

## Personal Income Tax Progressivity in the Czech Republic and Its Influence on Tax Revenue\*

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### Abstract

The article evaluates the influence of the tax progressivity of the personal income tax on tax revenue in the Czech Republic. The first part of the study deals with the analysis of tax progressivity. In the next part, the indicator of tax progressivity is used as a variable of the regression model examining its effect on tax revenue. The analysis is carried out for the period 1993-2020. For part of the period, the nominal tax rate was progressive, for part of the period, on the contrary, it was linear. This approach to solving the research topic is thus unique and creates added value to the text. This is due to the length of the examined period, the alternative approach to measuring tax progressivity, and the way the tax base from dependent activity was constructed in the Czech Republic for part of the period.

**Keywords:** Czech Republic, effective tax rate, personal income tax, tax revenue, tax progressivity.

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## 1. Introduction

The tax system of the Czech Republic consists of direct and indirect taxes. Direct taxes include income taxes, such as personal income tax and corporate income tax, and property taxes, which include road tax and real estate tax. From the point of view of tax revenue, personal income tax is the most important source for the public budget. Indirect taxes, such as value-added tax, excise duties, or energy taxes, also significantly contribute to revenues in the state budget. Other direct payments of a tax nature include social security contributions.

The personal income tax has been a part of the tax system of the Czech Republic since its establishment in 1993. The subject of personal income tax in the Czech Republic is divided into five partial tax bases. The most important is the partial tax base of dependent activities, which is also the subject of this research study.

The Income Tax Act, which regulates the area of personal income taxation, is undergoing constant changes. These legislative changes can thus affect state revenues. Among the most significant are changes in the technique of calculating the tax liability and the method of determining the tax base, changes in tax rates, and adjustments in the value of deductions – for example, for the taxpayer.

From 1993 to 2005, the tax base was the gross wage, which was reduced by social security contributions paid by the employee and non-taxable parts of the tax base (e.g., per taxpayer or children). This adjusted tax base was multiplied by the nominal progressive tax rate. The technique of calculating the tax liability from 1993 to 2005 is shown in Figure 1.

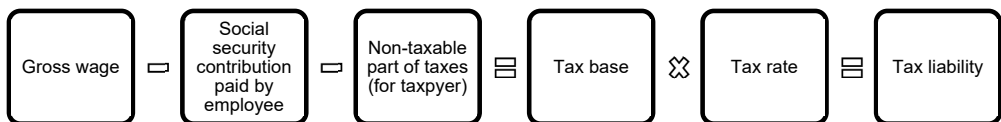


Figure 1: Income tax calculation in 1993–2005

Source: Author's own processing

Since 2006, a taxpayer relief has replaced the non-taxable part of the tax base per taxpayer. Again, this fact changed the technical procedure for calculating the tax liability, as shown in Figure 2.

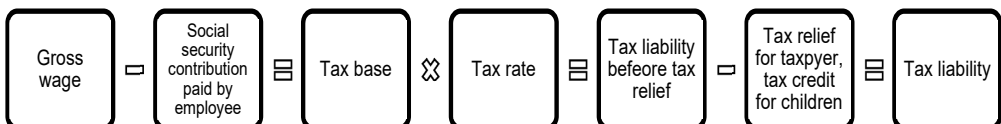
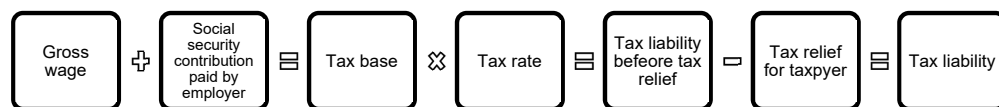


Figure 2: Income tax calculation in 2006–2007

Source: Author's own processing

Another change has taken place in the Czech Republic since 2008. The tax base has not been reduced by the social security contribution paid by the employee since this year. It is schematically shown in Figure 3.



**Figure 3:** Income tax calculation in 2008–2020

**Source:** Author’s own processing

For the entire period analyzed in this study, the method of determining the tax base and the technique of calculating the tax liability changed. Changes in the tax rate were also frequent.

Initially, in 1993 there were a total of six tax bands ranging from 15% to 47%. From 2006 to 2007, there were only four tax bands ranging from 12% to 32%. The change in the tax liability calculation technique as of January 1, 2008 also brought about a fundamental change in the type of tax rate. Since 2008, the nominal personal income tax rate has been proportional. This was true until the end of 2012. Since 2013, a solidarity tax surcharge of 7% has been added. The development is shown in more detail in Table 1.

**Table 1:** Personal income tax rate from 1993 to 2020

Period	Number of tax bands	Rate in the lowest band	Rate in the highest band
1993–1995	6	15%	47%
1996–2000	5	15%	40%
2001–2005	4	15%	32%
2006–2007	4	12%	32%
2008–2012	1	15 %	
2013–2020	2	15%	15% + 7%

**Source:** Author’s own processing

Relatively significant changes also took place in the area of tax deductions. The most used deduction is according to the Financial Administration (2022) deduction per taxpayer. The deduction for the taxpayer was in the form of the non-taxable part of the tax base from 1993 to the end of 2005.

The tax reform on 1 January 2006 replaced the non-taxable part of the tax base for the taxpayer with a tax relief.

The taxpayer’s relief remains unchanged until the end of the last analyzed period, i.e., in 2020 in the unchanged amount of CZK 24,840. This was not the case only in 2011 when the taxpayer’s relief was temporarily reduced by CZK 1,200.

The changes in the Income Tax Act, as it follows, take place very often. Tax revenue usually depends on the tax rate (Serrato and Zidar, 2018). However, this study’s conclusion

may not be entirely valid because not only the tax rate affects the amount of tax liability and thus the public tax revenue. In order to calculate the tax liability of a natural person, the taxpayer needs to know the tax rate and other structural elements of the tax, such as non-taxable parts of the tax base or tax reliefs. In addition to changes in other structural elements of the personal income tax, the globalization of the economy is also essential (Andrejovská *et al.*, 2020). The European Union's tax policy focuses on both direct and indirect taxation. The area of direct taxation is not significantly harmonized due to each country's very different national regulations. Therefore, on the contrary, harmonization in the field of taxation is more developed in the areas of indirect taxes, especially in value-added tax (Krzikallová and Tošenovský, 2020).

Personal income tax can have a proportional, regressive or progressive tax rate. The progressive personal income tax rate is a typical feature of most world tax systems. The principle of progression is that the tax burden is increasing faster than the taxpayer's income (Oishi *et al.*, 2018). Conversely, if the tax burden increases slower than the income, the tax rate is regressive. If the tax burden develops directly in proportion to income growth, the tax rate is proportional.

Analyzing the tax progressivity is the first theme of this study. The main goal is to evaluate the effect of tax progressivity on tax revenues of personal income tax, which, as already mentioned, is one of the significant sources of income for the state budget. The analysis will be done for the period from the establishment of the Czech Republic to 2020. The year 2020 represents the last year with available data sets. The year 1993 is the first year since which the personal income tax is a part of the tax system of the Czech Republic. A research study comprehensively evaluating such a long period in all personal income tax reforms has not yet been carried out in the Czech Republic.

Is it better for the state to have a linear or progressive tax rate? Does a progressive rate mean more tax revenue than with a nominal linear rate? And the tax burden of the taxpayer can only be assessed on the basis of the nominal tax rate? Based on the text above, the hypothesis is based on the fact that the degree of tax progressivity and tax revenue of the personal income tax is decreasing. This hypothesis is formulated mainly on the basis that the nominal tax rate was linear between 2008 and 2020. The structure of the article is chosen as follows. The introduction briefly describes the most significant changes in personal income tax in the Czech Republic for the period 1993–2020. The following part of the text, Chapter 2, deals with an overview of research studies that have already been carried out in the area already covered by the study. The third part is focused on the characteristics of input data and methods used in the analytical part of the article. The main part of the text is the fourth part. In this part of the study, there is verification, respectively refutation of formulated hypotheses and research questions. The conclusion of the text summarizes the main new findings and other possibilities for research in this area in the future.

## 2. Literature review

While the taxpayer tries to pay as little as possible in the tax, the state's goal is to collect as much money as possible. At first glance, it may seem that the way to achieve higher tax revenues is to increase the tax rate or tax progressivity. For the fact that a high nominal tax rate usually negatively affects the taxpayer, it is preferred to have a nominal tax rate progressive. As the income increases, the taxpayer thus moves to a zone with a higher nominal tax rate, which leads to an ever-increasing amount being drawn from the income. On the other hand, it is also necessary to consider that a high degree of tax progressivity leads to the transfer of activities to the shadow economy, which, on the contrary, causes a decrease in income to the state budget. Either a linear or progressive tax rate has its advantages and disadvantages. Therefore, when determining the type of tax rate, the state must, according to Perez *et al.* (2022) or Carnerio *et al.* (2022) consider the current economic situation, political orientation or preferred type of economic policy, or set economic goals. A progressive tax rate can disincentivize work at a high degree of progression. From the point of view of tax principles, a progressive tax rate better fulfills the principle of tax justice, and the stabilization of the national economy is also better ensured.

The existence of only one rate positively impacts the motivation to work, ensures the simplicity of the tax system, and, in some cases, in accordance with the rules of the Laffer curve, can lead to an increase in tax revenue. The arguments against a linear tax rate are based on the fact that it reduces the redistributive effect of taxes. Another negative effect is the reduction of the stabilization function of taxes (Dardanoni and Lambert, 2002).

Research studies and academic literature on personal income tax analyze the aspects of personal income tax from the macroeconomic and microeconomic points of view. Research studies have also focused on examining the progressivity of the personal income tax or tax revenues. General aspects of the measurement of progressiveness are stated by e.g., Kakwani (1977), Suits (1977) or Gerber *et al.* (2020).

Hunter and Scott (1983) analyzed the connection between tax progressivity and tax revenue. This study confirms that an increase in tax progressivity positively impacts tax revenue, but only up to a certain point. After that, there is already a decline. These conclusions are related to the theory of the Laffer curve (see Hiraga and Nutahara (2022) for more on the Laffer curve). A study conducted in Spain by de Sarralde *et al.* (2013) also mentions the possible negative impact of progressivity on tax revenue. The advantage of a progressive tax compared to a linear one is that the redistributive function of taxes is better ensured from the state's point of view. Datt *et al.* (2022), based on an analysis conducted in India, found that even a higher degree of progressivity can be beneficial. This is ensured by the potential for higher tax revenue and the fulfillment of other tax principles of the state's fiscal policy.

Holter *et al.* (2019) investigated the USA at which the highest rate of labor tax is possible to achieve the highest tax revenues. According to the study results, the tax burden on labor should not be higher than 50%. This is the total burden, including all other contributions to social insurance. If the goal is to maximize tax revenue, it is recommended to tax work's income by a progressive tax rate. If the government's goal is to increase state

budget revenues, it is recommended to use a progressive tax rate and increase the degree of progression. This solution is preferred over a blanket increase in tax rates (Heathcote and Tsujiyama, 2021).

Nam and Zelner (2016) in Germany, Thoresen (2004) in Norway, and Stanovnik and Verbič (2013) in Slovenia dealt with issues of tax progressivity evaluation. In addition, studies examining the progression of personal income taxes in several countries at the same time have been carried out, such as Wagstaff and van Doorslaer (2001). The conclusions of these studies lead to the finding that there is a reduction in tax progressivity in personal income tax. In the Czech Republic, Friedrich *et al.* (2012) or Dušek *et al.* (2013), for example, assessed the progressivity of personal income taxes. These studies also confirm the trend in other European Union countries that the progressivity of the personal income tax and its income are declining. The results of studies carried out outside the European continent, such as Shen *et al.* (2021), Splinter (2020) or Tran and Zakariyya (2021) in Australia, are the same. A study analyzing the tax progressivity of the personal income tax and revenue of this tax in the Czech Republic from 1993 until 2020 has not yet been carried out. Only partial studies evaluating, for example, the effects of the tax reform carried out in 2007 on tax progressivity were carried out (Friedrich *et al.*, 2012). As a result, the tax burden grows faster as the taxpayer's income rises. The second study (Šíroký and Maková, 2009) states that the progression of personal income tax rates in the Czech Republic increased in 2006 when a taxpayer relief replaced the non-taxable part of the tax base. Already mentioned studies used interval indicators to evaluate progressivity. This study aims to use a different approach and thus expand scientific knowledge in this area by analyzing not only progressivity but also its influence on tax revenue.

In the Czech Republic, the non-taxable parts of the tax base were replaced by tax reliefs in 2006. Tepperová *et al.* (2021) analyzed the impact of this tax reform on personal income tax revenues in the Czech Republic. This study states that the replacement of non-taxable parts of the tax base also affected the progressivity of the tax rate and tax revenues. Personal income tax revenue has decreased by more than CZK 20 billion.

## **2. Data and methodology**

### **2.1. Data**

The following data sources were used for analysis:

- tax revenue of personal income tax from the dependent activity (TR FO mil. CZK), tax revenue share of personal income tax from the dependent activity on total tax revenue of the Czech Republic (TR FO %) from the websites of the finance ministries (Customs Administration of the Czech Republic Tax Statistics, 2022);
- inflation rate (INFL) according to the Czech Statistical Office (Czech Statistical Office, 2022a);
- weighted averages of progressiveness indicator (PTO) and weighted averages of effective tax rates (ETR %) according to the wage distribution in the analyzed period in the Czech Republic and the author's own calculation;

- average wages in the period from 1993 to 2020 according to the Czech Statistical Office (Czech Statistical Office, 2022b);
- non-taxable part of the tax base, respectively taxpayer tax relief from valid versions of the Income Tax Act between 1993 and 2020.

Until 2005, the deduction per taxpayer took the form of a non-taxable part of the tax base (for tax calculation, see Figure 1), since 2006 it has taken the form of a tax relief. To verify the dependency, it is necessary to have the amounts adjusted for deductions of the same type. Therefore, the non-taxable part of the taxable amount per taxpayer will be converted into the value of the tax relief by the calculation methodology valid for the period 2006–2007. The calculation will be made using (1)

$$TR = (AGW - SSC_E) \cdot TR_p \quad (1)$$

where  $TR$  is the tax relief,  $AGW$  is the annual gross wage,  $SSC_E$  is the employee's social security contributions, and  $TR_p$  is the tax rate in the relevant tax band.

The taxpayer tax relief for 2006 and 2007 is retained, as the non-taxable parts of the tax base are adjusted for calculation according to the methodology valid in this period (see Figure 2). From 2008 until the end of 2020, the tax liability is calculated according to the scheme in Figure 3. The value adjustment according to the procedure valid for the period 2006 and 2007 is made using the formula (2)

$$TR = T_{BR} - T_{AR} \quad (2)$$

where  $TR$  is the tax relief,  $T_{BR}$  is the tax liability before the tax relief calculated according to the methodology valid for 2006 and 2007 and  $T_{AR}$  is the tax liability after the tax relief calculated according to the methodology for the period 2008 to 2012. As a total period of 30 years will be analyzed, these amounts will also be indexed to the 2020 price level in line with the inflation rate in the economy.

All the above data are analyzed for the period 1993–2020. The year 1993 is the first year when the Income Tax Act was valid, and it is also the year when the Czech Republic was founded. The year 2020 represents the last year for which the data are available for analysis from the database of the Czech Statistical Office (Czech Statistical Office, 2022a; Ministry of Finance, 2022).

To examine the dependence of tax revenue on tax progressivity, the values of progressivity indicators, or effective tax rates, are divided into the period 1993–2007, i.e., the period when the nominal tax rate was progressive, and the period 2008–2020, when the nominal tax rate was linear. Progressivity indicators and effective tax rates will be converted to average values based on the distribution of wages in the population.

## 2.2. Methodology description

Progressivity indicators—points or intervals—can be used to measure progressivity (Kakwani, 1977). A suitable indicator according to Suits (1977) is the indicator of the progressiveness of the tax obligation (PTO) determined generally by the equation (3)

$$PTO = \frac{\frac{T_1 - T_0}{T_0}}{\frac{Y_1 - Y_0}{Y_0}} \quad (3)$$

where  $Y_o$  is taxpayer income in the lower-income interval,  $Y_i$  is taxpayer income in the higher-income interval,  $T_o$  is tax obligation in the lower-income interval, and  $T_i$  is tax obligation in the higher-income interval. Table 2 shows the interpretation of progressivity indicators' values.

**Table 2:** Interpretation of progressivity indicators

Type	Progressive	Regressive	Proportional
PTO value	>1	<1	1

**Source:** Author's own processing according to Friedrich *et al.* (2012)

For the indicators to be reliable and relevant, it is necessary to choose the size of the income interval, i.e., the threshold values of the interval. According to Kinkor (1994), a range of at least 0.25 times for intervals with a higher frequency of wages, respectively at least 0.5 times for intervals with a lower frequency in the population is usually recommended. This requirement for the relevance of the evaluation is met because, for the purpose of the analysis, the intervals with a higher wage frequency are graded by 0.1 times, for intervals with a lower wage frequency, the recommended spacing of 0.5 times the average wage is applied. According to Kubátová (2016), the fact that the information on average wages is obtained from the Czech Statistical Office (Czech Statistical Office, 2022c) also means that it covers a wide range of employees. According to OECD methodology (OECD, 2022), the tax burden is standardly calculated from the average income of the unmarried and childless taxpayer. Therefore, the indicators PTO are calculated for the case where there is applied only the basic deduction for a taxpayer.

The effective tax rate (ETR) is determined (4)

$$ETR = \frac{\text{personal income tax}}{\text{gross wage}} \quad (4)$$

How the tax burden develops with the amount of wages can be evaluated using an effective tax rate. If formula (5) applies

$$ETR_L < ETR_H \quad (5)$$

where  $ETR_L$  is the effective rate in a lower multiple of the average wage,  $ETR_H$  is the effective tax rate for a higher multiple of the average wage. The tax burden grows faster, and the rate is progressive. If, on the other hand, the  $ETR_H$  is lower than the  $ETR_L$ , the actual tax rate is regressive. If the equality between  $ETR_L$  and  $ETR_H$  applies, the actual income tax rate is proportional.

Another way to assess whether the tax burden increases with the growth of the tax base in proportion to the tax base faster or slower, is the marginal tax rate indicator  $MTR$  generally determined (6)

$$MTR = \frac{\Delta T}{\Delta Y} \quad (6)$$

where  $\Delta T$  is the change in the taxpayer's tax liability in CZK,  $\Delta Y$  is the change in the taxpayer's income in CZK. If equation (7) applies, the income tax rate is progressive,

$$MTR_L < MTR_H \quad (7)$$

where  $MTR_L$  is the marginal rate in the lower income interval,  $MTR_H$  is the marginal tax rate for the higher income interval.

The article's main goal is to assess whether the progressivity of the personal income tax affects the tax revenue for the personal income tax. This goal will be achieved using regression analysis. In general, the relationship can be formalized according to (8)

$$Y = b_0 + b_1 \cdot X_1 + b_2 \cdot X_2 \quad (8)$$

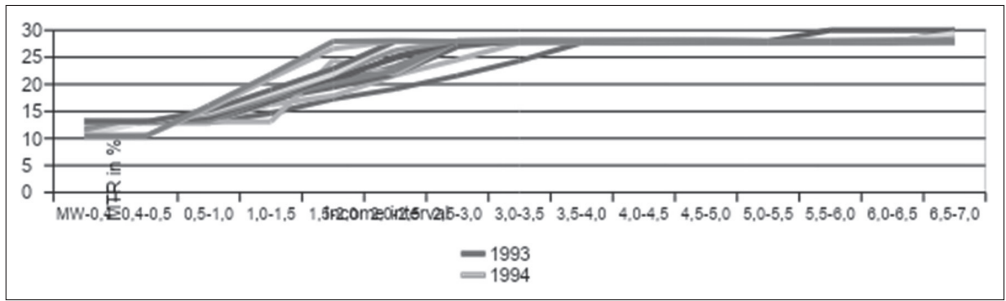
where  $Y$  is the tax revenue and  $X_n$  is the weighted average ETR, or PTO in the  $j$ -th year.

### 3. Results and discussion

Before analyzing the dependence of tax revenue on tax progressivity, or effective tax rate, the ETR and PTO indicators must be calculated.

The already mentioned interval progressivity indicator (3) is used to assess whether income tax was progressive. Following the OECD methodology (OECD, 2022), a taxpayer is used for tax purposes without additional deductions. This assumption will be maintained for this analysis as well. In addition to evaluating progressivity with the interval progressivity indicator, another approach can be chosen. Calculated marginal, respectively effective tax rates also make it possible to assess whether the tax rate is progressive. Based on the calculated values of these indicators, the study's main goal will be to examine the dependence of the tax revenue on the ETR values or PTO. Evaluating the progression of personal income tax revenue in the context of ETR or PTO values is one of the uniqueness of this study, as previously conducted studies used only indicators of interval progression (Friedrich *et al.*, 2012; Nadirov and Dehning, 2020). The analysis results are shown in Figures 4a, 4b, 5a and 5b. In addition, an approach in line with previously performed studies using an interval indicator is also chosen (Figure 6). The division of the analyzed period into two equally long periods in figures is for the sake of clarity of the graphic presentation. Another reason for the split is the already mentioned public finance reform on January 1, 2008, which changed the nominal progressive tax rate to the nominal proportional tax rate.

The first figure presented in this section (Figure 4a) captures the development of marginal tax rate in the years 1993–2007. This rate is calculated by the general formulation determined (6).



**Figure 4a:** Marginal tax rate in 1993–2007

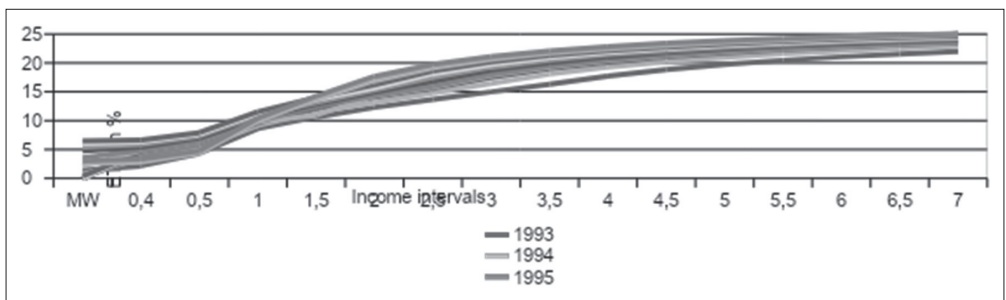
**Source:** Author’s own processing

The marginal tax rate is either increasing ( $MTR_L < MTR_H$ ) or constant ( $MTR_L = MTR_H$ ) in the analyzed income intervals, despite the fact that the nominal tax rate is progressive throughout the period under review according to the applicable legislation.

Lower values of the marginal tax rate are usually in the range of up to 2.0 times the average wage. The reason for this is the fact that a lower nominal tax rate is applied due to the lower tax base.

On the contrary, there is often a proportional taxation of another unit of income in the analyzed income intervals above the average wage. This is valid in 1993 from 4.0 times the average wage (MTR is approximately 28%), in 1994 from 3.5 times the average wage, in 1995–2003 from 3.0 times the average wage and in 2004–2005 from 2.5 times, respectively in the years 2006–2007 from 2.0 times the average wage. Also, in these cases, the marginal rate is around 28%.

Not only the marginal tax rate change, but different values were also obtained for the effective tax rate, as shown in Figure 4b.



**Figure 4b:** Effective tax rate in 1993–2007

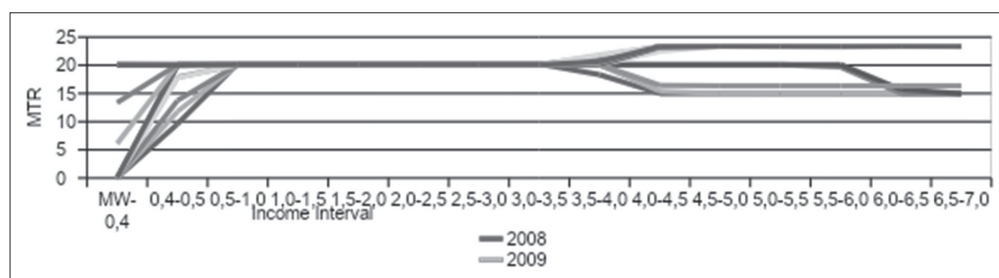
**Source:** Author’s own processing

Suppose it was assessed whether the tax rate is progressive based on the average tax rate of the income taxpayer corresponding to a multiple of the average wage. According to the

results of Figure 4b, the tax is progressive if the effective tax rate in the lower-income interval is lower than the effective tax rate in the higher-income interval.

The results show that between 1993 and 2007, the effective income tax rate in the Czech Republic was progressive in all analyzed intervals. With increasing income, the degree of progressivity of the personal income tax gradually decreases. In the years 1995–1998, taxpayers with an income at the minimum wage level had zero tax liability. Due to the deduction for the taxpayer and the method of construction of the tax base, taxpayers achieved zero tax base and thus zero tax liability (calculation of tax liability in these years is shown in Figure 1).

How the marginal, respectively effective tax rates in the years 2008–2020 changed, is captured in Figure 5. Specifically, Figure 5a shows the marginal tax rate, and Figure 5b effective tax rate.



**Figure 5a:** Marginal tax rate in 2008–2020

**Source:** Author's own processing

Since 2008, there have been situations where the tax liability also develops proportionally or regressively. The highest degree of increase in the tax burden between the income intervals is mainly in the interval between 0.5–1.0 times the average wage in 2008–2013.

From 2008 to 2013, the marginal tax rate had a proportional character in the interval between the minimum wage (MW) and 0.4 times the average wage. Thus, there is consistency that both the nominal rate and the real tax rate are proportional. The reason for this phenomenon is not only the nominal proportional tax rate. Another reason is the tax relief, which is higher than the tax before the relief. Papanikolaou (2021) also found similar results that the personal income tax may not be progressive. On the contrary, the results of this analysis differ slightly from those of Friedrich *et al.* (2012) and Šíroký and Maková (2009), who state that the real income tax rate was either progressive or regressive. In contrast to the mentioned studies, the examined income interval was refined, which led to a partial difference between the results of this study and the mentioned studies.

In 2008, 2009 and 2012, at intervals above 4.0 times the average wage, the marginal tax rate was around 15%, the same value as the nominal tax rate. In 2010 and 2011, the above was valid at intervals of more than 6.0 times the average wage. What is the reason for this? After exceeding this assessment base for social security contribution, the tax base is already

determined in the manner specified by equation (9)

$$TB = GW + 0,09 \cdot MABHI + 0,25 \cdot MABSSP \tag{9}$$

where  $TB$  is the tax base,  $GM$  is the gross wage,  $MABHI$  is the maximum assessment base for health insurance, and  $MABSSP$  is the maximum assessment base for social security premiums and the state employment policy contribution. Since the marginal tax rate is proportional but the tax base is decreasing, there is a regressive development of the tax liability. A similar conclusion is reached in a study by Wagstaff and van Doorslaer (2001).

The tax base in the form of a super-gross wage has remained the same since 2013. The marginal tax rate does not show a regressive character, even though the maximum assessment base for social security contributions and the contribution to the state employment policy is still in force. From 2013 until the end of 2020, a rate of 7%, referred to as a solidarity tax surcharge, is still applied to income exceeding this maximum assessment base.

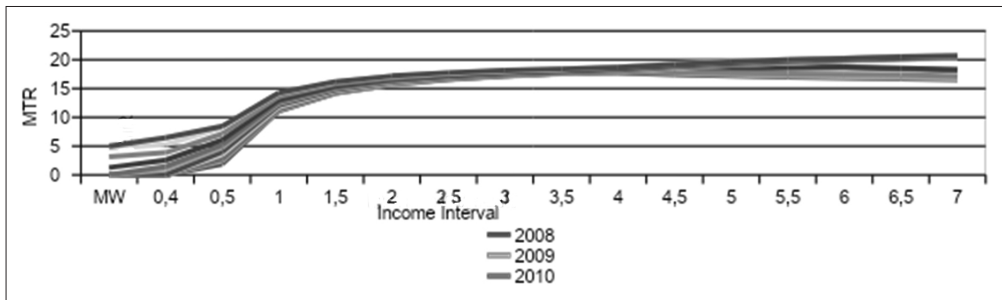


Figure 5b: Effective tax rate in 2008–2020

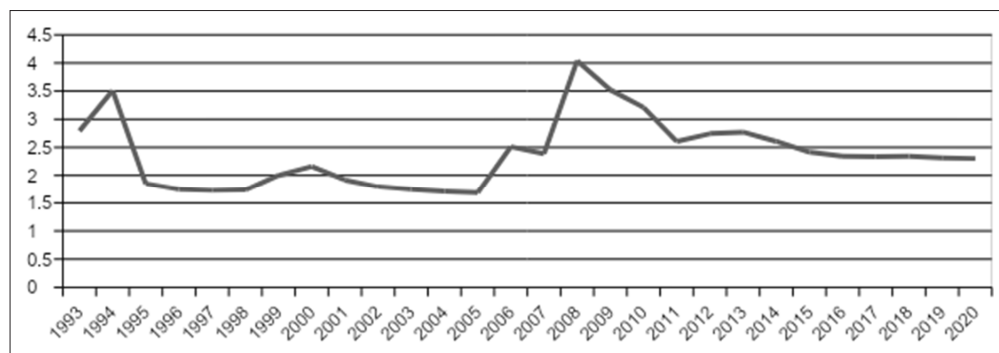
Source: Author's own processing

If progressivity is assessed based on the value of the effective tax rate in the lower income interval and the effective tax rate in the higher income interval, it was also found that the tax rate is proportional, progressive, or regressive. The proportional character of the tax burden is in the intervals between the minimum wage and 0.4 times the average wage in the years 2008 to 2013. In the period from 2008 to 2012, income tax based on effective tax rate has a progressive character up to 4.0 times (in 2008, 2009 and 2012), respectively 6.0 times (in 2010 and 2011), i.e., up to the value of the maximum assessment base for social security contribution. Since 2013, the effective tax rate has developed progressively in all examined intervals due to the solidarity tax surcharge.

As already mentioned, the examination of tax progressivity has also been carried out in the past using interval indicators of progressivity, including the PTO indicator. In order to maintain the uniqueness of the approach from the solution process already in the performed studies, the PTO values are calculated as weighted averages based on the distribution of wages in the national economy.

The weighted arithmetic averages of PTO are for the years presented in Figure 6. These values form the input data for the following part dealing with the regression analysis, which

is used to examine the dependence on the tax revenue on PTO and ETR. The results of Figure 6 do not confirm the findings of Vitek and Pavel (2013) that the tax progressivity decreased in 2008.



**Figure 6:** Development of PTO in the 1993–2020

**Source:** Authors' own processing

To evaluate the dependence of tax revenue on tax progressivity two separate regression models are created. Hereby, the mentioned issue is solved from the point of view of the established goal of the study, i.e., from the point of view of public policy. The state aims to maximize tax revenue and collect as much as possible from taxes. The obtained results are captured in Table 3. The first regression model  $S_1$  presents the above dependencies for the period when the nominal tax rate was of a progressive type, and the regression model  $S_2$  for the period when the nominal tax rate was linear.

**Table 3:** Regression analysis

	Model $S_1$		Model $S_2$	
	Coef.	Sig.	Coef.	Sig.
$X_1$ - PTO	28,516.5	0.014	14,244.5	0.040
$X_2$ - ETR	51,113.7	0.001	82,285.6	0.001
Constant	-501,052.4	0.001	-778,180.3	0.026
Observation	14		12	
$R^2$	0.934		0.790	
DW test	2.298		1.789	
F test	99.7	0.001	23.524	0.001

The general form of the regression equations is formalized by (10) and (11).

$$y = 28,516.5x_1 + 51,113.7x_2 - 501,052.4 \quad (10)$$

$$y = 14,244.5x_1 + 82,285.6x_2 - 778,180.3 \quad (11)$$

From the data in Table 3, it follows that the significance level values for all regression equation coefficients come out in order (lower than significance level 0.05). The *F*-test value is also in order by the conditions that must be met for regression modelling. The result of the *DW* test also proves that the data do not show autocorrelation (more e.g., Guillen *et al.*, 2021). The prerequisites for creating a regression model are thus fulfilled.

In both cases, it is confirmed that tax progressivity has a positive impact on tax revenue. In the context of the type of tax rate, it can be stated that a higher positive impact results from the value of the  $X_1$  coefficient is for the first time period.

The general form of the regression equations is formalized by (8) and from the state's point of view, in 1993–2007, the share of personal income tax in the total tax revenue was also higher. Also, in absolute value, there has been an increasing trend since 1993. The reason was also the type of economic policy of the state, which was rather left-oriented. This type of economic policy is characterized by a progressive tax rate for taxpayers with low incomes in order to reduce income inequality in society, and on the contrary, taxpayers with above-average incomes are taxed more.

For the period 2008–2020, the regression equation coefficients (11) also have positive values, but they are lower. Based on the analysis above, it follows that tax progressivity has a positive impact on tax revenue. The results of progressiveness show that the personal income tax rate was mainly progressive even in years when the nominal tax rate was linear. In 1993–2007, when the nominal tax rate was progressive, the impact on tax revenue was more favorable than when the nominal tax rate was linear.

From the state's point of view, it can be concluded that if tax progressivity were to increase, tax revenue would also increase. In connection with the current economic situation and the long-term high deficit of public finances, the above idea is one of the possible solutions to this situation. The current political situation in the country is in line with proposals to increase the tax revenue of this tax, aimed at a more significant abolition of tax exemptions in the context of tax exemption. This fact wouldn't affect tax progressivity. Increasing tax progressivity to achieve higher tax revenue can be motivating for the state on the one hand—the principle of tax justice is better fulfilled, or the deficit of public finances is reduced.

#### **4. Conclusion**

The article aimed to analyze the effect of tax progressivity in the personal income tax in the Czech Republic on its tax revenue. The above was examined for the period 1993–2020.

In the first part of the analytical section of the study, the tax progressivity of the personal income tax was examined. The reason for carrying out progressivity analysis is that these results are used as input data for the main part of the analysis examining the dependence of tax revenue on tax progressivity. An alternative evaluation approach was also chosen to measure tax progressivity—due to this fact the dependence of the tax revenue in the model was also examined on the effective tax rate. In addition to the effective tax rate, progressivity was also examined by using the marginal tax rate. The results of the analysis

of progressivity showed that, despite the fact that the nominal tax rate has been linear since 2008 the personal income tax in the Czech Republic is a progressive tax.

The dependence of the tax revenue on the progressivity of the tax was examined only in the legislative conditions that are valid in the Czech Republic. What is the reason for choosing only one state? From 2008 until the end of the last analyzed year, the Czech Republic was strongly specific in the way the tax base was constructed. The basis of the tax was the so-called super-gross wage, which represented the amount of the gross wage increased by the mandatory social security contributions from the wages of employees paid by the employer. Paradoxically, there was a situation where the nominal tax rate was 15%, but the real rate was approximately 5% higher due to how the tax base was constructed.

Another peculiarity of the Czech Republic was a uniform nominal tax rate of 15%. The Czech Republic government was often presented to the public as a 'fair' or 'one' tax rate. The results of the analysis show it was a progressive tax rate. The implementation of this rate was aimed, among other things, at simplifying the tax calculation technique and ensuring a higher tax yield. However, as the results show, this effect did not occur, as the tax revenue decreased in 2007 and 2008 for personal income tax.

The existence of only one nominal tax rate or the way the tax base was constructed until the end of 2020 is not typical in other countries of the world. Thus, the Czech Republic had a certain peculiarity in the tax rate and base. In comparison with other countries of the world, a nominal progressive tax rate is typical. The first band with a 0% tax rate is also standard in some countries. During the entire 13 years, when the analyzed method of construction of the tax base and the type of tax rate was in force, no other countries applied this method of determining the tax base. In particular, the approach to determining the tax base was strongly criticized, where not only the employee's salary was taxed, but also the social security contribution paid by the employer. This was also often referred to as double taxation. Also, introducing only one tax rate into the tax system of neighboring states or more distant countries was not implemented. Therefore, it follows that the dilemma for the tax systems of most countries is not whether to have a progressive nominal tax rate, but how large a degree of tax progression to set. A very high degree of progression can be affected by a decrease in tax revenues, a slowdown in economic activities, or their transfer to countries with a lower tax quota.

The analysis results for other jurisdictions can thus be an additional stimulus to ensure that, if the state's goal is to maximize personal income tax revenue, the system applied in the Czech Republic will not interfere too much. The basis of the tax is usually only the gross wage, or the amount of the gross wage reduced by the social security contributions paid by the employee. If the goal of the Czech Republic is to maximize tax revenue, the results indicate that it is possible to increase the degree of tax progression even further. The criticized fact of the construction of the tax base was abolished on January 1, 2021, and from 2021, in the Czech Republic as well as in many other countries, the basis of tax is the gross salary. What has also changed as of January 1, 2021 is the type of tax rate, which is progressive again in terms of the nominal rate. There are only two bands. These facts above

may also become the subject of further research studies in this area, following the availability of input data to perform the given analysis.

A limitation of this study may be the fact that the study was conducted only in the environment of one country. The reason is the specific way of constructing the tax base between 2008 and 2020. This limitation balances the alternative approach chosen to measure tax progressivity using effective or marginal tax rates. Uniqueness is also the fact that regression analysis modeling the dependence of tax revenue on tax progressivity used indicators of tax progressivity calculated as weighted averages based on the distribution of wages in the economy. This approach was not chosen in previously conducted studies.

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