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Comparison of Fiscal Policy Cyclicality Models in Foreign Countries

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ABSTRACT

The article **is devoted to** the issues of fiscal policy cyclicality in foreign countries. The **purpose** of the article is to explore the features of the fiscal policy cyclicality of some federal countries — representatives of the "group of twenty" for the period from 1971 to 2022. The objective predetermined the setting of the following **tasks**: to analyze the cyclicality of fiscal policy by expenditures, to analyze the cyclicality of tax policy, as well as to compare the obtained results to identify common patterns of cyclicality for countries with a similar level of economic development. The study of fiscal policy cyclicality is **relevant** because it allows governments to adjust their fiscal policies according to the current state of the economy. This helps to smooth out fluctuations in economic activity and reduce the risk of recessions. Research **methods** — econometric modeling (building a linear regression model and using pooled binary least squares estimation), comparison, analysis. Main **results** of the study: the procyclicality of the public expenditure policy is confirmed in all the countries studied over the period considered, and it has an inverse dependence on the level of economic development of the country (the higher the level of development of the country in the period considered, the less procyclical its expenditure policy). The fiscal policy of all countries under consideration is countercyclical in terms of VAT, corporate and individual income taxes, but the degree of countercyclicality is different everywhere. The **novelty** of the study is the construction of a dynamic model without a free term, as well as the inclusion in the analysis of periods of global financial crisis, pandemic, the current stage of technological mode change and geopolitical bifurcation. The **practical significance** of the study lies in the possibility of balanced development of territories: in federal countries, where there are different levels of economic activity and income in different regions, the establishment of the type of cyclicality of fiscal policy allows a more even distribution of tax and budgetary resources to support the sustainable development of all regions.
Keywords: fiscal policy; budget expenditures; tax rates; countercyclicality; procyclicality; financial crisis

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INTRODUCTION

Global challenges at the present stage are associated with four elements of the world landscape: climate change; demographic bifurcation; technological acceleration; geostrategic shifts.[1] Each of these areas is characterized by a high degree of uncertainty, affecting changes in the structure of financial flows to achieve development priorities both at the level of the global economy and for individual sovereign states.

The role of fiscal policy has significantly strengthened as a result of large-scale budgetary expansion measures during the global financial crisis [1]. Most developed countries made unprecedented decisions regarding financial aid during the pandemic, rapidly increasing expenditures, providing tax benefits, exemptions, deferrals, and budgetary rule exceptions, which further enhanced the significance of budgetary and tax instruments[2] [2–4]. Despite the fact that budget rules were more flexible during crises, they failed to prevent the growth of public debt, which negatively affected the debt burden and the servicing of debt obligations [5].

Procyclical fiscal policy is suboptimal and is characterized by the absence of smoothing effects on cyclical fluctuations from the applied tools. Identifying the sources of procyclicality is

[1] The Global Risks Report 2024. 19th Edition. World Economic Forum. URL: https://www3.weforum.org/docs/WEF_The_Global_Risks_Report_2024.pdf (accessed on 10.04.2024).

[2] Fiscal Monitor: Helping People Bounce Back. International Monetary Fund (IMF). 2022. Washington, DC: IMF, October. 100 p.

crucial for making informed decisions in public finance management, budget parameters, and the establishment of budget rules.

Studies on the nature of fiscal policy by the criterion of cyclicality show a number of common conclusions, with most research assessments based on the classification of countries by income level. In developing countries, government spending usually exhibited a procyclical nature, while in developed countries, it was acyclical or countercyclical [6, 7]. The procyclical nature of fiscal policy in many developing countries has also been confirmed by most authors [8, 9]. The acyclicality of tax policy in developed countries and procyclicality in developing countries was demonstrated in the work [6]. After the global financial crisis, fiscal procyclicality showed a decline in low — and middle-income countries, while high-income countries returned to procyclical behavior [10].

The role of budget rules in reducing the procyclicality of fiscal policy has both positive effects [11, 12] and negative effects [13]. Results have shown that expenditure rules cause procyclical effects; the balance rule increases the degree of countercyclicality of value-added tax (VAT), corporate tax, and income tax rates, while the revenue rule increases the degree of countercyclicality of the income tax rate [14].

Thus, previous studies do not reflect absolute consensus in assessing the impact of fiscal policy on cyclicality, although general conclusions have been reached in some cases. Using the approach [6], we evaluated the cyclicality of fiscal policy and tax rates for individual taxes, with the advantage of our study being the inclusion of 2022 data, which had not been done before.

For the analysis of budgetary and tax policy, countries with developed fiscal institutions were selected: Australia, Germany, India, the USA, and South Africa. Observations were made over the period from January 1971 to December 2022. It should be noted that in the USA and Australia, VAT is not levied at the federal level, so the analysis of the cyclicality of the VAT rate in these countries was not conducted. The period for assessing cyclicality in India was conducted from the year VAT was introduced — from 2005. In South Africa, VAT was introduced in 1991; before that, a goods and services tax (GST) was used, which was taken into account when collecting and processing data.

The sources of data were the national accounts of the World Bank, the official websites of the Tax Policy Center, Tax Foundation, Trading Economics, the Australian Department of Finance, the Parliament of the Commonwealth of Australia, and the South African Reserve Bank.

The purpose of the paper is to assess the cyclicality of the fiscal policy of federal states over a fifty-year retrospective through the modeling of real final consumption and tax rates.

METHODOLOGY

At the preprocessing stage, procedures were carried out to transform the dataset, which consists of numerous records: deflating nominal government expenditures and gross domestic product (GDP) using the GDP deflator; calculating growth rates for all indicators.

To measure the cyclicality of fiscal policy (government spending, tax rates) across countries, a regression model was used:

$$FISCAL_t = \beta RGDP_t + \varepsilon_t,$$

where t — year; ε_t — random measurement error, *FISCAL* is measured either by the growth rate of real government final consumption or the tax rate, and *RGDP* — is real GDP.

Such a model has already been used by some researchers [15] to analyze the cyclicality of fiscal policy in countries of the Organization for Economic Co-operation and Development (OECD) and non-OECD countries. The feature of this work is the construction of a model without a constant term, which ensures its greater robustness, as confirmed by passing all statistical tests. The model is dynamic, as growth rates of indicators were used instead of absolute values.

In the linear regression model, the combined estimate of binary least squares is unbiased and efficient under usual assumptions. The variance decreases since there is no other linear unbiased estimator of the regression coefficients.

For government expenditures, the calculated indicator β is a measure of the cyclicality of expenditure policy: a positive and statistically significant coefficient indicates procyclicality of the budget; a negative and statistically significant coefficient indicates countercyclicality of the budget, while a statistically insignificant coefficient indicates acyclicality of the budget.

The study also employs the approach [6], where the dependent variable reflects VAT, personal income tax (PIT), or corporate income tax (profit tax). However, the interpretations of the signs of the cyclicality coefficients of tax rates are opposite to those of the expenditure policy estimates. We acknowledge the potential error in the panel estimates, which is likely due to endogeneity and omitted variables.

RESULTS

The fiscal behavior of government expenditures across five countries during the analyzed period is presented in *Tables 1–3*.

Analyzing the regression statistics (*Table 1*), we see that real GDP explains 21.3% of the variation in real government final consumption expenditure in the USA, 29.4% in Germany, 62.2% in India, 66.2% in Australia, and 41% in South Africa.

The data in *Table 2* show that, since the F-significance values are less than 0.01 for all countries, the results are significant.

The results of the *t*-test (*Table 3*) show that the values of coefficient β are statistically significant for the ordinary least squares models constructed for all countries.

A positive and statistically significant *beta* coefficient indicates the procyclicality of fiscal policy in all five countries from 1971 to 2022.

However, the fiscal policy of some countries is more procyclical. For example, the fiscal policy of Australia, India, and South Africa was more procyclical than the policy of Germany and the US. That is, the higher the level of development of a country during the evaluation period, the less procyclical its policy was. This is generally consistent with the results obtained in [15], which concluded that the fiscal policy of non-OECD countries is more procyclical than that of OECD countries, and found that high-income countries are the least procyclical in fiscal terms, followed by upper-middle-income countries, lower-middle-income countries, and low-income countries. This also aligns with the results of the study [14], which proves that on average, large OECD countries (the USA, the UK, Japan, Germany, France, Italy, and Spain) conduct procyclical fiscal policy slightly less often than other OECD countries.

The fiscal behavior of tax rates across five countries during the analyzed period is presented in *Tables 4–6*.

According to the data presented in *Table 4*, real GDP explains 40% to 80% of the variations in tax rates.

Based on the obtained data (*Table 5*), the hypothesis of equality of means is not accepted (F-significance < 0.05), thus the results are significant for all models.

Despite the results of individual studies noting the acyclic nature of tax rates, the application of a model without a constant term allowed us to achieve significance for coefficient β in the models constructed for the selected taxes in the countries under consideration. In all countries (*Table 6*), fiscal countercyclicality is observed.

CONCLUSIONS AND DISCUSSIONS

Interpreting the obtained results, we saw that they almost completely coincide with the conclusions of the work [15], with the only difference being that the models constructed by the authors of this study indicate procyclicality of tax policy regarding VAT in OECD countries. However, considering the very low values of coefficient β in our models for all three VAT-collecting countries (0.02–0.03), one can

Table 1

Regression Analysis of the Impact of real GDP on the Percentage Change in Real Government Spending by Country (Australia, Germany, India, USA, South Africa) for the Period 1971–2022

Country	Values of the indicators	
Australia	Multiple R	0.81388449
	R-squared	0.66240796
	Normalized R-squared	0.64280012
	Standard error	2.44023152
	Observations	52
Germany	Multiple R	0.54258807
	R-squared	0.29440181
	Normalized R-squared	0.27479397
	Standard error	2.43156644
	Observations	52
India	Multiple R	0.78862213
	R-squared	0.62192486
	Normalized R-squared	0.60231702
	Standard error	4.27653813
	Observations	52
USA	Multiple R	0.46178387
	R-squared	0.21324434
	Normalized R-squared	0.1936365
	Standard error	1.89742589
	Observations	52
South Africa	Multiple R	0.640029661
	R-squared	0.409637966
	Normalized R-squared	0.390030123
	Standard error	3.297287836
	Observations	52

Source: Author's calculations.

conclude that there is very weak (or implicit) countercyclicality. One of the reasons for this phenomenon may be the nature and characteristics of fiscal regulation. Similar results were obtained [14] with an explanation of the countercyclicality of VAT through the action of the budget balance rule, which increases the degree of countercyclicality of the tax.

Recent studies using dynamic general equilibrium models have shown that fiscal policy is particularly effective during periods of recession [16]. Empirical data is also accumulating on the increased effectiveness of fiscal tools during adverse periods [17, 18].

Budget consolidation aimed at reducing expenditures and budget deficits, tightening tax

Table 2

Analysis of Deviations in Assessing the Impact of Real GDP on the Percentage Change in Real Government Spending by Country (Australia, Germany, India, USA, South Africa) for the Period 1971–2022

Country	Indicator	df	SS	MS	F	Significance F
Australia	Regression	1	595.8893	595.8893	100.0699	0.0000
	Balance	51	303.6912	5.9547		
	Total	52	899.5805			
Germany	Regression	1	125.8130	125.8130	21.2791	0.0000
	Balance	51	301.5383	5.9125		
	Total	52	427.3513			
India	Regression	1	1 534.3155	1534.3155	83.8938	0.0000
	Balance	51	932.7277	18.2888		
	Total	52	2467.0432			
USA	Regression	1	49.7665	49.7665	13.8232	0.0005
	Balance	51	183.6115	3.6002		
	Total	52	233.3780			
South Africa	Regression	1	384.7385	384.7385	35.3877	0.0000
	Balance	51	554.4775	10.8721		
	Total	52	939.2160			

Source: Author's calculations.

Table 3

The Values of the Coefficient β When Assessing the Impact of Real GDP on the Percentage Change in Real Government Spending by Country (Australia, Germany, India, USA, South Africa) for the Period 1971–2022

Country	Coefficient b	Standard error	t-statistic	Value P
USA	0.2846	0.0765	3.7180	0.0005
Germany	0.5608	0.1216	4.6129	0.0000
India	0.8739	0.0954	9.1594	0.0000
Australia	1.0035	0.1003	10.0035	0.0000
South Africa	0.8219	0.1382	5.9488	0.0000

Source: Author's calculations.

Table 4

Regression Analysis of the Impact of Real GDP on the Tax Rates by Country (Australia, Germany, India, USA, South Africa) for the Period 1971–2022

Country	Values of the indicators			
	Descriptive statistics	VAT (GST)	Income tax	Corporate income tax
Australia	Multiple R	-	0.89287404	0.88939524
	R-squared	-	0.79722405	0.79102389
	Normalized R-squared	-	0.77761621	0.77141604
	Standard error	-	0.23550847	0.17391146
	Observations	-	52	52
Germany	Multiple R	0.63348667	0.68912649	0.70269714
	R-squared	0.40130536	0.47489532	0.49378327
	Normalized R-squared	0.38169752	0.45528748	0.47417543
	Standard error	0.12223079	0.37140913	0.34182669
	Observations	52	52	52
India	Multiple R	0.83905552	0.73746282	0.80273366
	R-squared	0.70401417	0.54385141	0.64438133
	Normalized R-squared	0.64151417	0.52424357	0.62477349
	Standard error	0.08356748	0.33862127	0.27112467
	Observations	17	52	52
USA	Multiple R	-	0.78757497	0.80377563
	R-squared	-	0.62027433	0.64605526
	Normalized R-squared	-	0.60066649	0.62644742
	Standard error	-	0.29217865	0.22901153
	Observations	-	52	52
South Africa	Multiple R	0.62219026	0.68121186	0.66852275
	R-squared	0.38712072	0.46404959	0.44692267
	Normalized R-squared	0.36439345	0.44444175	0.42731483
	Standard error	0.10127868	0.34769908	0.29639579
	Observations	45	52	52

Source: Author's calculations.

Table 5

Analysis of Deviations in Assessing the Impact of Real GDP on the Tax Rates by Country (Australia, Germany, India, USA, South Africa) for the Period 1971–2022

Country	Tax	Indicator	df	SS	MS	F	Significance F
Australia	Income tax	Regression	1	11.1211	11.1211	200.5091	0.0000
		Balance	51	2.8287	0.0555		
		Total	52	13.9498			
	Corporate income tax	Regression	1	5.8387	5.8387	193.0470	0.0000
		Balance	51	1.5425	0.0302		
		Total	52	7.3813			
Germany	VAT	Regression	1	0.5107	0.5107	34.1853	0.0000
		Balance	51	0.7620	0.0149		
		Total	52	1.2727			
	Income tax	Regression	1	6.3625	6.3625	46.1235	0.0000
		Balance	51	7.0352	0.1379		
		Total	52	13.3977			
	Corporate income tax	Regression	1	5.8128	5.8128	49.7474	0.0000
		Balance	51	5.9591	0.1168		
		Total	52	11.7719			
India	VAT	Regression	1	0.2658	0.2658	38.0566	0.0000
		Balance	16	0.1117	0.0070		
		Total	17	0.3775			
	Income tax	Regression	1	6.9722	6.9722	60.8057	0.0000
		Balance	51	5.8479	0.1147		
		Total	52	12.8201			
	Corporate income tax	Regression	1	6.7931	6.7931	92.4120	0.0000
		Balance	51	3.7489	0.0735		
		Total	52	10.5420			
USA	Income tax	Regression	1	7.1118	7.1118	83.3075	0.0000
		Balance	51	4.3538	0.0854		
		Total	52	11.4656			
	Corporate income tax	Regression	1	4.8822	4.8822	93.0903	0.0000
		Balance	51	2.6748	0.0524		
		Total	52	7.5570			
South Africa	VAT or GST	Regression	1	0.2851	0.2851	27.7923	0.0000
		Balance	44	0.4513	0.0103		
		Total	45	0.7364			
	Income tax	Regression	1	5.3385	5.3385	44.1581	0.0000
		Balance	51	6.1656	0.1209		
		Total	52	11.5041			
	Corporate income tax	Regression	1	3.6204	3.6204	41.2113	0.0000
		Balance	51	4.4804	0.0879		
		Total	52	8.1008			

Source: Author's calculations.

Table 6

The Values of the Coefficient β When Assessing the Impact of Real GDP on the Tax Rates by Country (Australia, Germany, India, USA, South Africa) for the Period 1971–2022

Country	Tax	Coefficient b	Standard error	t-statistic	Value P
Australia	PIT	0.1371	0.0097	14.1601	0.0000
	Profit tax	0.0993	0.0071	13.8941	0.0000
Germany	VAT	0.0357	0.0061	5.8468	0.0000
	PIT	0.1261	0.0186	6.7914	0.0000
	Profit tax	0.1205	0.0171	7.0532	0.0000
India	VAT	0.0180	0.0029	6.1690	0.0000
	PIT	0.0589	0.0076	7.7978	0.0000
	Profit tax	0.0581	0.0060	9.6131	0.0000
USA	PIT	0.1076	0.0118	9.1273	0.0000
	Profit tax	0.0891	0.0092	9.6483	0.0000
South Africa	VAT or GST	0.0243	0.0046	5.2718	0.0000
	PIT	0.0968	0.0146	6.6452	0.0000
	Profit tax	0.0797	0.0124	6.4196	0.0000

Source: Author's calculations.

policies, is focused on restoring fiscal stability. At the same time, implementing austerity plans through budget cuts is less costly and has a quicker effect. Meanwhile, economic decisions based on tax increases lead to a deepening recession in the short-term [19, 20]. In the long-term, tax instruments and responsible fiscal policy are a priority. At the same time, non-compliance with budget rules is not necessarily a sign of inefficiency and should be considered in conjunction with the decisions made by the government [14, 21].

The impact on cyclicality occurs through the limitation of budget parameters during economic downturns, when the cost of financing additional expenses can significantly increase in the absence of a formed reserve. After budgetary expansion, if the borrowing country faces rising borrowing costs, its ability to service the debt will be in a high-risk zone.

The imbalance in the current period is characteristic of Russia, despite the extremely low level of public debt by international standards (about 15% of GDP), the cost of borrowing is quite high. The share of debt servicing costs in the total revenue of the federal budget will be 6.5% in 2024, with a projected increase to 9.7% in 2026. Due to the exit of foreign investors, a decrease in market liquidity and predictability of borrowing costs is noted.

We consider that an abundance of fiscal space, determined by the budget balance, the level of budget expenditures, and tax policy, minimizes the possibilities of conducting counter-cyclical fiscal policy; the combination of several fiscal rules appears to be more effective.

The conducted analysis allows for the formulation of a number of important recommendations for future research. The grouping of countries, time periods, and the selection of regressors influence the obtained results. It seems interesting to continue research on federal states in terms of the

freedom to make decisions at the sub-federal level regarding the management of budget expenditures, tax rates, and incentives, as well as the impact on the cyclical behavior of fiscal policy of such institutional categories as budget rules, which should help in justifying decision-making during periods of economic growth and decline.

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