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Does the Type of Nominal Personal Income Tax Rate Affect Its Progressivity? A Case Study from the Czech Republic

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Abstract

Background: The article evaluates the influence of the type of nominal personal income tax rate on its progressivity. This is examined in the Czech Republic in the period 1993–2020. Between 1993 and 2007, the nominal tax rate was progressive, while from 2008 until the end of 2020, the nominal rate was linear. **Objectives:** The paper aims to analyse if the type of nominal tax rate affects personal income tax progressivity. **Methods/Approach:** The article uses analysis, synthesis, comparison and regression analysis methods. The progressiveness of the tax obligation indicator is used to evaluate the degree of tax progressivity. **Results:** In the context of the analysis of the degree of tax progressivity, personal income tax is more progressive in the period of validity of the nominal linear rate for taxpayers with incomes below the average wage level. **Conclusions:** Since the linear rate has been in force, the government in the Czech Republic has often mistakenly presented that tax rate innovations will ensure that everyone pays the same tax.

Keywords: personal income tax; progression; tax reliefs; tax reform; Czech Republic.

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Introduction

The Czech Republic was established on January 1, 1993. On the same date, significant tax reform took place. Since this tax reform, personal income tax has been imposed on the income of natural persons. This tax replaced the payroll tax and inhabitant income tax.

In the historical context of the Czechoslovak state, however, the income tax originally had an important role. The Income Tax Act regulated taxation during the First Republic (1918 – 1938). The income tax was newly created, as the tax system adopted after Austria-Hungary was unsuitable for a country exhausted by the war conflict. The income tax law, like the tax laws in the surrounding European countries, was set up so that taxation was progressive. The tax burden increased faster with income growth; the tax rate was 1% to 29%. During the period of the Protectorate (1938 – 1945), the state's war expenses increased, and thus, the tax burden also increased, with the highest rate being up to 61%.

A significant change occurred with the implementation of the currency reform in 1952. A total of nine new taxes were created. The tax system consisted of taxes from the economic sector and the population's income. The change in the economic and political situation forced a change in personal income taxation. The original income tax law was repealed because it did not meet the political conditions of the time. A typical symbol was the high tax burden, especially in private business. The wage tax was decisive for taxing citizens who did not do business. This tax rate was also progressive, compared to the income tax during the period of the First Republic, but the degree of progression of this tax was much higher. When determining the tax rate, it was not only the amount of income that was decisive, but especially the number of dependents - children of the taxpayer. Persons with only one or no dependents could have the tax rate increased by up to 40%; however, with five or more dependents, the tax rate was reduced by up to 45% of the original value.

The construction of this law thus fulfilled the state ideology's requirement of equality and other political conditions that applied in the states of the Soviet Union. Also, the high Taxation of the entrepreneurial activity of natural persons very significantly dampened unwanted private entrepreneurial activity, which was a typical feature of Eastern European countries. For example, entrepreneurs could be taxed at a tax rate of up to 85%. This also fulfilled the ideology of shared ownership, equality, the existence of state enterprises, zero private entrepreneurship and the role of fiscal policy in a centrally planned economy. This trend was also typical in the neighbouring countries of the former Soviet Union.

After the political coup in 1989, the intention was to switch from a centrally planned economy to a market economy. It was necessary to reform the existing tax system to make this step possible. Until then, it had been set up in such a way as to favour state enterprises in the tax burden at the expense of private business. However, this was not the case only in Czechoslovakia at the time but also in the surrounding states that used to form the Soviet Union.

The idea to modify the provisions of the payroll tax law was ultimately not accepted. It turned out that the original tax system was utterly inappropriate. This led to the creation of a new system of the Czech Republic containing direct and indirect taxes. The structure of these regulations was set by the modern market environment so that the Czech Republic would be competitive in the European market environment. The transition from a centrally planned economy to a market economy and its orientation towards Western markets were other reasons for this tax reform. The ideology prohibiting private business or equality between citizens has also changed. It might appear at first glance that the new law has switched from a progressive tax rate to a

linear one. However, this did not happen, and even in the Income Tax Act, which regulated the Taxation of the income of natural persons, the tax rate was progressive in the version valid on January 1, 1993.

In addition to income tax, direct taxes included property taxes, such as real estate or road tax. Their share in the tax mix and tax revenue is only one per cent in the long term. The second significant tax is a value-added tax. This tax is one of the indirect taxes and ensures relatively stable tax revenue in the long term due to its functioning mechanism. It should be noted that compared to income tax, the currently valid value-added tax law is highly harmonised with the direction of the European Union. In addition to value-added tax, the system of indirect taxes also includes excise duties and energy taxes.

The income distribution in society is unequal (Rattan et al., 2021). A progressive income tax rate is a tool to reduce inequality in the distribution of incomes in the economy. Its principle is based on the fact that as income increases, income tax increases faster than the taxpayer's income. This fact then causes the distribution of incomes in society to be more balanced. The question of tax progressivity must be analysed in connection to fiscal solidarity since taxpayers with higher incomes pay higher amounts to the state budget than taxpayers with lower incomes. The tax revenues cover the costs of running the state of public goods and services, and the result is that taxpayers with higher incomes have a higher share of the payment of these costs. The research of Vasilopoulou and Talving (2020) or Seelkopf and Yang (2018) in the European Union states shows that citizens who live in poorer countries are less willing to fiscal solidarity than citizens from more prosperous countries. Solidarity aspects are applied to the construction of the tax by the state, guaranteeing a certain non-taxable minimum, whether in the form of a zero tax rate, a non-taxable part or a tax relief. Another aspect of solidarity is based on the fact that social security contributions are also deducted from the taxpayer's income. Social support benefits are paid from this insurance to those registered as unemployed. For example, there has been a change in the historical context in this area since 1989, as unemployment was not possible under the former communist regime.

Income polarisation must also be considered when deciding whether and to what extent to set the progressivity of the personal income tax. Suppose the goal is to reduce inequality in income distribution in society. In that case, the tax rate will be structured differently in states where a higher proportion of households are low-income than, for example, in states with a large number of the middle class and a minimal number of low-income or high-income households. The study's conclusions by Panek and Zwierzchowski (2020) show that, for example, in Poland, individuals in the lower and upper classes are gradually approaching the middle-income group with their incomes. The results of Wang et al. (2017) also testify that income polarisation is higher in Central and Eastern Europe than in Western Europe.

From a macroeconomic point of view, fiscal policy mainly has a stabilising function. Based on changes in government revenues and expenditures, the goal is to eliminate deviations of the real product from the potential product. Fiscal policy instruments include built-in stabilisers and deliberate measures. An example of a built-in stabiliser is the income tax. The question is whether the income tax should be linear or progressive.

According to Beramendi and Rehm (2016), one of the positives of the progressive tax rate is that the tax burden of persons with lower incomes is reduced. The tax liability increases faster than the taxpayer's income, which also applies in the opposite direction; when the income decreases, the tax burden, in percentage terms, falls more than the taxpayer's income. If a progressive tax is applied, it will also reduce income inequality, as taxpayers with higher incomes bear a higher tax burden. In contrast,

taxpayers with below-average incomes can have zero tax burdens. As mentioned by Lapov and Mayburov (2021), the advantages of progressive Taxation are also from the state's point of view, specifically in the form of higher tax revenue. Higher economic growth is also a benefit of progressive Taxation. This is because lower-income taxpayers have a higher net income with which they purchase goods and services. On the contrary, taxpayers with higher incomes would not spend their entire income, and a part would be saved, which, on the contrary, will reduce economic growth according to the conclusions of analysis by Ganchev and Todorov (2021) or Oh (2017).

On the other hand, if the tax burden increases faster with the increase in income, according to studies by Čok et al. (2013) or Buffon and Stefano (2022), this fact has demotivating character. Employees may not be willing to work more as their net income decreases. This fact can harm economic growth. Another disadvantage is the possible migration of residents with higher incomes if the degree of tax progression is significantly lower in the surrounding states. This fact thus negatively affects tax revenues. A very high progression can also lead to citizens not officially recognising part of their income, which leads to tax evasion. According to a study by Coelho and de Oliveira (2019), an increase in tax by 1% leads to an increase in tax evasion by up to 3%.

The Income Tax Act, which regulates the area of personal income taxation, has undergone extensive changes throughout its validity period. Changes in tax rates were relatively frequent, especially in the first years of the act´s validity. In 1993, income tax rates were set in six bands ranging from 15% to 45%. In the last year, when the nominal tax rate was in force, i.e. in 2007, four bands ranged from 12% to 32%. What remained the same until the year 2008 was the nominal type of rate, which was progressive. Thus, due to the nominal progressive tax rate, personal income tax was expected to be a progressive tax in this period. However, one of the research questions is whether this was the case in all situations, regardless of how high the employee's wage was. The existence of tax reliefs, which were often implemented in the form of non-taxable parts of the tax base, could affect tax progressivity.

Significant tax reform took place in 2008, which, among other things, changed the type of nominal tax rate. The nominal linear tax rate replaced the nominal progressive tax rate. This legislation was valid in the Czech Republic until the end of 2020. Was it also valid that with the growth of the taxpayer's income, the tax liability increased faster than the taxpayer's income, or was the income tax in this period a so-called flat tax? Non-taxable-part for the taxpayer has been abolished, so at first glance, it might seem that for this reason, not only the nominal but also the real tax rate will be linear. However, this may not be the case, as the newly implemented relief for taxpayers was used to reduce tax liability. This relief affects tax progressivity.

Another research question is to examine whether the progressivity was higher in 1993–2007, i.e. when the nominal tax rate was progressive, or in 2008–2020, when the nominal tax rate was linear. Could there be a paradoxical situation? The nominal flat tax rate, often presented to the public as a real flat rate, could be a more progressive tax than a nominal progressive rate. Or, on the contrary, did the nominal linear rate cause a more evenly distributed tax burden?

The article aims to evaluate whether the personal income tax in the Czech Republic was a progressive tax when the nominal tax rate was linear. Another aim is to determine whether income tax was more progressive when the nominal progressive tax rate was valid or whether the degree of progressivity was higher when the nominal tax rate was linear. Another goal is to evaluate personal income tax progressivity from 1993 to 2020.

The structure of the article is as follows. The introduction of the article defines the research problem. The next part deals with an overview of studies examining the area of personal income tax – in the Czech Republic and abroad with a focus on tax progressivity. The introduction of the methodological part briefly defines the methods and indicators used for analysis and the input data. The main section deals with the study of tax progressivity. These results are discussed and summarised in the final part of the article.

Literature

A tax is progressive if the taxpayer's tax burden grows faster than his income. General aspects of tax progression are the subject of study, for example, Mattesini and Rossi (2012) or Chen and Guo (2019). The progressive tax rate is an automatic stabiliser and reduces inequalities in income distribution. If the tax rate were only linear, cyclical fluctuations would deepen, as confirmed by the results models of Alessandrini (2021). Therefore, a progressive income tax is typical for most of the world's tax systems. These are confirmed by Berens and Gelepithis (2019) and Nadirov et al. (2021). Globally, the trend is to reduce the degree of tax progression (Wu, 2021). This increases income inequality (Chen, 2020). Greater equality in income distribution can only be achieved if the tax is more progressive, as evidenced by the results of Oishi et al. (2018), who examined personal income tax progressivity in the USA.

Wagstaff et al. (1999) and Husman and Brezeanu (2021) analysed the degree of income tax progression in Europe. According to the results of the studies, the tax was highly progressive in Sweden and Finland. When determining the degree of progression, it is essential to respect the aversion of taxpayers with high above-average incomes to progressive Taxation and the high preference of low-income groups for progressive Taxation (Puy, 2019). An Australian study by Joseph and Mallon (2019) states that when there are more tax bands, the tax becomes less regressively progressive at the higher end of each tax bracket. Wiśniewska-Kuźma (2020) examined the degree of progression of the personal income tax in the former post-communist countries of Europe, which are now members of the Organisation for Economic Co-operation and Development (from now on, OECD). In most OECD countries, progression occurs.

A study in the Czech Republic examining tax progression has already been conducted. Tax progressivity using interval indicators of progressivity in the context of the effective tax rate during 1993–2008 was examined by Friedrich et al. (2012). The study evaluated progressivity, where the basic deduction is applied to the taxpayer. According to the study results, the income tax was progressive in all examined intervals until 2007. This study thus expanded the original results of Široký and Maková (2009), analysing tax progressivity and effective tax rates in the Czech Republic from 1993 to 2007. Interval indicators were also used in this case to evaluate progressivity. Krajňák (2019) also used indicators of interval tax progressivity to examine whether income tax is progressive in the Czech Republic, among other things. However, this study did not primarily analyse tax progressivity but the influence of tax advantages on the tax revenue of personal income tax.

The connection between tax progressivity and non-religion was the subject of a study by Čábelková et al. (2022). Progressivity was not analysed here using tax progressivity indicators but by regression analysis. An important factor influencing the attitude towards tax progressivity is classification in a specific social class according to income; in the context of the connection with religion, which was the second analysed factor, the justification for tax progressivity follows, as the rich should support the poor. The study by Čábelková and Smutka (2021) also shows similar conclusions.

In addition to tax progressivity, the mentioned effective tax rate marginal and average tax rates were examined (Dušek et al., 2014). Also, these results obtained through effective tax rates confirm the tax progression. Vítek (2012) and Vítek and Pavel (2013) state that the Czech tax reform 2008 has reduced tax progression.

The tax reform in the Czech Republic in 2008 also implemented ecological taxes. This was one of the impulses for the study of Brůha and Ščasný (2008). The study analysed the impact of implementing ecological taxes in the Czech Republic, specifically on the related distributional effects. Progressivity was analysed in the context of individual taxes and the tax system as a whole. It was found that the tax system of the Czech Republic is slightly progressive. Environmental taxes, according to Suit index values, reduced this progressivity.

In other countries, tax progressivity was analysed concerning the Gini coefficient by Stanovník and Verbič (2013). The study was conducted in Slovenia, and the period examined was from 1991 to 2009. Tax reforms have led to an increase in tax progressivity. Onrubia and Picos (2013) analysed progressivity in Spain, where income tax was progressive from 1999–2007. In particular, the 2007 reform led to a decline in tax revenues. The study of tax progressivity is the subject of research not only in the European environment, e.g. in China, but the Peng study (2009) also analysed this issue. The study examined the progressivity of this tax from 1995 to 2007. Although the tax was progressive, according to the study results, it was recommended to carry out a more significant reform in income taxation to ensure the redistributive function of taxes in the economy. In addition to progressiveness, tax reliefs, for example, were also examined (Kubátová & Jareš, 2011).

Research studies deal not only with the issue of tax progressivity in personal income tax but also with other taxes, such as energy taxes (Hájek et al., 2019), excise duties (Kukalová et al., 2021), value-added tax (Krzikallová & Tošenovský, 2020; Andrejovská et al., 2020).

An overview of research studies shows that the evaluation of tax progressivity in the Czech Republic for 1993–2020 has not been comprehensively performed. Only partial studies investigating aspects of tax progressivity have been conducted over a shorter period. The distribution of household incomes in the Czech Republic was not taken into account in the studies of Široký and Maková (2009), Friedrich et al. (2012) or Krajňák (2019) when calculating interval progressivity indicators. This study will consider this when analysing progressivity. Likewise, other studies mentioned above did not consider inequality in the distribution of household incomes when calculating progressivity indicators.

An innovative approach to addressing this issue also lies in including social security contributions for tax payment or applying other tax reliefs, which previously conducted studies abstracted. All facts emphasise the uniqueness of this study, the originality of this research and its added value.

Data and Methodology

The input database of data for the analysis consists of amounts of gross wages of employees and tax obligations from this gross wage, including social security contributions. Average wage data is sourced from the Czech Statistical Office (2021). Social security contributions and tax liability from the employee's gross wage were calculated according to the valid legislation in 1993–2020.

To achieve the paper´s objective, the author used standard positivist economic methodology, including the scientific methods of description, deduction, comparison, and study of legal sources and synthesising methods; regression analyses were used for a dependency analysis between the examined factors.

Indicators of tax progressivity are used to assess whether income tax is progressive. These indicators can be divided into two large groups - global and interval. Interval indicators determine the degree of progression within a specific range. The group of global indicators is based on the analysis of income distribution.

According to Seidl (2009), global indicators have the disadvantage that they can compensate income subintervals with opposite properties of tax schedules. Jakobsson (1976), Kakwani (1979) and Liu (1985) also consider interval indicators for measuring tax progressivity to be credible. A study by Duclos and Tabi (1996) states that interval indicators of progressivity are suitable for measuring the progressivity of income taxes. Also, studies have already been conducted in the Czech Republic or abroad. E.g. Široký and Maková (2009) and Friedrich (2012), Tran and Zakariyya (2021) or 57.

Wiśniewska-Kuźma (2020) used interval indicators of tax progressivity to measure progressivity.

If these interval indicators are used, a particular limitation of the results may occur, according to the mentioned studies, if the intervals are poorly chosen, e.g., because the entire population's coverage is not ensured using the selected intervals. Also, a not properly chosen width of the interval, e.g. if even the nominal tax rate is progressive, can lead to finding results that are not relevant. However, these limitations do not occur in this study, as the analysis is performed up to 8.0 times the average wage, which ensures coverage of more than 99% of the population. Intervals with a higher frequency of up to 2.0 times the average wage for analysis are graded by a multiple of a tenth of the average wage for an interval with a lower frequency above 2.0 times by 0.5 times the average wage. Approximately 90% of the population receives an income up to 2.0 times the average wage, and a further 9.9% of the population in the Czech Republic gets an income between 2.0 and 8.0 times (Czech Statistical Office, 2022). This ensures the coverage of the entire population and, in the case of progressive tax rates, also the filling of the marginal values in each band of the applicable tax rate.

It is possible to evaluate whether the tax is progressive based on an interval indicator of progressivity. Because the calculations are made on average wages or their multiples, using an interval indicator to analyse progressivity is a logical step.

Tax progression is analysed using the interval indicator progressiveness of tax obligations (PTO_T), which is based on a comparison of the elasticity of tax liability concerning pre-tax income (1),

$$PTO_T = \frac{\frac{T_1 - T_0}{T_0}}{\frac{Y_1 - Y_0}{Y_0}}, \tag{1}$$

where Y_0 is the taxpayer's gross wage in the lower-income interval, Y_1 is the taxpayer's gross wage in the upper-income interval, T_0 is the tax liability after applying for reliefs, non-taxable parts in the lower-income interval, T_1 is the tax liability after applying for reliefs, resp. non-taxable parts in the upper-income interval (De Sarralde et al., 2013).

OECD classifies social security contribution as a payment of tax character (OECD, 2022). Therefore, a social security contribution deducted from the employee's wage will be included as a tax payment. The form of the PTO_{T+I} indicator is then modified into (2),

$$PTO_{T+I} = \frac{\frac{T_1 - T_0}{T_0}}{\frac{Y_1 - Y_0}{Y_0}}, \tag{2}$$

Y_0 is the taxpayer's gross wage in the lower-income interval, Y_1 is the taxpayer's gross wage in the upper-income interval, T_0 is the social security contribution, which is deducted from the employee's wage and the tax liability after applying for reliefs, resp. non-taxable parts in the lower-income interval, T_1 is social security contribution from the employee's wage paid by the employee and the tax liability after applying for reliefs, non-taxable parts in the upper-income interval.

According to the OECD methodology (OECD, 2022), a taxpayer who applies only the basic deduction (deduction per taxpayer) is used to assess the tax burden. Tax reliefs reduce the tax burden, as follows from the study by Farfan-Portet et al. (2008). The deduction per taxpayer shows the tax-free minimum to which each taxpayer is entitled. This shows S_0 situations. According to Husman and Brezeanu (2021), the second most used deduction includes the deduction for children. Therefore, two more cases will also be analysed when evaluating tax progressivity. These situations - S_1 and S_2 are based on the assumption that, in addition to applying the basic deduction to the taxpayer, a deduction is also applied to one or two children. The range of used deductions then affects the total tax burden. The above shows that the tax liability will be lower with more deductions. However, it is a question of how tax progressivity will develop. While the OECD methodology abstracts from applying this deduction to children, this study does not abstract from this second most commonly applied deduction to increase added value and use the study results more widely in practice. The already mentioned deductions do not represent variables for regression analysis. These deductions express the deduction's total value in CZK and the taxpayer's tax liability difference.

In summary, tax progressivity is evaluated from the taxpayers' point of view in three model situations. These situations differ according to the type of deductions.

- S_0 - deduction per taxpayer is applied,
- S_1 - deduction per taxpayer and one child is applied,
- S_2 - deduction for the taxpayer and two children is applied.

These are the most common situations in income Taxation from the dependent activity. An interval indicator progressiveness of tax obligation (from now on, PTO) is used to evaluate progressivity (Tran & Zakariyya, 2021). Multiples of average wages limit the intervals; therefore, average wages and their multiples in the Czech Republic for 1993–2020 are used as primary input data (Czech Statistical Office, 2021). Progressivity is examined at intervals of up to 8.0 times the average wage to ensure sufficient explanatory power. Concerning the distribution of wages in the population, approximately 99.5% of the population is covered (Cengiz et al., 2019; Bílková, 2012).

Concerning the distribution of wages, the intervals with a higher frequency of wages (up to 2.0 times the average wage) are graduated by 0.1 times the average wage. At the same time, to cover as much of the population as possible, the minimum wage limits the first income interval. The minimum wage is approximately 30 to 35% of the average wage (Meixnerová & Krajňák, 2020). For this reason, this income interval is determined by threshold values such as the minimum wage and 0.4 times the average wage. Intervals with a lower wage frequency (from 2.0 times the average wage to 8.0 times the average) are graduated by 0.5 times the average wage.

The calculation of social security contribution, which is deducted from the employee's wage, is generally formalised by (3),

$$SSC = AB \cdot S, \tag{3}$$

SSC is the social security contribution deducted from employees' wages, AB is the assessment base, and S is the social security contribution rate.

The calculation of the tax liability is performed differently in each analysed period. In the first period from 1993 to 2007, the relation (4),

$$T = (GW - SSC - NTP) \cdot TR, \quad (4)$$

where *T* is tax, *GW* is gross wage, *SSC* is the employee's social security contribution, *NT* is the non-taxable part for taxpayers or children, and *TR* is the tax rate. Since 2005, there has been a change in the tax liability calculation. The deduction was not in the form of a non-taxable part but in the form of a tax relief, a tax credit, which can be formally indicated using (5),

$$T = [(GW - SSC) \cdot TR] - TC, \quad (5)$$

where *T* is tax, *GW* is gross wage, *SSC* is social security contribution paid by the employee, *TC* is a taxpayer´s relief or tax credit for children and *TR* is the tax rate.
Following the reform from 2008 to the end of 2020, the calculation of *T* using formula (6),

$$T = (SGW \cdot TR) - TC, \quad (6)$$

where *T* is tax, *SGW* is super-gross wage, *TC* is a taxpayer´s relief or tax credit for children, and *TR* is the tax rate.
Combined regression lines (Choi & Seo, 2022) will be used to evaluate the dependence of the type of tax rate and tax progressivity. The angle expresses the dependence between regression lines. Formally defines the above equations (7),

$$cotg\ \varphi = \frac{|r_{xy}|}{1-r_{xy}^2}\left(\frac{s_y}{s_x} + \frac{s_x}{s_y}\right), \quad (7)$$

where r_{xy} is the correlation coefficient, r^2_{xy} is the coefficient of determination, s_x is the variance of the values of the character x, s_y is the variance of the character y. Therefore, the model assumes two regression lines. The first line expresses the progressiveness of the tax liability in 1993–2007 when the nominal tax rate was progressive. The second regression line was in 2008–2020 when the nominal tax rate was linear.

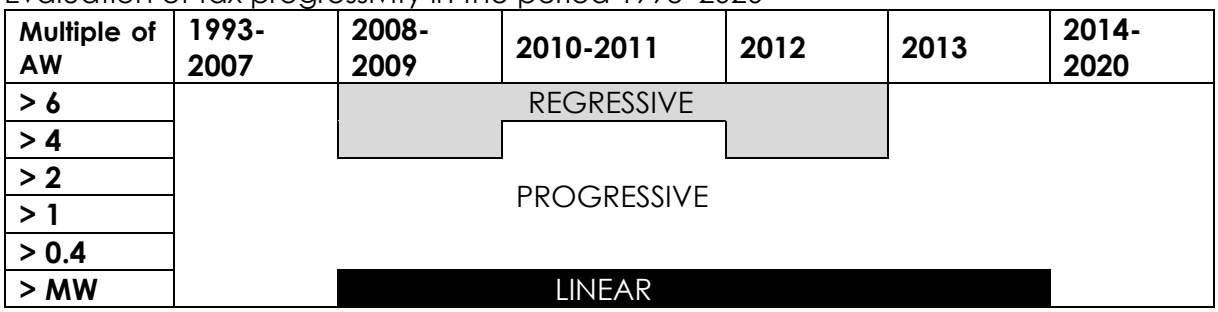
Results and discussions

The evaluation of the tax progressivity of personal income tax is performed on two levels. First, the indicator of the progressiveness of the tax obligation is used to determine in which income intervals and in which years the personal income tax was progressive. The second part of the analysis deals with the impact of the public finance reform, which took place in 2008, on tax progressivity.

Evaluation of tax progressivity

Tax progressivity is evaluated using the PTO indicator in the three mentioned situations. Each of them is not the same because there are differences in the type of applied deductions. First, the progressivity of the personal income tax will be analysed in the case where the taxpayer uses only the basic deduction (per taxpayer). The results are presented in Figure 1.

Figure 1
Evaluation of tax progressivity in the period 1993–2020



Note: AW - average wage, MW - minimum wage
Source: Author´s illustration

The personal income tax was always progressive in 1993–2007 and 2014–2020. The reason for this between 1993 and 2007 is that the nominal tax rate was progressive.

The results for the period 2008–2013 are somewhat different. The tax is linear in the intervals between the minimum wage and 0.4 times the average wage. The reason for this linearity is not the nominal linear tax rate. The taxpayer receiving income at the minimum wage and 0.4 times the average wage has the tax before the tax relief lower than the taxpayer's relief amount. In practice, this means zero tax liability (more equation 6). This has not been the case since 2014 because a taxpayer with an income of 0.4 times the average wage did not have a zero tax liability. The relief per taxpayer did not increase from 2008 until the end of 2020, so its real value decreased due to the increase in the price level. The results obtained here partially deviate from the already performed study by Friedrich et al. (2012), which stated that in 2008, the income tax was either progressive or regressive. In contrast to the above study, the examined interval was refined in this case, which led to a partially different conclusion.

In most analysed income intervals, the personal income tax had a progressive character even when the nominal rate was not progressive. Income tax was progressive due to a non-taxable minimum in the form of tax relief. This non-taxable minimum caused tax progressivity.

As shown in Figure 1, taxpayers receive income more than four or six times the average wage; however, tax obligation developed regressively in 2008–2012. This is due to the construction of the tax base for dependent activity and the maximum assessment bases for social security contribution. In that period, the tax base was a super-gross wage, which can be formally written according to equation (8),

$$TB = GW + 0.09 \cdot GW + 0.25 \cdot GW, \quad (8)$$

where *TB* is the tax base, *GW* is the gross wage, the coefficient 0.09 expresses the health insurance rate paid by the employer, and the coefficient 0.25 is the rate of social security premium and the contribution to the state employment policy, which the employer pays. The method of determining the tax base in this way is valid only until the moment when the maximum assessment bases for social security contribution is exceeded; from this moment, the tax base is determined according to (9),

$$TB = GW + 0.09 \cdot MBHI + 0.25 \cdot MBSP, \quad (9)$$

where *TB* is the tax base, *GW* gross wage, *MBHI* is the maximum assessment base for health insurance premiums, and *MBSP* is the maximum assessment base for social security premiums and the contribution to the state employment policy (from now

on referred to as MBSP). If the maximum assessment bases are exceeded, the tax base is not a super-gross wage but a gross wage of the amount exceeding this maximum assessment base. The tax rate remains the same, but the tax base decreases, and the tax liability develops regressively despite a nominal linear tax rate.

Why has this situation not occurred since 2013? The maximum assessment base for public health insurance has been abolished. Another reason is the application of another 7 % tax rate. This is a solidarity tax surcharge. This causes income tax to be progressive from this year onwards, even after exceeding the MBSP.

The next part of this analysis study again evaluates progressivity. However, the difference in comparison with the first situation is in the concept of social security contributions. Both contribution and personal income tax are tax payments. The results are in Figure 2.

Figure 2
Evaluation of tax progressivity in the period 1993–2020

Multiple of AW	1993-2007	2008-2009	2010-2011	2012	2013	2014-2020
> 6		REGRESSIVE				
> 4						
> 2		PROGRESSIVE				
> 1						
> 0.4						
> MW		LINEAR				

Note: AW - average wage, MW - minimum wage
Source: Author´s illustration

In contrast, where social security contribution is not considered a tax payment, there are no differences in income intervals and periods when the tax burden is linear. On the contrary, differences arose in 2013–2020 in intervals above 4.0 times the average wage. The MBSP causes the regressivity here. Although the solidarity surcharge is applied, the tax liability develops regressively.

Furthermore, progressivity will be analysed if tax deduction for children is applied. Formalized is in (1). In the case of applying a deduction for one child, see results in Figure 3a and two children in Figure 3b. Differences arise mainly in the periods when the tax is linear. A tax payment in this section of the analysis is personal income tax.

Figure 3a
Evaluation of tax progressivity in the period 1993–2020

Multiple of AW	1993-1995	1996-1997	1998-2001	2002-2007	2008-2009	2010-2011	2012	2013	2014-2020
> 6					REGRESSIVE				
> 4									
> 0.4					PROGRESSIVE				
> MW	LIN		LIN		LINEAR				

Note: AW - average wage, MW - minimum wage, LIN - linear
Source: Author´s illustration

Figure 3b
Evaluation of tax progressivity in the period 1993–2020

Multiple of AW	1993	1994-2002	2003-2004	2005-2007	2008-2009	2010-2011	2012	2013	2014-2020
> 6					REGRESSIVE				
> 4									
> 0.6									
> 0.5					PROGRESSIVE				
> 0.4									
> MW	LINEAR				LINEAR				

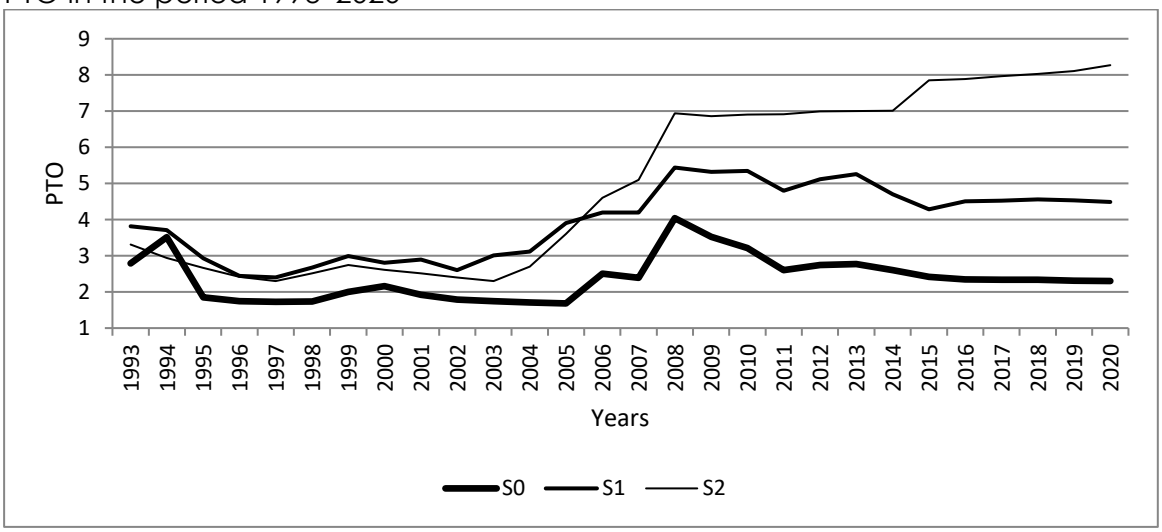
Note: AW - average wage, MW - minimum wage
Source: Author´s illustration

If the deduction for children is applied, the tax liability is also linear in 1993–1995 and 1998–2001, i.e., when the nominal tax rate was progressive. The reason for linearity is not tax relief or tax credit but the existence of non-taxable parts of the tax base for the taxpayer or the children. These cause the same tax base for a taxpayer with an income at the minimum wage level and 0.4 times the average wage (this applies in 1993–1995 and 1998–2001 if the deduction for one child is used). The same fact would be the reason for linearity if the deduction for two children in 1993–2004 were applied.

At the same time, according to the results of PTO values, income tax is linear in the years 2008–2013 in the income interval between the minimum wage and 0.4 times the average wage. This is the same as only the basic taxpayer deduction is applied. Also, the intervals when the income tax is regressive are the same as in the S_0 situation. These identical results are based on why only the deduction per taxpayer is applied.

The research question also remains about how tax progressivity has evolved regarding the degree of progressivity. The answer to this question is given in Figure 4, capturing the average PTO values for all three analysed situations (S_0 - deduction per taxpayer, S_1 - per taxpayer and one child, S_2 - per taxpayer and two children). There are weighted averages of PTO values for all analysed income intervals while respecting the distribution of wages in the intervals in the Czech Republic. Concerning this fact, the last year presented is 2020 (due to the current unavailability of information on inequalities in the distribution of wages for 2021).

Figure 4
PTO in the period 1993–2020



Source: Author´s illustration

PTO values changed over time. Compared to the initial analysed year 1993 and the last year 2020, progress has slightly changed for taxpayers applying for tax relief only to the taxpayer. In all situations, the highest increase in progressivity is between 2007 and 2008, even though a linear tax rate has replaced the nominal progressive tax rate. The increase in this progressivity is the increase in tax relief and tax credits for children.

In the case of situation S_0, tax progression increased in the years 1993 and 1994 - however, the reason was not a change in the rate or change in the values of non-taxable parts of the tax base, but an increase in wages, which caused shifting to bands with higher nominal tax rates. Another slight increase between 1998 and 1999 caused an increase in the non-taxable parts of the tax base and a change in the range of bands at the nominal progressive tax rate. Since 2006, the non-taxable part of the taxpayer's tax base has been replaced by a tax relief, which increases tax progressivity. Since 2008, there has been a gradually declining trend. A slight increase can be seen in 2013 when a solidarity tax surcharge was implemented into tax legislation. As wages increase, the degree of tax progression gradually decreases, as neither the nominal tax rate nor the tax relief value per taxpayer changes.

Tax progressivity is different in some years if the taxpayer applies a deduction for one child. The replacement of the non-taxable part of the tax base by a tax credit in 2005 caused an increase in progressivity, most notably when the deduction for two children was applied. As the amount per second child has significantly increased since 2015 than the amount per first child, this fact also increases tax progression.

The lower value of PTO until 2005 in the case of the deduction for two children is mainly. In the intervals between the minimum wage, 0.4 and 0.5 times the average wage, there was often a zero tax base, which means that the tax was the same as for a taxpayer with an income at the minimum wage level, for example, a taxpayer with 0.5 times the average wage. However, this has not been the case since 2005.

The above analysis results decrease the PTO for taxpayers who apply only a deduction for the taxpayer. This is the same conclusion as the results of the analysis of Vítek (2012) and Vítek and Pavel (2013). On the contrary, when applying the other deductions from which the studies were abstracted, the conclusions of this analysis are different. The increase in tax progressivity occurs if the taxpayer also applies other deductions.

Analysis of the influence of the tax rate type on tax progressivity

The effect of the nominal tax rate on tax progressivity is compared using the empirical regression equation and the angle that these regression lines form. In situation S_0 (Fig. 5a), the tax is more progressive at intervals up to the average wage in 2008–2020, even though the nominal tax rate was of a linear type (see line PTO2). On the contrary, in intervals above the average wage due to the progressive nominal rate, progressivity is higher in 1993–2007 (see line PTO1). This analysis concludes that tax progression has increased for taxpayers with below-average wages since the public finance reform in 2008. The main reason is the value change of the taxpayer´s relief between 2007 and 2008 (CZK 7,200 in 2007, CZK 24,840 in 2008).

Similar conclusions are from the analysis of the tax progressivity of taxpayers, which also applies deductions to children (Fig. 5b, Fig. 5c). Higher progressivity in 1993–2007 is for taxpayers with incomes over 1.25 times the average wage. On the contrary, from 2008–2020, the higher degree of progressivity of the personal income tax in income intervals was up to 1.25 times the average wage. It is confirmed that tax progressivity increases with increasing amounts of deductions, as evidenced by the results for situation S_2. In particular, the deduction for children, which has been in the form of a

tax credit since 2005, increases the tax progressivity of taxpayers with below-average wages, as this deduction takes the form of a tax bonus.

Using relation (7), the degree of similarity in developing tax progressivity in 1993-2007 and 2008-2020 will be verified.

This similarity in the development of progressivity will be verified again for all three mentioned situations S_0, S_1 and S_2, which differ in the scope of applied deductions. For these stated situations, Fig. 5a-5c shows 2 regression lines. The first regression line, linear PTO1, shows the dependence between the income interval and the progressivity values in 1993–2007. The second regression line, linear PTO2, shows the dependency between the income interval and the progressivity values in 2008–2020.

The angle the regression lines enclose is 21°38' for S_0 (see Figure 5a). This fact indicates a moderate dependence between the developments of tax progressivity in both analysed periods. What is common to both periods is higher progressivity in income intervals up to the amount of the average wage.

For the S_1 situation (Figure 5b), when the deduction for one child is also applied, a lower degree of tax progressivity in 1993–2007 also results in an interval of up to 1.25 times the average wage. On the contrary, the indicator PTO takes on higher values in intervals above 1.25 times the average wage in 1993–2007. Compared to situation S_0, the angle between the regression lines PTO1 and PTO2 is 1°76', indicating a very close dependence between the two regression lines. Thus, in situation S_1, the differences in tax progressivity are the lowest in both analysed periods. It is confirmed that the tax progressivity also increases due to the higher number of applied deductions.

The lowest degree of dependence between the regression lines shows the development of tax progressivity depending on the income level in situation S_2. In this situation, the deduction is also applied to two children (Figure 5c). The angle takes on a value of 22°67'. It is confirmed that tax deductions significantly increased tax progressivity, especially in years when the tax rate was linear. Higher tax progressivity is in intervals up to 1.75 times the average wage in 2008–2020.

Figure 5a. Empirical lines of regression

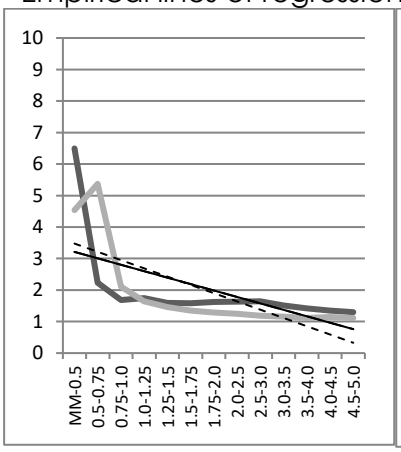


Figure 5b.

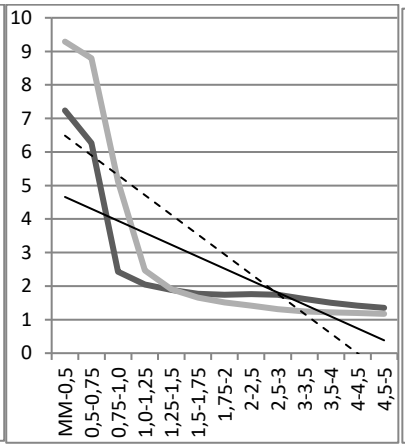
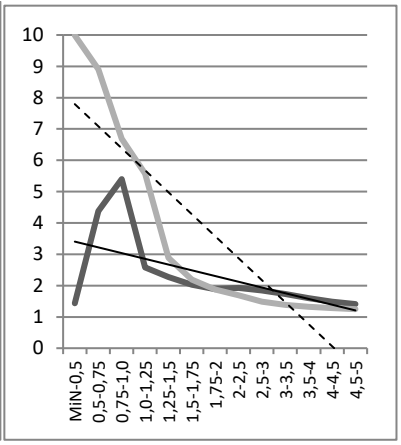


Figure 5c.



PTO1 PTO2 Linear PTO1 Linear PTO2

Note: MM…minimal wage, PTO1 = period 1993–2007, PTO2 = period 2008–2020
Source: Author´s illustration

Conclusion

The article aimed to evaluate the progressivity of personal income tax in the Czech Republic from 1993 to 2020. Another objective was to determine whether income tax

was more progressive when the nominal tax rate was progressive or whether the degree of progressivity was higher when the nominal tax rate was linear.

The personal income tax was progressive throughout the period analysed, with a few exceptions. This was invalid from 2008 to 2012 if the MBSP was exceeded. Taxpayers with an income over this maximum assessment base pay a lower tax on each additional unit of their income, which means that personal income tax is regressive in these income intervals.

Taxpayers with an income close to the minimum wage had the linear character of the tax obligation from 2008 to 2013. In applying the deduction to children, it was found that the income tax was also linear in some intervals below the average wage, even in years when the nominal tax rate was progressive. The weighted values of the indicator PTO, which were calculated based on the distribution of wages in the Czech Republic, confirmed that the degree of tax progressivity increases if taxpayers use more deductions for tax liability reduction. Concerning the weighted values of the indicator PTO, income tax is paradoxically more progressive in years when the nominal tax rate was only linear.

The personal income tax is essential to the state's fiscal policy. The research results confirm that the type of tax rate is not the only factor that depends on whether income tax is progressive. It is important to analyse other personal income tax parameters, such as determining the tax base or the number of deductions in the form of non-taxable parts of the tax base or tax reliefs. All of these factors affect whether income tax is progressive and to what extent it is progressive.

The research was carried out in the conditions of the Czech Republic. Other countries were not included in the study, mainly due to the peculiarity of constructing the tax base until the end of 2020 as a super-gross wage. The construction method of the tax base determined this way was not in other states neighbouring the Czech Republic or other states of the European Union.

About the ongoing tax reform on 1 January 2021, which abolished the super-gross wage, it is possible to carry out another similar study in the future (depending on the availability of data), which may lead to an extension of the period under study. In addition to the change in the structure of the tax base, the tax relief for taxpayers and the tax credit for children also increased in the Czech Republic. Exploring differences in tax progressivity parameters can further expand scientific knowledge in this field.

References

1. Alessandrini, D. (2021). Progressive Taxation and Economic Stability. *Scandinavian Journal of Economics*, *123*(2), 422-452. https://doi.org/10.1111/sjoe.12410
2. Andrejovská, A., Konečná, V., & Hakalová, J. (2020). Tax Gap as a Tool for Measuring VAT Evasion in the EU Countries. *Ad Alta-Journal of Interdisciplinary Research*, *10*(2), 8-13. https://doi.org/10.33543/1002813
3. Beramendi, P., & Rehm, P. (2016). Who gives, who gains? Progressivity and preferences. *Comparative Political Studies*, *49*(4), 529-563. https://doi.org/10.1177/0010414015617961
4. Berens, S., & Gelepithis, M. (2019). Welfare state structure, inequality, and public attitudes towards progressive taxation. *Socio-Economic Review*, *17*(4), 823-850. https://doi.org/10.1093/ser/mwx063
5. Bílková, D. (2012). Recent development of the wage and income distribution in the Czech republic. *Prague Economic Papers*, *21*(2), 233-250. https://doi.org/10.18267/j.pep.421
6. Brůha, J., & Ščasný, M. (2008). Distributional Effects of Environmentally-Related Taxes: Empirical Applications for the Czech Republic. Available from Internet: http://www. czp. cuni. cz/czp/images/stories/Vystupy/Seminare/SSP/2008/080603/Bruha_Scasny. pdf.
7. Buffon, M., & Stefano, M. (2022). Regressive tax benefits: A study on distributive public policies in the light of Theodore J. Lowi. *Journal of Institutional Studies*, *8*(1), 138-159.

8. Čábelková, I., & Smutka, L. (2021). The Effects of Solidarity, Income, and Reliance on the State on Personal Income Tax Preferences. The Case of the Czech Republic. *Sustainability*, *13*(18), 10141. https://doi.org/10.3390/su131810141
9. Čábelková, I., Mareš, D., Strielkowski, W., Zenchenko, S., & Radyukova, Y. (2022). Income Tax Progressivity and Non-religion in Central and Eastern Europe: A Case of the Czech Republic. *Religions*, *13*(4), 358. https://doi.org/10.3390/rel13040358
10. Cengiz, D., Dube, A., Lindner, A., & Zipperer, B. (2019). The effect of minimum wages on low-wage jobs. *The Quarterly Journal of Economics*, *134*(3), 1405-1454. https://doi.org/10.1093/qje/qjz014
11. Chen, S. H. (2020). Inequality-growth nexus under progressive income taxation. *Journal of Macroeconomics*, *65*, 103234. https://doi.org/10.1016/j.jmacro.2020.103234
12. Chen, S. H., & Guo, J. T. (2019). Progressive taxation as an automatic destabiliser under endogenous growth. *Journal of Economics*, *127*, 47-71. https://doi.org/10.1007/s00712-018-0623-3
13. Choi, J. Y., & Seo, J. (2022). Copula-based redundancy analysis. *Multivariate Behavioral Research*, *57*(6), 1007-1026. https://doi.org/10.1080/00273171.2021.1941729
14. Coelho, A. F. C., & de Oliveira, J. A. W. D. (2019). How to fight tax evasion: real progressivity. *Revista Brasileira de Estudos Políticos*, *118*. https://doi.org/10.9732/P.0034-7191.2019V118P013
15. Čok, M., Urban, I., & Verbič, M. (2013). Income redistribution through taxes and social benefits: the case of Slovenia and Croatia. *Panoeconomicus*, *60*(5), 667-686. https://doi.org/10.2298/PAN1305667C..
16. Czech Statistical Office. (2021). Average Wage. Retrieved from https://www.czso.cz/csu/czso/hmu_cr (Accessed on 20 December 2021).
17. Czech Statistical Office. (2022). Household in Numbers, Retrieved from https://www.czso.cz/documents/10180/167607753/160021221b.pdf/ada07a11-b343-46c0-bd6c-0ea03dda64b0?version=1.1 (Accessed on 2nd March 2023)
18. De Sarralde, S. D., Garcimartín, C., & RUIZ-HUERTA, J. E. S. Ú. S. (2013). Progressivity and redistribution in non-revenue neutral tax reforms: The level and distance effects. *Review of Income and Wealth*, *59*(2), 326-340. https://doi.org/10.1111/j.1475-4991.2012.00499.x
19. Duclos, J. Y., & Tabi, M. (1996). The measurement of progressivity, with an application to Canada. *The Canadian Journal of Economics/Revue canadienne d'Economique*, *29*, S165-S170.
20. Dušek, L., Kalíšková, K., & Münich, D. (2014). Dopady reformy přímých daní k roku 2015: vyhodnocení pomocí modelu TAXBEN. *Politická ekonomie*, *62*(6), 749-768. https://doi.org/10.18267/j.polek.980.
21. Farfan-Portet, M. I., Hindriks, J., & Lorant, V. (2008). Progressivity of childcare tax policies in Belgium. *Recherches Économiques de Louvain/Louvain Economic Review*, *74*(2), 143-165. https://doi.org/10.3917/rel.742.0143
22. Friedrich, V., Maková, K., & Široký, J. (2012). Testing the predicative ability of the tax progressiveness indices: using the example of an employee in Czech republic 1993-2008..
23. Ganchev, G., & Todorov, I. (2021). Taxation, government spending and economic growth: The case of Bulgaria. *Journal of Tax Reform*, *7*(3), 255-266. https://doi.org/10.15826/jtr.2021.7.3.102
24. Hájek, M., Zimmermannová, J., Helman, K., & Rozenský, L. (2019). Analysis of carbon tax efficiency in energy industries of selected EU countries. *Energy Policy*, *134*, 110955. https://doi.org/10.1016/j.enpol.2019.110955
25. Husman, I., & Brezeanu, P. (2021). Progressive taxation and economic development in EU countries. A panel data approach. *Economic Computation and Economic Cybernetics Studies and Research*, *55*(1), 285-300.
26. Jakobsson, U. (1976). On the measurement of the degree of progression. *Journal of Public Economics*, *5*, 161-168. https://doi.org/10.1016/0047-2727(76)90066-9
27. Joseph, S. A., & Mallon, M. (2019). How Equitable Is Australia's Progressive Tax Rate: A Review at Higher Income Levels. *J. Australasian Tax Tchrs. Ass'n*, 14, 58.
28. Kakwani, N. (1979). Measurement of tax progressivity: a reply. *The Economic Journal*, *89*(355), 653-657. https://doi.org/10.2307/2231877

29. Krajňák, M. (2019). Do selected tax advantages affect tax revenue from the personal income tax?. *Journal of Competitiveness*, *11*(4), 73. https://doi.org/10.7441/joc.2019.04.05
30. Krzikallová, K., & Tošenovský, F. (2020). Is the value added tax system sustainable? the case of the Czech and Slovak Republics. *Sustainability*, *12*(12), 4925. https://doi.org/10.3390/su12124925
31. Kubátová, K., & Jareš, M. (2011). Identifikace a kvantifikace daňových úlev v ČR v roce 2008 [Identification and Quantification of Tax Reliefs in the Czech Republic in the Year 2008]. *Politická ekonomie*, *2011*(4), 475-489. https://doi.org/10.18267/j.polek.800.
32. Kukalová, G., Moravec, L., Bína Filipová, D., & Kučírková, L. (2021). Evaluation of estimated direct health expenses on tobacco-and alcohol-related diseases in context of excise taxes revenues in the Czech Republic. *Central European Journal of Public Health*, *29*(2), 143-152. https://doi.org/10.21101/cejph.a5538
33. Lapov, D. E., & Mayburov, I. A. (2021). Modelling of a relative income tax bracket-based progression with the effect of a slower tax burden growth. *Journal of Tax Reform*, *7*(2), 160-172. https://doi.org/10.15826/jtr.2021.7.2.096
34. Liu, P. W. (1985). Lorenz domination and global tax progressivity. *Canadian Journal of Economics*, 395-399.
35. Mattesini, F., & Rossi, L. (2012). Monetary policy and automatic stabilisers: the role of progressive taxation. *Journal of Money, Credit and Banking*, *44*(5), 825-862. https://doi.org/10.1111/j.1538-4616.2012.00512.x
36. Meixnerová, L., & Krajňák, M. (2020). Macroeconomic Time Series Affecting the Minimum and Average Wages of V4 Countries. *E&M Economics and Management*, *23*(4), 4–22. https://doi.org/10.15240/tul/001/2020-4-001
37. Nadirov, O., Dehning, B., & Pavelkova, D. (2021). Taxes and the incentive to work under flat and progressive tax systems in Slovakia. *Economics and Sociology*, *14*(2), 40-55. https://doi.org/10.14254/2071-789X.2021/14-2/2
38. OECD. (2022). *OECD Tax Database*, Retrieved from http://www.oecd.org/tax/tax-policy/tax-database.htm#pit (22 September 2022)
39. Oh, J. S. (2017). Are progressive tax rates progressive policy. *New York University Law Review*, *92*(6), 1909-1976.
40. Oishi, S., Kushlev, K., & Schimmack, U. (2018). Progressive taxation, income inequality, and happiness. *American psychologist*, *73*(2), 157. https://doi.org/10.1037/amp0000166
41. Onrubia, J., & Picos, F. (2013). Income inequality and redistribution through the Spanish PIT, 1999-2007. *Revista de economia aplicada*, *21*(63), 75-115.
42. Panek, T., & Zwierzchowski, J. (2020). Median relative partial income polarisation indices: Investigating economic polarisation in poland during the years 2005–2015. *Social Indicators Research*, *149*(3), 1025-1044. https://doi.org/10.1007/s11205-020-02274-2
43. Peng, H. (2009). Redistributive effect and progressivity of the personal income tax in China: 1995-2007. *Proceedings of the 2009 International Conference on Public Economics and Management (ICPEM 2009): Economic Policies, Planning and Assessment*, 412-417.
44. Puy, M. S. (2019). Incentives for progressive income taxation. *Journal of Theoretical Politics*, *31*(1), 66–102. https://doi.org/10.1177/0951629818809420
45. Rattan, P., Arora, S., & Mahajan, K. K. (2021). Testing for multisample generalised Lorenz curves dominance. *Journal of Statistics and Management Systems*, *24*(5), 895-915. https://doi.org/10.1080/09720510.2020.1776462
46. Seelkopf, L., & Yang, H. (2018). European fiscal solidarity: an EU-wide optimal income tax approach. *International Journal of Public Policy*, *14*(1-2), 145-163. https://doi.org/10.1504/IJPP.2018.090752
47. Seidl, C. (2009). *Measurement of Tax Progression with Different Income Distributions*. Retrieved from https://dialnet.unirioja.es/descarga/articulo/2941913.pdf (10nd March 2023).
48. Široký, J., & Maková, K. (2009). Independence between the Efficient Tax Rate and Tax Progressiveness in the Czech Republic during 1993–2007. *Ekonomický časopis (Journal of Economics)*, *7*(57), 653-666.
49. Stanovník, T., & Verbič, M. (2013). Earnings inequality and tax progressivity in Slovenia, 1991–2009. *Acta Oeconomica*, *63*(4), 405-421. https://doi.org/10.1556/aoecon.63.2013.4.1

50. Tran, C., & Zakariyya, N. (2021). Tax progressivity in australia: Facts, measurements and estimates. *Economic Record*, *97*(316), 45-77. https://doi.org/10.1111/1475-4932.12578
51. Vasilopoulou, S., & Talving, L. (2020). Poor versus rich countries: a gap in public attitudes towards fiscal solidarity in the EU. *West European Politics*, *43*(4), 919-943. https://doi.org/10.1080/01402382.2019.1641781
52. Vítek, L. (2012). Distributional Effects of Tax and Benefit Reforms in the Czech Republic. *International Journal of Economics and Management Engineering*, *6*(11), 2976-2982.
53. Vítek, L., & Pavel, J. (2013). Impact of taxes on Redistribution in the Czech Republic. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis*, *61*(7), 2931-2938. https://doi.org/10.11118/actaun201361072931.
54. Wagstaff, A., van Doorslaer, E., van der Burg, H., Calonge, S., Christiansen, T., Citoni, G., Gerdtham, U.-G., Gerfin, M., Gross, L., Häkinnen, U., John, J., Johnson, P., Klavus, J., Lachaud, C., Lauridsen, J., Leu, R. E., Nolan, B., Peran, E., Propper, C., … Winkelhake, O. (1999). Redistributive effect, progressivity and differential tax treatment: Personal income taxes in twelve OECD countries. *Journal of Public Economics*, *72*(1), 73-98. https://doi.org/10.1016/S0047-2727(98)00085-1
55. Wang, J., Caminada, K., & Wang, C. (2017). Measuring income polarisation for twenty European countries, 2004–13: A Shapley growth-redistribution decomposition. *Eastern European Economics*, *55*(6), 477-499. https://doi.org/10.1080/00128775.2017.1345637
56. Wiśniewska-Kuźma, M. (2020). Measurement of personal income tax progressivity in the post-socialist countries of Europe compared to other OECD countries. *Eastern journal of European studies*, *11*(2), 113-131.
57. Wu, C. (2021). More unequal income but less progressive taxation. *Journal of Monetary Economics*, *117*, 949-968. https://doi.org/10.1016/j.jmoneco.2020.07.005

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