

Estimating fiscal multipliers in Russian economy

With application to national projects

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Motivation

- Growing concern about fiscal policy effects on output after financial crisis of 2007–08
- Frequent changes in fiscal policy agenda in Russia
- Scrutiny of national projects' effectiveness (in terms of GDP growth)
- The lack of methods based on prior knowledge about shocks in the literature for Russian economy

Definition of fiscal multiplier

The change of GDP in units (dollars) to the 1 unit (dollar) change in government expenditures or revenues. The widely used approach is to combine the values of impulse response function.

- 1 Peak multiplier:

$$mult_i = \max(\theta_{YG}^h)$$

- 2 Mean multiplier:

$$mult_i = \frac{\sum_{h=0}^H \theta_{YG}^h}{H+1}, H \in N$$

- 3 Cumulative multiplier:

$$mult_i = \sum_{h=0}^H \theta_{YG}^h, H \in N$$

- 4 Integral multiplier:

$$mult_i = \frac{\sum_{h=0}^H \theta_{YG}^h}{\sum_{h=0}^H \theta_{GG}^h}, H \in N$$

θ_{YG}^h – response of GDP to expenditure shock in h quaters after the shock.

Literature review

		Model type	
		<i>SVARs</i>	<i>Local Projections</i>
Shock identification method	<i>SVAR residual approach</i>	19 studies (from 2002)	—
	<i>Narrative approach</i>	8 studies (from 2011)	9 studies (from 2011)

SVAR residual approach: shocks are obtained as structural residuals of SVAR models either amplified with off-model data (e.g. Blanchard, Perotti (2002)) or not (the usual recursive models).

Narrative approach: shocks are constructed entirely off-model.

Russian studies review

Authors	Method	Multipliers	
		Revenue	Expenditure
Vlasov, Ponomarenko (2010)	SVAR model identified as Blanchard, Perotti (2002)	-0,10	0,60
Ivanova, Kamenskih (2011)	Two-step procedure	-	0,13
Drobyshevskiy, Nazarov (2013)	Recursive SVAR model	-	0,45
Kudrin, Knobel (2017)	Recursive SVAR model	-	0,91
Vlasov, Deryugina (2018)	BVAR model identified with sign and zero restrictions	-0,75	0,28

There is no a single model using either narrative approach or, at least, off-model data in SVAR to identify shocks.

Methodology

- I use Narrative Sign Restrictions (Antolín-Díaz, Rubio-Ramírez (2018)) identification strategy for a SVAR model.
- The method imply imposing additional restrictions on structural shocks obtained using Householder transformation.
- The baseline model consists of GDP, total government expenditures, total government revenues, MIACR 1 day, Urals price in rubles/bl.
- Estimation period is from 2004Q1 till 2019Q3.

Sign restriction for baseline model:

		Shocks	
		G	T
Variables	G	+	+
	T	+	+
	Y	+	-
	i		
	P_oil		

Off-model restrictions on structural shocks

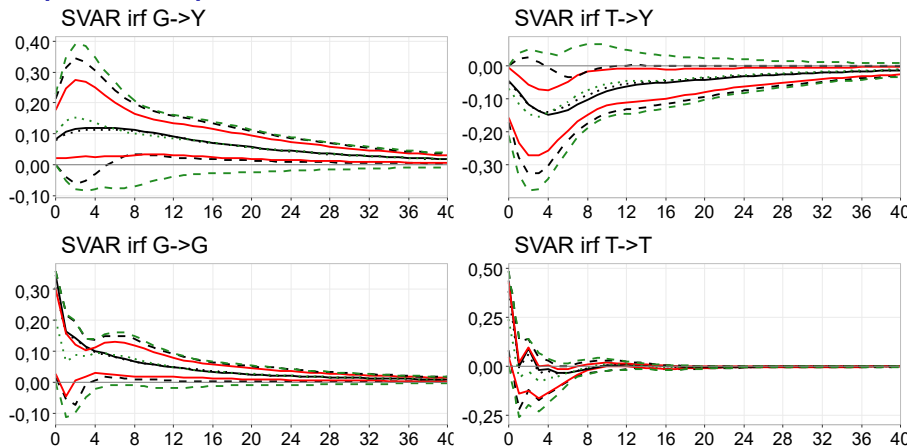
On expenditure shocks:

- 1 Failure to fulfill a defence procurement
 $2011Q1 < 0$
- 2 Double allowance indexation for military personnel on January 1, 2012
 $2012Q1 > 0$
- 3 500 bl rub. withdrawal from the Reserve Fund in February 2015 which probably financed defence spending
 $2015Q1 > 0$
- 4 State guarantees repayment for the military industry on 800 bl rub. in December 2016
 $2016Q4 > 0$
- 5 A lump sum payment to pensioners in the amount of 5000 rub.
 $2017Q1 > 0$

On revenue shocks:

- 1 Unified Social Tax rate increase from 26% to 34% from January 1, 2011
 $2011Q1 > 0$
- 2 Unified Social Tax rate decrease from 34% to 30% from January 1, 2012
 $2012Q1 < 0$
- 3 The beginning of the tax maneuver:
 $2015Q1 > 0$ (*extraction tax revenue increase*)
 $2015Q1 < 0$ (*decrease in export duty revenue*)
- 4 Revenue from the privatization of Rosneft in December 2016
 $2016Q4 > 0$
- 5 Value Added Tax rate increase from 18% to 20% from January 1, 2019
 $2019Q1 > 0$

Impulse response functions for baseline model



Notes: The dashed green (black) lines are the upper and lower boundaries of the set of IRF models' values generated by the Householder transformation and satisfying for sign (and off-model) restrictions. The point green (black) line is the median impulse response that satisfies sign (and off-model) restrictions. The solid black line is medium target IRF (Fry, Pagan (2011)) that is closest to the median response. Red lines - 95% bootstrap (Kilian (1998a)) confidence intervals - 500 iterations.

Multipliers for baseline model

	Peak	Cumulative 4q	Cumulative 20q
Expenditure	0,12 (0,03 – 0,27)	0,42 (0,09 – 0,97)	1,92 (0,53 – 3,48)
Revenue	-0,15 (-0,27 – -0,07)	-0,38 (-0,93 – -0,17)	-1,67 (-3,07 – -0,50)

Given the confidence intervals, the fiscal policy pursuant to the budget rule (a change in expenditures is equal to a change in non-oil and gas revenues) tends to be neutral, since the hypothesis that expenditure and revenue multipliers are equal in absolute value cannot be rejected.

Multipliers for revenue component models

Model	Variable	Peak	Cumulative 4q	Cumulative 20q
VAT	Expenditure	0,19 (0,07 – 0,27)	0,60 (0,16 – 0,91)	2,42 (0,78 – 3,33)
	VAT	-0,12 (-0,22 – -0,02)	-0,38 (-0,77 – -0,06)	-0,90 (-2,45 – -0,11)
Profit tax	Expenditure	0,15 (-0,02 – 0,28)	0,55 (0,07 – 0,97)	1,90 (-0,05 – 2,89)
	Profit tax	-0,17 (-0,31 – -0,08)	-0,47 (-1,04 – -0,20)	-1,68 (-3,00 – -0,43)
Personal income tax	Expenditure	0,26 (0,15 – 0,33)	0,83 (0,46 – 1,12)	3,12 (1,26 – 4,12)
	Personal income tax	-0,08 (-0,16 – -0,11)	-0,26 (-0,57 – -0,06)	-0,57 (-1,34 – 1,33)
Extract. tax	Expenditure	0,14 (-0,03 – 0,27)	0,45 (0,08 – 0,96)	0,57 (-0,26 – 2,00)
	Extract. tax	-0,19 (-0,20 – -0,07)	-0,62 (-0,72 – -0,18)	-1,83 (-1,92 – -0,42)
Export duty	Expenditure	0,21 (0,08 – 0,27)	0,65 (-0,23 – 0,92)	-0,29 (-0,92 – 1,33)
	Export duty	-0,14 (-0,19 – -0,08)	-0,45 (-0,73 – -0,21)	-2,28 (-2,79 – -1,25)

Multipliers for expenditure component models

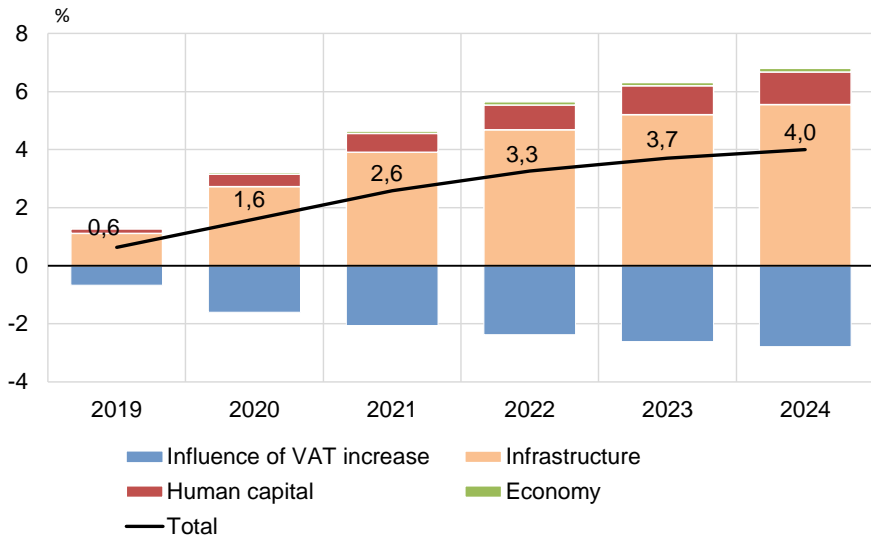
Aggregation functional classification of expenditures into 3 groups: social ones, economic ones and military ones.

Model	Variable	Peak	Cumulative 4q	Cumulative 20q
Social	Social	0,10 (0,05 – 0,27)	0,33 (0,12 – 0,92)	0,65 (-0,28 – 1,65)
	Revenue	-0,22 (-0,27 – -0,13)	-0,64 (-0,92 – -0,33)	-1,85 (-2,01 – -0,47)
Economic	Economic	0,14 (0,06 – 0,29)	0,48 (0,14 – 1,03)	0,79 (-0,78 – 3,21)
	Revenue	-0,20 (-0,24 – -0,07)	-0,48 (-0,76 – -0,12)	-3,11 (-3,47 – -0,72)
Military	Military	0,12 (-0,10 – 0,23)	0,25 (-0,04 – 0,78)	1,50 (-0,02 – 3,00)
	Revenue	-0,20 (-0,24 – -0,10)	-0,24 (-0,64 – -0,03)	-2,23 (-3,14 – -1,02)

Estimation the impact of national projects on GDP: methodology

- Aggregating NPs in 3 groups – human capital, infrastructure, economy – which are matched with functional classification of expenditures (FCE).
- Estimating NPs multipliers by these groups using FCE time series.
- Defining extra actions of government induced by NPs:
 - ① VAT rate increase in the beginning of 2019 (negative influence on GDP at the rate of $\sim 0,5\%$ GDP every year)
 - ② The creation of Development Fund ($\sim 0,5\%$ GDP every year, neutral influence on GDP)
 - ③ Extra expenditures financed by VAT and Development Fund (positive influence on GDP proportional to total expenditures on 3 groups)

Estimation the impact of national projects on GDP: results (the uplift to the level of real GDP)



Conclusion

- Using off-model data (Narrative Sign Restrictions) tightens the set of suitable IRFs in accordance with economic sense.
- There is a great evidence in favor of fiscal policy neutrality in Russia.
- Oil and gas revenues tends to influence GDP more than non-oil and gas.
- Social expenditures are less effective in term of GDP growth than others. Economic ones are influential on the horizon of 2 years after shock whereas military – after 3-4 years after shock.
- If done in order with the plan, national projects raises GDP growth at 1.0 pp during 2020-2021, in 2022 - at 0.7 pp, in 2023 - 0.4 pp, in 2024 - 0.3 pp. The influence on GDP in 2019 can be estimated at 0.4 pp given the excess VAT revenues and expenditures under-fulfillment.