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The Impact of Personal Income Tax on Real Gross Domestic Product in the United States of America

Abstract: This article discusses income tax and its impact on economic systems, detailing the case of the United States of America and personal income tax. The purpose of the article is to examine the impact of personal income tax on real gross domestic product in the United States of America in order to develop a model for such a relationship for other highly developed countries. The method applied to examine this relationship is an econometric model using the Classical Least Squares Method, tax data representing the values of real gross domestic product, and the percentages of personal income tax rates for the lowest-earning (lowest rate) and highest-earning (highest rate) groups in the United States of America between 1947 and 2024. Based on the results of the presented model, it is possible to conclude that personal income tax had an unambiguously negative impact on real gross domestic product in the United States during the period under study, regardless of the level of income that was

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	taxed (lowest and highest earners). The impact was –1.64% (±0.28%) of the value of real *GDP* from each one percentage point increase in the tax rate for the highest earners and –3.57% (±1.26%) of the value of real *GDP* from each one percentage point increase in the tax rate for the lowest earners.
Keywords:	Income tax, *GDP*, gross domestic product, United States, U.S.
JEL:	E62, H21, H24, O47

1. Introduction

Income coming from taxes is needed by states, as without tax revenues, they would not be able to function. The issue is, however, which taxes and in what form are optimal for the parties involved, as well as the opportunity cost of levying and collecting specific taxes. The issue of income taxes has polarised political and economic scenes around the world for years. It is a fundamental problem, since income tax revenues account for a significant portion of the total state budget (Wyszkowski, 2010:37).

All processes related to tax determination and collection take place in socio-economic systems, where each citizen plays a specific role. The state of the systems can be measured by indicators that illustrate, among others, how rich a country is. The type of this system determines the impact of various factors on the socioeconomic system. This study focuses on the market system, which is shaped largely on a macroeconomic scale by fiscal and monetary policy. It is a budgetary policy that determines how a country's tax system functions and what tax revenues will be used for (Winiarski, 2006:32–33).

The purpose of this study is to examine the effect that personal income tax has on the economic system, represented in simplified form by a measure such as real gross domestic product, and then to interpret the results of the study and present the potential causes of the dependencies recorded. The case of the United States of America over the period 1947–2024, including the bordering years, will be analysed. The Classical Least Squares Method is used in the study. The data used to conduct the analysis were sourced from the website https://fred.stlouisfed.org, which is a platform containing economic databases on the United States in the form of files, charts and tables that allow research and analysis.

2. An Economic System Illustrated by Gross Domestic Product

An economic system is defined by a set of interconnected elements which are the economic agents, i.e., all organisational units and households located in a given legal order (Kosztowniak, 2011:182). Through economic processes, the system produces and distributes goods and services to society. These goods and services are part of the total wealth accumulated

by economic systems (Adkisson, 2009:28). The level of assets or wealth is calculated by an indicator called gross domestic product (*GDP*) (Roszko-Wójtowicz, Grzelak, 2020:664). *GDP* is the basics of assessing the economic situation of countries and their condition, forecasting their economic development, and presenting the wealth of the country as a whole as well as the level of wealth per citizen on average (*GDP per capita*). However, in economic theory, as well as in economic practice itself, it is pointed out that *GDP* has its drawbacks. The level of complexity of economies, their globalisation and virtualisation, does not allow an accurate, error-free calculation of *GDP*. Thus, it is often better to talk about estimation rather than the calculation of *GDP* (Mączyńska, 2014:10–11). In addition, gross domestic product does not translate into the level of welfare of citizens. This is because it does not take into account such factors as the level of education and healthcare, the state of the environment, or the amount of leisure time of citizens (Dynan, Sheiner, 2018: 5). The Human Development Index (*HDI*) is an indicator that better reflects the level of well-being, since it regards, among others, the previously mentioned categories. In this aspect, it is possible to speak of a system that not only takes into account the economy in the quantitative sense but also the quality and way of life of citizens, i.e., a socio-economic system (Singh et al., 2025:27)

However, while focusing on the economic part of the socioeconomic system, it is justified to use the estimated values of gross domestic product in economic assessments, analyses and studies (Syrquin, 2011: 8). Gross domestic product is, according to one definition of this indicator, the net sum of final sales over a specific time period and geographic area. This means that both the activities of a country's citizens and foreigners are included. Thus, it is to some extent a reflection of a country's wealth. The definition refers to final sales, meaning sales in which the good or service sold will not be resold again during the period under review, but purchased by the consumer or the company that would consume it. Products sold for resale are classified in this method as intermediate sales, which are not included in *GDP* to avoid double-counting them in the sales total (Burda, Wyplosz, 2000:36–37). The following formula shows how *GDP* is calculated using the final sales sum method.

$$GDP = C + I + G + NX, \tag{1}$$

where:
GDP – Gross Domestic Product,
C – consumption,
I – investments,
G – government expenditures,
NX – net export.

GDP thus consists of consumption, investment, government spending and net exports. Consumption is defined as all goods and services purchased by consumers. Purchase can therefore be equated in this case with consumption in the economic sense. It usually occupies a dominant position in the structure of *GDP*. Investment consists of all purchases of fixed assets by businesses (buildings for productive use, machinery and equipment), as well as housing purchases

made by a country's population (buying houses and apartments). Government spending consists of all purchases of goods and services by central and local governments. However, they do not include the payment of social benefits, such as unemployment benefits or pensions, from which funds can be used for consumption. Net exports are the difference between goods sold abroad by consumers, businesses and states (exports) and goods purchased from abroad by the same entities (imports). Thus, these items can appear in *GDP* with a negative value and reduce its net total of final sales (Blanchard, 2011:64–65).

GDP can appear in two forms – nominal or real. Nominal *GDP* is the sum of the value of final sales which is multiplied by current prices occurring in the economy. This means that it can increase under the influence of an increase in final sales, but also under the influence of an increase in prices. Real *GDP* is also the sum of the value of final sales, but it is multiplied by the fixed prices of the goods sold. Nominal *GDP* is also referred to as *GDP* at current prices, and real *GDP* as *GDP* in real terms, at constant prices or adjusted for the impact of inflation (Blanchard, 2011:31–32).

3. Personal Income Tax in the United States of America

Income tax is included in the group of direct taxes. Direct taxes affect the income and property of the taxpayer. A direct tax can be considered a tax whose normatively specified source, its object and subject are common, that is, consistent with the economic source and subject of the tax in practice. The depth of taxation in these taxes depends on how the legislature defines income. Income can be considered as a pure increase in wealth over a certain period of time, but the concept is broad enough to allow lawmakers some flexibility in determining what income is considered in a given system. Typically, income tax levels are progressive – more favourable financial performance means a higher rate of tax required to be paid (Gomułowicz, Malecki, 2011:126).

The origins of income tax in the United States date back to the second half of the 19th century. In 1861, the U.S. Congress used its authority to enact North America's first personal income tax, the proceeds of which were intended to cover Civil War expenses. It remained in effect until 1872, when it was abolished (Hybka, 2016:9). It appeared among the existing taxes again in 1894, but after a year it was declared unconstitutional by the Supreme Court. To gain the legal ability to collect from citizens a portion of their earned income, the 16th Amendment to the Constitution of the United States of America was ratified in 1913 (Mariański, 2018:14), which allowed Congress to 'levy and collect taxes on all kinds of income' while not having to 'take into account either the proportional distribution among the states, or any estimates or censuses' (United States Senat, n.d.). Thus, personal income tax was introduced (Ippolito, 2012:2), which is still in effect today (Hybka, 2016:9). Personal income tax rates in the United States between 1947 and 2024 are shown in the chart below.

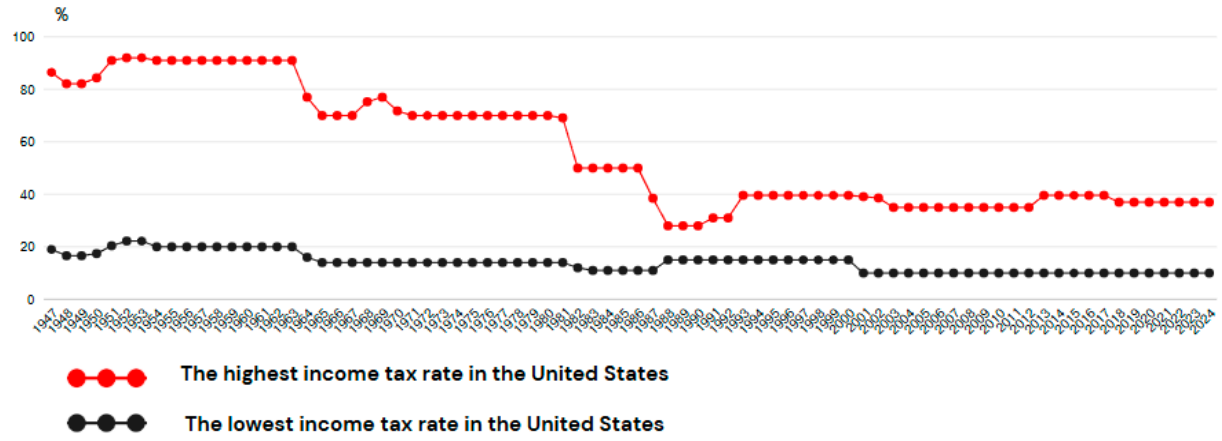

Figure 1. U.S. personal income tax rates from 1947–2024
Source: own elaboration based on Federal Reserve Economic Data, n.d.

Income tax was not initially substantially significant for the U.S. budget. It did not cover a large part of the population, and its rates were only between 1 and 7%. The situation changed rather quickly with the beginning of the First World War (1914–1918). The maximum tax rate rose first to 67% and later to 77%. Similar developments also occurred during other crises in the first half of the 20th century. In response to the Great Depression, the top personal income tax rate was raised by 38 percentage points, reaching 63%. During World War II, in 1944, it climbed to 94% – the highest level in U.S. history. During that period, the personal income tax rate for the lowest earners also increased significantly for the first time. At the beginning of the war, it was 4%, and at the end it was 23% – the highest since its inception. In the post-war United States, fiscalism within income gradually declined, reaching in 1988 the lowest values for the highest personal income tax rate since 1931 – 28%. The lowest rate of this tax has not returned to pre-World War II levels but it has remained 13 percentage points lower than during the war, at 10%, since 2001 (Federal Reserve Economic Data, n.d.). The most recent significant changes to personal income tax in the United States were introduced in 2017 by the Tax Cuts and Jobs Act (TCJA) and will remain in force until the end of 2025, unless extended. The Act introduced changes to tax rates in most brackets and changes to the rules governing allowances and deductions (Bakija, 2024:34–36). Research from 2024 showed that tax changes had a positive impact on the financial situation of households, especially among higher-income households (Dobridge, Hsu, Zabek, 2024:19)

4. Fiscal Efficiency of Income Tax and Its Impact on Taxpayers

There is no agreement on what specific tax solutions are optimal for economic development. Linear and progressive options, questions of the level of expansion of tax breaks, reducing tax bases or the level of tax rates for different income levels are subjects of discussion among economists. Emerging flaws in tax systems, including the design of income taxes, should be eliminated so that tax law is transparent, efficient and does not create tax dilemmas (Sosnowski, 2013:383–384).

These dilemmas can multiply in the context of the design of income taxes, as they have been a burden for those who pay them. Their revenues increase the level of monetary resources and income of countries. However, there is a limit to the amount of income taxation beyond which an inflated tax brings no benefit. Producers unable to bear the burden of taxation may be forced to cease their operations. Higher taxes lead to a decrease in the marginal utility of labour by reducing the value of the fruits of that labour. This results in an increase in the marginal utility of leisure time. As a result, some taxpayers may seek other avenues of income generation, ones that do not require such sacrifice to the public-private union to which they belong, and as a result, both tax revenues and output may fall (Rothbard, 2017:720).

Income taxes are destructive to savings and investment when imposed on the latter. The return on investment, the level of which is set by the free market, decreases as a result of taxation. People adjust their budgets for individual consumption, investment or savings expenditures according to the conditions in which they operate, where savings and investments are the casualties. A low net return on investment causes it to gradually disappear, so that, relatively speaking, consumption increases in the short term, although it can also decline. Income taxes also hit consumption in another way because savings and the whole point of savings is that people keep money in the present to use it for consumption in the future. If current savings are equated with consumption in the future, it means that income taxes tax consumption twice, lowering a person's standard of living in terms of present and future consumption (Rothbard, 2017:722–723).

Another downside of income taxes is their fiscal efficiency. Fiscal efficiency refers to the entire tax system. A high level of fiscal efficiency in the tax system refers to the government's ability to effectively implement fiscal policy by ensuring adequate tax revenues in advance – sufficient to cover public expenditures or to prevent significant budget deficits (Raczkowski, 2016:71). In terms of fiscal efficiency, direct taxes including income taxes yield to indirect taxes. Business cycles cause economic fluctuations. Indirect taxes are more resilient to them than direct taxes, because consumption taxed with them during a crisis or a weak economy remains at a similar level or falls more slowly than the income of individuals and businesses, which also has a bearing on tax revenues (Rosati, 2017:362–363).

One of the factors affecting fiscal efficiency is the level of taxation. The level of tax rates determines government revenues. If tax rates are raised, then tax revenues also increase, but only until a certain limit is exceeded. This limit is the level of taxation beyond which tax revenues

decrease instead of increasing. This effect observed in economic reality is named after the man who popularised it, and it is the Laffer effect, whose graphical, illustrated complement is the Laffer curve (Rosati, 2017:362–363) shown in the figure below.

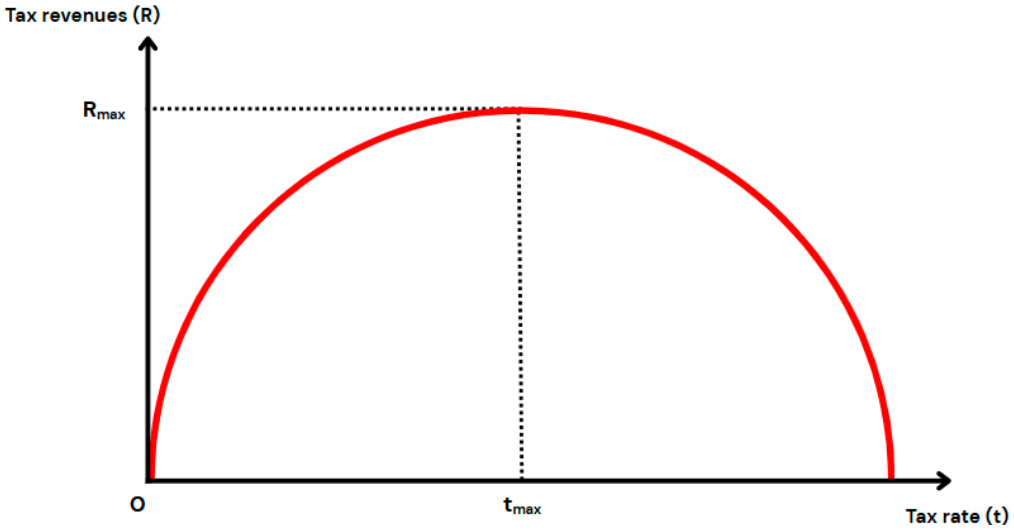

Figure 2. Laffer Curve
Source: own elaboration based on Rosati, 2017.

The Laffer curve represents the dependence of tax revenue on the tax rate. If, in economic reality, the tax-setting institutions decide that the tax is 0%, the revenue from this tax will be zero, because, despite its existence, the tax rate does not allow any revenue from it. On the Laffer curve, tax revenues also do not occur in the case of a tax rate situated at 100%. This is a theoretical situation in which all income is taxed, so no one chooses to undertake any work or production because the individual does not get any benefit from it (Rondinel, Hines Jr., Sanz-Sanz, 2025:1). The shape of the curve is due to the initial directly proportional effect of the two variables on each other, followed by an inversely proportional effect. An increase in the tax rate up to a certain level exceeds the effect of a decrease in the amount of taxed resources, causing an increase in budget income. After the maximum of the function is exceeded, the effect of an increase in the rate does not sufficiently reduce the effect of a decrease in the tax base, so budget income falls. The Laffer effect, because of the value of the tax optimum, is asymmetric in economic reality (Rosati, 2017:363–365).

The values of the optimal income tax rate depend on the country's situation. Therefore, the key values on the Laffer curve are described by letters, not numbers. The value of t_{max} can be influenced by historical and cultural factors. During wartime, the value can approach 100%, as exemplified by the defenders of Stalingrad during World War II, who worked for the common good, limiting their demands as to what an individual should be paid for their work. Once the point of fiscal optimum is exceeded, problems grow, related not only to the budget revenues themselves. In taxpayers, there is a reluctance to work, to take risks, e.g., by investing in new ventures, and this results in a reduction in job growth (a potential increase in unemployment), a reduction in economic growth, and a general deterioration in the economic

situation. From the law of demand comes the interplay between prices and the quantity of a given resource. Thus, inflating tax rates (by which prices will rise) causes a decrease in demand for labour and a drop in savings and investment by taxpayers, who are discouraged by a reduction in their income. Lowering taxes leads to exactly the opposite phenomenon (Gwiazdowski, 2005:13).

5. The Model of the Impact of Income Tax on Real Gross Domestic Product in the United States of America

The analysis of the impact of personal income tax on real gross domestic product in the United States of America was carried out for the period 1947–2024. The Ordinary Least Squares Method used in econometrics, recognised by the Gauss-Markov Theorem as the best tool for obtaining the best unconstrained linear estimator of parameters in a classical linear regression model, was used to estimate 78 time series data – annual observations (Davidson, MacKinnon, 2021:159). The idea behind this method is to fit a straight line to the points in such a way that the squared (due to different signs) and then summed distances between the points and the straight line are as small as possible (Goryl et al., 2018:37). The model formula is shown below.

$$\ln(rGDP)_t = \beta_0 + \beta_1 TaxMax_t + \beta_2 TaxMin_t + \beta_3 GovExp_t + \mu_t, \tag{2}$$

where:
$\ln(rGDP)_t$ – real gross domestic product in logarithmic form,
$TaxMax_t$ – maximum personal income tax rate,
$TaxMin_t$ – minimum personal income tax rate,
$GovExp_t$ – government spending,
μ_t – random component.

The model is in logarithmic form with a logarithmised endogenous variable, which is real gross domestic product (*rGDP*). The variable has been logarithmised since it takes on high numerical values, and the semi-elasticity estimation results will thus be clearer to interpret. The exogenous variables in the model are the personal income tax rates for the highest earners (*TaxMax*) and the lowest earners (*TaxMin*), and a variable representing current government spending in a given year. The model is static. It was assumed that the explanatory variables influenced the dependent variable in the same period in which they were recorded. The results of estimating the model using the Gretl program are shown in the printout below.

```
Model 2: OLS, using observations 1947-2024 (T = 78)
Dependent variable: l_rGDP
HAC standard errors, bandwidth 3, Bartlett kernel

             coefficient    std. error    t-ratio    p-value
  ------------------------------------------------------------
  const       10.2247        0.152185      67.19     4.48e-068 ***
  TaxMax      -0.0164364     0.00280319    -5.863    1.18e-07  ***
  TaxMin      -0.0357131     0.0125720     -2.841    0.0058    ***
  GovExp       0.000128596   1.99725e-05    6.439    1.07e-08  ***

Mean dependent var   9.006594   S.D. dependent var   0.699404
Sum squared resid    2.272103   S.E. of regression   0.175226
R-squared            0.939677   Adjusted R-squared   0.937232
F(3, 74)             164.9491   P-value(F)           1.09e-32
Log-likelihood       27.22692   Akaike criterion    -46.45384
Schwarz criterion   -37.02700   Hannan-Quinn        -42.68010
rho                  0.798401   Durbin-Watson        0.319994
```

Figure 3. Results of estimation of the econometric model on the impact of personal income tax on real gross domestic product in the U.S. from 1947 to 2024 created by the Ordinary Least Squares Method

Source: own calculations in the Gretl program.

The estimation of the model's parameters allows us to know the values necessary to determine the influence of the exogenous variables on the endogenous variable: whether a significant influence is observed, and if so, in what direction and with what strength they act on the endogenous variable. The estimation results are presented below in the form of a formula.

$$\ln(rGDP)_t = \underset{\pm 0,1522}{10,2247} - \underset{\pm 0,0028}{0,0164} TaxMax_t - \underset{\pm 0,0126}{0,0357} TaxMin_t + \underset{\pm 1,99725e^{-5}}{0,0001} GovExp_t + \mu_t. \qquad (3)$$

The model fulfils the numerical assumptions of the Ordinary Least Squares Method about the superiority of the number of observations over the number of estimated structural parameters and the condition about the equality of the order of the matrix X concerning the number of estimated structural parameters, which proves the lack of collinearity of the explanatory variables. Stochastic assumptions were also tested in the model to verify its unburdenedness and efficiency. Tests were performed to check for normal distribution of the random component, homoscedasticity, and autocorrelation of the random component in the model, followed by testing for individual significance of the structural parameters. For the purpose of the study, significance was assumed at $\alpha = 0.05$. The course and results of all tests and the conclusions drawn from them are presented in the table below.

Table 1. Stochastic verification and tests for the individual significance of parameters in the model

Tested parameter	Test name	Test result	Conclusion
Normality of the distribution of residuals	Doornik-Hansen test	$p = 0.00033 < \alpha$	The random component is not normally distributed.
Heteroscedasticity	White's test	$p = 0.012457 < \alpha$	The variance of the residuals is not constant.
Autocorrelation of random components	Durbin-Watson test for positive autocorrelation	$DW = 0.319994$ $d_L = 1.5323$ $d_U = 1.7054$ $DW < d_L$	There is a positive autocorrelation of order I random components in the model.
Individual significance of the parameter β_0	t-Student test	$p = 4.48e^{-68} < \alpha$	The parameter β_0 is significantly different from 0.
Individual significance of the parameter β_1	t-Student test	$p = 1.18e^{-7} < \alpha$	The parameter β_1 is significantly different from 0. The *TaxMax* variable has a statistically significant impact on real *GDP*.
Individual significance of the parameter β_2	t-Student test	$p = 0.0058 < \alpha$	The parameter β_2 is significantly different from 0. The *TaxMin* variable has a statistically significant impact on real *GDP*.
Individual significance of the parameter β_3	t-Student test	$p = 1.07e^{-12} < \alpha$	The parameter β_3 is significantly different from 0. The *GovExp* variable has a statistically significant impact on real *GDP*.
Collinearity of explanatory variables	Multicollinearity assessment VIF – variance inflating factor	*TaxMax* – 3.120 *TaxMin* – 3.131 *GovExp* – 2.224	There is no collinearity between the explanatory variables.

Source: own calculations in the Gretl program.

Conclusions from the tests performed are favourable for the level of reliability of the estimation results in the case of tests for individual significance of parameters (Student's t tests). However, other tests showed the presence of undesirable features in the econometric model, which are the lack of normal distribution of the random component, heteroscedasticity and autocorrelation of random components of order I, but this is a typical situation for time series models. To increase the reliability of the data collected for the study and the results of the analysis, the 'robust standard errors' function with the 'HAC' variant for time series was already used in the estimation of the model.

Successful economic and stochastic verification and successful testing of the significance of the explanatory variables allows us to conclude on the state of reliability of the results of the model estimation of their readiness for use in economic practice and understanding of the mechanisms and relationships occurring between the level of personal income tax rates and the level of wealth of countries in their macroeconomic environments, in this case

the United States of America. The *TaxMax* and *TaxMin* variables included in the model are of fundamental importance. This results from the *GovExp* variable, which reflects the annual federal government expenditures in the United States. In this model, it serves only a supplementary role: while it has a statistically significant impact on the dependent variable, its effect is marginal from an economic perspective.

Thus, identifying the results of the model estimation, it was found that the semi-elasticity of the parameter (β_1) was –0.0164 (±0.0028). This means that if the value of the level of the highest personal income tax rate (under the progressive system) increases by 1 percentage point, real gross domestic product falls by 1.64% on average with an average error of ±0.28% under the ceteris paribus condition (other factors unchanged). Analysing the impact of the second key parameter (β_2), it was found that its semi-elasticity was –0.0357 (±0.0126), which means that if the value of the level of the lowest personal income tax rate (under the progressive system) increases by 1 percentage point, real gross domestic product falls by an average of 3.57% with an average error of ±1.26% under the ceteris paribus condition.

6. Conclusions

Following the results of the analysis, it can be concluded with certainty that the impact of the personal income tax on real gross domestic product in the United States was unequivocally negative from 1947 to 2024, regardless of whether it applied to individuals earning the most or the least. In the extreme case, an increase in the personal income tax rate could have reduced real gross domestic product by nearly 5%. Potential consequences of such an impact of the analysed tax could be the creation of informal sectors and black markets, a reduction in the marginal utility of citizens' labour, or a mismatch between the tax rate and its fiscal efficiency. The results also imply that income redistribution, albeit through social benefits, has not stimulated consumption and investment in the United States enough to compensate for the losses associated with income taxation. The conclusion that is drawn from these considerations states that in general the wealth of the state is formed based on the work of citizens (facilitated by low-income taxes), rather than high, excessive taxation of income and its subsequent redistribution. Governors – when focusing on maximising gross domestic product – should take care of the welfare of workers, through whom the state's enrichment is made possible, and keep transfer payments to a minimum. An important consideration here is the way tax revenues are allocated, as the efficiency and purpose of such spending may influence *GDP* changes following an increase in personal income tax.

The study was conducted based on one country only. The case of the United States was analysed due to the wealth of history, information and data related to income tax in this country. However, the United States of America, as one of the largest countries in the world, is a representative with an economy that is proportional to most developed countries. Therefore, with a high degree of probability, the negative impact of the personal income tax would also be detected

if the study was repeated in other highly developed countries with differences only in specific values regarding the percentage change in real gross domestic product after increasing or decreasing the personal income tax rate by 1 percentage point.

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Wpływ podatku dochodowego od osób fizycznych na realny produkt krajowy brutto w Stanach Zjednoczonych Ameryki

Streszczenie: Artykuł omawia kwestie podatku dochodowego i jego wpływu na systemy gospodarcze z wyszczególnieniem przypadku Stanów Zjednoczonych Ameryki i podatku dochodowego od osób fizycznych. Celem opracowania jest zbadanie wpływu podatku dochodowego od osób fizycznych na realny produkt krajowy brutto w Stanach Zjednoczonych Ameryki jako wzoru tej zależności dla innych państw wysoko rozwiniętych. Metodą zastosowaną do zbadania tej zależności jest model ekonometryczny z zastosowaniem klasycznej metody najmniejszych kwadratów przy użyciu danych podatkowych przedstawiających wartości realnego produktu krajowego brutto oraz wartości procentowe stawek podatku dochodowego od osób fizycznych dla grup osób zarabiających najmniej (najniższa stawka) i dla grupy osób zarabiających najwięcej (najwyższa stawka)

w Stanach Zjednoczonych Ameryki w latach 1947–2024. Na podstawie wyników modelu można wywnioskować, że podatek dochodowy od osób fizycznych miał jednoznacznie negatywny wpływ na realny produkt krajowy brutto w Stanach Zjednoczonych w badanym okresie, niezależnie od poziomu dochodów, jakie zostały poddane opodatkowaniu (zarabiający najmniej i najwięcej). Wpływ ten wyniósł –1,64% (±0,28%) wartości realnego PKB od każdego wzrostu o jeden punkt procentowy stawki podatku dla zarabiających najwięcej i –3,57% (±1,26%) wartości realnego PKB od każdego wzrostu o jeden punkt procentowy stawki podatku dla zarabiających najmniej.

Słowa kluczowe: podatek dochodowy, PKB, produkt krajowy brutto, Stany Zjednoczone, USA