is greater than the level of significance α. In this case, the significance level is set at 5 %. The assumption of data normality is thus confirmed, the null hypothesis is thus not rejected. The verification of the data normality is carried out using the statistical software program R. Brensch-Pagan test is used to verify the assumption of homoskedasticity. The resulting p-value is 0.6467 (64.67 %). 0.6467 > 0.05, i.e., the p-value is greater than the level of significance α. In this case, the significance level is set at 5 %. The assumption of homoskedasticity is confirmed; the null hypothesis is thus not rejected. The assumption of serial independence is verified using the Durbin-Watson test. The resulting p-value is 0.02717 (2.717 %). 0.02717 > 0.01, i.e., the p-value is greater than the significance level α. In this case, the significance level is set at 1%. The assumption of serial independence is thus confirmed, and the null hypothesis is not rejected. Based on the above data, when the null hypotheses are not rejected, it can be stated that all the assumptions for regression analysis are met.
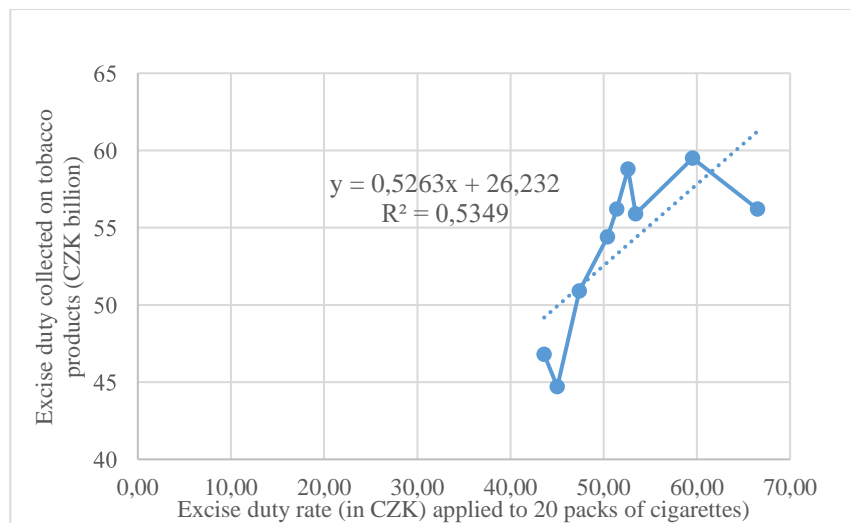

Figure 5. The relationship between the amount of the collected excise tax and the excise tax rate in the years 2013-2021 in the CR
Source: Authors based on data from the Customs Administration of the CR and the Ministry of Finance of the CR

The equation of the regression line is as follows: $y = 0.5263x + 26.232$. Y is a dependent (response) variable, which is the amount of the collected excise tax on tobacco products; x is an independent (explanatory) variable, i.e., the excise tax rate on cigarettes. 26.232 is a constant, and 0.5263x indicates how the amount of the excise tax on cigarettes influences the revenue from the excise tax on tobacco products to the state budget of the CR. The regression equation supplemented with values shows how much the revenue from the excise tax on tobacco products will increase on average if the excise tax on a 20-cigarette pack is increased by CZK 1. The graph also shows the linear trend line and the R^2 value.

RQ3 Development trend of illegal tobacco products in the CR in the years 2013-2021

Figure 6. Quantity of illegal tobacco products in the CR in the years 2013-2021
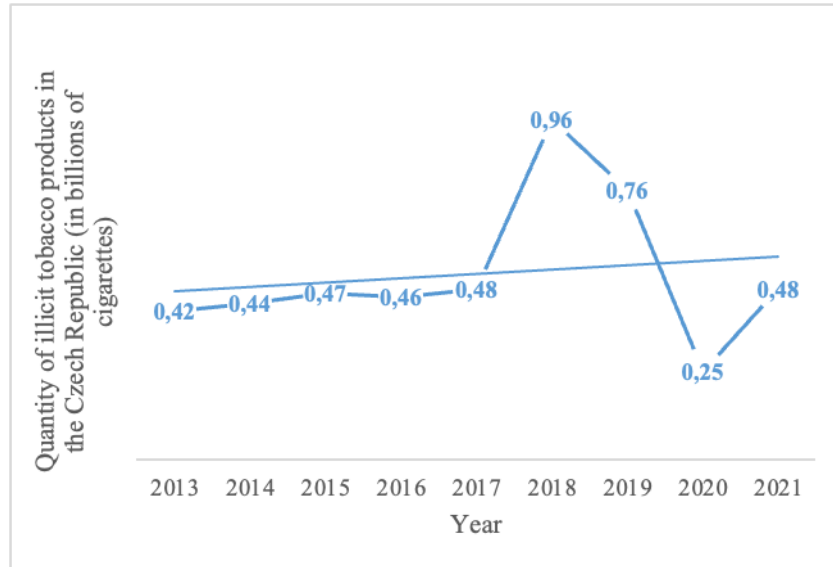
Source: Authors based on KPMG data

As seen in Figure 6, the highest volume of illegal tobacco products in the CR was recorded in the year 2018. Here, it should be noted that the results for the years 2020 and 2021 are influenced by the COVID-19 pandemic.

RQ 4 Net revenue from excise tax on tobacco products in the years 2013-2021

The net tax revenues from the excise tax on tobacco products in the CR were calculated using the difference-in-difference method. The incurred costs were deducted from the amount of the collected excise tax on tobacco products in the CR for each year in the reference period 2013-2021. Given the fact that smokers do not die instantly from the effects of smoking, they represent a burden for the health system and their life expectancy varies, it is very difficult to calculate the exact costs associated with smoking. For this reason, in-depth literary research of available scholarly papers dealing with costs incurred by the state about smoking on the Web of Science was carried out. Suitable data sources were searched using the following keywords: costs of smoking, and costs of the state with smoking. The time filter for the date of the scholarly papers' publication was set to the last five years, i.e., the period 2018-2022. In addition, an analysis of papers related to the costs of smoking was conducted using other available web sources: the World Health Organization, the Government of the Czech Republic, the Ministry of Health of the CR, Nemocnice Strakonice, a.s., Zdravotnický deník, Tobacconomics.

Tobacco tax is the most cost-effective measure to reduce tobacco consumption and costs of health care, especially among young people and low-income groups of people, as well as to increase the state income in many countries. Tax increases must be high enough to push prices above revenue growth. Rising tobacco prices by 10 % reduces its consumption by about 4 % in high-income countries and by about 5 % in low- and middle-income countries (Tobacco, Key Facts, WHO, 2022).

Based on the results of the content analysis, a method for the calculation of the costs of smoking was selected. For this reason, to calculate the costs of smoking in the CR, the highest and the lowest % value of the GDP stated in research and the % value of GDP for the CR. The lowest cost of smoking cited in the literature was 0.65 % of the

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GDP (Komonpaisarn, 2021), while the highest cost represented 3 % of the GDP (Ministerstvo zdravotnictví ČR, 2021). 2 % of the GDP was cited for the CR (Schillerová et al., 2019).

Table 2. Costs of smoking in the CR calculated based on the GDP.

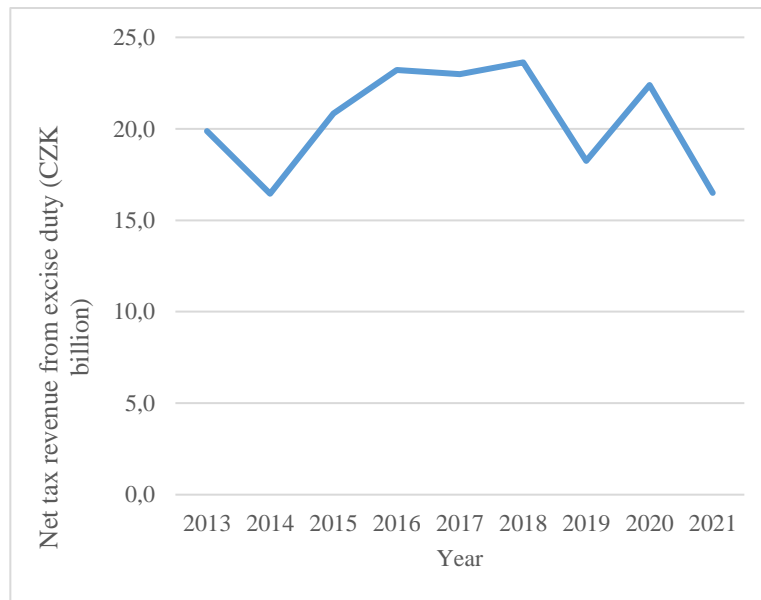| Year	Excise duty collected on tobacco products in the year (CZK billion)	GDP in the Czech Republic in CZK billion	Smoking-related expenditure in the Czech Republic, calculation 0.65% of Czech GDP (CZK billion)	Smoking-related expenditure in the Czech Republic, calculated as 3% of Czech GDP (CZK billion)	Smoking-related expenditure in the Czech Republic, calculated as 2% of Czech GDP (CZK billion)	Difference between excise duty collected on tobacco products and smoking-related expenditure of 0.65% of Czech GDP (CZK billion)	Difference between excise duty collected on tobacco products and smoking-related expenditure of 3% of Czech GDP (CZK billion)	Difference between excise duty collected on tobacco products and smoking-related expenditure of 2% of Czech GDP (CZK billion)
2013	46.8	4142.8	26.9	124.3	82.9	19.9	-77.5	-36.1
2014	44.7	4345.8	28.2	130.4	86.9	16.5	-85.7	-42.2
2015	50.9	4625.4	30.1	138.8	92.5	20.8	-87.9	-41.6
2016	54.4	4796.9	31.2	143.9	95.9	23.2	-89.5	-41.5
2017	56.2	5110.7	33.2	153.3	102.2	23.0	-97.1	-46.0
2018	58.8	5410.8	35.2	162.3	108.2	23.6	-103.5	-49.4
2019	55.9	5791.5	37.6	173.7	115.8	18.3	-117.8	-59.9
2020	59.5	5709.1	37.1	171.3	114.2	22.4	-111.8	-54.7
2021	56.2	6108.4	39.7	183.3	122.2	16.5	-127.1	-66.0

Source: Authors

Figure 7. Difference between the collected excise tax on tobacco products and costs of smoking of 0.65 % of GDP in the CR (in CZK billion)
Source: Authors based on the calculated data

As seen in Figure 7, when calculating the costs of smoking of 0.65 % of the GDP in the CR, the difference between the amount of the collected excise tax on tobacco products and the costs of smoking takes positive values, which means that the state budget of the CR received a higher amount than it incurred to cover costs of smoking.
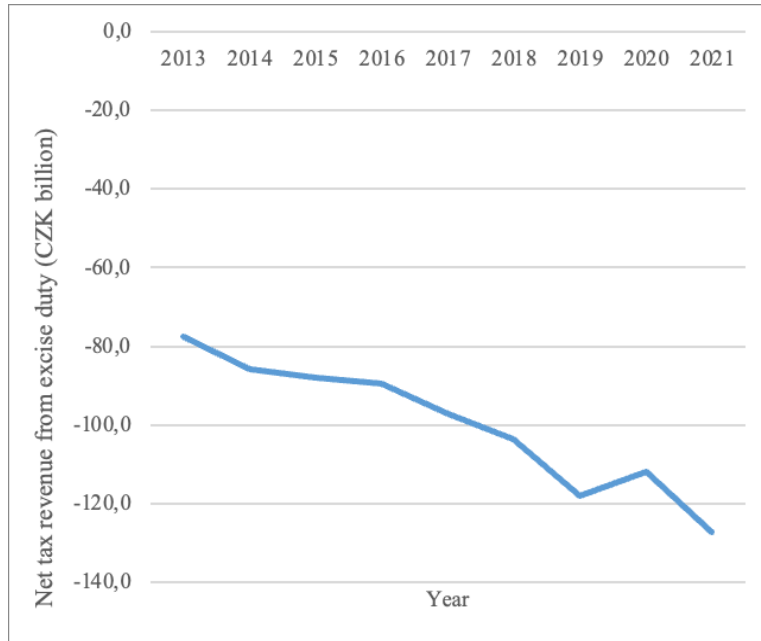
Figure 8. Difference between the collected excise tax on tobacco products and costs of smoking of 3 % of the GDP in the CR (in CZK billion)
Source: Authors

Based on Figure 8, it can be stated that when calculating the costs of smoking of 3% share of the GDP in the CR, the difference between the amount of the collected excise tax on tobacco products and the costs of smoking takes negative values, which means that the amount the state budget of the CR receives is lower than the amount of the collected excise tax from tobacco products.
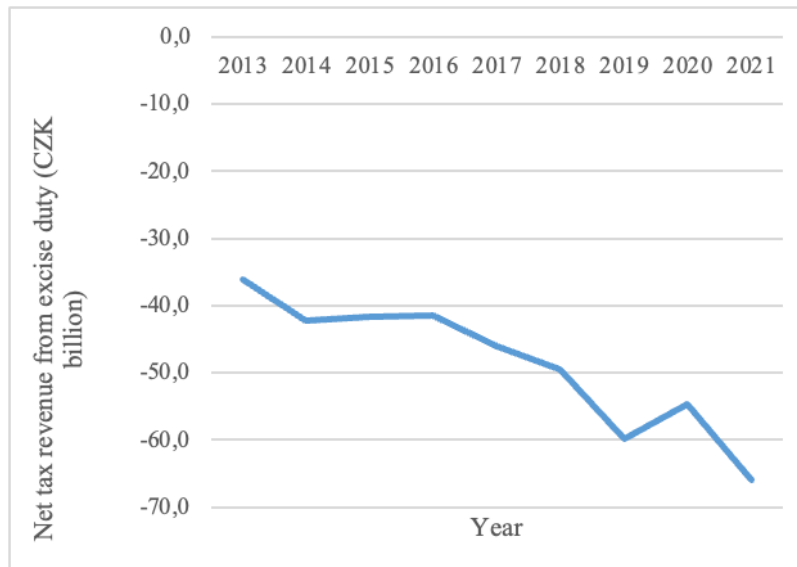
Figure 9. Difference between the collected excise tax on tobacco products and costs of smoking of 2% share of GDP in the CR (in CZK billion)
Source: Authors

As seen in Figure 9, when calculating the costs of smoking of 2% share of the GDP in the CR, the difference between the amount of the collected excise tax on tobacco products and the costs of smoking achieves negative values, which means that the state budget of the CR receives a lower amount than the amount of the collected excise tax on tobacco products.

5. Conclusions

The objective of the paper was to identify the relationship between the amount of the excise tax on tobacco products (cigarettes, cigars/cigarillos, and smoking tobacco) in the CR in the period 2013–2021 and the collected excise tax on tobacco products in the state budget of the CR between 2013 and 2021.

Excise tax on tobacco products is part of the state budget of the CR. Setting the amount of the excise tax and the mechanism for its calculation is one of the factors influencing the amount of the collected excise tax on tobacco products in the state budget. It is not an automatic rule that the higher the excise duty rates on tobacco products, the higher the revenue to the state budget, which is confirmed by the results presented in this paper. Another factor affecting the amount of the collected excise tax on tobacco products in the CR is the number of illegal tobacco products in the CR in the reference period, as the state does not receive any revenue from them. Here, the direct proportionality applies, as the greater the amount of illegal tobacco products in the CR, the greater the tax leakage and the amount the state budget loses. The development trend of illegal tobacco products in the CR in 2020 was partly influenced by the COVID-19 pandemic, especially the restriction of the movement of people between countries and thus the flow of illegal tobacco products.

The state collects excise tax for the state budget from tobacco products. On the other hand, the state has to cover the costs of smoking, which include, e.g., the costs related to smoking treatment or the costs related to the reduction of smoking. Smoking is associated with adverse health effects on smokers, often resulting in premature death, thus depriving the state of income tax, reducing the productivity of the Czech Republic, and causing further economic losses to the state. The costs of smoking cannot be precisely determined, as many factors cannot be clearly quantified and attributed to smoking. The amount of the incurred costs related to the consumption of tobacco products in the CR may vary significantly depending on the chosen percentage of the gross domestic product of the CR since the percentage of the GDP varies as well, as confirmed by the content analysis performed on WoS sources.

It should be noted that on the revenue side of the state, there are excise taxes on tobacco products as well as taxes on the profits of tobacco companies, which employ many people and generate additional income taxes paid to the state budget. The tobacco companies are linked to other companies dealing with the purchase, sale, storage, distribution, logistics, and transport of tobacco products, which pay other taxes on their profits to the state budget and generate additional taxes on the income of their employees.

Further research could deal with the moral decision-making concerning the amount of excise tax on tobacco products, specifically on the development of sales and the effects of the imposed excise tax on other alternatives to tobacco products. These are primarily nicotine pouches and disposable flavoured e-cigarettes, which are currently not subject to any excise tax and thus the regulation by the state. Consumers of these products often include very young people who in some cases, do not meet the age limit for purchasing these products. Due to this fact, the state loses part of its revenue to the state budget; moreover, the legislation does not fulfil the function of reducing the demand for these products.

In addition, further research could also focus on the amount of excise tax on heated tobacco products, as there is a large disproportion in setting the amount of excise tax compared to conventional cigarettes.

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Author Contributions: All authors contributed equally. All authors have read and agreed to the published version of the manuscript.

Vendula SIMOTOVÁ is a lecturer at the Institute of Technology and Business in České Budějovice, Czech Republic. Her fileds of reserch are demand, supply. She teaches microeconomics and macroeconomics. She participated in several research project focused on economic environment assessment. Her methodology for economic environment assessment is used in several softwares used in companies for demand prediction.
ORCID ID: https://orcid.org/0000-0002-6383-8623

Martin VOTAVA is a junior researcher at the Institute of Technology and Business in České Budějovice, Czech Republic. He is a specialist in tobacco trade. He is experienced not only in reserch he also provides consultations to tobacco corporations – in the field of pricing strategy. He participated in several reserch projects.
ORCID ID: https://orcid.org/0009-0002-3138-2120

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