

Tax Buoyancy and Economic Growth: Empirical Evidence of Bulgaria

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ABSTRACT

The study analyzes the long-run and short-run tax buoyancies of Bulgaria and their relationship with Bulgaria's economic growth. The buoyancy measures the response of tax revenue to changes in economic growth. The buoyancy indicates whether collectability of the tax on income, profit, and consumption increases. The object of this study is the collectability of aggregate tax revenues and of the revenues from different types of taxes – value added tax, personal income tax, corporate tax and social security contributions in Bulgaria. The subject of the study is the relationship of different tax revenues with economic growth. The research methods employed are the fully modified least squares (FMOLS) and autoregressive distributed lag model (ARDL). The research covers the period from the first quarter of 1999 to the second quarter of 2017 and uses the Eurostat data (78 observations). The study aims to show which type of revenues (from direct or from indirect taxes) is more important for Bulgaria's state budget. It is shown that the buoyancies of aggregate tax revenue, personal income tax and social security contributions significantly differ from one another in the long-run. The buoyancies of the value-added tax and the corporate tax are above one in the long run. In the short-run the buoyancy of the aggregate tax revenues, the corporate tax, the income tax and the social security contributions are different from one. The short-run buoyancy of VAT exceeds one, hence dynamics of VAT revenues is sustainable. The collectability of the aggregate tax revenue, personal income tax and social security contributions has increased neither in the long run nor in the short run. It is therefore recommended that inefficient taxes, whose collectability does not increase, be reformed.

KEYWORDS

tax buoyancy, aggregate tax revenue, direct taxes, indirect taxes, economic growth, fully modified least squares, autoregressive distributed lag model

JEL H24, H25, H63

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Эмпирическое исследование взаимосвязи динамичности налоговых доходов и экономического роста в Болгарии

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АННОТАЦИЯ

В настоящем исследовании анализируется динамичность налоговых доходов в Болгарии в кратковременной и долговременной перспективе, а также связь этого показателя с экономическим ростом. Динамичность налоговых доходов – показатель, который характеризует чувствительность налоговых поступлений к изменениям в темпах экономического роста. Это выражается прежде всего в наличии или отсутствии увеличения собираемости налоговых платежей для налогов на доходы физических лиц, прибыль и потребительских налогов. В фокусе настоящего исследования – суммарная собираемость налоговых платежей и доходы от различных видов налогов, в частности, налога на добавленную сто-

имость, налога на доходы физических лиц, налога на прибыль и отчислений в систему социального страхования в Болгарии. Иными словами, анализируется взаимосвязь между доходами от различных видов налогов и экономическим ростом. Методология исследования включает в себя полностью модифицированный метод наименьших квадратов и авторегрессионную модель с распределенным лагом. В качестве эмпирических данных используются данные Евростата (78 наблюдений) за период с первого квартала 1999 г по второй квартал 2017 г. Цель исследования – установить, поступления каких видов налогов (прямых или косвенных) наиболее важны для государственного бюджета Болгарии. Полученные результаты показали, что в долгосрочной перспективе существуют значительные различия в динамичности суммарных налоговых доходов, поступлений от налога на доходы физических лиц и отчислений в систему социального страхования. Динамичность доходов от НДС и налога на прибыль превышает единицу в долгосрочной перспективе. В краткосрочной перспективе динамичность суммарного налогового дохода, а также дохода от налога на прибыль, налога на доход физических лиц и отчислений в систему социального страхования отличалась от единицы. В краткосрочной перспективе динамичность доходов от НДС превышает единицу, поэтому можно заключить, что динамика поступлений НДС является достаточно устойчивой. Собираемость в долгосрочной и краткосрочной перспективе не увеличилась для суммарного налогового дохода, налога на доходы физических лиц, а также для отчислений в систему социального страхования. В результате делается вывод, что необходимо реформирование неэффективных налогов, чья собираемость не повышается.

КЛЮЧЕВЫЕ СЛОВА

динамичность налоговых доходов, суммарный налоговый доход, прямые налоги, косвенные налоги, экономический рост, полностью модифицированный метод наименьших квадратов, авторегрессионная модель с распределенным лагом

1. Introduction

Over the last years the rates of direct and indirect taxes in Bulgaria were changed several times. VAT was introduced in 1994 with a rate of 18%, in 1996 the VAT rate was raised to 22%, and in 1999 it was lowered to 20%. The corporate tax was substantially decreased from 40.2% in 1997 to 10% in 2007. The rates of the progressive income tax (18%, 20% and 22%) were also diminished to 10% in 2008. After the changes made, the revenues in Bulgaria's state budget became highly dependent on consumption taxes. The proclaimed goal of the 2007–2008 tax reform was to stimulate economic growth and increase the revenues from direct and indirect taxes.

The relationship between the revenues from different types of taxes and economic growth is broadly discussed in specialized literature. There is much theoretical and empirical evidence that a link exists between the tax structure and the economic growth. There is no consensus among economists on how to determine the optimal combination of consumption

taxes and income taxes. Barro considers taxation essential to economic development [1]. He finds that the tax on income and tax on capital distort revenues and cause a slowdown of the economy, but consumption taxes do not. According to Stiglitz, taxes are distortionary, no matter if they are imposed on labor or consumption [2]. Contrary to theoretical expectations, there is no empirical evidence that the fiscal revenues are affected by distorting or non-distorting taxes. According to liberal economics, if income tax is proportional, fiscal revenues will increase [3]. On the other hand, Keynesian economics proves that fiscal revenues will increase if the progressive income tax rate is applied [4]. The change in the income tax rate altered the structure of the entire tax system. It is possible to generate a higher revenue to the budget if the high progressive taxes on income and capital are abolished and a single tax rate on consumption is introduced [5].

It should be noted that specific types of taxes have different impact on investment, saving, consumption and economic

growth [6]. Lowering direct taxes increases investment and employment in the short term [7]. Some empirical investigations have shown that a tax rate increase of 1% will cause a GDP decrease of 0.36% [8]. A study of the taxes in 63 countries [9] has proven that tax rates have a negative effect on economic growth. In the long run, higher rates of indirect taxes increase commodity prices and lower industrial production in Britain and the United States. In the short run, wages grow after lowering direct taxes, but there is no long-run influence of direct taxes on wages [10]. Madsen and Damania [11] investigate the impact of the decrease in indirect tax rates and the increase in budget revenues in OECD countries over the period of 1960–1990. They conclude that budget revenues do not grow when they depend mainly on consumption. Lower indirect taxes have a long-term negative effect on economic growth. At the same time an increase in government spending associated with higher taxes has a strong negative effect on investment spending. Increased government spending has a positive effect on production and growth, but higher taxes negatively influence production and growth [12]. The study of the tax structure in 70 countries for the period of 1970–1997 showed that if the corporate tax falls by 10%, the rates of economic growth rise by 1.1% per year [13].

An empirical study of Nigerian economy has demonstrated that indirect taxes have a negative impact on consumption, government revenues and economic growth [14]. In OECD countries, economic growth can be stimulated by lowering direct taxes and increasing consumption taxes [15]. In that case, it should be noted that many countries shift the focus on taxation from income taxes to consumption taxes [16]. Tax revenues are an important variable for any economy as they have implications for budget deficit depending on how they relate to government expenditure [17].

Our research aims to analyze whether higher indirect tax rates and lower direct tax rates lead to higher aggregate tax revenue (ATR) in Bulgaria's budget. The so-

called tax buoyancy is used to measure the efficiency of the tax system.

2. Literature review

Tax buoyancy is a term used to measure and show the rate of responsiveness of taxes due to increase in GDP) of any nation, that is, to what extent tax revenues and tax collection increase as a result of an increase in national income [18]. "Tax buoyancy may differ between the short-run and the long-run. Short-run buoyancy is closely related to the stabilization function of fiscal policy. Indeed, if tax revenue increases by more than GDP (short-term buoyancy exceeding one), the tax system is a good automatic stabilizer. If short-term buoyancy is smaller than one, tax revenue is more stable than GDP and functions less as an automatic stabilizer. Long-run buoyancy is important for the impact of economic growth on long-term fiscal sustainability. Long-run buoyancy exceeding one would *ceteris paribus* imply that higher growth will improve the fiscal balance through the revenue side of the budget, while with a long-run buoyancy smaller than one growth will do the opposite. A buoyancy of one would imply that an extra percent of GDP would increase tax revenue also by 1 percent, thus leaving the tax-to-GDP ratio unchanged. A tax buoyancy exceeding one, however, would increase tax revenue by more than GDP and potentially lead to reductions in the deficit ratio" [19].

There is evidence showing a long-run positive relationship between the buoyancy of aggregate revenue and economic growth in Kenya for the period of 1963–2010 [20]. Another study demonstrates that for the economy of Nepal, the long-run buoyancies of aggregate tax revenues, VAT, personal income tax and import taxes were sustainable during 1975–2005 [21]. The revenue productivity of the Zambian tax structure for the period between 1981 and 1999 was analyzed by means of Divisia Index. The results showed elasticity of the ATR of 1.15 and buoyancy of 2.0, which confirmed that tax reforms had improved the revenue productivity of the overall tax system [22]. For Indian economy, the tax

buoyancy estimate was above one during the pre-tax reform period, which showed that during the pre-tax reform period, the ratio of the total tax revenue to GDP was increasing along with the increase in GDP.

There are several studies using the data on Ghana: according to one, the tax buoyancy was less than one during the post-tax reform period [23]. Overall, the tax system in Ghana was buoyant and elastic in the long run, with the overall tax elasticity 1.03 [24]. Another investigation of the tax reform in Ghana for the period between 1970 and 1993 showed the pre-reform buoyancy of 0.72 and elasticity of 0.71 for the period 1970–1982. The period after the reform (1983–1993) showed increased buoyancy of 1.29 and elasticity of 1.22. The study concluded that the reforms had contributed significantly to tax revenue productivity from 1983 to 1993 [25].

A study of Ethiopia indicates that ‘the share of service sector value added, import and over all government budget deficits to GDP affects positively, whereas the share of official development assistance to GDP affects it negatively’ [26, p. 182]. The IMF research by Belinga et al. [19] estimates the long-run and short-run buoyancies of the aggregate revenue (AR), personal income taxes (PIT), corporate income taxes (CIT), social security contributions (SSC), goods and services taxes (GST), excise taxes and property taxes for 34 OECD countries over the period of 1965–2012. The IMF experts

infer that the short-run buoyancy of aggregate tax revenues has been growing steadily in twenty-five countries, while the long-run buoyancy of aggregate tax revenues has also demonstrated a stable upward trend in fourteen countries. The corporate tax revenues have been found to be most sustainable in all countries. The revenues from the personal income tax and social security contributions are sustainable neither in the short run nor in the long run.

3. Empirical data analysis and research methods

In Bulgaria, fiscal revenues are largely dependent on consumption taxes (see Figure 1).

As can be seen (Figure 1), consumption taxes provide 75% of all fiscal revenues. Over the analyzed period, the revenues from direct taxes and social security contributions in Bulgaria’s state budget are relatively stable as a share in GDP, while the indirect revenues have increased their share in GDP. The rise of the share of indirect tax revenues in GDP can be explained by the following: first, the increase in nominal income; second, the decrease in the direct tax rates; and third, the increase in domestic consumption. Such structure of tax revenues is only effective if the economy grows and consumption rises. During the recession (after 2008), indirect tax revenues fell because of the decline in consumption.

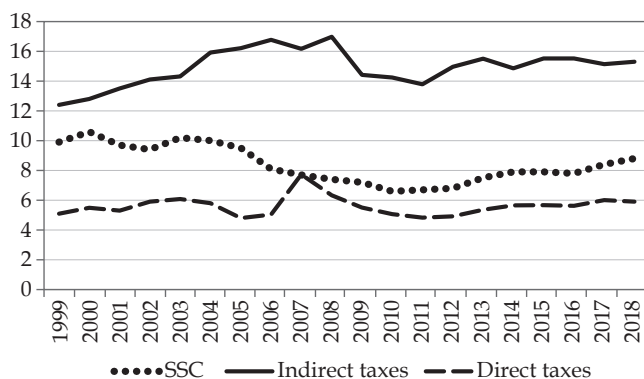


Figure 1. Revenues from direct taxes, indirect taxes and social security contributions in Bulgaria’s state budget for the period 1999–2018, percentage of GDP

Source: Eurostat. Available at: https://ec.europ.eu/taxation_customs/business/economic-analysis-taxation/data-taxation_en

According to IMF [19], if the long-run tax buoyancy exceeds one, it can be assumed that the budget revenues are sustainable. On the other hand, if in the short run, tax revenues increase faster than GDP, the tax structure is considered to be a good automatic stabilizer.

As a whole, the growth rates of aggregate tax revenues and social security contributions (SSC) do not exceed the growth rates of nominal GDP over the period of investigation (Figure 2). Hence, it may be inferred that Bulgaria’s tax structure is not well structured. In the case of recession, tax revenues and SSC in Bulgaria decline faster than the nominal output.

One reason for the lack of fiscal sustainability is the replacement of the progressive income tax by the proportional income tax in 2008. The proportional tax, unlike the progressive one, does not function as an automatic economic stabilizer.

Another reason is that after 2008 fiscal revenues have depended mainly on the consumption taxes.

Figures 3 and 4 show the linear relationship between GDP growth and the growth of total tax revenue and SSC. We obtained this relationship by using the following equation:

$$Y_t = C + X_t + \varepsilon_t, \tag{1}$$

where Y_t is the growth rate of aggregate tax revenue and social security contributions as a percentage of GDP; C is the constant; X_t is the growth rate of GDP; ε_t is the vector of residuals.

There is a positive connection between the rates of change of tax revenues and GDP (see Figure 3), which is confirmed by the positive sign of the regression coefficient before GDP (0.6986). The tax system is well structured when the regression coefficient before GDP is above one. Since

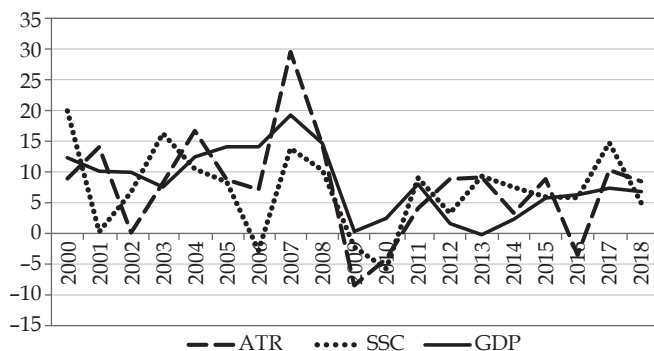


Figure 2. Growth rates of Bulgaria’s nominal GDP, aggregate tax revenue and social security contributions for the period 1999–2018 (in percentage)

Source: Eurostat. Available at: https://ec.europa.eu/taxation_customs/business/economic-analysis-taxation/data-taxation_en

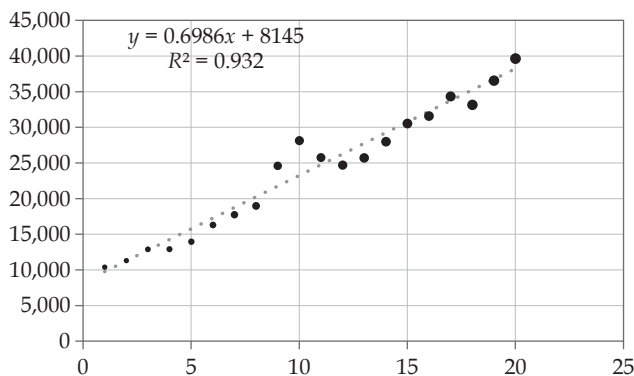


Figure 3. Percentage change on the previous year of GDP and aggregate tax revenue (Period of calculations: 1999–2018)

this coefficient is below one, it may be concluded that Bulgaria’s tax system does not provide fiscal stability.

The revenues from SSC and GDP are negatively related (the regression coefficient before GDP is -0.0019). When GDP rises, the collectability of SSC decreases. A possible reason for the decline of SSC revenues in times of economic growth is that SSC are regressive in relation to income, i.e. they charge the income to an upper limit (2600 BGN). All incomes above the upper limit of 2600 BGN are not charged with SSC.

Tax buoyancy is defined as the ratio between the percentage increase in tax revenues and the percentage increase in the tax base. Typically, the base is taken to be GDP, when the revenue collectability is analyzed. The revenue collectability could refer to total tax revenue or to revenue from any given tax in the long and short run.

We estimated the long- and short-run buoyancies for aggregate tax revenue (ATR); revenue from Value Added Tax (VAT); income tax (IT); corporate tax (CT) and social security contributions (SSC) over the period of 1999–2017 by using quarterly time series data for the period 1999Q1–2107Q2 (78 observations).

The methods employed are fully modified least squares (FMOLS) for the long run and the auto regressive distributed lag model (ARDL) with fixed effects for the short run.

As it was mentioned above, tax revenues are influenced by GDP growth.

Buoyancy measures the effectiveness and sustainability of tax revenues and is calculated as the ratio of revenue growth to GDP growth.

In this study the tax buoyancy in Bulgaria is estimated by applying the empirical methodology proposed by the IMF [27]. If buoyancy is above one in value, it means that in the long run fiscal revenues are sustainable and in the short run they serve as automatic fiscal stabilizers. When buoyancy is below one, in the long term the revenue side of the state budget is not sustainable and in the short term budgetary revenues do not serve as automatic fiscal stabilizers.

According to the IMF, the long-run and short-run buoyancies of budget revenues and (different types) of taxes (equation 2) can be estimated by applying the following equation:

$$\Delta \ln y_{it} = \varphi_i y_{it-1} + \beta'_i x_{it-1} + \sum_{j=1}^{p-1} \lambda_{ij} \ln y_{it-j} + \sum_{q=1}^{q-1} \gamma'_{ij} \Delta \ln x_{it-j} + \mu_i + \xi_{it}, \quad (2)$$

$i = 1, 2, \dots, N; t = 1, 2, \dots, T,$

where it is natural logarithm of tax revenues, ex_{it} , $K \times 1$ vector of explanatory variables for a group I (which includes the natural logarithm of GDP); μ_i , fixed effects; φ_i , the coefficient before the lagged dependent variable; β'_i , $K \times 1$ vector of the coefficients in front of explanatory variables; λ_{ij} , scalar coefficients before the lagged first differences of dependent variables; and γ'_{ij} , $K \times 1$ coefficient vector of first differences of explanatory variables and their lagged values.

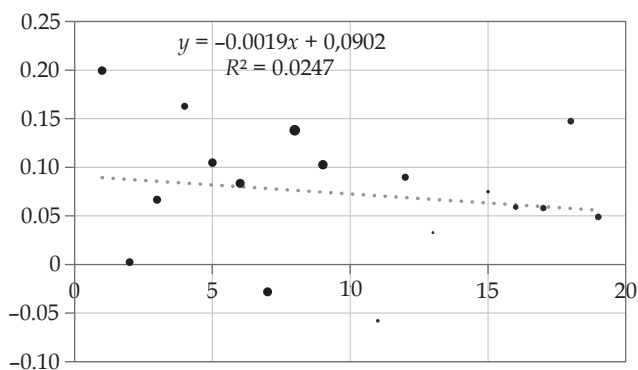


Figure 4. Percentage change on the previous year of GDP and SSC (Period of calculations: 1999–2018)

It is assumed that the disturbance ξ_{it} in the ARDL model is independently distributed across i and t , with mean zero and constant variances. Equations 2 mean that developments in tax revenues can be explained by the distributed lag of order p of the dependent variable, and the distributed lag of order q of GDP (independent variable).

Assuming that $\varphi_i < 0$ for all i , there is a long-run relationship between y_{it} and x_{it} :

$$\ln y_{it} = \theta'_i \ln x_{it} + \eta_{it}, \quad (3)$$

$$i = 1, 2, \dots, N; t = 1, 2, \dots, T,$$

where $\theta'_i = -\beta'_i / \varphi_i$ is a $K \times 1$ vector of the long-run coefficients, and η_{it} 's are stationary with possible non-zero means (including fixed effects).

Therefore, equation 3 can be rewritten as:

$$\Delta \ln y_{it} = \varphi_i \eta_{it-1} +$$

$$+ \sum_{j=1}^{p-1} \lambda_{ij} \ln y_{it-j} + \sum_{q=1}^{q-1} \gamma'_{ij} \Delta \ln x_{it-j} + \mu_i + \xi_{it}, \quad (4)$$

$$i = 1, 2, \dots, N; t = 1, 2, \dots, T,$$

where η_{it-1} is the error correction term (that is, the deviation of variables at a certain point in time from their long-run equilibrium), and φ_i is measured the speed of adjustment towards the long-run equilibrium.

This research is based on the quarterly data for the period of 1999Q1-2017Q2 (78 observations). The trend is removed and the time series are seasonally adjusted using Census X12.

Stationarity of variables is tested for the period 1999Q1-2017Q2 by the Aug-

mented Dickey-Fuller Test with the critical significance level of 5% [28]. All variables – GDP, VAT, Income taxation (IT), Corporate taxation (CS), Social Security Contributions (SSC) – are found to be integrated of the first order $I(1)$ (see Appendix 1).

Co-integration means the presence of a long-run or equilibrium relationship between variables. The co-integration test [29] shows that variables are co-integrated (see Appendix 2).

4. Empirical results

The estimation of the relationship between long-run and short-run tax buoyancies and economic growth requires that the data have logarithmic values. The method of fully modified least squares (FMOLS) is applied to determine the long-run tax buoyancies. Short-run tax buoyancies are estimated by an auto regressive distributed lag model (ARDL) with fixed effects. The relationship of the buoyancies for each type of tax and economic growth is examined separately in the long- and short-run.

Under such tax system, which relies primarily on consumption taxes, the buoyancy of aggregate tax revenue is slightly below one – 0.889878 (see Table 1). The closer to one the aggregate tax revenue buoyancy is, the more stable the tax system is. The coefficient before GDP shows that total tax revenues are near equilibrium with economic growth. The lack of equilibrium (value of the aggregate tax revenue buoyancy below one) caused an increase in Bulgaria’s public debt after the global financial crisis in 2008.

Table 1

Long-run tax buoyancies and relationship with economic growth

Variable	Coefficient	Std. Error	t-Statistic	Probability	R-squared	Long-run buoyancy
Aggregate tax revenue	0.060042	0.068463	3.223650	0.0237	0.968956	$K < 1$
GDP	0.889878	0.028043	31.73272	0.0000		
VAT	-3.543782	0.419305	-8.451564	0.0000	0.951719	$K > 1$
GDP	1.115117	0.043799	25.45963	0.0000		
Income tax	-0.611466	0.086469	-10.42623	0.0007	0.865022	$K < 1$
GDP	0.759480	0.061261	12.39746	0.0000		
Corporate tax	-13.16542	1.500402	-8.774590	0.0000	0.826141	$K > 1$
GDP	1.732225	0.156728	11.05244	0.0000		
Social security contributions	0.385398	0.077745	2.020259	0.0111	0.934822	$K < 1$
GDP	0.698947	0.039458	17.71360	0.0000		

Dependent variable: ATR; VAT; IT; CT; SSC

Independent variable: GDP

Table 2

Short-run tax buoyancy and its relationship with economic growth

Variable	Coefficient	Std. Error	t-Statistic	Probability	R-squared	Short-run buoyancy
Total revenue GDP	0.394510 0.437780	0.119465 0.109724	3.302320 3.989845	0.0015 0.0002	0.974358	$K < 1$
VAT GDP	0.590386 1.034938	0.122213 0.124103	4.830816 2.698864	0.0000 0.0088	0.971020	$K > 1$
Personal income tax GDP	0.769207 0.180648	0.119209 0.065808	6.452570 2.745074	0.0000 0.0077	0.946370	$K < 1$
Corporate tax GDP	1.153475 0.008970	0.119212 0.079433	9.675833 3.112921	0.0000 0.0104	0.982842	$K < 1$
Social security contributions GDP	0.914589 0.049381	0.121775 0.042872	7.510457 1.151815	0.0000 0.2534	0.985549	$K < 1$

Depend variable: ATR; VAT; IT; CT; SSC

Independ variable: GDP

In the regression equation for the VAT buoyancy there is a long-run relationship with GDP dynamics. The regression coefficient is 1.115117, which means that in the long-run, the VAT revenues grow more rapidly than GDP. The reason for the VAT revenue long-term sustainability is the rise in domestic demand for goods and services after the crisis. The VAT revenue sustainability has a positive effect on the Bulgarian state budget, where revenues depend mainly on consumption taxes (see Figure 1). The corporate tax revenues are the most sustainable of all tax revenues in the long-run with a coefficient of 1.732225. A possible reason for the sustainability of the corporate tax revenue is the decrease in the corporate tax rate from 37% to 10% in 2007. It may be concluded that the corporate tax rate may be raised to generate higher corporate tax revenues in the long-run. This inference is in agreement with the IMF findings for developing economies such as Bulgaria [28].

In the equation of labor tax revenue, the GDP coefficient has a value of 0.75948, which implies that there is no sustainable long-run nexus between GDP and the buoyancy of income tax revenues. A possible explanation for this result is the change in the income tax rate in 2008, when the progressive income tax was replaced by the proportional income tax and the non-taxable minimum income was abolished. Another explanation for the lack of a long-term equilibrium between income tax and GDP is the regressive effect of the former

on low incomes¹. To achieve revenue sustainability in the long run, the non-taxable minimum for the lowest income and the progressive tax ought to be restored.

The results for the social security contributions are similar to the income tax revenues. The GDP coefficient is 0.698947. This result is not surprising for the economy of Bulgaria, because social security contributions are charged only on income up to BGN 2600. The income above BGN 2600 is not charged with social security contributions, which generates a regressive effect of social security payments on income. This effect resembles the regressive effect of the proportional tax on income. To increase the buoyancy of social security contributions, the upper threshold of income charged with social security contributions should be raised.

Table 2 presents the short-run relationships between buoyancies of different tax revenues and economic growth.

In the short term, aggregate tax revenue is not in equilibrium with economic growth. The GDP coefficient is significantly below one with a value of 0.437780. This means that in the short run taxes cannot act as automatic stabilizers and it is hard to ensure fiscal sustainability.

The buoyancy of the VAT revenues is 1.034938, which implies a short-run equilibrium with economic growth. VAT reve-

¹ The proportional income tax in Bulgaria was adopted in 2008 without a non-taxable minimum, which contradict to the theory of linear taxes. For more detail on the theory of linear taxes see [3].

nues raise the sustainability of the Bulgarian tax system both in the short and in the long run with buoyancies above one.

However, the buoyancies of the personal income tax and corporate tax do not follow economic growth. The GDP coefficients with income tax and with corporate tax (0.180648 and 0.008970 respectively) are well below one, which means that there is no sustainability between these variables. A similar result is obtained for the buoyancy of social security contributions with a GDP coefficient of 0.049381.

In the long run, the buoyancy of the corporate tax is sustainable but in the short run it isn't. The reason is that corporate tax revenues are paid in advance (for profits from 0 to 300 000 BGN one annual advance payment is made, for profits from 300 000 to 3 000 000 BNG there are four quarterly advance payments and if the profit is above 3 000 000 BNG, there are 12 monthly advance payments). The full amount of tax should be paid in the year after the profit is made, which is why the buoyancy of the corporate tax does not follow economic growth in the short run.

The buoyancies of the revenues from the personal income tax, social security contributions and corporate tax do not follow economic growth in the short run. These buoyancies are below one, which implies that they are not sustainable and do not serve as stabilizers for Bulgarian economy. If the buoyancies of the income tax and social security contributions are compared in the long and short period, it can be seen that the short-run coefficients are lower than long-run coefficients. This means that the personal income tax and social security contributions are not effective short-run stabilizers for the Bulgarian economy.

The buoyancies of the aggregate tax revenue, VAT, PIT, CT and SSC are much

more sustainable in the long term than in the short term. The empirical results from this study are in agreement with the results of the IMF [28].

5. Conclusion

From the equations of the relationship between GDP and the buoyancies of different types of tax revenue in the long and short run, the following conclusions can be drawn:

1. The buoyancy of aggregate tax revenues in the long run is close to equilibrium. Its coefficient is slightly below one. However, only if higher economic growth generates higher government revenues, fiscal balance can be considered sustainable in the long term. The buoyancies of the VAT revenues and the corporate tax revenues are the most sustainable of all buoyancies in the long run.

2. In the short term, the buoyancy of the aggregate revenues is considerably below one, which means that they do not serve as an automatic stabilizer. The main part of fiscal revenues is generated by consumption taxes, such as VAT, which has a coefficient above one. In order to create fiscal sustainability, progressive income taxation should be introduced and the ceiling of the income on which social security contributions are payable should be raised.

3. In the long run, it is possible that the Bulgarian government will face difficulties in financing its expenditures. In the short run, there is no evidence that Bulgaria's tax system is an effective automatic stabilizer. VAT is the main contributor to aggregate government revenues, which implies that the revenue part of the state budget is not well structured.

4. In order to guarantee the sustainability of the revenue side of the state budget, the reforms in the Bulgarian tax system are imperative.

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APPENDICES

Appendix 1

Unit Root test (1999Q1-2017Q2)

Test critical values: 5% level	Augmented Dickey-Fuller test statistic	t-Statistic	Prob.*
GDP	-2.901779	-0.438714	0.8961
(D)GDP	-2.902358	-8.216024	0.0000
Aggregate revenue	-2.902358	-0.859342	0.7955
(D)Aggregate revenue	-2.902358	-12.60518	0.0001
Income taxation	-2.901779	-1.142139	0.6949
(D)Income taxation	-2.902358	-9.638030	0.0000
Corporate taxation	-2.902358	-1.607704	0.4735
(D)Corporate taxation	-2.902358	-5.662774	0.0000
Social contributions	-2.901779	0.332575	0.9785
(D) Social contributions	-2.902358	-8.887032	0.0000
VAT	-2.902358	-0.779836	0.8186
(D)VAT	-2.902358	-12.75150	0.0001

Appendix 2

Johansen Cointegration Test (1999Q1-2017Q2)

Series: GDP-AGREGATE REVENUE

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.065744	13.72134	15.49471	0.0909
At most 1*	0.023797	3.588621	3.841466	0.0495

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.065744	10.13272	14.26460	0.2034
At most 1*	0.023797	3.588621	3.841466	0.0495

Series: GDP-VAT

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.065744	13.72134	15.49471	0.0909
At most 1*	0.023797	3.588621	3.841466	0.0499

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.065744	10.13272	14.26460	0.2034
At most 1*	0.023797	3.588621	3.841466	0.0499

Series: GDP-INCOME TAXATION

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.051889	11.86009	15.49471	0.1638
At most 1*	0.025971	3.920760	3.841466	0.0477

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.051889	7.939335	14.26460	0.3849
At most 1 *	0.025971	3.920760	3.841466	0.0477

Series: GDP-CORPORATE TAXATION

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.065744	13.72134	15.49471	0.0909
At most 1 *	0.023797	3.588621	3.841466	0.0495

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.065744	10.13272	14.26460	0.2034
At most 1 *	0.023797	3.588621	3.841466	0.0495

Series: GDP-SOCIAL CONTRIBUTIONS

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.051883	11.86004	15.49470	0.1635
At most 1 *	0.025970	3.920759	3.841464	0.0471

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.051883	7.939335	14.26460	0.3849
At most 1*	0.025970	3.920759	3.841464	0.0471

