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VAT increase and budget maneuver estimate: SVAR and CGE analysis

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Budget maneuver

- VAT increase is a part of the fiscal maneuver consisting in financial resources mobilization for implementation the national projects "system" to accelerate economic growth.
- 12+1 national projects are being implemented. The main directions are: "Infrastructure", "Roads", "Ecology", "Demography", "Healthcare".
- **Fiscal devaluation.** The idea of VAT increase with simultaneous reduction of insurance contributions was discussed. The measure was going to provide stimulation export and the innovation sector development. The share of labor in the innovation sector is high and exporters do not pay VAT, while VAT is imposed on imports.

National Project	Federal Projects	Budget, billion rubles.
comprehensive plan for modernization and expansion of mainline infrastructure	11	6348,1
Safe and high quality roads	4	4779,7
Ecology	11	4041
Demographics	5	3105,2
Healthcare	8	1725,8
Digital economy	6	1634,9
Housing and urban environment	4	1066,2
International cooperation and export	5	956,8
Education	10	784,5
Science	3	636
Small and medium enterprises and support for individual entrepreneurial initiative	5	481,5
Culture	3	113,5
Labor productivity and employment support	3	52,1

Research hypothesis

Investments in infrastructure and human capital provide growth in cases **below**:

1. If infrastructure and human capital are at extremely low levels that hinder the organization and conduct of business. For example, the country lacks transport highways, port and railway infrastructure, as well as specialists able to interact with technologies of any level.

2. If infrastructure and human capital are at relatively high levels, but they become a bottleneck **for** rapidly growing industries and other sectors of the economy (no pipeline infrastructure to new fields).

When infrastructure and human capital are at medium levels, **their** contribution to economic dynamics becomes essential only **if** their development is **a** part of the complex development of a set of industries.

Fiscal policy (Vlasov S., Deryugina E. 2018; Ilzetzki et al. 2013; Auerbach, Gorodnichenko 2012)

- Magnitude of the fiscal policy effect depends on the way that expenditures are financed - tax increase, debt increase, reduction of state savings. Similarly, for tax rates increase where additional funds will go.
- Negative tax policy effect is less observed in a open economy, but it depends on a exports volume and limited by production costs rather than its quality (the stimulating effect in case of fiscal devaluation).
- Negative effects are lower in countries with a high level of debt burden (up to a negative value), because higher tax revenues can reduce the debt burden and the associated negative effects.
- The multiplier is higher in fixed exchange rate economies (Central Banks can increase an effect of fiscal policy with the support of an exchange rate). The effect is reduced in countries with flexible exchange rates.
- Degree of export diversification. In case of high export concentration, fiscal devaluation may increase it.
- Demand and business cycle – in high demand it is easier for manufacturers to transfer the VAT increase to product prices. This discourages business activity to a lesser extent.
- What matters is the model of the labor market. In case of tough labor contracts, when an employer reacts to a business cycle by employment, the effect of tax and budgetary measures is higher.
- Capacity utilization is important.
- Share of the shadow economy (this activity is deducted from taxation).
- For government spending the propensity to import matters (most of demand can flow into imports) and the overall efficiency of government spending as well.
- Effects of fiscal policy depend on a prevailing type of household: ricadian/non ricadian.

Studies for Russian economy

- The study of the Russian Central Bank Department of Research (Vlasov S., 2018). The Bayesian VAR method was used. Total tax multiplier minus 0.75, budget multiplier 0.28. The total effect of the budget maneuver will amount to 0.2 - 0.3% of GDP. (http://www.cbr.ru/Content/Document/File/54558/analytic_note_181119_dip.pdf)
- Gaidar Institute Estimates based on the DSGE model (Polbin A., 2018). Decrease in GDP by 0.2-0.35%, in investment by 0.4-0.7%, in import by 0.35-0.45%. (<https://www.iep.ru/ru/makroekonomicheskie-effekty-ot-povysheniia-nds-s-18-do-20.html>)
- Gazprombank's estimates. Implementation of national projects during 2019-2021 will add about 1.6 p.p. to Russia's economic growth in 2019, 0.1 and 0.7 and 0.8 in 2020 and 2021 respectively. (<https://www.rbc.ru/economics/08/10/2019/5d9c65e39a7947a673869d55>)

SVAR model

$$\begin{pmatrix} GDP_t \\ X_t \\ VAT_t \end{pmatrix} = \begin{pmatrix} c_0^1 + c_1^1 \times t \\ c_0^2 + c_1^2 \times t \\ c_0^3 + c_1^3 \times t \end{pmatrix} + \sum_j \sum_{i=1}^3 A_{i,j} \begin{pmatrix} GDP_{t-1} \\ X_{t-1} \\ VAT_{t-1} \end{pmatrix} + \begin{pmatrix} c_2^1 \\ c_2^2 \\ c_2^3 \end{pmatrix} \times p_t^{oil} + \begin{pmatrix} 1 & b_2^1 & b_3^1 \\ 0 & 1 & b_3^2 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} e_t^{GDP} \\ e_t^X \\ e_t^{VAT} \end{pmatrix}$$

VAT_t – value added tax revenue to the federal budget, p_t^{oil} — growth rate of average quarterly price of Brent oil (in dollars); X_t — federal budget expenditures or consumer price index depending on the model specification; GDP_t — quarterly GDP; e — the structural shocks of the variables. The data except the oil price are taken from the Rosstat. The GDP indicator was deflated to the base year. The VAT and federal budget expenditures are also taken at the levels and brought to the base year by the GDP deflator (for comparability of estimates).

SVAR estimates

	GDP	Gov. expend.	VAT
GDP	1	0.02126*	-0.01273**
Gov. expend.	0	1	0.12091**
VAT	0	0	1

In terms of percentage of GDP, the multiplier is -0.26, which is a relatively small value. Taking into account the total value of the VAT rate increase by 2 p.p., the multiplier value will be - 0.14. The growth of VAT has a positive impact on the growth of government spending, which in turn has a positive impact on GDP.

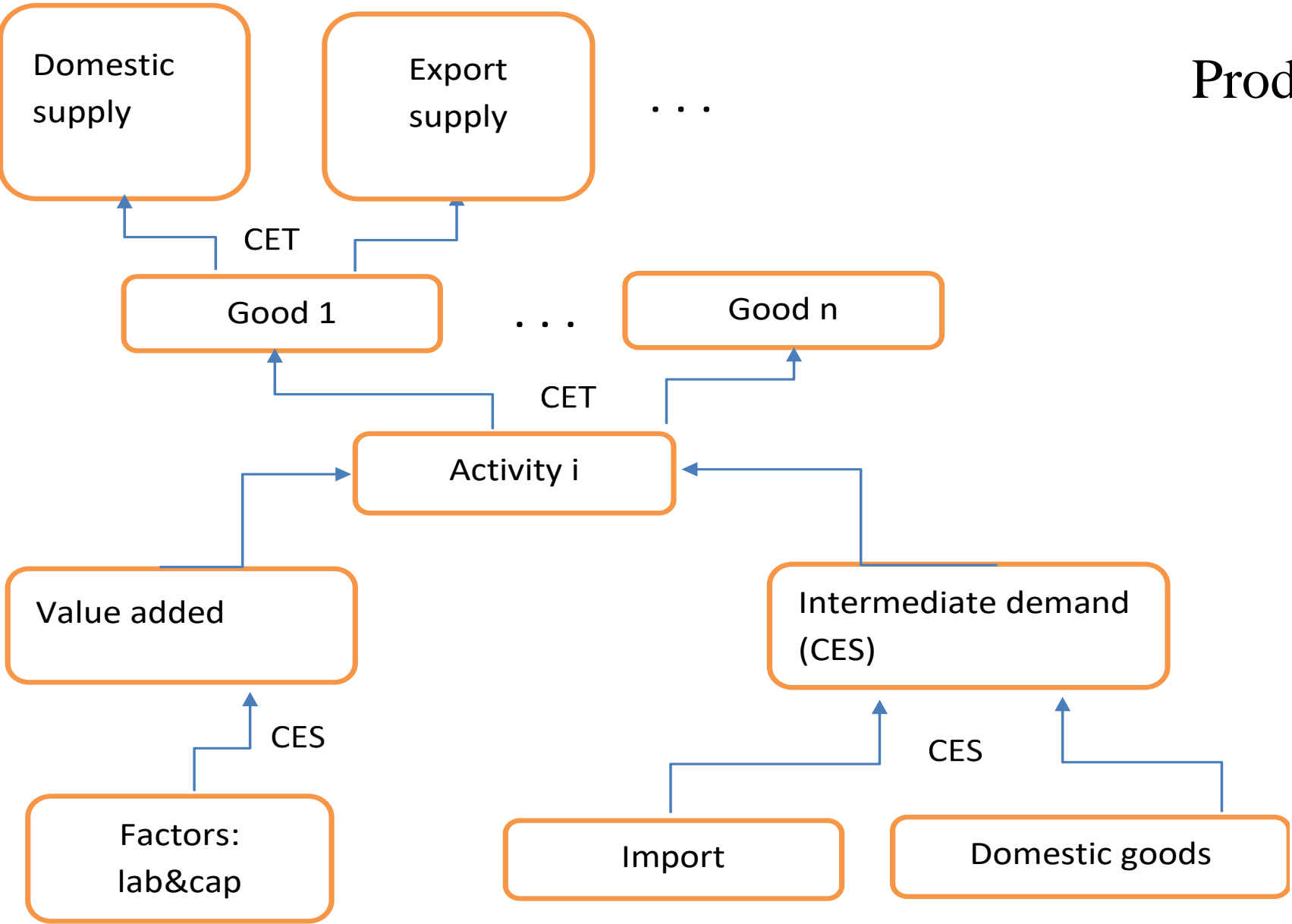
	GDP	IPC	VAT
GDP	1	-0.2022*	-0.003593**
CPI	0	1	0.019766*
VAT	0	0	1

Specification with inflation has a lower direct effect on GDP, but also a positive effect on price growth. At the same time, price increases have a negative effect on GDP. The effect seems to be due to the actions of the Central Bank in response to price increases, which makes an additional negative contribution to GDP. It seems that this is the scenario that was implemented in 2019.

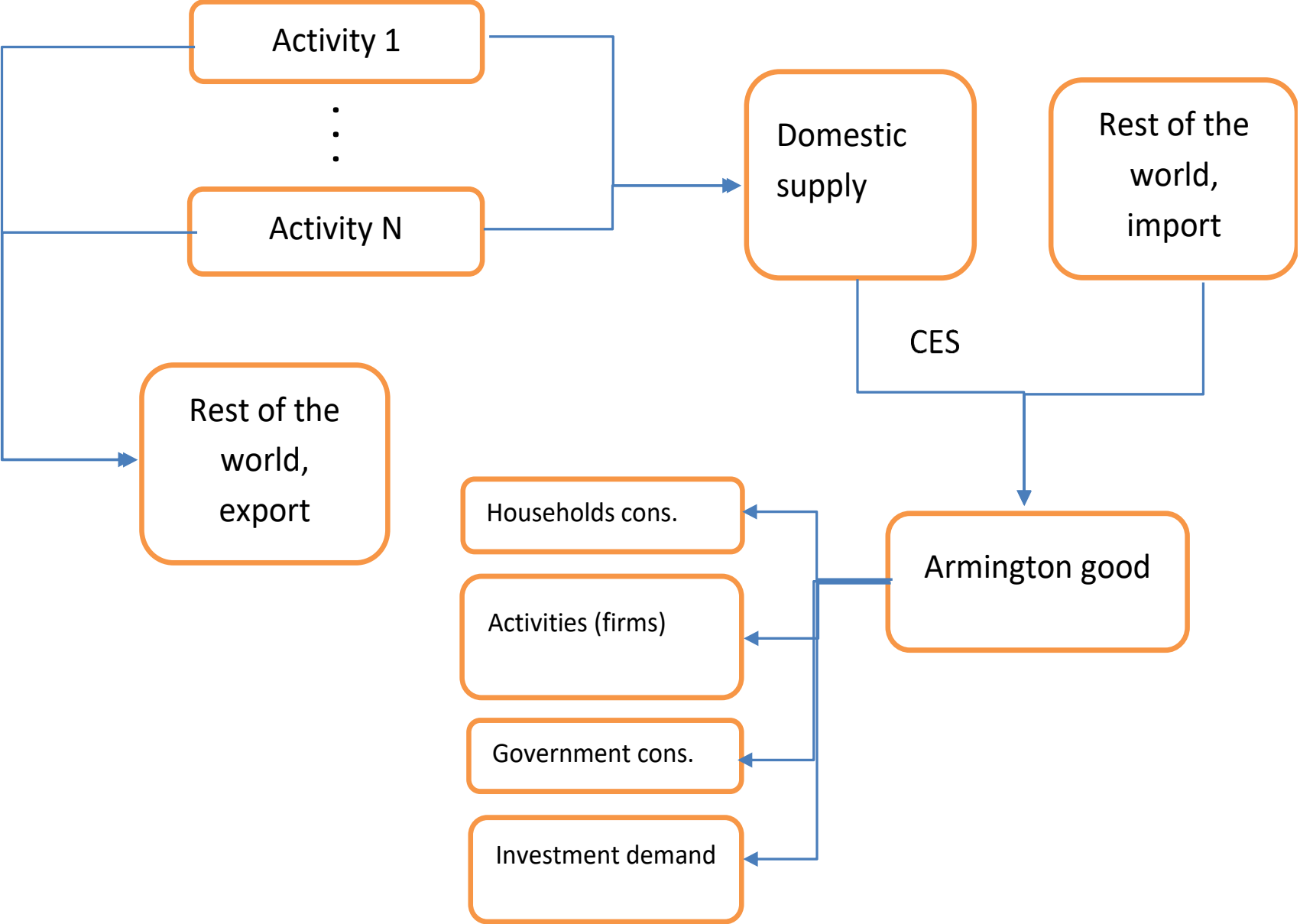
CGE model

- CGE - a system of nonlinear equations, the solution of which is a general economic equilibrium - balancing supply and demand in the markets of goods and factors of production. The equilibrium is achieved by iterative calculation by specialized application packages (GAMS, GEMPACK, MPSGE, etc.).
- CGE describes cross-sector relationships at a detailed level, as well as input-output models, but also considers behavioral aspects based on the Arrow-Debre general economic equilibrium theory - how firms and consumers make economic decisions.
- CGE models are applied in international trade, taxation, public finance, labor markets, etc..
- General equilibrium models were also built for Russia: (V.L. Makarov, 1999), (A.R. Bakhtzin, 2003), (T. Rutherford, Tarr D., 2004), (N. Turdieva, 2006).
- There were no CGE models published for new Russian make and use tables (OKVED).

Production by activity i



One good distributional scheme



Consumer and producer objectives

$$\left\{ \begin{array}{l} c_i = rk_i + wl_i + \sum_j p_j x_j \xrightarrow{k_i, l_i, x_j} \min \\ s.t. \bar{y}_i = y_i(k, l, x_j) = \varphi(\beta k_i^\rho + (1 - \beta)l_i^\rho)^{\frac{1}{\rho}} + (1 - \varphi) \left(\sum_j x_j^\varepsilon \right)^{\frac{1}{\varepsilon}} \end{array} \right.$$

The cost minimization problem with CES production function with the nested structure. k - capital, l - labor, r - cost of capital, w - wages, y - output (for domestic consumption and exports), x - intermediate consumption.

$$\left\{ \begin{array}{l} c_h = \sum_j p_h y_j \xrightarrow{y_j} \min \\ s.t. \bar{U}_h = U_h(y_j) = \left(\sum_j \alpha_j y_j^\rho \right)^{\frac{1}{\rho}} \end{array} \right.$$

The task of minimizing the consumer basket with a given utility function (CES) level.

Mixed complementary problem

- Zero profit conditions:

$$MC - MP \geq 0; Q \geq 0; (MC - MP) * Q = 0;$$

- Market-clearing conditions:

$$S \geq D; P \geq 0; (S - D) * P = 0;$$

- Income and expenditure balance condition:

$$E \geq I; E \geq 0; (E - I) * E = 0.$$

Social accounting matrix

		Expenditure																
		Activities	Goods	Factors		Margin				Taxes				Households	Budget	Investment, saving	Rest of the world, export	Total
				Wage	Profit	Domestic trade	Export trade	Domestic transport	Export transport	Internal indirect taxes	Export indirect taxes	Labor taxes	Direct taxes					
Receipts		Activities	100 960,17															100 960,17
		Goods	48 875,74			10 954,28	1 836,48	482,96	189,04					29 939,47	10 752,75	14 735,88	16 865,19	134 631,79
Factors		Wage	16 296,79															16 296,79
		Profit	31 276,86															31 276,86
Margin		Domestic trade		10 954,28														10 954,28
		Export trade		1 836,48														1 836,48
		Domestic transport		482,96														482,96
		Export transport		189,04														189,04
Taxes		Internal indirect taxes		4 345,93														4 345,93
		Export indirect taxes		3 852,47														3 852,47
		Labor taxes	3 961,89															3 961,89
		Direct taxes	548,60															548,60
Households				16 296,79	31 276,86													47 573,65
Budget										4 345,93	3 852,47	3 961,89	548,60					12 708,89
Investment, saving														17 634,17	1 956,14		-4 854,43	14 735,88
Rest of the world, import			12 010,76															12 010,76
Total		100 959,87	134 632,08	16 296,79	31 276,86	10 954,28	1 836,48	482,96	189,04	4 345,93	3 852,47	3 961,89	548,60	47 573,65	12 708,89	14 735,88	12 010,76	0,00

VAT increase CGE effects	“Short run”, fixed factor supplies		“Long run”, fixed factor prices	
	Without distrib.	With distrib.	Without distrib.	With distrib.
GDP, %	-0,39	-0,29	-0,82	-0,49
Expected additional VAT revenues, bill. rub., 2011 prices	202,95	202,95	202,95	202,95
"Actual" additional tax revenue, billion rubles, 2011 prices.	134,83	164,62	161,66	198,83
Activities				
<i>Agriculture</i>	-0,10	-0,19	-0,57	-0,36
<i>Mining</i>	0,36	0,42	0,08	0,29
<i>Industry</i>	-0,96	-0,96	-1,33	-1,13
<i>Utilities</i>	-0,15	-0,05	-0,62	-0,29
<i>Construction</i>	0,00	0,22	-0,09	0,17
<i>Trade</i>	-0,10	-0,18	-0,64	-0,39
<i>Transport</i>	-0,10	-0,21	-0,70	-0,43
<i>Financial sector</i>	0,39	0,30	-0,13	0,12
<i>Other sector</i>	0,35	0,39	-0,17	0,61
Wages / labor supply	-0,58	-0,43	-0,45	1,00
Profit / capital supply	-0,59	-0,34	-0,44	-0,15
Consumption	0,18	-0,06	-0,41	-0,24
Government cons.	0,43	0,90	-0,16	0,95
Investment	0,00	0,17	0,00	0,20
Exchange rate	-0,41	-0,17	0,19	0,19
Export	-0,26	-0,24	-0,58	-0,36
Import	-0,36	-0,33	-0,81	-0,50

VAT increase CGE effects. Results

- Four computational experiments are considered:
 1. fixed factor supplies, flexible factor prices, no redistribution of additional budget revenues from tax rate growth;
 2. fixed factor supplies, flexible factor prices, redistribution of additional budget revenues from the tax rate growth;
 3. flexible factor supplies, fixed factor prices, no redistribution of additional budget revenues from the tax rate growth;
 4. flexible factors supply, fixed factors prices, redistribution of additional budget revenues from tax rate growth;
- "Actual" aggregate tax revenues are substantially lower than expected (VAT only) revenues for 1,2,3 scenarios. For scenario 4, due to employment growth and growth of several sectors, the revenues are close to the expected revenues, but these are aggregate revenues.
- Without redistribution, the effect of VAT on GDP is: -0.39 (-0.82) %. With redistribution, the negative effect on GDP is lower: -0.29 (-0.49) %.
- Slow down in the scenarios 1,2,4 : agriculture, industry, housing and utilities sector, trade, transport - sectors of VAT payers. The following sectors grow: mining sector, financial sector and state sector (in the first scen. - due to price decrease, in the second scen. - due to redistribution). In scenario 4, public sector and financial sector are also slowing down.
- The largest decline in all scenarios is in the industrial sector.
- Both total exports and total imports decline in all scenarios. In 3.4, the decline is stronger, and depreciation is observed.
- In 3.4, the decline is stronger, especially for industry. Private and public consumption drops in 2,3,4 scen..

VAT increase CGE effects. Mechanisms

- The tax rate growth through distorting changes in relative prices leads to a reduction in demand and, as a result, output in VAT-sensitive sectors, primarily the industrial sector.
- Cheaper production factors do not offset the negative effect, but mitigate the slowdown. Growth source in growing sectors is an export orientation that maintained (in the model) external demand (and higher relative export prices). Additional demand from government consumption (public sector, financial sector and construction) maintains growth of these sectors.
- In case of redistribution, there is a stronger growth in the public sector, construction and mining sectors, which increases the cost of factors and leads to a deeper decline in other sectors. **The public sector reproduces the Dutch disease mechanism.**
- Decrease in aggregated demand (as a result of decline in revenues from factors of production) along with the direct impact of VAT on imports leads to decline in imports, which leads to current account expansion and exchange rate appreciation, which leads to an additional negative impact on price sensitive exports (industry).
- "Fiscal devaluation" leads to a new equilibrium with lower output and more expensive exchange rate. As a result of lower consumer prices, however, consumption is growing.

Budget Maneuver (BM) estimate	“Short run”, fix factor supplies		“Long run”, fix factor prices	
	FM	BM	FM	BM
GDP, %	0,38	1,03	1,25	2,92
Activities				
<i>Agriculture</i>	-0,52	-1,74	0,69	1,33
<i>Mining</i>	0,21	0,95	0,74	2,12
<i>Industry</i>	-0,19	-1,64	0,70	0,58
<i>Utilities</i>	0,32	0,72	1,25	2,77
<i>Construction</i>	0,85	2,43	0,90	2,39
<i>Trade</i>	-0,50	-1,66	0,90	1,82
<i>Transport</i>	-0,15	-0,76	0,99	2,01
<i>Financial sector</i>	-0,49	-1,13	0,88	2,29
<i>Other sector (incl. government sec.)</i>	0,66	2,58	3,15	8,37
Wages / labor supply	1,93	0,12	1,77	4,37
Profit / capital supply	1,25	-0,23	1,06	2,46
Consumption	-1,27	-3,68	0,50	1,00
Government cons.	2,68	8,58	4,62	12,32
Investment	0,61	1,71	0,61	1,71
Exchange rate	1,26	0,00	-0,02	0,13
Export	0,02	-0,24	0,79	1,58
Import	0,03	-0,34	1,11	2,22

Budget Maneuver estimation (BM). Results.

- Four computational experiments have been made: "fiscal multiplier" (FM) - increase in government spending (15% - investment, 60% - government consumption, 25% - public sector wages) by 1% of GDP (with fixed supply of factors (1) and fixed prices (3)), "budget maneuver" (BM) - increase in government spending on the value of financing national projects in average annual terms (with fixed supply of factors (2) and fixed prices (4)).
- Scenario of the FM, short term: public sector, construction and moderate raw materials sector are growing. The cost of production factors grows. Consumer prices are rising, consumption is decreasing.
- BM scenario, short term: significant growth in the public sector. As a result the construction (also as a result of growing investment demand) and the mining sector (due to public sector demand and the distorting effect of VAT rate increase: relative export prices are higher than domestic prices) grow.
- In the FM scenario, all sectors of the economy grow in the "long-term" period, while the manufacturing sector grows at the slowest rate.
- In the BM long-term scenario, the public sector, the utilities sector, the construction sector, and the mining sector grow the most. Compared to the previous scenario, despite a higher financial injection, the growth of the industrial sector is lower.

Budget Maneuver estimation (BM). Results.

- Government demand growth leads to an increase in the cost of production factors, which depresses production, including exports. The mining sector is affected to a lesser extent. Thus, under the fixed factor supply scenarios the sectors that directly depend on the government demand grow, while other sectors slow down. In addition to limited factors of production, the multidirectional picture are determined by the specificity of the model, which assumes the possibility to produce different goods by one sector (firm). In this case there is a shift along the production curve due to the price incentives changes. The same features leads to a substitution effect between private (falling) and public (growing) consumption. In case of unlimited supply of factors, this effect partially disappears (private consumption also increases), but the growth of sectors is not homogeneous.
- As a result of current account reduction, there is an exchange rate depreciation. At the same time, growth in the public sector does not compensate for the demand for imports, because it translates to the domestic goods. As a result import is decreasing.
- In the scenario of budget maneuver negative effects of VAT increase are amplified. While the public sector and mining sector grow the economy experiences a double negative impact.
- Hypotheses of the research are confirmed.

Thank you for your attention!