The Fiscal Policy Impact on Indicators of the State's Economic Growth

Volodymyr Martyniuk
Administration & Social Sciences Faculty
Higher School of Economics and Innovation (WSEI)
Lublin, Poland
volmartynyuk@gmail.com

Oleksandr Dluhopolskyi
Economics and Economic Theory Department
Ternopil National Economic University
Ternopil, Ukraine
dlugopolsky77@gmail.com

Sviatoslav Kniaz
Department of Entrepreneurship and Environmental Examination of Goods
Lviv Polytechnic National University
Lviv, Ukraine
svkniaz@ukr.net

Nazar Podolchak
Department of Administrative and Financial Management
Lviv Polytechnic National University
Lviv, Ukraine
Nazar_podolchak@yahoo.com

Yuliia Muravska
Department of Security, Law Enforcement and Financial Investigations
Ternopil National Economic University
Ternopil, Ukraine
yakubivskay@gmail.com

Bogdana Martyniuk
Department of Informational Tecnologies, Manegment and Tourism
Ternopil Ivan Pul'uj Nation Technical University (Technical College)
Ternopil, Ukraine
mbb_95@ukr.net

Abstract — **The important role of fiscal policy in ensuring long-term economic growth of the country has been shown. The quantitative connection between fiscal policy impact and macroeconomic indicators has been established. The influence of VAT and CIT on GDP, government debt, unemployment and CPI dynamics has been analyzed during the long period of time. Regression equations of fiscal policy instruments and main macroeconomic indicators of Ukraine have been built.**

Keywords — fiscal policy, economic growth, value added tax, corporate income tax, personal income tax, consumer price index, public debt

I. Introduction

Today, fiscal policy combined with monetary instruments is the most common method of regulating economic processes in all countries of the world.

The impact of fiscal policy on economic growth is one of the most discussed in the scientific literature (S. Masca, I. Cuceu, V. Vaidean, M. Auteri, M. Constantini, I. Rosoiua, S. Turnovsky) [1; 2; 3; 4]. For example, R. Kneller, M. Bleaney and N. Gemmell [5] emphasized that distortionary taxation reduces growth. T. Oo [6] has shown the relationship between the country's fiscal deficit and economic growth in the example of Myanmar. M. Klok [7] discussed the positive effect of fiscal policy on Dutch GDP growth till 2021. F. Andersson [8] showed that fiscal consolidation as reflected in a falling debt-to-GDP ratio does not arrest growth in the Sweden's example. In our previous studies [9; 10; 11; 12], we have already assessed the impact of fiscal policy instruments on the country's economic security indicators (for example, Ukraine), fiscal consolidation effects, stringency of government regulation, but a thorough study of the impact of taxation and government spending on the dynamics of the country's macroeconomic development, in both the short term and the long term perspective remains an important though insufficiently researched aspect.

II. Results

The priority objective of this phase of the study is to simulate the impact of tax rates on tax revenues and the impact of tax revenues on the macroeconomic trends inherent in Ukraine in recent periods. This will allow us to form an understanding of the impact of the fiscal regulation mechanism on the development of the economy foreign economic relations, and to determine the prospects for further changes in 1-5 years' perspective. It will also make it possible to identify directions for facilitating fiscal policy in order to improve its impact on the country's economic development and strengthen its economic security.

Fig. 1 presents a simplified view of the impact outline that reflects the logic of analyzing and modeling the impact of fiscal policy instruments on the country's economic growth indicators.

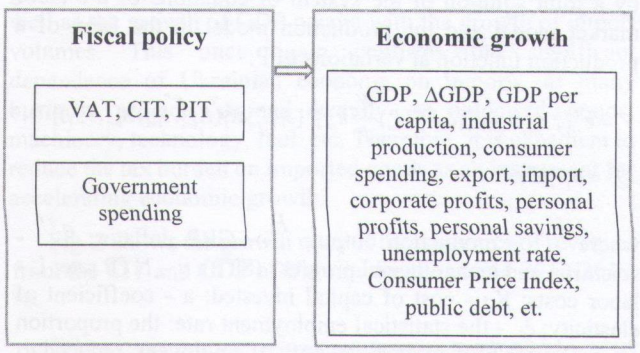

Fig. 1. Outline of the impact of fiscal policy instruments on economic growth indicators

As a basic model for forecasting and diagnostics of the socio-economic development of Ukraine, we will use the model of general economic equilibrium, based on a systematic approach applying advanced ideas of neo-Keynesian, neoclassical and monetarist theories and includes three subsystems:

- "aggregate demand function model" consisting of models of goods and services market, money market and currency market;
- "aggregate supply function model", which includes production models in the form of production function and labor market;
- a "general economic equilibrium model" that defines the interaction of aggregate demand and aggregate supply functions for the endogenous calculation of the real gross regional product (GRP) and the GDP deflator. This is a model of managed economic growth, which defines the conditions for achieving the desired rate of economic growth.

978-1-7281-6760-2/20/$31.00 ©2020 IEEE

The aggregate demand function (the dependence of nominal GDP on the change in the overall price level (P) is determined by solving the system of equations of the model of the market of goods and services and the model of the money market at a given exchange rate at different values of P:

$$Q_t^D = F[C_t(Y_t^V, Y_{t-1}^V, T), G_t, E_t(e_t), Z_t(Q_t^D, e_t), I_t(i_t)] \text{ – line equation IS;}$$

$$Q_t^D = F[M_t, P_t, i_t] \text{ – line equation LM;}$$

$$Q_t^D = Q_t^D(P_t) - IS - LM \text{ model,} \quad (1)$$

where C_t is household consumption; Y_t^V - household income; Y_{t-1}^V - income of households for the previous period; T - taxes (consolidated budget revenues); G_t - consolidated budget expenditures (distributed in the model for government consumption C_g and government investment I_g); E_t - export of goods and services; e_t - UAH / USD exchange rate; Z_t - import of goods and services; I_t - investments; i_t - NBU refinancing rate; M_t - money supply (monetary aggregate M2 or M3); P_t - GDP deflator.

The aggregate supply function $Q_t^S(P_t)$ (the dependence of real GDP on the change in the GRP deflator) is determined by a joint solution of the system of equations of the labor market model and the production model in the form of a production function at variations of P:

$$V_t = e^{\gamma t} L_t^{a_t} K_{Z_t}^{1-a_t} = e^{\gamma t}[\xi_t N_t^D(P_t)\frac{W_t}{P_t}k_{sn}]^{a_t}[\vartheta_t(I_t)K_t(K_{t-1}, I_{t-1}, A_{t-1}, P_{t-1})]^{1-a_t},$$

$$Q_t^S = \sigma_t V_t(P).$$

where V_t - production output; P_t - GRP deflator; $e^{\gamma t}$ - scientific and technological progress (STP); γ – NTP rate; L - labor costs; K_Z - cost of capital invested; a - coefficient of elasticity; ξ_t - the statistical employment rate: the proportion of employees plus another category of employees, reduced to the equivalent of employees in the total number of persons employed in the economy; N^D - optimal demand for work; W is the average annual nominal wage of employees; k_{sn} - the coefficient of social charges on wages; ϑ - capital utilization ratio; I_t - investment; K_t is the capital value overvalued by the GRP deflator; A_{t-1} - consumption of fixed capital in the previous period; σ - share of GRP in output (production technology ratio).

Since neither aggregate demand nor aggregate supply separately determine the equilibrium in the economy because they are calculated at a given price level, the overall equilibrium in the economy can only be found in the interaction of all economic entities in all aggregated markets. In economic terms, the overall economic equilibrium is written in the form of a transcendental equation, the solution of which is the GDP deflator (P) and real GDP:

$$Q^D(P, \vec{V}^D)/P - Q^S(P, \vec{V}^S) = 0 \quad (2)$$

Vectors $\vec{V}^D$ and $\vec{V}^S$ are the vectors of macroeconomic decisions that determine the economy variables vector $\vec{Y}$. It should be noted that the concept of equilibrium in the economy is specific. Under the influence of external or internal factors, the economic system is constantly changing its equilibrium state. In this case, unlike technical systems, the economic system does not return to the previous equilibrium state under the influence of perturbations, but switches to a new equilibrium state with new qualitative characteristics, either better or worse. Meanwhile, the equilibrium (the aggregate demand correspondence with the aggregate supply) exists in each period because of the price level, that is, the equilibrium is dynamic because of the change in the overall price level.

It is this construction of a model where economic growth and inflation (GDP deflator) are endogenous parameters, that provides a breadth of functionality, that is, emergent properties of the model in assessing the state and forecasting socio-economic development of the country, its regions and its major economic activities, which allows to study the macroeconomic policy impact on economic growth and inflation.

Using the ZER model, a study of 2019 Ukrainian key macro indicators' sensitivity to changes in fiscal parameters such as consolidated budget revenues and expenditures was made. A multiplier $\vec{U}_P(\vec{V})$, or sensitivity coefficient (such as that of inflation to a change in aggregate demand instruments) is defined as:

$$\vec{U}_P(\vec{V}) = \lim_{\Delta\vec{V}\to 0}\frac{P(\vec{V}_0 + \Delta\vec{V}) - P(\vec{V}_0)}{\Delta\vec{V}} = \frac{\partial P(\vec{V}_0)}{\partial\vec{V}} \approx \frac{\Delta P(\vec{V}_0)}{\Delta\vec{V}} \quad (3)$$

which is the measure of the effect of the deviation $\Delta\vec{V}$ on the solution P.

As for the systems that are in the constant mode (static, comparative static), the vector $\vec{U}_P(\vec{V})$ remains constant; for systems in transition, the vector $\vec{U}_P(\vec{V})$ is a function of time. Because equations describing macroeconomic interaction allow for differentiation by variable parameters, an additional increase in the initial (output) parameter P can be represented by factorization into a Taylor series by expansion rate. Considering only the linear terms of the factorization, we obtain the total increase of the initial parameter and its new value:

$$P = P_0 + \sum_i^N U_P^X \Delta X_i, \quad (4)$$

where P_0 is the calculated value of the output parameter in the initial state (basic mode); U_P^X - coefficient of sensitivity of parameter P to change of parameter X; ΔX_i - change (+ or -) of parameter X; $X \in \{\vec{V}^D, \vec{V}^S\}$; N is the number of variable parameters.

Equation (4) indicates the additivity (independence) of the impact of each individual parameter on the output variable value. In other words, it is assumed that the parameters' deviations from their setpoints are present in the linear range, which is inside the nonlinear system. By changing the sequentially managed parameters, one can determine their additive influence on the output macro indicators, which is the most important factor for the purposes of managing the economy. Therefore, multiplier calculations are essentially a study of the sensitivity of a macroeconomic system, since vectors $\overline{U}_i(\vec{V}^D)$ characterize the sensitivity of the positions of a macroeconomic equilibrium point to changes in system parameters. The calculated coefficients of sensitivity are given in table 1.

TABLE I. SENSITIVITY RATIOS OF KEY MACROECONOMIC INDICATORS TO CHANGES IN FISCAL INSTRUMENTS, 2019

Fiscal policy indicators	Macro indicators		
	GDP	Industrial production	Consumer Price Index
Increase in consolidated budget revenues	-2,79	-0,05	-0,135
Consolidated budget revenues reduction	3,0	0,05	0,139
Consolidated budget expenditure increase	3,96	0,068	0,19
Consolidated budget expenditure reduction	-3,53	-0,063	-0,169

*Made by authors based on [13; 14]

The sensitivity ratios of major fiscal policy instruments characterize their quantitative impact on macroeconomic indicators and determine the following:

• Consolidated budget revenues. Increase of consolidated budget revenues from tax revenues by 1% decreases nominal GDP by 2.79%, industrial production by 0.05% and CPI by 0.135%. On the contrary, a 1% reduction in consolidated budget revenues increases nominal GDP by 3%, industrial production by 0.05%, and CPI by 0.139 pp. Increasing state budget revenues through tax increases reduces household disposable income and, at habitual consumption rate, reduces savings and, as a consequence, reduces investment, thus leading to a decline in aggregate demand.

• Consolidated budget expenditures. A 1% increase in consolidated budget expenditures causes nominal GDP to grow by 3.96%, industrial production growth by 0.068%, and CPI by 0.19%. On the contrary, a 1% reduction in consolidated budget expenditures reduces nominal GDP by 3.53%, industrial production by 0.063%, and CPI by 0.169%, which indicates non-linear economic processes.

As the calculations show (table 1), the government expenditure multiplier outweighs the government revenue multiplier to stimulate economic growth, which is why the deficit budget is more conducive to economic growth. However, if the increase in consolidated budget expenditures is aimed at increasing investment rather than consumption, real GDP growth rates will increase 1.6 times, due to a slowdown in inflation (CPI) by 1.36 times.

The sensitivity factors of economic growth to changing fiscal policy instruments change over time and depend on the current socio-economic situation in the country. Therefore, they must be recalculated every year. A graphical view of the interdependence of individual fiscal and macroeconomic indicators will be presented in fig. 2-4.

Based on the analysis of Fig. 2 we see that the dynamics of GDP and VAT revenues from imported goods are highly correlated:

$$GDP = 35.6 + 8.39VAT, \quad (5)$$

where GDP – Gross Domestic Product value, USD; VAT – VAT tax receipts to the State budget of Ukraine from the goods imported into the customs territory of Ukraine, USD.

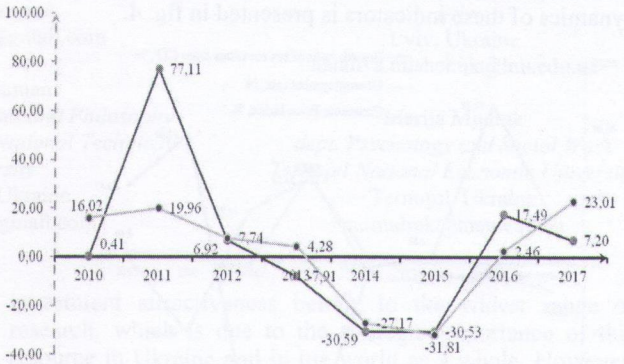

Fig. 2. Comparison of GDP and growth rate of tax revenues from VAT on imported goods in Ukraine, % [13; 14; 15]

The equation (5) shows that the growth of Ukraine's GDP by 1% takes place when tax revenues from VAT on imported goods increase by 8.4%. This enables us to conclude that the growth of the level of entrepreneurial activity in Ukraine as well as the growth of GDP occurs with the growth of import volumes. This once again confirms the significant dependence of Ukrainian economy on imports, as many business projects depend heavily on imported goods: machinery, technology, fuel, etc. Therefore, it is expedient to reduce the tax burden on imported goods as an instrument for accelerating economic growth.

Fig. 3 shows the growth rates of the dynamics of revenues from the CIT and GDP of Ukraine for the period 2010-2017, %.

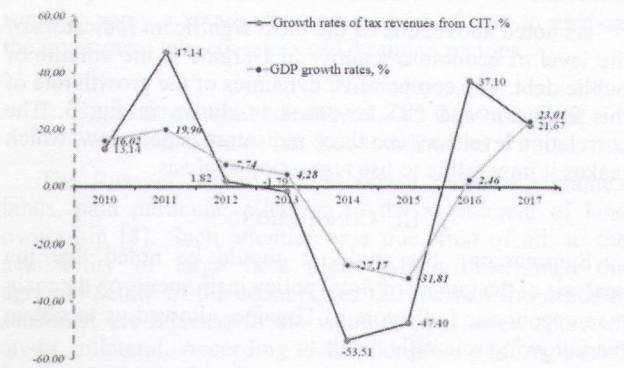

Fig. 3. Comparative dynamics of growth rates tax revenues from CIT and GDP of Ukraine for the period 2010-2017, % [13; 14; 15]

Based on Fig. 3 it can be concluded that the dynamics of changes in CIT revenues are more volatile than the dynamics of GDP change. Also, as logically follows from statistical data, the growth of CIT revenues corresponds to overall economic growth. To better understand the interdependence between these indicators, we construct a regression equation:

$$GDP = 66,14 + 15,48CIT \quad (6)$$

where CIT –tax revenues from CIT, USD.

Based on equation (6), we can confirm a preliminary assumption that the growth of CIT revenues corresponds to the growth of Ukraine's GDP. With an increase in GDP by 1%, revenue is rising by 15.48%. We will investigate the effect of CIT revenues on other indicators of economic security of the state (unemployment and inflation rate, measured in the form of a consumer price index). The dynamics of these indicators is presented in fig. 4.

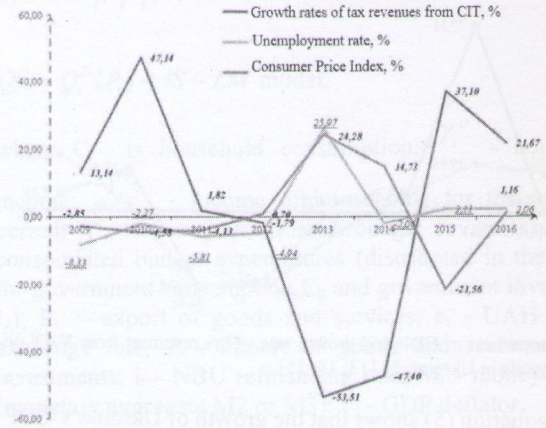

Fig. 4. Comparative dynamics of growth rates of tax revenues from CIT, consumer price index and unemployment rate for the period 2010-2016 in Ukraine, % [13; 14; 15]

As we see from fig. 4, the change in CIT revenues usually corresponds to a decrease in the consumer price index and unemployment rate. This proves that the increase in revenues from the payment of this tax corresponds to the growth of the economy and increased business activity. The regression equation of dependence between these indicators will look like this:

$$U = 10{,}55\text{-}0{,}33CIT \quad (7)$$

$$CPI = 136{,}57\text{-}5{,}28CIT \quad (8)$$

As noted above, one of the most significant indicators of the level of economic security in Ukraine is the volume of public debt. The comparative dynamics of the growth rate of this indicator and CIT revenues is shown in fig. 3. The correlation level between these indicators is quite low, which makes it impossible to use regression analysis.

III. Conclusions

Summarizing the study, it should be noted that the analysis of the impact of fiscal policy instruments on the main macroeconomic indicators of Ukraine, allowed us to obtain the following scientific results:

1. A quantitative relationship between fiscal and macroeconomic indicators has been identified, which allows one to choose between allowable inflation, tax burden and economic growth in accordance with the priorities set.

2. It has been found that economic growth is highly dependent on imports of objects and means of labor. The results of the study showed that the GDP growth in Ukraine by 1% occurs with an increase in tax revenues from VAT on imported goods by 8.4%.

3. There is an inversely proportional relationship with the time lag of several years between the amount of VAT receipts from imported goods and the unemployment rate and inflation. The rapid increase in tax revenues is not immediately accompanied by significant changes in unemployment and inflation. However, the positive changes in these basic indicators of economic security are beginning to be evident within 2-3 years.

4. The study showed that the increase in tax revenues from VAT and income tax usually corresponds to a decrease in public debt, however, contrary to economic logic, there is no significant correlation between these indicators in Ukraine.

Abbreviations

CIT – Corporate income tax
CPI – Consumer Price Index
GDP – Gross Domestic Product
PIT – Personal income tax
VAT – Value added tax
U – unemployment
P – overall price level

References

[1] I. Rosoiua, "Uncertainty and the transmission of fiscal policy," Procedia Economics and Finance, Vol.32, 2015, pp.769-776.

[2] S. G. Masca, I. C. Cuceu, V. L. Vaidean, "The fiscal policy as growth engine in EU countries," Procedia Economics and Finance, Vol.32, 2015, pp.1628-1637.

[3] M. Auteri, M. Constantini, "Fiscal policy and economic growth: the case of the Italian regions," The Review of Regional Studies, Vol.34(1), 2004, pp.72-94.

[4] S. J. Turnovsky, "Fiscal Policy, Elastic Labour Supply, and Endogenous Growth," Journal of Monetary Economics, Vol.45(1), 2000, pp.185-210.

[5] R. Kneller, M. F. Bleaney, N. Gemmell, "Fiscal policy and growth: evidence from OECD countries," Journal of Public Economics, Vol.74(2), 1999, pp.171-190.

[6] T. L. Oo, "The Effect of Fiscal Policy on Economic Growth in Myanmar," East Asian Community Review, Vol.2, 2019, pp.101-124.

[7] M. Klok, "The Netherlands: A milder slowdown thanks to fiscal policy," THINK: Economic and Financial Analysis, 2019. https://think.ing.com/articles.

[8] F. Andersson, "Fiscal policy is no free lunch: lessons from the Swedish fiscal framework for fiscal targeting," VOX, CEPR Policy Portal, 2019. https://voxeu.org/content.

[9] V. Martyniuk, N. Shuprudko, "The impact of fiscal instruments on indicators economic security of the state: evidence from Ukraine," WSEI Scientific Journal. Series: Economics, №15(1), 2018, pp.187-205.

[10] O. Dluhopolskyi, "Fiscal consolidation effect in theory and practice," Czech Journal of Social Sciences, Business and Economics, Vol.5(4), 2016, pp.19-30.

[11] V. Koziuk, Y. Hayda, O. Dluhopolskyi, Y. Klapkiv, "Stringency of environmental regulations vs. global competitiveness: empirical analysis," Economics and Sociology, Vol.12(4), 2019, pp.264-284.

[12] V. Koziuk, O. Dluhopolskyi, Y. Hayda, et., "Ecological framework of welfare state," Kyiv: Lyra-K, 2019. 224 p.

[13] World Bank Group. http://www.worldbank.org.

[14] Financial and Economic Analysis Office in the Verkhovna Rada of Ukraine. https://feao.org.ua/?lang=en.

[15] State Statistics Service of Ukraine. http://www.ukrstat.gov.ua.