



Determinants of the Proportional Income Tax Revenue: A Comparative Assessment of Russia and Bulgaria

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ABSTRACT

Initially flat-rate income taxes only existed in tax havens, but presently, 26 countries have adopted the proportional tax as a fiscal instrument to increase budget revenues and accelerate economic growth. This article empirically examines the determinants affecting the revenues from a proportional income tax with non-taxable minimum (negative flat tax) used in Russia and a proportional income tax without non-taxable minimum (pure flat tax) used in Bulgaria. The research objective is to estimate the impact of the macroeconomic variables such as gross disposable income, employment, gross capital formation and government expenditures on the revenue from the proportional income tax in Russia and Bulgaria. The study employs an ordinary least square (OLS) method and quarterly seasonally adjusted data for the period 2008–2020. For Russia, quarterly seasonally adjusted data for the period from March 2008 till December 2020 were used, including 52 observations. For Bulgaria, quarterly seasonally adjusted data for the period from March 2008 till March 2020 were used, including 49 observations. Basing on the results, it may be inferred that the increase of the gross disposable income and higher marginal tax rate of the proportional tax with a non-taxable minimum collect more nominal revenue in the budget, as Russia's example showed. The increase of the employment related with a lower marginal tax rate of the proportional income tax without a non-taxable minimum collect less nominal revenue as Bulgaria's example shows. A standpoint of the revenue in the budget the proportional income tax with non-taxable minimum is more effective than proportional income tax without non-taxable minimum.

KEYWORDS

tax revenue, proportional income tax, negative flat tax, pure flat tax, OLS method

JEL H20, H24, H61

УДК 336.114

Факторы, влияющие на доходы от пропорционального подоходного налога: сравнительный анализ России и Болгарии

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АННОТАЦИЯ

Первоначально подоходный налог с фиксированной ставкой существовал только в налоговых гаванях, но в настоящее время 26 стран приняли пропорциональный налог в качестве фискального инструмента для увеличения доходов бюджета и ускорения экономического роста. В статье эмпирически исследуются факторы, влияющие на доходы от пропорционального подоходного налога с необлагаемым минимумом (отрицательная фиксированная ставка), используемого в России, и пропорционального подоходного налога без необлагаемого минимума (чистая фиксированная ставка), используемого в Болгарии. Целью исследования является оценка влияния макроэкономических

переменных, таких как валовой располагаемый доход, занятость, валовое накопление и государственные расходы, на поступления от пропорционального подоходного налога в России и Болгарии. В исследовании используется обычный метод наименьших квадратов и квартальные сезонно скорректированные данные за период 2008–2020 гг. Для России использовались квартальные сезонно сглаженные данные за период с марта 2008 г. по декабрь 2020 г., включающие 52 наблюдения. Для Болгарии использовались квартальные сезонно скорректированные данные за период с марта 2008 г. по март 2020 г., включающие 49 наблюдений. Результаты исследования позволяют сделать вывод, что увеличение валового располагаемого дохода и более высокая предельная налоговая ставка пропорционального налога с необлагаемым минимумом дает больше номинальных доходов в бюджет, как показал пример России. Увеличение занятости, связанное с более низкой предельной налоговой ставкой пропорционального подоходного налога без необлагаемого минимума, дает меньше номинального дохода, как показывает пример Болгарии. С точки зрения поступлений в бюджет пропорциональный подоходный налог с необлагаемым минимумом является более эффективным, чем пропорциональный подоходный налог без необлагаемого минимума.

КЛЮЧЕВЫЕ СЛОВА

налоговые поступления, пропорциональный подоходный налог, отрицательный фиксированный налог, чистый фиксированный налог, обычный метод наименьших квадратов

1. Introduction

The proportional income tax (flat tax) is a system applies the same tax rate to every taxpayer regardless of income bracket. If the income of one person is increase or decrease the tax rate of the flat tax is not changing. This means that average tax rate (ATR) is equal of marginal tax rate (MTR). On one hand the average tax rate is the total tax paid divided by taxable income. On another hand the marginal tax rates show the amount of tax paid on the next earned unit income. Therefore, the average tax rates show the general share of income paid in taxes. Typically, a flat tax applies the same tax rate to all taxpayers with no deductions or exemptions allowed (pure flat tax). Nevertheless, in some country applied flat tax systems with different deductions (negative flat tax). In the economic theory the proportional taxes are proposed as alternatives to progressive income tax.

Karavitis [1] proves that the flat tax includes quite a few versions that may differ significantly between them. There is the “pure flat tax”, which is applied across the economy with no allowances or credits. When deductions are allowed for what we actually have is a “marginal flat tax”, which in effect is a progressive tax

with a single rate. Negative income tax is an advanced version of the marginal flat tax, whereas deductions exceeding income entitle the taxpayer to a refund equal to their difference times the tax rate. A capped flat tax would apply up to a threshold after which income would go untaxed or would be taxed at a lower than the basic rate. This, in fact, is a regressive tax. According to him the many variants of these basic versions show that flat tax is a lively theme of research, policy analysis and dispute. At present, three of these four types of tax are applied in different countries around the world.

The main idea of a negative income tax is related with theoretical conception of Friedman [2]. He predicted that a flat rate tax of 23.5 percent is more effective than progressive income tax. Friedman confirm that the flat rate tax might raise more revenue than the progressive tax system such eliminating distractions that hinder tax collection and economic growth. The main conclusion in the theory argue that the negative income tax whit higher MTR is more effective than the lower MTR.

In the 20th century, flat-rate income taxes only existed in tax havens such as Hong Kong or the Channel Islands. However, the flat tax idea has been remarkably

successful in the last two decades, coincidentally especially in former communist countries in Eastern Europe, Peichl [3]. According to Greenberg [4] the proportional income tax rose to success in the late 1990s and the beginning of the new millennium, when a number of Central and Eastern European (CEE) countries adopted the proportional tax. Estonia became the first CEE country to replace the progressive tax with a proportional one in 1994.

Since then, fifteen more countries in the region have adopted the proportional tax as a fiscal instrument to increase budget revenues and accelerate economic growth. To these we can add some countries from Asia (Georgia 2005, Kyrgyzstan 2006, Kazakhstan 2007, Mongolia 2007), North and South America (Jamaica 1980, Bolivia 1986, Paraguay 2006, Belize 2009) and several island states in part of Africa (Mauritius 2007, Seychelles 2010). Since the revival of the idea in the 1990s, with a proportional tax has been levied the incomes in approximately thirty countries around the world. Russia was the first major economy in the world to introduce the flat tax.

At the present moment, there are 26 countries in the world that impose a proportional tax on income. The economic literature states that any tax reform must be accompanied by an impact assessment. It is associated with the identification, anticipation and evaluation of possible results, positive and negative, from the implementation of certain policies, regulations and other initiatives by the government, Boneva et al. [5].

The main purpose of the study has to analyse the budget revenues of the negative flat tax and the pure flat tax.

In the particular context, it is possible to summarize the main points of the research:

- To analyse the theoretical foundations of proportional taxation.
- To analyse the range of the flat tax in the countries of the world.
- To estimate empirically the impact of the proportional income tax with non-taxable minimum in budget revenues in Russia.

- To estimate empirically the impact of the proportional income tax without non-taxable minimum in budget revenues in Bulgaria.

- To formulate suggestions for increase of the budget revenues of proportional income tax.

According to this case four hypotheses are tested:

H1. Gross disposable income can increase the revenue in the budget of the proportional income tax with non-taxable minimum.

H2. Employment can increase the revenue in the budget of the proportional income tax without non-taxable minimum.

H3. Gross capital formation can increase the revenue in the budget of the proportional income tax with non-taxable minimum and of the proportional income tax without non-taxable minimum.

H4. Government expenditures can increase the revenue in the budget of the proportional income tax with non-taxable minimum and of the proportional income tax without non-taxable minimum.

2. Literature review

According to Piper et al. [6] the standard tax policy principles used to evaluate the potential effectiveness of a particular tax include: equity (fairness), efficiency (causing minimum distortions) and simplicity (easily understood). They proved that in practice, no single tax perfectly satisfies all these criteria, and each criterion will sometimes conflict with the others. The efficiency criterion relates to the extent to which the tax system collects the necessary revenue without otherwise affecting economic behaviour.

The study of the budget revenue of the proportional tax (flat tax) is associated with the scientific works of Sheshinski [7] and Hall et al. [8]. Sheshinski [7] proves that the proportional income tax is optimal. Hall et al. [8] argue that replacing the existing individual income tax with their flat tax would be a major improvement for three reasons: the flat tax would be much simpler than the current income tax, consumption is a better tax base than income, and the flat tax would be much more effi-

cient than the current income tax system, Bickley [9]. The key and most radical difference to the classical income taxes (personal and corporate) is rather in the segment of corporate taxation, including the elimination of double taxation of income from dividends – both as corporate income, and as personal income, Galabov [10]. Hall et al. [8] confirmed that this tax improves the economic growth. The supporters of the proportional tax claim it increases employment, budget revenues, investments and the growth. According to them, the low size of the proportional tax (under 20%) reduces the distortions in the economy and improves economic efficiency. Therefore, the advantages of the proportional tax are a convenient fiscal tool of the government to increase budget revenues and stimulate economic development.

The debate over the advantages or disadvantages of introducing a proportional tax is the basis of many empirical studies. A major argument in the debate over flat tax reform is the effect that such a reform would have on economic performance, Adhikari and Alm [11]. In accordance with Popescu et al. [12] the choice of the fiscal structure must take into account many factors, such as: the effects on the economic incentives, its fairness among persons with similar taxable capacity, its effects on the distribution between the rich and the poor, whether it is compatible with desirable international economic relations, and also based on its simplicity, ease of understanding and absence of excessive administrative costs.

According to Wheaton [13] the adoption of a flat tax structure has a strongly significant positive effect of 1.36 percentage points on GDP growth. Mohs [14] confirm that flat rate tax system can lower incentives for individuals and businesses to avoid taxes. According to Gorodnichenko et al. [15] the Russian economy grew at almost 5% in real terms, revenues from the personal income tax increased by over 25% in real terms. They argue that the Russian experience would appear to have been so successful that many other countries have followed suit with their own flat rate income tax reforms, and an increasing

number of countries around the world are considering the adoption of a flat rate income tax.

Ivanova et al. [16] confirmed that the replacement of the progressive income tax with a proportional tax does not lead to an increase of the revenues in Russia. They argue that the increase of the incomes leads to increase of the proportional income revenue.

Balatsky and Ekimova [17] confirmed that the transition from the flat to progressive PIT scale in Russia will generate extra revenue, which will be enough to finance the advancement of the country's high-tech industries.

Barrios et al. [18] analyze the fiscal, redistributive and macroeconomic impact of introducing/increasing progressivity in the Central and Eastern European countries with flat tax schedules, namely Bulgaria, Estonia, Latvia, Lithuania, Hungary and Romania. They suggest that enhancing progressive elements in the personal income tax system under alternative and plausible tax reform scenarios would have significant positive effects on redistribution and equity and would yield additional tax revenues.

Bartha [19] found that the tax rate cuts did not lead to an increase in personal income tax revenues in Hungary. He confirms that economic growth did not pick up.

Adhikari et al. [20] founds positive relationship between flat tax and GDP per capita in economy of Latvia. They confirm that adopt the flat tax the GDP per capita has increased.

Omodero et al. [21] empirical findings for economy in Nigeria that the personal income tax (progressive tax) has a significant positive influence on the gross national income in period 2011 till 2020.

Elshani et al. [22] compares influence of the proportional income tax and the progressive on economic growth in 35 European countries. They findings that countries applying the linear tax experience the largest economic growth, whereas countries applying progressive tax have a smaller economic growth of 3.13% compared to countries applying linear taxation.

Keen et al. [23] for the economy of Russia, argue that there is little evidence that the strong revenue performance after the reform was due to the flat tax itself: rather it appears to have reflected a wider macroeconomic recovery.

Stoilova et al. [24] empirically confirms for the Bulgarian economy that personal income tax has a negative impact on economic growth.

Inversely Gabriel et al. [25] provide evidence that income tax has a significant positive effect on gross domestic product in Nigeria. Similar empirical findings in Kenya are supported by Muriithi [26]. He concludes that income tax results in a steady increase in government revenues.

Baimagambetov et al. [27] confirm that the introduction of a progressive tax scale in the Republic of Kazakhstan will lead to an increase in the trend towards filling of the state budget more than fixed or regressive taxes, since the highest percentage of taxes will be levied on the highest amounts of money.

3. Proportional income tax and the budget revenue in Russia and Bulgaria

In 2001, Russia adopted a 13% proportional income tax with a non-taxable minimum. Thus, the Russian Federation became the first major economy in the world to start imposing a proportional tax on personal income. In Russia, the proportional tax is applied with a number of social benefits. In theory, this tax is known as a negative flat tax.

According to Gorodnichenko et al. [15], in January 2001, Russia introduced a fairly dramatic reform of its personal income tax, becoming the first large economy to adopt a flat tax. The Tax Code of 2001 replaced a conventional progressive rate structure with a flat tax rate of 13 percent. The reform introduced a flat PIT rate of 13 percent; it eliminated the existing progressive rate schedule (with rates of 12 percent up to 50,000 rubles of annual income, 20 percent for 50,001–150,000 rubles, and 30 percent above 150,000 rubles. The income up to 50 000 rubles is not taxed. The non-taxable minimum of

income after introducing of the flat PIT is not reject. The tax revenues are collected in the budgets of local authorities. From 1 January 2021, in Russia the annual income above 5 million is taxed whit 15%, Balatsky and Ekimova [17].

In the striving to stimulate economic growth and to increase budget revenues in 2008, Bulgaria adopted a proportional tax of 10%. The tax base has been significantly expanded and covers all sources of income realized by employees. This tax replaced the progressive income tax with sizes of 20%, 22% and 24% with a non-taxable minimum of up to BGN 2,400 on an annual basis. With 20% tax is levied on annual income from BGN 2,400 to BGN 3,000, with 22% tax is levied on income from BGN 3,000 to BGN 7,200 and with 24% are levied income over BGN 7,200 received on an annual basis. Revenues from this tax are collected by the government. After the adoption of the proportional tax, the non-taxable minimum in Bulgaria has been removed. Bulgaria became the second country after Georgia to adopt the proportional (pure flat tax) form and the first in the countries of Central and Eastern Europe.

There are three main differences from the adopted proportional tax in Russia and Bulgaria. First, the proportional tax in Russia includes a non-taxable minimum for the lowest incomes, while in Bulgaria the non-taxable minimum has been abolished. Second, the marginal tax rate in Russia is higher than in Bulgaria. Third, revenues in the Russian Federation are administered by regional authorities, while in Bulgaria they are collected by the government. This means that the local authorities in Russia have more financial resources than those in Bulgaria. Fourth, the flat tax in Russia confirms the Milton Friedman's theory.

Figure 1 shows the nominal values of revenue from proportional income tax in the budget of Russia for the period 2006–2020.

The budget revenue from proportional tax (see Figure 1) in the regional budget of Russia showed an increase by 3,57 or a by a bit more than 350% du-

ring the studied period. After the implemented reform, the revenue increased in nominal values. A deceleration was only registered during the Global financial and economic crisis in 2008–2010. After that period the indicator has shown an increase.

Figure 2 shows the nominal values of revenue from proportional income tax with non-taxable minimum in the budget of Bulgaria for the period 2008–2019.

The budget revenue from proportional tax (see Figure 2) showed an increase by 1,14 or a by a bit more than 114% during the studied period. After the implemented reform, the revenue increased in nominal values. A deceleration was only registered during the Global financial and economic crisis in 2008–2010. After that period the indicator has shown an increase.

Figures 3 and 4 show the growth rates of nominal GDP and proportional income tax for Russia and Bulgaria.

Figure 3 shows that during the crisis (2010–2012) proportional tax revenues contracted faster than nominal GDP for Russia's economy. On the one hand, this means that revenue collection is declining, but on the other hand, it is clear that this type of proportional tax works as a fiscal stabilizer. During growth (after 2012), collection increases as revenue outruns growth. The effect of the tax is similar in Bulgaria (see Figure 4).

Figure 4 shows that during the crisis (2009–2011) the revenues from the proportional tax decreased faster than the decrease of the nominal GDP for Bulgaria. During growth, collection increases. Therefore, the effect of the two types of

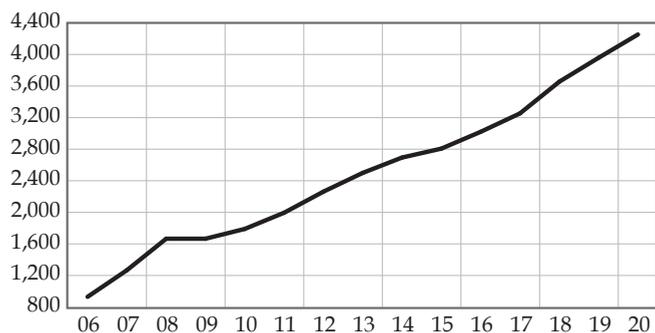


Figure 1. Nominal revenue from proportional tax on income in the Regional budget of Russia, bln. Rub

Source: Prepared by the author

Data: Ministry of Finance of the Russian Federation

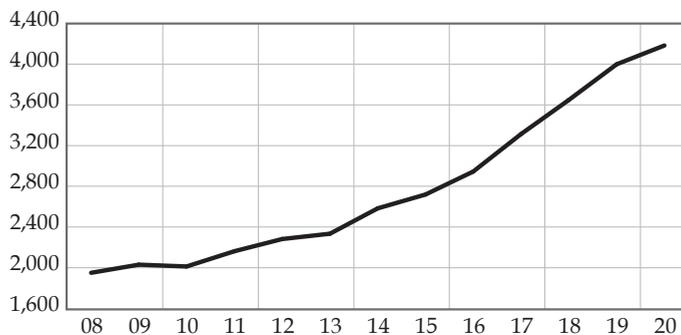


Figure 2. Nominal revenue from proportional tax on income in the budget of Bulgaria, mln. lv

Source: Prepared by the author

Data: Ministry of Finance of Bulgaria

proportional tax (negative flat tax and pure flat tax) during a crisis and growth is similar. On this basis, it is possible to make the following conclusions:

First, the expansion of the taxable mass, following the example of Bulgaria, by introducing a pure flat tax does not collect more revenue in the budget than the introduced negative flat tax in Russia (see Figures 1 and 2). Therefore, with an appropriate tax rate and a non-taxable minimum included the revenues from the proportional tax increase more than with the proportional tax without the non-taxable minimum. Second, during the economic crisis, revenues from this tax do not

increase. This means that the proportional tax in its two forms (negative flat tax and pure flat tax) can be used by governments as an automatic fiscal stabilizer during an economic downturn (see Figures 3 and 4). During growth, it can be assumed that the budgeted revenues will be collected.

The main conclusion is that with a higher marginal tax rate (MTR) and a non-taxable minimum included, nominal budget revenues increase more as in Russia than with a proportional tax without a non-taxable minimum as in Bulgaria. Nevertheless, from 1 January 2021, in Russia the annual income above 5 million is taxed with 15%.

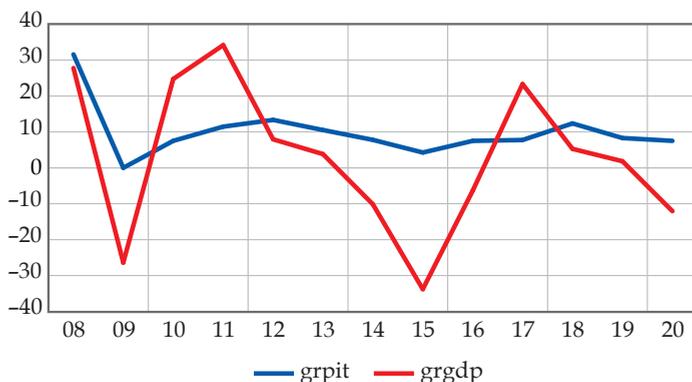


Figure 3. Nominal GDP and revenue from proportional income tax in the regional budget of Russia

Source: Prepared by the author
Data: Ministry of Finance of the Russian Federation

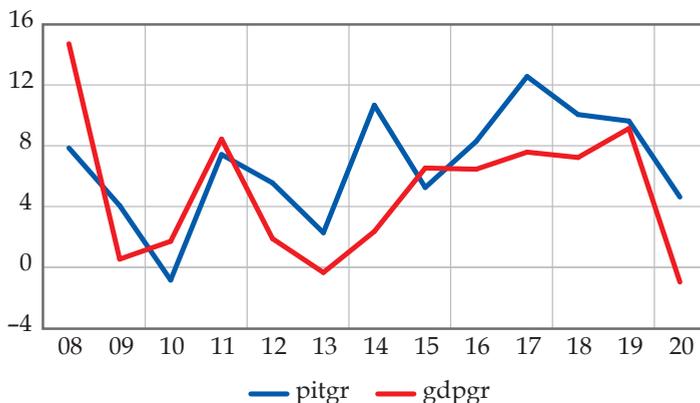


Figure 4. Nominal GDP and revenue from proportional income tax in the budget of Bulgaria

Source: Prepared by the author
Data: Ministry of Finance of Bulgaria

4. Methodology and data of the research

The constructive variables affecting the revenues from the proportional tax in Russia and Bulgaria have been examined.

For Russia, were used quarterly data for the period March 2008 – December 2020 with 52 observations included. All data in the empirical analysis are in absolute amounts (million rubles) except the employment. The data on employment are in the number of employees working under labor relations. Data from the Federal Statistical Office and the Ministry of Finance of Russia were used.

For Bulgaria, were used data for the period March 2008 – March 2020 including 49 observations. Eurostat data were used. All data in the empirical analysis are in absolute amounts (million BGN) except the employment. The data on employment are in the number of employees working under labor relations.

The specification of the regression equation models (for Russia and Bulgaria) includes the following variables – proportional income tax revenues (**PT**), number of employees under labor relations aged 15 to 64 (gross), gross disposable income (**GDI**), gross capital formation (**GCF**), government expenditure (**GEXP**). The dependent variable is (**PT**).

The empirical analysis was performed in the following sequence: seasonal smoothing of data with **TRAMO SEATS**; logarithm with natural logarithm; testing of variables for a single root- **Summary Unit Root Test**; determining the

number of lags- **Lag Length Criteria (LR, FPE, AIC, SC, HQ)**; testing for cointegration connections- **Johansen cointegration test**; choice of econometric method (**OLS**); serial correlation testing- **Breusch-Godfrey Serial Correlation LM Test**; testing for heteroscedasticity- **Heteroskedasticity Test: Breusch-Pagan-Godfrey**; testing for errors in the model specification – **Ramsey RESET Test**; testing for dynamic stability of the model – **CUSUM test**; Testing for normal residue distribution – **Jarque-Bera statistics**.

5. Results

5.1. Empirical analysis of the revenue of proportional income tax in Russia

The study period for Russia covers March 2008 – December 2020 with 52 observations included. Table 1 shows the group test for stationarity of the variables.

The group test for single root of **PT**, **EMPL**, **GDI**, **GCF** and **GEXP** (Table 1) shows that the variables are not stationary as a group. Therefore, their first differences are calculated (Table 2).

Table 3 shows that the optimal number of lags is 1.

The Johansen cointegration test shows that the variables are not cointegrated. In this case, it is not possible to use autoregressive models such as **VEC** or **VAR**. Therefore, multiple linear regression in the form of **OLS** was applied. The results of the equation of the **OLS** method with dependent variable **PT** are presented in Table 4.

Table 1

Group stationarity tests of **PT**, **EMPL**, **GDI**, **GCF** and **GEXP**

Method	Statistic	Probability	Cross-sections	Observations
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t^*	2.79664	0.9974	5	244

Source: Prepared by the author

Table 2

Group stationarity tests of **PT**, **EMPL**, **GDI**, **GCF** and **GEXP** (first difference)

Method	Statistic	Probability	Cross-sections	Observations
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t^*	-8.58402	0.0000	5	242

Source: Prepared by the author

All variables except GCF in the OLS equation are statistically significant at a critical level of 5%. A strong positive impact on the income of the proportional tax in Russia has the gross disposable income of the employees working under labour relations with a coefficient (0.12). The results show that with a unit increase in income, revenues in Russia's local budgets increase by 12%. This result fully confirms the theoretical assumptions of the negative income tax, in which the increase in income is of paramount importance. This result is consistent with the conclusions of Ivanova et al. [16].

Empirical analysis shows that the variables of employment and government spending are negative. Therefore, they have a negative impact on the proportional tax revenue. Employment has a coefficient (-0.03) and government spending by (-0.67). With a proportional tax with a non-taxable minimum included an increase in low-income employment at the expense of an increase in high-income em-

ployment may even lead to lower incomes. Therefore, with a negative tax, budget revenues increase if the average and high incomes of the population increase.

One of the reasons for the negative values is that attempts to promote employment by the state are usually aimed at low-income people. The impact of government spending is similar. When the state seeks to increase incomes by increasing government spending, these expenditures are usually directed at low-income people. Gross capital formation also has a negative coefficient. Its value is (-0.05) and does not lead to an increase in proportional tax revenues.

The value of the coefficient of determination (R-squared = 0.987474) shows that 98% explains the efficiency of Russia's proportional tax revenues by changing the independent variables participating in Table (4). The probability of F-statistics (Probability F-statistic = 0.00) shows that the alternative hypothesis for the adequacy of the model used is confirmed.

Table 3

Optimal lag length in the VAR

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1732.548	NA	1.90e+25	72.39781	72.59273	72.47147
1	-1457.879	480.6698*	5.82e+20*	61.99496*	63.16446*	62.43692*
2	-1443.188	22.64849	9.25e+20	62.42451	64.56859	63.23476
3	-1427.857	20.44125	1.52e+21	62.82738	65.94605	64.00593
4	-1400.544	30.72757	1.65e+21	62.73099	66.82424	64.27784

Source: Prepared by the author

Table 4

Results from the econometric estimation whit OLS method (Equation 1)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2946.034	1166.726	2.525043	0.0150
GDI	0.120811	0.009220	13.10335	0.0000
EMPL	-0.037240	0.016952	-2.196797	0.0330
GEXP	-0.677873	0.100908	-6.717723	0.0000
GCF	-0.050986	0.064292	-0.793044	0.4317
R-squared	0.987474	Mean dependent var	1619.166	
Adjusted R-squared	0.986408	S.D. dependent var	445.7112	
S.E. of regression	51.96300	Akaike info criterion	10.83015	
Sum squared resid	126907.2	Schwarz criterion	11.01777	
Log likelihood	-276.5840	Hannan-Quinn criter.	10.90208	
F-statistic	926.3059	Durbin-Watson stat	2.076944	
Prob(F-statistic)	0.000000			

Source: Prepared by the author

Testing for the absence of serial correlation of the disturbances shows that the null hypothesis in the regression equation is valid (Table 5). The results of the residue heteroskedasticity test shown in Table 6 also justify the null hypothesis of no heteroskedasticity. In Table 7, the results for the model specification show that the null hypothesis should also be accepted.

Table 5
Results from the serial correlation test of residuals in Equation (1)

F-statistic	0.763609	Prob. F(2,45)	0.4719
Obs*R-squared	1.706857	Prob. Chi-Square(2)	0.4260

Source: Prepared by the author

Table 6
Results from the heteroscedasticity test of residuals in Equation (1)

F-statistic	0.503561	Prob. F(4,47)	0.6139
Obs*R-squared	1.943785	Prob. Chi-Square(4)	0.5178

Source: Prepared by the author

Table 7
Results from the specification of the model (Ramsey RESET Test)

t-statistic	0.079962	46	0.9366
F-statistic	0.006394	(1, 46)	0.9366
Likelihood ratio	0.007227	1	0.9323

Source: Prepared by the author

The results of the CUSUM test (Figure 5) show that the equation is stable over time. Actual CUSUM values are within the confidence interval at a 5% significance level.

The probability of the Jarque-Bera statistic is 0.8 (see Figure 6), which is a reason to accept the null hypothesis of a normal residual distribution.

5.2. Empirical analysis of the revenue of proportional income tax in Bulgaria

The study period for Bulgaria covers March 2008 – March 2020 with 49 observations included. Table 8 shows the group test for stationarity of the variables.

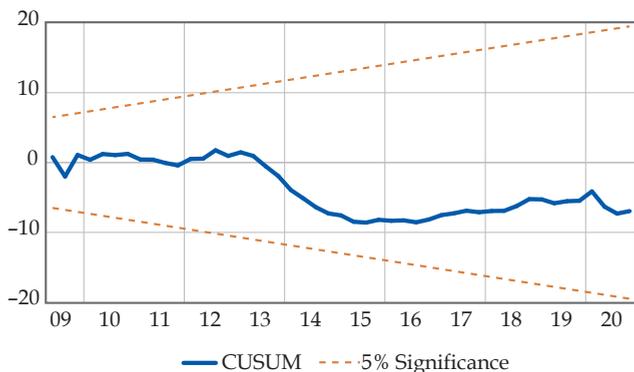


Figure 5. CUSUM test for dynamic stability of Equation (1)

Source: Prepared by the author

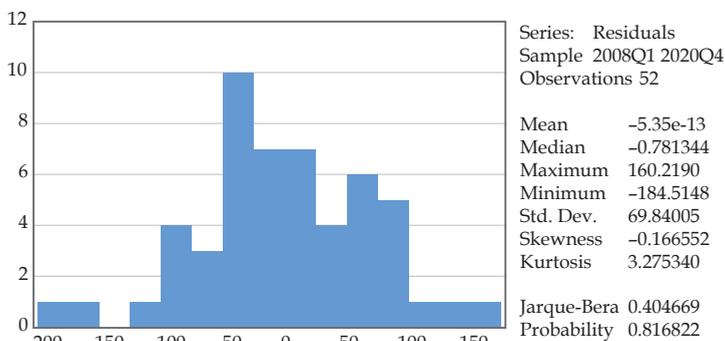


Figure 6. Test for normal distribution of residuals in Equation (1)

Source: Prepared by the author

The group test for single root of PT, EMPL, GDI, GCF and GEXP (Table 8) shows that the variables are not stationary as a group. Therefore, their first differences are calculated – Table (9).

Table 10 shows that the optimal number of lags is 1.

The Johansen cointegration test shows that the variables are not cointegrated. In

this case, it is not possible to use autoregressive models such as VEC or VAR. Therefore, multiple linear regression in the form of OLS was applied. The results of the equation of the OLS method with the dependent variable PT are presented in Table 11.

For Bulgaria, all variables except GEXP in the OLS equation are statistical-

Table 8

Group stationarity tests of PT, EMPL, GDI, GCF and GEXP

Method	Statistic	Probability	Cross-sections	Observations
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	4.44362	1.0000	5	238

Source: Prepared by the author

Table 9

Group stationarity tests of PT, EMPL, GDI, GCF and GEXP (first difference)

Method	Statistic	Probability	Cross-sections	Observations
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-10.5909	0.0000	5	227

Source: Prepared by the author

Table 10

Optimal lag length in the VAR

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1842.995	NA	3.22e+29	82.13309	82.33383	82.20792
1	-1631.660	366.3132*	8.21e+25*	73.85156*	75.05600*	74.30056*
2	-1608.777	34.57889	9.41e+25	73.94564	76.15379	74.76882
3	-1592.330	21.19842	1.54e+26	74.32577	77.53762	75.52312
4	-1560.642	33.80076	1.44e+26	74.02852	78.24407	75.60003

Source: Prepared by the author

Table 11

Results from the econometric estimation whit OLS method (Equation 2)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	569.2231	192.3106	2.959915	0.0049
GDI	0.000565	1.87E-05	30.29138	0.0000
EMPL	0.222138	0.075257	-2.951727	0.0051
GEXP	0.014884	0.008733	1.704408	0.0954
GCF	0.032458	0.012129	2.676139	0.0104

R-squared	0.992331	Mean dependent var	1649.606
Adjusted R-squared	0.991634	S.D. dependent var	422.2555
S.E. of regression	38.62188	Akaike info criterion	10.24197
Sum squared resid	65632.58	Schwarz criterion	10.43501
Log likelihood	-245.9282	Hannan-Quinn criter.	10.31521
F-statistic	1423.383	Durbin-Watson stat	2.451979
Prob(F-statistic)	0.000000		

Source: Prepared by the author

ly significant at a critical level of 5%. The government expenditure variable is statistically significant at a critical level of 10%. All coefficients are positive, which means that they lead to an increase in budget revenues. Employment with the coefficient (0.22) has the strongest positive impact. The results show that a unit increase in employment budget revenues from the proportional tax increased by 22%. When taxing income with a proportional tax without a tax-free minimum, employment has a key role in increasing budget revenues. This high coefficient is due to the wide taxable mass, which is typical for pure flat tax.

This result is quite expected, as a proportional tax in Bulgaria is levied on all employment incomes. Gross capital formation with a coefficient (0.03) and government expenditure with (0.01) have a weaker but also positive impact. The increase in gross capital formation per unit increases revenues by 3%. This means that the increase in the capital assets of enterprises does not redirect funds to salaries, which leads to an increase in revenues from proportional tax. The increase in government spending per unit leads to an increase in revenues by 1%.

The positive value of government expenditures in Bulgaria, in contrast to that of Russia, shows that with a proportional tax without a tax-free minimum, incomes increase and this leads to an increase in budget revenues. While with a proportional tax with a non-taxable minimum, incomes increase, but budget revenues do not. This result is due to the wide taxable mass in Bulgaria. Gross disposable income is also positive, but unlike Russia, its impact is insignificant with a coefficient (0.0005).

The value of the coefficient of determination (R -squared = 0.992331) shows that 99% explains the efficiency of the revenues from the proportional tax of Bulgaria through a change in the independent variables participating in Table (11). The probability of F -statistics (Probability F -statistic = 0.00) shows that the alternative hypothesis for the adequacy of the model used is confirmed.

Testing for the absence of serial interference correlation shows that the null hypothesis in the regression equation is valid (Table 12). The results of the residue heteroscedasticity test shown in Table 13 also justify the null hypothesis of no heteroscedasticity. In Table 14, the results for the model specification show that the null hypothesis should also be accepted.

Table 12

Results from the serial correlation test of residuals in Equation (2)

F-statistic	2.575979	Prob. F(2,42)	0.0881
Obs*R-squared	5.353881	Prob. Chi-Square(2)	0.0688

Source: Prepared by the author

Table 13

Results from the heteroscedasticity test of residuals in Equation (2)

F-statistic	0.822361	Prob. F(4,44)	0.5180
Obs*R-squared	3.408431	Prob. Chi-Square(4)	0.4919

Source: Prepared by the author

Table 14

Results from the specification of the model (Ramsey RESET Test)

t-statistic	0.035714	43	0.9717
F-statistic	0.001275	(1, 43)	0.9717
Likelihood ratio	0.001453	1	0.9696

Source: Prepared by the author

The results of the CUSUM test (Figure 7) show that the equation is stable over time. Actual CUSUM values are within the confidence interval at a 5% significance level.

The probability of the Jarque-Bera statistic is 0.07 (see Figure 8), which is a reason to accept the null hypothesis of a normal residual distribution.

6. Conclusions

From the results derived in the OLS model, the following conclusions can be drawn for Russia and Bulgaria:

In Russia, rising incomes are key to revenue growth. The increase in income is associated with the increase in economic growth. If the government wants to increase proportional tax revenues further, it must implement policies to increase

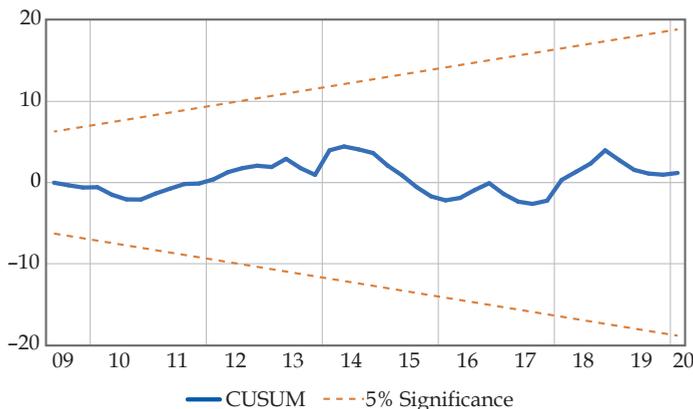


Figure 7. CUSUM test for dynamic stability of Equation (1)

Source: Prepared by the author

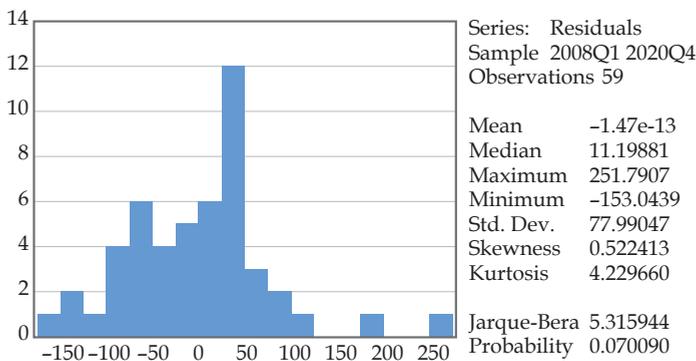


Figure 8. Test for normal distribution of residuals in Equation (1)

Source: Prepared by the author

middle and high incomes. However, this should not be at the expense of low incomes, as inequalities in income distribution will increase. Employment can also be important if policies for increase middle and high incomes are implemented. However, government spending has a strong negative impact, mainly due to low-income policies, as social spending targets these groups.

For Bulgaria, the number of employees is the most important tool for providing budget revenues. This conclusion is in line with the theory of proportional tax without a non-taxable minimum to increase revenue due to the expanded taxable mass. Therefore, if the government wants to increase budget revenues, it should implement policies that promote employment.

With this tax, however, profitability decreases due to increased costs of forming a unit of income. This is a major drawback to the extended proportional tax base without a non-taxable minimum. The growth of gross disposable income is not a leading factor in increasing revenues in Bulgaria, which is a major disadvantage of the fiscal system in contrast to Russia.

When it comes to income taxation, it is not employment that is leading, but the growth of gross income. When you have lower income growth, it is more convenient to apply a tax without a tax-free minimum, which provides more revenue to the budget. It is more appropriate to increase incomes faster and to apply a tax with a non-taxable minimum included. The funds allocated for gross capital for-

mation by companies in Bulgaria are not significant and do not hinder the increase of salaries and respectively the revenues in the budget. Government spending has an important role to play in increasing incomes, which example should be followed by the private sector.

It may be inferred that the increase of the gross income and higher marginal tax rate (MTR) of the proportional tax with a non-taxable minimum are collect more nominal revenue in the budget, as in Russia. The increase of the employment related with a lower MTR of the propor-

tional income tax without a non-taxable minimum collect less nominal revenue as in Bulgaria.

From the point of view of the basis, theoretical framework of the efficiency of the proportional income tax on revenue in the budget, we can confirm that these conclusions are related more whit the theory of the Milton Friedman. Consequently, a higher MTR of proportional income tax with include non-taxable minimum is more efficient than the lower MTR without non-taxable minimum in the tax collection.

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