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June 19, 2017

Approved By
European Department

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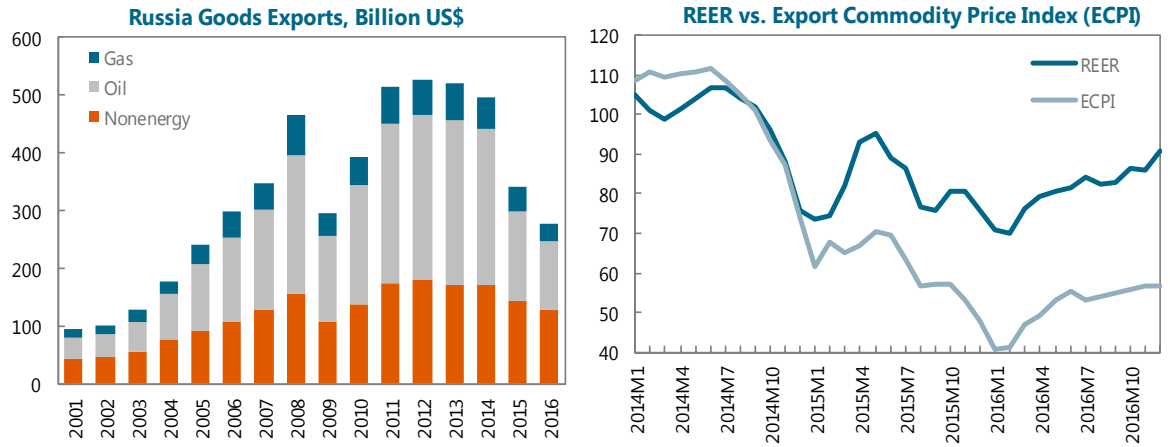
A. Introduction and Summary

1. An often-cited silver lining of lower commodity prices is the ensuing real depreciation and potential to unwind the Dutch disease that commodity exporters experienced during the preceding commodity booms. While there is anecdotal evidence supporting the recovery of select tradable sectors in Russia, it has yet to manifest itself in a meaningful way in macro-level data. (Figure 1).

Figure 1. Russia's Exports Composition and Competitiveness



2. A Selected Issue Paper accompanying the 2016 Russia Article IV staff report argued that structural weaknesses attenuated the economy's ability to reallocate resources across sectors in response to relative price changes. The study drew in part on Culiuc and Kyobe (2017), who link lower REER export elasticities to structural weaknesses. As many of these weaknesses are present in Russia, the 2016 Article IV concluded that structural reforms in key areas should be conducive to a larger/faster response of the tradable sector to the recent depreciation. The present study argues the task may be more complicated when the adjustment in relative prices is driven by a negative terms of trade (ToT) shock. Two sets of factors are explored: (i) disruptiveness of sudden terms-of-trade driven devaluations and (ii) issues related to external demand and access to external markets.

3. First, sudden depreciations like those triggered by an export commodity price drop put the economy under stress, and may not be conducive to a large reallocation of resources across sectors.

[1] Prepared by Alexander Culiuc.

Section B confirms this empirically, and links the finding to the uncertainty associated with the REER correction, the irreversibility of the Dutch disease, and the stress of the banking sector.

4. Sections C and D document the impact of global demand and market access on the Russia's ability to take advantage of the recently improved price competitiveness. It is well established that episodes of commodity busts—especially for oil—are generally associated with (and driven by) a softer global demand, and this relationship normally blunts the effect of improved competitiveness of non-commodity exporters in commodity-dependent economies. However, the most recent oil price collapse was primarily driven by supply factors, which means that global demand was not the culprit and remained reasonably strong in the last two years. But, Russia's main trading partners economies (CIS) performed relatively poorly, where Russia has a high concentration of non-commodity exports.

5. Section E briefly considers the structural transformation to date achieved by Russian exporters. Results are mixed: generally positive long-term trends in diversification have stalled and have not been accompanied to a move into more sophisticated products.

6. Section F concludes with a set of policy recommendations pertaining to (i) efforts to insulate the non-commodity sector from oil price volatility, (ii) structural reforms to support reallocation of resources across sectors, (iii) initiatives to improve penetration of global markets, and (iv) measures to ensure that the financial system can support reallocation of resources even during periods of stress.

B. Export Elasticities During Terms-of-Trade Driven Depreciations

7. The argument that a reduction in commodity prices will unwind the Dutch disease assumes symmetry: since increasing commodity prices drove resources out of the non-commodity tradable sector (via an appreciated real exchange rate), decreasing commodity prices and ensuing real depreciation should bring resources back into the non-tradable sector. Effectively, this implies that the magnitude of the elasticity of non-commodity exports to the real effective exchange rate (REER) is equal regardless of the direction of the REER movement, and is not affected by the phase of the commodity cycle. We test whether this symmetry holds in the data, by estimating this elasticity separately for periods of rising and falling commodity prices.

8. Elasticities of exports with respect to the REER and trading partner growth are estimated using a standard panel regression setup[2]:

$$\Delta \log X_{it} = \beta_1 \Delta \log PartnerGDP_{it} + \beta_2 \Delta \log REER_{it-1} + \omega_i + \eta_t + \varepsilon_{it} \qquad (1)$$

where X is manufacturing exports (data from World Bank's World Development Indicators), ω is a country dummy and η is a time dummy. β_1 and β_2 represent, respectively, the estimated export elasticities with respect to export trading partners GDP growth and REER. The analysis uses data averaged over three year periods, which means that estimates are best interpreted as medium-term

[2] See, for example, Eichengreen and Gupta (2013).

elasticities. The REER is lagged one period to alleviate endogeneity concerns.[3] This baseline setup is augmented with the export commodity price index (ECPI) data from the Gruss (2014) as follows.[4]

$$\Delta \log X_{it} = \beta_1 \Delta \log PartnerGDP_{it} + \beta_1 \Delta \log REER_{it-1} * ECPI_{up} + \\ + \beta_1 \Delta \log REER_{it-1} * ECPI_{down} + \omega_i + \eta_t + \varepsilon_{it} \quad (2)$$

$ECPI_{down}$ and $ECPI_{up}$ are dummy variables indicating the direction in which the ECPI is changing. Interacting these dummies with the $\Delta \log REER_{it-1}$ allows to estimate the elasticity of manufactured exports w.r.t. REER separately for periods of ECPI rises and falls.[5]

Table 1. Panel Estimations of Elasticities of Manufactured Exports with Respect to the REER

	Non-LICs			Commodity exporters		
	(1)	(2)	(3)	(4)	(5)	(6)
Trading partner growth	2.726***	2.729***	2.574**	1.587	1.574	0.0368
	(0.963)	(0.969)	(1.168)	(1.689)	(1.729)	(2.319)
Lagged Δ Ln REER	-0.191***			-0.545**		
	(0.0653)			(0.204)		
Lagged Δ Ln REER (Δ ECPI<0%)		-0.182			-0.387	
		(0.111)			(0.273)	
Lagged Δ Ln REER (Δ ECPI>0%)		-0.196**			-0.581**	
		(0.0851)			(0.232)	
Lagged Δ Ln REER (Δ ECPI<-2.5%)			-0.0702			-0.276
			(0.185)			(0.354)
Lagged Δ Ln REER (Δ ECPI>2.5%)			-0.214***			-0.627**
			(0.0757)			(0.241)
Country fixed effects	YES	YES	YES	YES	YES	YES
Time fixed effects	YES	YES	YES	YES	YES	YES
R^2	0.332	0.332	0.419	0.238	0.240	0.242
Observations	628	628	439	196	196	151
Countries	61	61	61	21	21	21

Note: Dependent variable is the first difference in log manufactured exports. Standard errors in parentheses are clustered by country. *** p<0.01, ** p<0.05, * p<0.1.

9. Results are presented in Table 1 and summarized in Figure 2. Baseline results in column 1 for a set of 61 advanced and emerging markets (both net exporters and importers of commodities) are

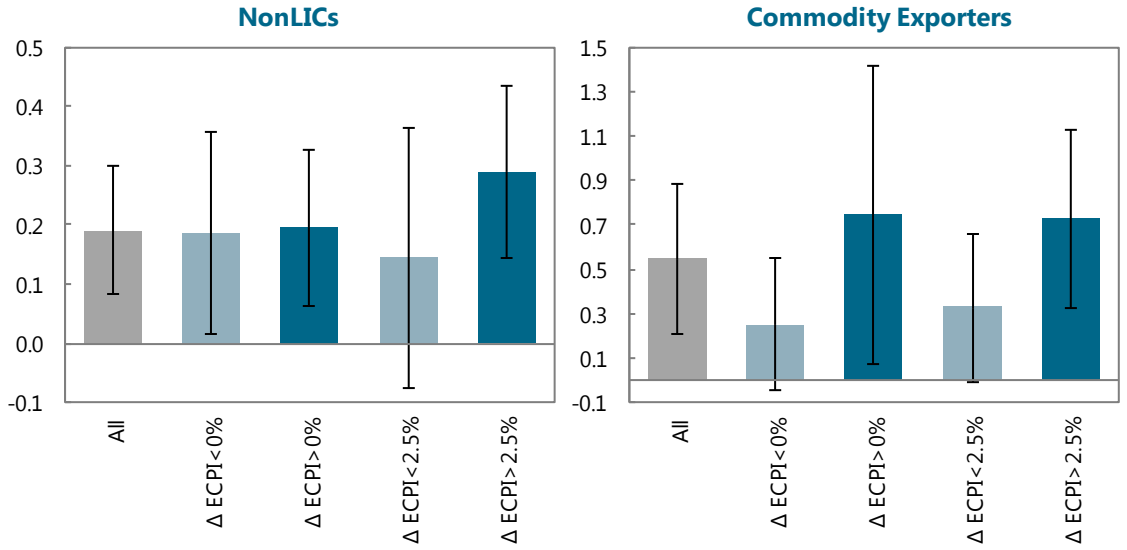
[3] The focus on manufacturing exports alone also reduce concerns about reverse causality as manufacturing exports represent relatively small shares of total current account flows, especially in commodity-exporting countries.

[4] The dataset offers country-specific price indices of commodities.

[5] Note that the dummy is not introduced separately on the right-hand side, and neither is the level or change in the ECPI. While manufactured exports are affected by export commodity prices, we are only interested in measuring its impact as revealed via the elasticity, which is the standard measure for assessing the response to a price competitiveness improvement.

as expected: REER elasticity is negative and external demand elasticity is positive, both significant at the 1 percent level. Column 2 estimates the elasticity w.r.t. REER separately for periods of rising and falling export commodity prices, and in column 3 the focus is on periods when annualized swings in ECPI exceeding 2.5 percent (which corresponds to the 90th percentile in the three-year change in ECPI). The findings indicate that the elasticity of manufacturing exports w.r.t. REER is close to zero when the country is emerging from a period of falling prices for its commodity exports. Columns 4 through 6 repeat the exercise restricting the sample to commodity exporting countries.[6] The differences between periods of commodity price upswings and downswings become even more dramatic here: the elasticity is nearly twice as large when commodity prices are on the rise than when they are on the decline (and the latter elasticity is not statistically significant from zero).

Figure 2. Estimated Elasticities with Respect to the REER



The literature provides several potential explanations for this asymmetric elasticity, which is particularly pronounced in the case of commodity exporters.

10. Krugman (1987) discussed asymmetric response of non-commodity exports to movements in the REER in the presence of learning by doing externalities in the tradable sector. During commodity booms, the marginal tradable industries are driven out of the market. As this happens, foreign competitors gain an advantage on the back of learning-by-doing externalities. Even if the real exchange rate reverses back to the original level, the domestic manufacturers of tradable products lost during the over-appreciation period can no longer compete.

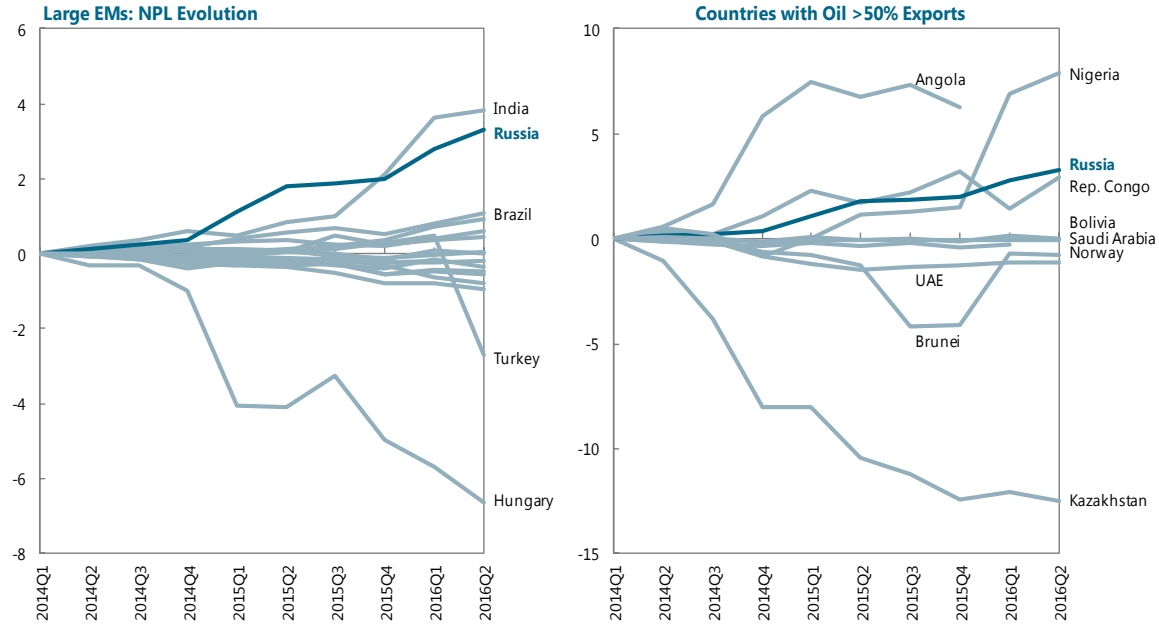
11. Krugman (1989) formalized the concept of hysteresis (i.e., a more prolonged *J*-curve) of exports to large and volatile REER movement attributable to the sunk cost of exporting. He argues that the uncertainty about the future exchange rate leads to delaying the decision to incur fixed costs associated with exporting. Krugman's original argument dealt with REER uncertainty associated with volatile capital flows in the context of the US in the 1980s. However, the argument is

[6] Commodity exports represent over 20 percent of all export or over 10 percent of GDP.

easily extendable to uncertainty related to commodity prices, which is the main driver of Russia's exchange rate. Indeed, in light of the recent rebound of Russia's exchange rate, the 2015–16 depreciation might be viewed by investors as a temporary overshooting.

12. Finally, deep linkages between the commodity and non-commodity sectors can prevent the non-commodity tradable sector from taking advance of the depreciation caused by a commodity price shock because such a depreciation puts under stress the entire economy. The financial sector is the most obvious transmission mechanism. During the commodity boom, the financial system of a commodity exporter becomes concentrated on the commodity sector and on the non-tradable sector (e.g., construction, retail) that prosper during periods of appreciated currency. As the commodity and non-tradable sectors turn sour, the balance sheets of financial institutions come under stress. Fiscal adjustment in the face of the shock can also increase NPLs of companies dependent on public contracts (Alesina et al. 2008). Figure 3 provides some stylized evidence from the most recent oil shock. While few of the 20 largest EMs showed an increase in NPLs of the scale experienced by Russian banks, a few countries with equally large oil-to-exports ratios have shown a similar deterioration in asset quality.[7]

Figure 3. NPL Evolution (p.p. Change since 2014 Q1)



Source: IMF Financial Soundness Indicators.

13. In short, lending becomes restricted and expensive at the very moment when non-commodity tradable industries need to invest in order to take advantage of the depreciated real exchange rate. While established manufacturers may be able to finance expansions internally

[7] There may be some bias in the data. Russia and India were both involved in large scale cleanups of their banking system, so the increase also reflects more stringent supervision. In some oil-rich countries, the deterioration of bank assets may be partially obscured by loan restructurings (evergreening).

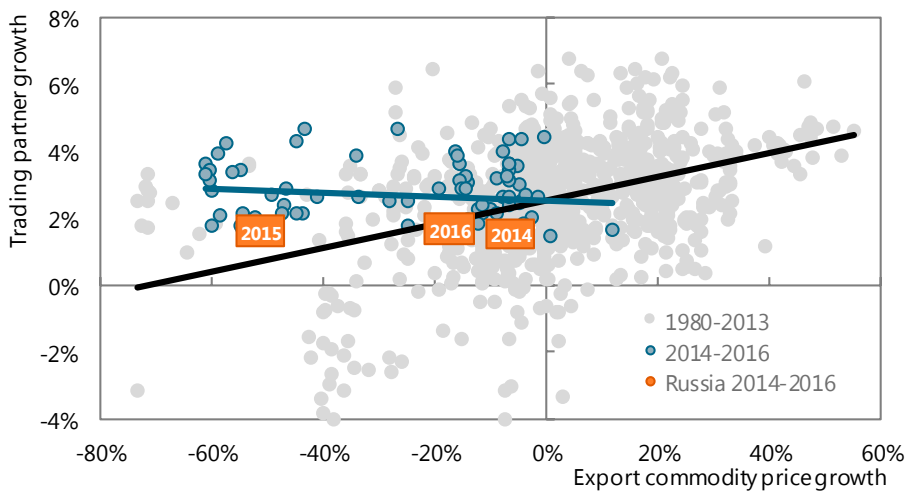
(especially as they see profits rise on the back of improved price competitiveness), tight credit may prevent entry into the sector.

14. Recent empirical studies support the commodity-banking channel. Kinda et al. (2016) show that negative shocks to commodity prices tend to weaken the financial sectors of commodity exporting emerging and developing markets, with larger shocks having more pronounced impacts. More specifically, negative commodity price shocks are associated with higher non-performing loans, bank costs and banking crises, while they reduce bank profits, liquidity, and provisions to nonperforming loans. A bank-level analysis of 46 commodity-dependent LICs by Agarwal et al. (2016) shows a reduction of commodity prices reduces bank lending by domestic bank in commodity-dependent countries on the back of deteriorated bank capitalization.

C. Trading Partner Growth

15. Changes in commodity prices don't happen in a vacuum. An important driver is global demand; the same global demand that drives non-commodity exports directly. Figure 4 shows that this correlation is significant at the country level—trading partner growth is positively and statistically significantly correlated with the export commodity price index for a group of 29 commodity-exporting countries.

Figure 4. Export Commodity Prices and Partner Growth



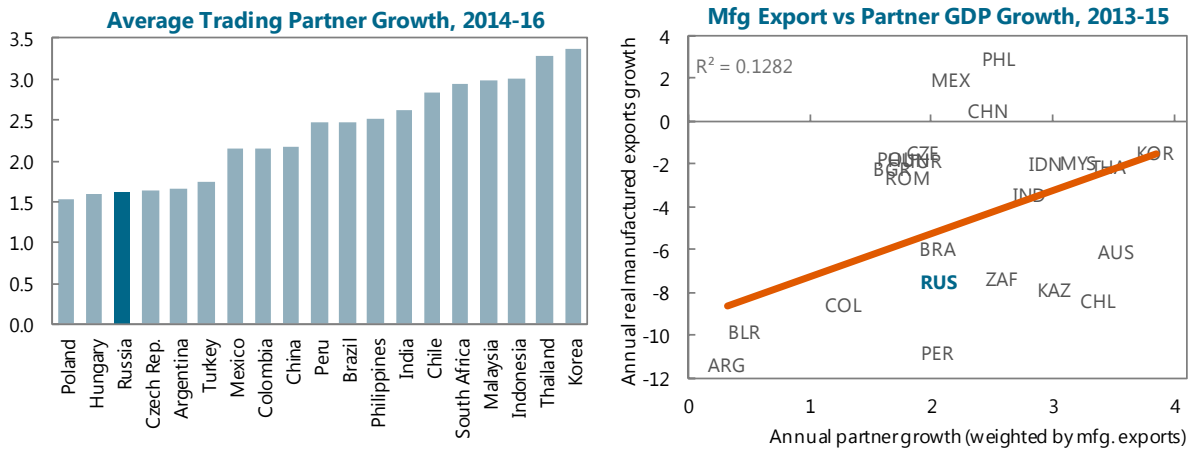
Source: Author's calculations using data from IMF DOTS, WEO, Gruss (2014).

16. The recent drop in oil prices has been linked primarily to supply factors, suggesting that depressed demand should not have prevented countries from taking advantage of improved price competitiveness. Indeed, there is little correlation between trading partner growth and commodity prices when focusing on the 2014–16 period (the 2014–16 regression line in virtually flat in Figure 4)—trading partner growth stayed roughly at the level of long-time averages.

17. However, Russia's experience in the latest oil price decline did not fit the same pattern, as its trading partner have performed significantly worse than those of the average commodity exporter (Figure 4 shows Russia's data points for 2014–16 lie some 1–1½ percentage point below the

corresponding regression line). In fact, Russia's trading partners performed roughly in line with what the longer-term correlation would suggest. The low growth of Russia's export markets is also apparent when comparing it to trading partners of other major EMs (Figure 5, left panel). Russia is at the bottom of the distribution along with a few European EMs, despite being much less dependent on EU's slowly-recovering economy. It is therefore not surprising that Russia's manufacturing exports performed relatively poorly in the same timeframe, as shown in the right panel of Figure 5.[8] It is notable that all EM commodity exporters are well below the regression line, which provides further support to the main result in section B—non-commodity tradable industries of commodity exporters generally face an uphill battle during periods of commodity price collapses, even when controlling for trading partner growth.

Figure 5. Trading Partner Growth and Manufacturing Exports in Large EMs



Sources: Author's calculations using data from IMF DOTS, WEO and Gruss (2014).
Note: Left chart shows export-weighted real GDP growth of each country's export trading partners. Right chart weights trading partners by their share in the exports of manufactured goods on the horizontal axis (see Annex 1). The vertical axis presents annualized growth of manufactured exports deflated by the US CPI.

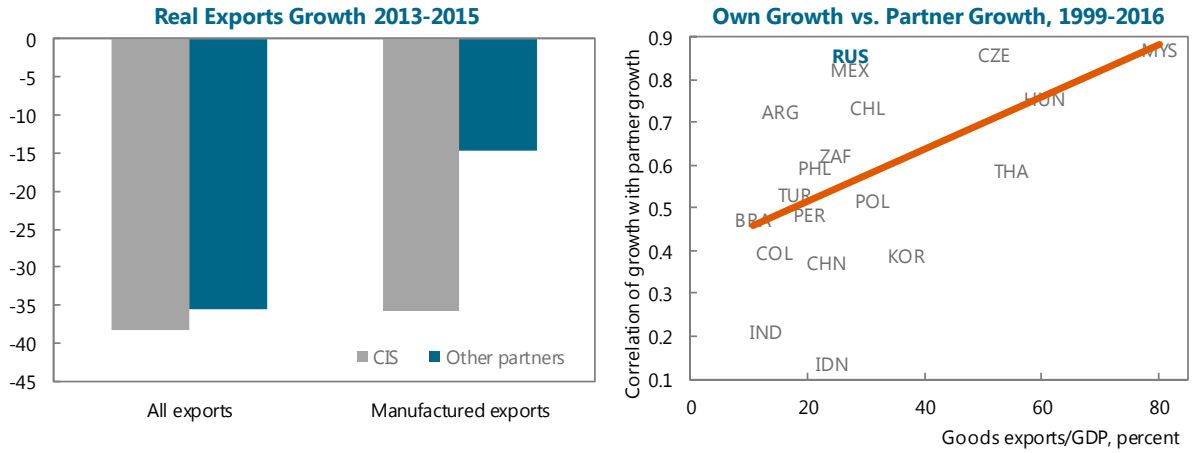
18. Russia's low trading partner growth relates in part to the geographical distribution of its exports, which are highly concentrated on its neighbors. While CIS markets account for just over ½ percent of global GDP, they absorbed 12 percent of Russia exports in 2013 (on the eve of the crisis), and some 28 percent of manufacturing exports. Growth in these countries is strongly correlated with that of Russia, either because the countries are also commodity exporters, or because they are themselves highly dependent on exports to or remittances from Russia. It is therefore not surprising that Russia's manufactured exports registered particularly large drops on CIS markets (left chart in figure 6).[9] The strong dependence on neighboring markets explains a longer-term peculiarity of

[8] Here and below manufactured exports are defined in accordance with Annex 1.

[9] Excluding from the analysis exports to Ukraine, to which exports decreased due to geopolitical tensions, does not change the overall results: manufactured exports to other CIS members has decreased by over 30 percent, more than twice the drop registered on non-CIS markets.

Russia's macroeconomic performance—its growth is much more correlated with that of its export partners than its trade openness would suggest (right chart in figure 6).

Figure 6. Consequences of Russia's Dependence on Neighbouring Markets



Source: Author's calculations using data from COMTRADE.
Note: Exports are deflated by US CPI.

D. Market Access

19. One reason for Russia's excessive concentration of exports on neighboring markets is the fact that Russia has no free trade agreements beyond them. This section investigates whether limited preferential market access—especially when compared to other major emerging markets—may be an additional impediment dampening the non-commodity export industries' response to the real depreciation.

20. The private sector and commentators have mentioned limited preferential access to global goods as a drag on export potential. Comparisons to other EMs are often brought into the discussion. For example, Mexico's car manufacturing industry benefited greatly from tariff-free access to its northern neighbors thanks to NAFTA and a free trade agreement with the EU. Russia's tariff-free trade is restricted to the much smaller markets of the Eurasian Economic Union (EAEU). This makes Russia a poor choice for setting up export-oriented operations, as higher tariff and non-tariff barriers faced for final exports puts Russian-based operations at a disadvantage. On top of that, import trade restrictions raise costs of firms operating global value chains, most of which extend well beyond Russia's immediate neighborhood.

21. Russia currently has regional trade agreements (RTAs) only with other EAEU members and Serbia.[10] The EAEU has de facto replaced 2011 CIS Free Trade Agreement, which Russia has terminated in 2016.[11] Back in the early nineties, most emerging markets were in a similar situation:

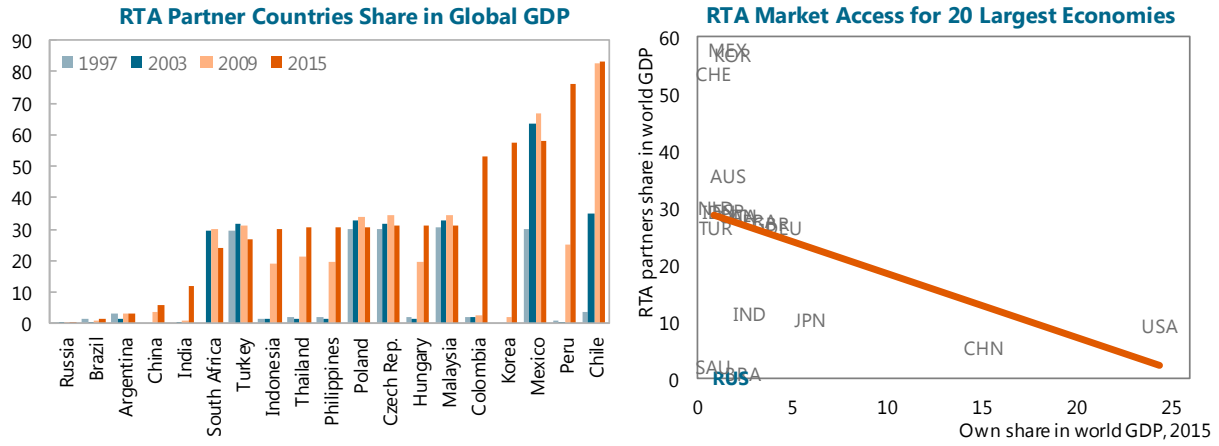
[10] The Eurasian Economic Union (EAEU) includes Armenia, Belarus, Kazakhstan, Kyrgyz Republic and the Russian Federation. It provides for free movement of goods, services, capital and labor, as well as coordinated, agreed or common policy in different areas. The bilateral agreement with Serbia applies to select goods only.

[11] The 1994 CIS free trade agreement was never ratified by Russia.

according to the WTO database, none of the large EMs had RTAs with countries representing more than 1 percent of global GDP. The situation has changed dramatically since the mid-nineties with the establishment and enlargement of major regional agreements (NAFTA, APEC, EU).

22. Figure 7 below shows the explosive growth in the participation on most large EMs in regional trading agreements, with several comparator countries participating in RTAs comprising over half of the global GDP. Russia is a rare exception, with virtually no preferential access to major markets, and no meaningful change over nearly three decades. It could be argued that Russia's large domestic market affords the country to have fewer RTAs. Indeed, large countries generally have less expansive RTA networks (figure 7, right chart). However, Russia is an outlier even by the standards of large economies, as it is last among the twenty top economies on this metric. Carrying through ongoing efforts to establish bilateral agreements (e.g., with India and Vietnam), as well as plans for other RTAs included in announced development strategies could support Russian exporters, as well multinationals contemplating including Russia into their global value chains.

Figure 7. Regional Trade Agreements: Russia Against other EMs and other Large Economies

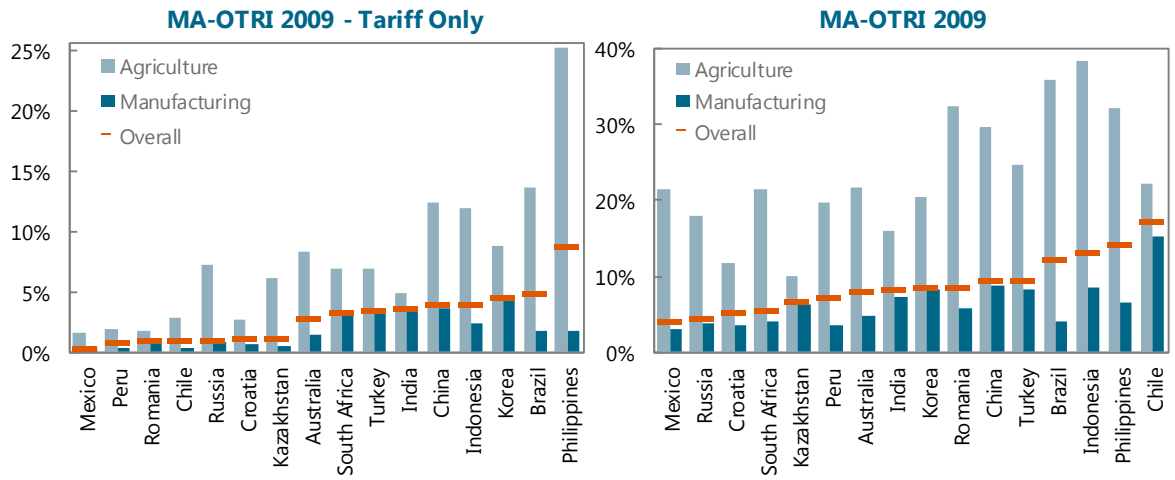


Sources: Author's calculations using data from IMF WEO, WTO, CEPI.

23. Nevertheless, it should be noted that on its existing markets, Russian exporters face relatively low trade barriers. Building on the seminal work of Anderson and Neary[12], Kee et al. (2009) construct MA-OTRI (Market Access Overall Trade Restrictiveness Index)—an index of trade restrictions faced by exporters on their markets. Importantly, it covers both tariff and non-tariff trade barriers. Figure 8 shows that Russia in fact faces relatively low tariff and overall trade restrictions on their external markets. However, the index appears to suffer from selection bias, as it is affected by the markets to which countries export and basket of goods it exports, which are endogenous variables, driven in part by trade barriers. For example, the estimated low barriers faced by Russian manufacturers may be due in part to relatively high share of manufactured exports to EUEA discussed above.

[12] Their work on the subject starts in 1992; a comprehensive overview can be found in Anderson and Neary (2005).

Figure 8. MA-OTRI Index of Restrictions Faced by Exporters



Source: Kee et al. (2009).

E. Quantifying Structural Transformation

24. Sections B and C analyzed aggregate performance of exports in the wake of a ToT shock. This section provides a brief overview of the changing structure of Russia's exports using two analytical tools that operate with disaggregated trade data: export growth decomposition and export sophistication evaluation using the EXPY index.

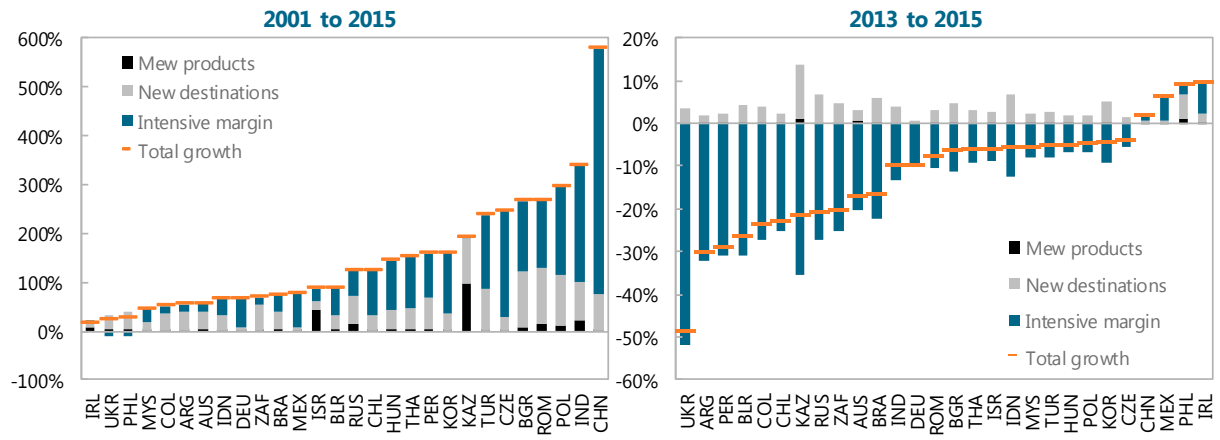
25. Export growth decomposition computes the contribution of the extensive and intensive margins of growth in real exports (denominated in U.S. CPI-deflated US$). The intensive margin refers to exporting more of the old products to old markets (destinations). The extensive margin refers to growth associate with exporting new products and/or exporting to new destinations. The methodology, based on Zahler (2007), and detailed results are covered in Annex 2.

26. Over the medium term, Russia's manufacturing exports grew in a balanced way (Figure 9). New products contributed to 14 percent of total exports growth, which places Russia in the top quintile of analyzed countries.[13] Despite its market access handicap, Russia also managed to grow its exports considerably by introducing its products to new markets. However, the period associated with falling oil prices (right chart in figure 9), shows that commodity price-driven ToT shocks are not conducive to a structural change in the export basket: neither Russia, nor other commodity exporters managed to introduce new products, and few have made significant gains on external markets.[14]

[13] Comparator group includes most large EMs, as well as five advanced economies as benchmarks: two large exporters (Germany and Korea), two hi-tech small open economies (Ireland and Israel) and one commodity exporter (Australia).

[14] The results for Kazakhstan are explained in part by the low base; manufactured exports account for less than a quarter of the country's exports.

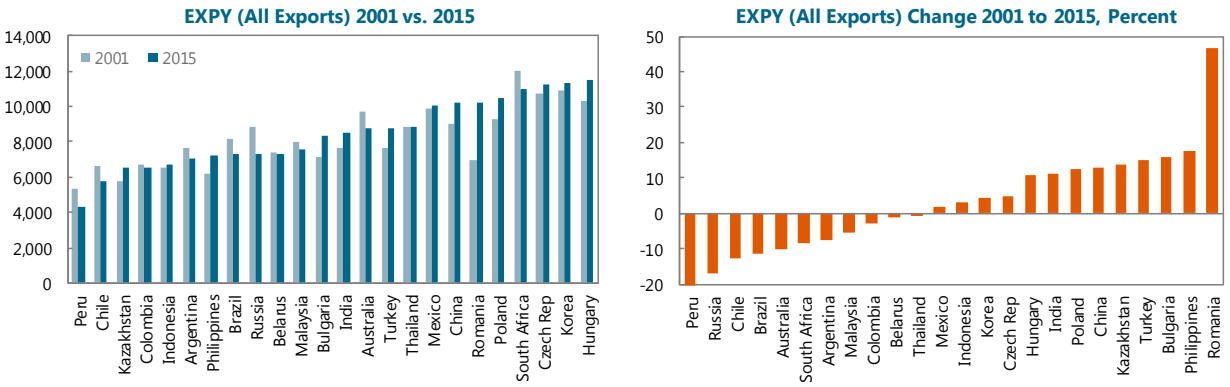
Figure 9. Manufactured Exports Growth Decomposition



Source: Author's calculations based on Zahler (2007) methodology and data from COMTRADE.

27. Sophistication of exports can be measured using the EXPY index, introduced by Hausmann et al. (2007). It is a useful tool for tracking structural transformation of tradables and a good predictor of future growth. The index is based on the observation that rich and poor countries export different goods (e.g., nuclear reactors vs. cotton). A country that manages to export a basket of products that is characteristic for a richer country can be regarded as having achieved relatively high level of sophistication. The index is constructed in two stages. First, an intermediate index PRODY is computed for each product as the weighted average of per-capita GDPs, where the weights correspond to the revealed comparative advantage of each country in the particular good. EXPY for a country is then computed as the weighted average of the PRODY for that country, where the weights are simply the value shares of the products in the country's total exports. Figure 10 shows that Russia's EXPY has decreased significantly between 2001 and 2015, along with that of most other commodity exporters.

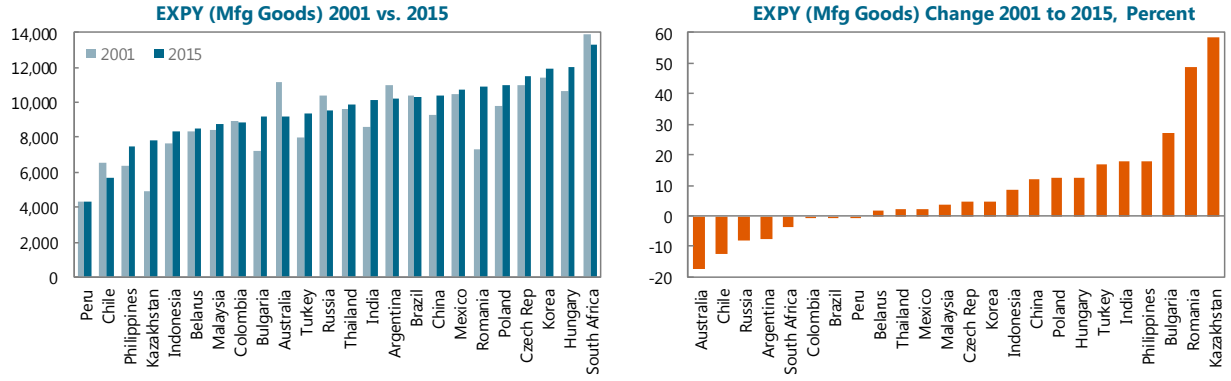
Figure 10. EXPY Levels and Changes for Large EMs



Source: Author's calculations based on data from COMTRADE, IMF WEO and Hausmann, Hwang, Rodrik 2007).

28. However, one issue with EXPY and related indices is that weights are based on dollar amounts, and hence terms of trade shocks change the EXPY even if volumes remain constant. Therefore, evaluating evolution of the overall EXPY during periods of rising/falling commodity prices automatically result in the mechanical decrease/increase of the index (as oil and most other commodities have low PRODYs). Results in figure 10—which places most commodity exporters in the bottom half of the range—could therefore be driven by the increase in the share of commodities on the back of rising real commodity prices between 2001 and 2015. To get around this issue, Figure 11 presents EXPY recomputed for manufactured exports only.[15] The overall picture remains unchanged: Russia, along with most commodity exporters, has registered a negative evolution in the sophistication of the manufactured exports basket. In other words, in line with Krugman (1987), structural transformation in commodity-exporting countries is an uphill battle.

Figure 11. EXPY for Manufactured Goods: Levels and Changes for Large Ems



Source: Author's calculations based on data from COMTRADE, IMF WEO and Hausmann, Hwang, Rodrik 2007).

F. Outlook and Policy Implications

29. This work qualifies the results and conclusions of last year's SIP. Structural reforms will facilitate resource reallocation to other sectors in response to a negative REER shock. However, when the REER shock is the result of an unfavorable commodity price shock, several factors further blunt the competitiveness effect:

- The stress the economy is under due to worsened ToT impedes reallocation of resources to the non-commodity tradable sector; uncertainty and banking sector weaknesses are two channels.
- Episodes of ToT-driven depreciation usually coincide with reduced trading partner growth, which reduces demand for non-commodity exports.
- Low trading partner growth reduces incentives for experimenting with the introduction of new products, which limits opportunities for large structural transformation.

[15] Computing EXPY for a subset of the basket is more straightforward than undertaking a similar exercise for the more recent Index of Economic Complexity, introduced by Hausmann and Hidalgo (2009). This in part explains the reliance on EXPY in this section.

30. These results paint a somewhat subdued picture: the non-commodity tradable sector suffers from an overvalued exchange rate during commodity booms, but busts are not conducive to a rapid reversal of the process. The policy recommendations are therefore for Russia to compensate for this handicap by doing even more on the structural front:

- Attenuate the effects of commodity price effects on the non-commodity sector through highly counter-cyclical fiscal policy – the new mechanism introduced by the Ministry of Finance is a welcome step in this direction.
- Ensure that product and labor market regulations are conducive to reallocating resources in response to price signals (2016 Article IV Selected Issues Paper). This may need to be accompanied by the strengthening of the social safety net.
- Strengthen regional and multilateral trade relations to allow for greater penetration of foreign markets by Russian entities and to facilitate Russia's integration into global value chains.
- Ensure financial system is healthy enough to shift credit to new sectors even during periods of external stress.

Annex I. Defining Manufactured Exports

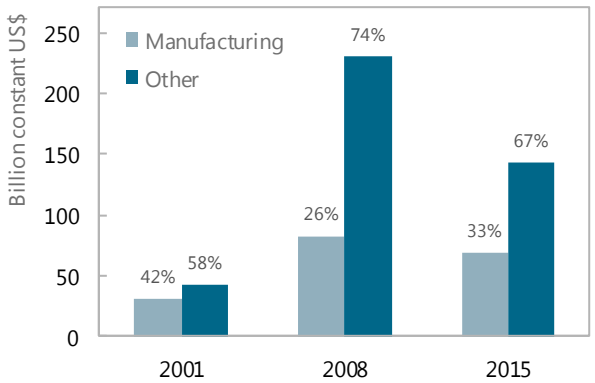
The analysis uses disaggregated trade data from COMTRADE, with goods classified according to the 1996 version of the Harmonized System (HS). There is no single "correct" way to extract manufactured exports only from HS data, in part because what constitutes a manufactured good is subject to interpretation (how much processing should a raw material be subject to before it becomes a manufactured product?). However, classifications of economics activities—ISIC (UN), NAICS (NAFTA countries) and NACE (Eurostat)—do separate manufacturing. Matching one of these classifications (all of them compatible among each other, at least at the 2-digit level) with HS 1996 codes would allow to isolate manufactured exports in a consistent and replicable way for all countries used in the analysis.

We rely on Pierce and Schott (2009), who provide a concordance table between HS 1996 and NAICS 2007 codes. In the first step, HS codes corresponding to NAICS codes 31 through 33 are labeled as manufactured goods. This eliminates most raw materials within broad HS categories (e.g., excludes raw furs, but not leather products; excludes wood logs, but not sawn wood). In the second step, we eliminate two broad sets of HS codes (even if they are classified as manufacturing under NAICS): agricultural products, including processed foods (HS 2-digit codes 01 through 24), and mineral commodities and their derivatives (codes 25 through 28).

While the elimination of mineral products is self-explanatory, the blanket elimination of all agricultural and food products deserves an explanation. One of the objectives of the study is to understand the impact of price competitiveness on non-commodity imports. However, when it comes to agricultural products and processed food, export performance is subject to factors that are outside the scope of this study. Two of them are universal: weather (affects the harvest) and global prices for agricultural commodities. The third one is unique to Russia: counter-sanctions—introduced soon after the devaluation—have predominantly affected processed foods, and have been quoted as an important contributor to flourishing import substitution in respective sectors. To the extent that import substitution spills over into exports (e.g., thanks to learning-by-doing externalities accumulated on the domestic market), it is difficult to separate the exports response to price devaluation from that to counter-sanctions.

The figure shows the broad evolution (in constant US$ terms) of Russia's exports separated into two main categories: manufacturing vs. the rest.

Figure. Russia's Exports in Constant US$



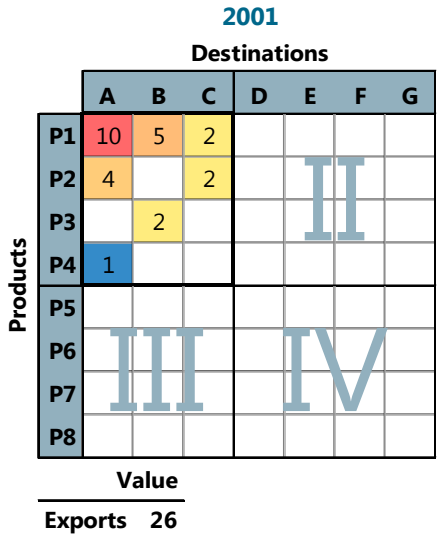
Annex II. Export Growth Decomposition: Methodology and Extended Results

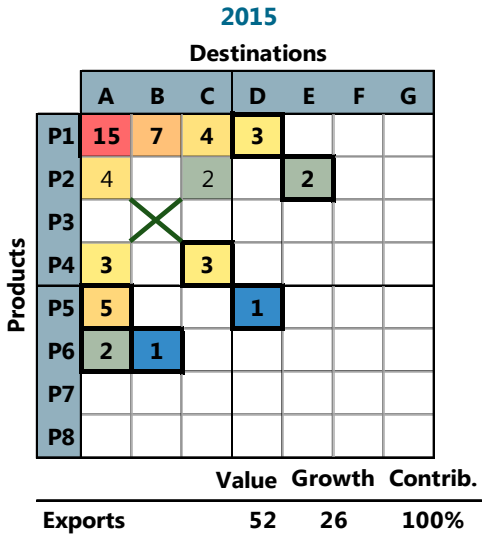
An export growth decomposition analyzes export growth along the intensive and extensive margins, where the intensive margin reflects growth due to exporting "more of the same", while the extensive margin has both a product and market dimension (exporting new products and exporting to new destinations).[16]

Stylized Example

The methodology is best illustrated with the following stylized example (see Figure). The full set of possible product-destination (PD) combinations can be visualized as a matrix with some 200 columns (countries) and some 5000 rows (products in the Harmonized System).

Figure 1. Conceptual Presentation of the Export Growth Decomposition Exercise





	Value	Growth	Contrib.
Exports	**52**	**26**	**100%**
Surviving P-D	35	11	42%
New P-D, old spac	3	3	12%
New P, old D	8	8	31%
Old P, New D	5	5	19%
New P, New D	1	1	4%
Dead P-D	-2	-2	-8%

Suppose a country filled in 2001 only 7 cells of this product-country matrix, by exporting 4 products (P1 through P4) to 3 countries (A through C). The numbers within cells represent the value of exports of each product-destination (PD) combination, which sum up to 26. Note that only P1 is exported to all three countries. The 3-by-4 PD subset in which all exports are located is called the

[16] Based on Zahler (2007) methodology.

potential PD space (outlined with bold line), and defines quadrant I. Assume exports doubled to 52 in value by 2015. Forty two percent of this growth was on account of old goods to old destinations (*surviving PD*). Filling cells within the old potential PD space (P4 to C) accounts for 12 percent of growth. Sending old goods to new destinations (quadrant II) accounts for 19 percent of growth; new goods to old destinations (quadrant III) account for 31 percent of growth; and new products to new destinations (quadrant IV) account for 4 percent. Finally, the death of old PD combinations (P3 no longer exported to B) has a negative contribution of 8 percent.

Interpretation of Results

The sum of surviving PDs and extinct PDs represents the intensive margin of export growth, whereas the rest are part of the extensive margin of growth (along the product and destination dimensions). The relative importance of these five margins (surviving PDs, new PD in the old space, new P old D, new D old P, new P and D, extinct PDs) can shed light on the degree of experimentation that a country's exporting sectors are involved with, and therefore their ability to capture new business and, more generally, successfully engage in a structural transformation of the economy.

The exercise can only be undertaken between two points in time. Naturally, the shorter the interval between the two extremes, the larger is the contribution of surviving PDs (intensive margin), as only a very small number of products is introduced each year, and only a few new markets are captured. Over longer periods of time, extensive growth will play a more prominent role (because it incorporates all the new PDs added in all intervening years, and growth registered by each new PD in the interim).

Detailed Results

Figure 2 presents full decompositions for Russia, focusing on different periods (e.g., pre-GFC boom vs. the post GFC), and different basis of the analysis (all exports vs. manufacturing exports only). The charts in panel figure 3 compare Russia to other large EMs and a small sample of advanced economies.

Figure 2. Export Growth Decomposition for Russia

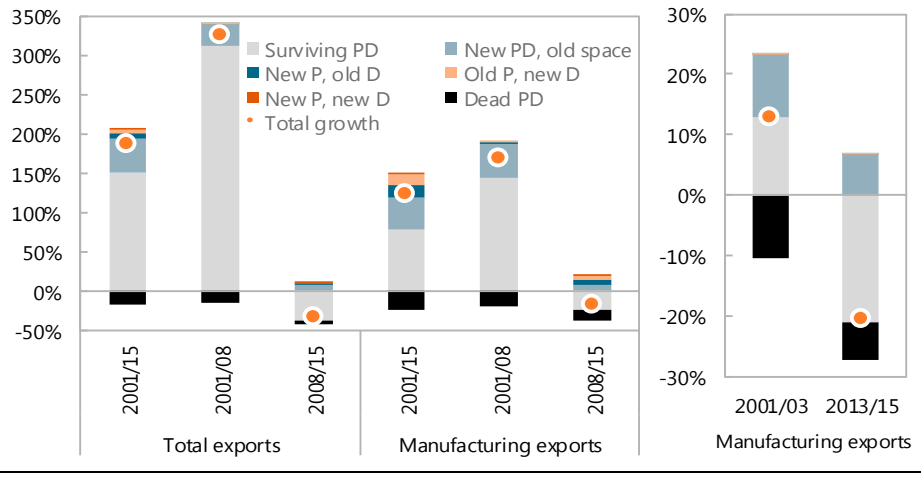
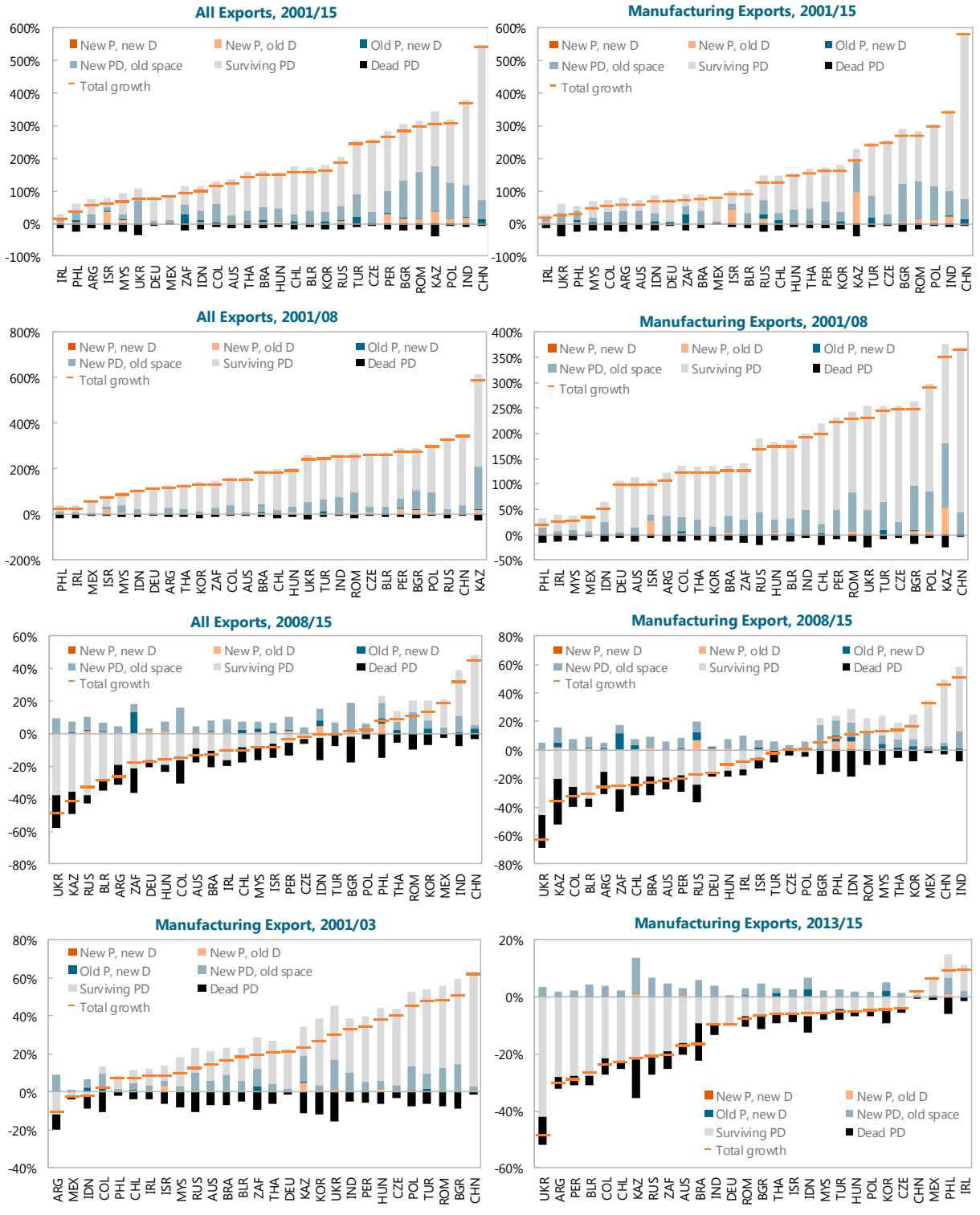


Figure 3. Export Growth Decomposition for Select Countries



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EVALUATING FISCAL RULES?[1]

A. Introduction

1. A fiscal rule for Russia should shield the budget from volatile oil prices, replenish the reserve fund and save for future generations. An appropriate rule must delink public expenditure from volatile oil prices to reduce fiscal procyclicality and mitigate the effect of oil on the real exchange rate (REER) preserving the competitiveness of the economy. In the short-term, increasing fiscal policy buffers and replenishing the nearly-depleted reserve fund, are a priority to protect against volatile oil prices. In preparation for the period after the depletion of oil reserves, the fiscal target should account for inter-generational equity; i.e. how much current and future generations benefit from resource wealth and consider long-term budget pressures from a rapidly aging population.

2. This paper assesses the authorities' proposal for a new fiscal rule. The IMF Flexible System of Global Models (FSGM) is used to simulate fiscal and macroeconomic outcomes under three alternative rules—the authorities' proposal for a new rule; the old rule suspended in 2015; and staff's proposal that modifies the old rule—and different oil price shocks. The simulation shows that the authorities' proposed new rule appropriately builds up the nearly depleted reserve fund under a scenario where oil prices are as in staff's baseline and in the scenario where oil prices are persistently higher than the US$40pb benchmark. However, should oil prices be persistently lower than the US$40pb benchmark, the new rule results in lower savings compared to Staff's proposed rule. Simulations illustrate that savings can be achieved through a more stringent fiscal target as in Staff's proposal, a more credible option, instead of an inflexible conservative benchmark that risks the fiscal rule being abandoned should oil prices be persistently below or above the benchmark price. Moreover, both staff and authorities' proposed rules perform equally well in shielding the economy from volatile oil prices, with no discernible difference among the rules in their impact on growth and the real effective exchange rate. Finally, the simulation validates the reason for abandoning the old rule—maintaining the old rule would have led to the lowest savings and highest spending in the period of high oil prices and to a large fiscal stimulus in the face of persistent low oil prices, quickly depleting reserve buffers and increasing debt.

B. Russia's Fiscal Rules

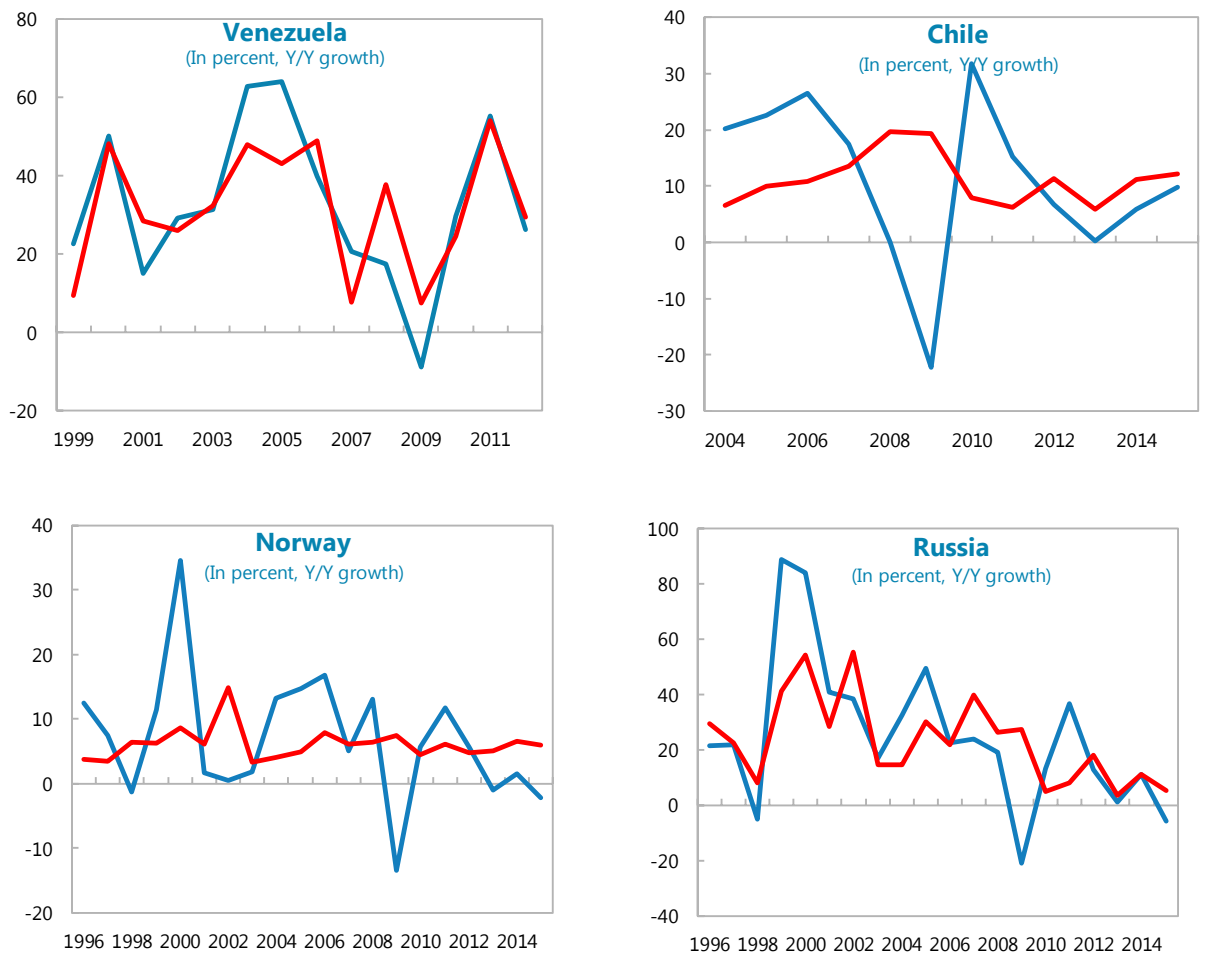
Considerations for a Fiscal Rule

3. Fiscal outcomes are better in countries with fiscal rules. Fiscal rules encourage counter-cyclical fiscal policy to mitigate revenue volatility. For example, expenditure growth is de-linked from revenues countries with well-developed fiscal rule frameworks as in Norway and

[1] Prepared by Gabriel Di Bella, Oksana Dynnikova, Zoltan Jakab and Annette Kyobe.

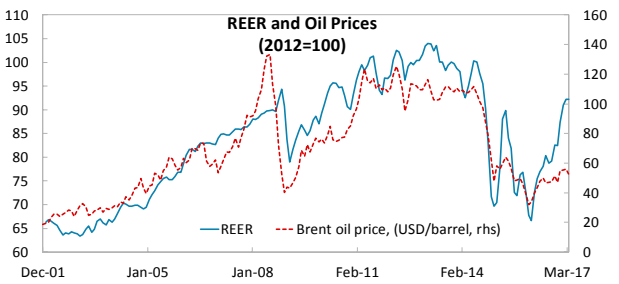
Chile, to a lesser extent in Russia and highly correlated in Venezuela, a country with no fiscal rule (see Figure 1).

Figure 1. Fiscal Rules or Lack Thereof—Central Government Revenue and Expenditure



IMF Staff estimates.

4. An important objective for a fiscal rule in Russia is to delink government expenditures from oil prices. The energy sector accounts for around one-fifth of GDP, two-thirds of exports, and around one third of general government revenues. Since energy revenues are so large, fluctuations in oil and gas prices generate fluctuations in budget revenues that are passed onto expenditures, in turn resulting in fluctuations in the REER, inflation, and output volatility. Moreover, in the past, high oil prices led to an appreciated exchange rate resulting in an even less diversified economy over time.



5. An appropriate fiscal target should consider long term fiscal sustainability. Establishing a fiscal target should account for long-term fiscal liabilities, demographic trends and consider intergenerational equity. Russia's current and projected non-oil primary deficits are larger than the long-term fiscal benchmarks consistent with intergenerational equity (in the range of 3–4.5 percent of GDP, see SIP, 2015). Moreover, Russia has long-term fiscal risks to consider including off-balance sheet liabilities deriving from implicit liabilities to the pension and health systems, transfers to SOEs, the banking sector, and subnational governments.[2] An additional consideration in Russia are investment needs, thus long-term sustainability benchmarks could be established based on a modified permanent income hypothesis (MPIH) rule that allows front-loading of capital expenditure or a Fiscal Sustainability Framework that explicitly accounts for the expected impact of higher investment on growth and non-resource revenues. [3]

6. Considerations for a fiscal rule should account for the interaction between federal and regional budgets. About 40 percent of consolidated general government spending is executed in regions and extra budgetary funds (EBFs). Consolidated federal transfers (through the budget or federal extra budgetary funds, EBFs) to the regions (including territorial EBFs) represented 3.5 percent of GDP in 2016 (about 65 percent of federal oil and gas revenues). Transfers finance a large share of regional fiscal spending. These earmarked transfers decrease federal spending flexibility, creating challenges for the design and coverage of a fiscal rule.

Russia's Fiscal Rules: Past and Present

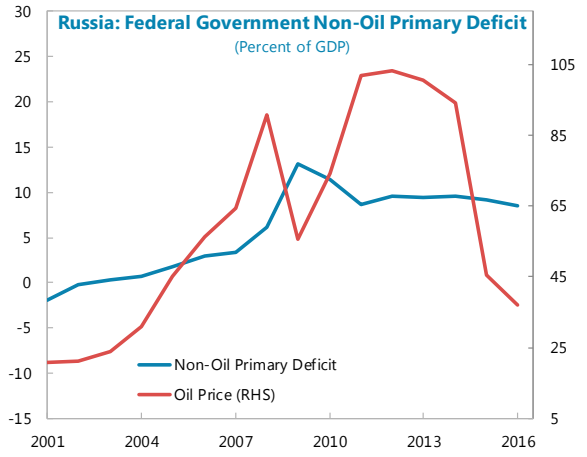
7. Shortcomings in previous frameworks led to procyclical fiscal policies and insufficient savings. In the early 2000s, fiscal policy focused on the overall balance, rather than the non-oil balance, leading to procyclical fiscal policies which amplified the oil price boom and put appreciation pressures on the currency. As part of a reform of the fiscal framework, a formal fiscal rule was introduced in 2008 followed by a second rule in 2013. Despite sound theoretical underpinnings, both rules suffered from unsustainable parametrization and proved untenable in the face of large shocks (Box 1). The first rule was suspended to allow for a fiscal package to stimulate the economy during the global financial crisis. The second rule was abandoned in the face of the dual shock of lower oil prices and sanctions, as it led to an overly generous spending envelope in light of persistently low prices. Furthermore, resources in the oil funds appeared insufficient for supporting expenditiures at levels prescribed by the rule.

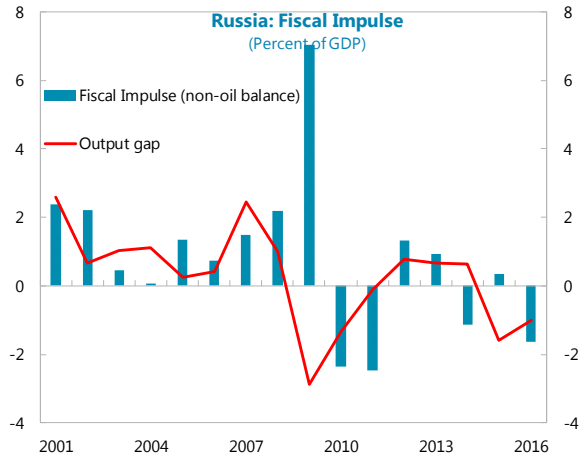
[2] The net present value of the increase in pension costs is estimated at 98 percent of GDP, and healthcare costs at 37 percent of GDP. This represents the cost of the expected increase in pension spending as a share of GDP from its current level, which is driven largely by expected increases in life expectancy, relatively early retirement ages for women and men, and continued low fertility rates, see Fiscal Transparency Report.

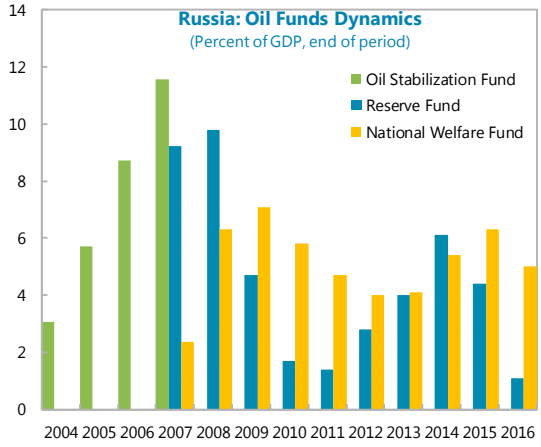
[3] Modified PIH deviates from PIH by allowing a scaling up of investment over the medium term, but followed by a scaling down of spending after the "scaling up" period to preserve net financial wealth at the PIH level. It does not consider the growth impact associated with additional investments. Unlike the FSF which aims to stabilize net resource wealth (over the longer term) at a level lower than the PIH, or MPIH, while allowing scaling up of expenditures—lower financial wealth will be compensated by higher non-resource revenues, see Macroeconomic Policy Frameworks for Resource-Rich Developing Countries.

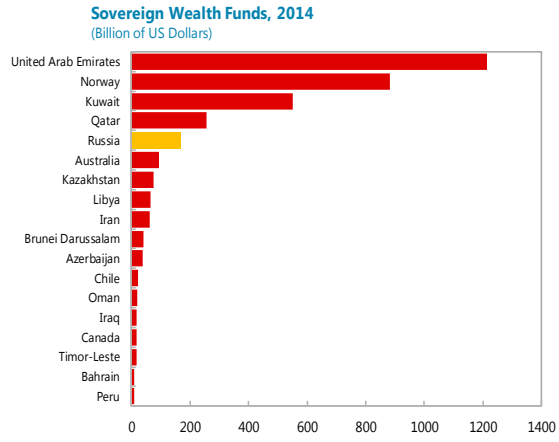
8. The authorities' are proposing a new fiscal rule to shield the budget from oil price fluctuations and replenish the reserve fund. The new fiscal rule, likely to be reinstated in 2019, will target a primary balance calculated at a benchmark oil price. The benchmark oil price is fixed at US$40pb (in real US$ 2016 terms) with a proposed annual adjustment of the oil price benchmark by US CPI inflation—implicitly assuming the relative price of oil with respect to the CPI basket remains constant. The US$40 benchmark price equates to a 50-year fixed (1965–2015) long-term average oil price. For dealing with persistent drops in oil prices, the authorities are considering capping decreases in fiscal buffers whenever they reach a threshold of 5 percent of GDP.

Figure 2. Procyclical Fiscal Policies and Insufficient Savings









Sources: Institutional Investor; national authorities; Sovereign Wealth Center; Sovereign Wealth Fund Institute; IMF staff reports and IMF staff estimates.

9. The authorities' proposed new fiscal rule is broadly appropriate.[4] Though not fully consistent with intergenerational equity, the rule appropriately includes a fiscal anchor, which is a "quasi-structural" primary balance (defined as the primary balance excluding the cyclical component of resource revenues). In addition, the use of a fixed oil-price benchmark appropriately delinks expenditures from externally-driven volatility in commodity prices. Finally, the rule provides a simple framework for saving (drawing down) oil resources when the actual oil price is higher (lower) than the oil price benchmark. The oil price benchmark of US$40, notwithstanding that it is fixed and assuming it can be credibly implemented (i.e. resisting pressures to spend windfall oil revenues if oil prices are significantly higher than US$40) may be prudent. Not only does it increase savings, compared to benchmarks established under previous fiscal rules, it is apt, given the time series properties of oil prices and macro-economic conditions (the economy has adjusted to an oil price of around US$40 pb and the REER is no longer considerably overvalued).

Box 1. Russia's Previous Fiscal Frameworks

Russia established an Oil Stabilization Fund (OSF) in 2004, but it was not supported by a full-fledged fiscal rule. In the context of rising oil prices the Fund was established to save windfall oil revenues—export duties and the mineral extraction tax—and shield the budget from oil price fluctuations. Oil revenues above a cut-off price (US$20 pb in 2004–05; US$27pb in 2006–07) would be accumulated in the OSF. OSF balances above US$20 billion would be freely usable. Despite heavy use, the OSF reached US$157 billion at end-2007. Given the lack of a fiscal rule—no targets were set for the fiscal balance, or limits established for new borrowings—the OSF did not prevent fiscal policy from being pro-cyclical. Fiscal policy was loose and the non-oil and gas federal deficit increased from 2.9 percent of GDP in 2002 to 5.1 percent in 2007, and to 6.5 percent in 2008. As part of the reform of the fiscal framework in 2008, the OSF was abolished and two new Funds were created. The Reserve Fund (initial balance of US$25 billion) would be used to smooth public spending against oil price fluctuations; and, the National Welfare Fund (initial balance of US$32 billion) would finance long-term liabilities of the pension system. Oil revenue windfalls would be saved in the RF until it reached 7 percent of GDP; 50 percent of the excess would then accrue to the NWF, and the remaining portion would finance infrastructure and other priority budgetary projects. After more than a decade of record-high oil prices, resources in Russia's NWF stand at US$73 billion, while the Reserve Fund (RF) is nearly depleted—declining from US$125 billion in early 2008, to US$16 billion as end-2016 (See Figure)

A formal fiscal rule was introduced in 2008 but suspended during the global financial crisis. The rule targeted a long-term non-oil fiscal deficit of 4.7 percent of GDP to be achieved by 2011, beginning at a deficit of 6.6 percent of GDP in 2008. This target was consistent with a POIM approach and kept government spending constant in real terms in the long run, supporting intergenerational equity and fiscal sustainability. The rule was suspended to allow for a fiscal package to stimulate the economy during the global financial crisis. It was abolished in 2012.

[4] The authorities proposal is incomplete and subject to change. We evaluate elements of the intended fiscal ruel outlined in budget guidelines for 2017–19, with the cavtear that aspects of the final rule may change.

Box 1. Russia's Previous Fiscal Frameworks (concluded)

A redesigned fiscal rule was implemented in 2013 and abandoned in 2015 following the sharp decrease in oil prices. The previous budget balance rule was replaced by an expenditure rule that was first, more intuitive to explain to the public (low headline deficits had masked urgent needs in sizable budget consolidation) and second the thinking was setting limits on expenditures would be clearer than setting limits on non-oil deficit and thus more sustainable. The rule set a ceiling on federal expenditures equivalent to the sum of oil revenues measured at a benchmark oil price, plus non-oil revenues, plus a net borrowing limit of 1 percent of GDP. The benchmark was set as the minimum of a backward-looking moving average of up to ten years of Urals oil price—a proxy for the long-term price of oil; and (ii) a three-year backward looking average, to protect the budget from excessive deficits in the event of a sustained fall in oil prices. The rule did not ensure a fast-enough adjustment of benchmark oil prices and its continued implementation would have resulted in unwarrantedly large non-oil fiscal deficits. Even the 3-year moving average escape clause resulted in a benchmark price of about US$85pb versus an actual oil price of US$42pb in 2016.

Modifications to Strengthen the Proposed New Rule

10. The oil-price benchmark could adjust to perceived changes in the long-term price of oil. The fixed US$40 pb in the oil rule formula may not prove credible should oil prices be persistently and significantly higher than this benchmark. The choice of a benchmark formula represents a tradeoff between smoothing expenditures and adjusting to changes in oil prices. In principle, fiscal policy should adjust to permanent/persistent oil price shocks and smooth-out short-term fluctuations. Hence, a higher pace of adjustment of the oil-price benchmark is desirable if an oil price shock is permanent or persistent, which is only known ex-poste. One possibility to the make oil-price rule more flexible is to include futures oil prices in the benchmark calculation. The caveat is that future oil prices (in levels) are strongly correlated with observed oil prices and may not give a good indication of the "structural" price of oil (Box 2). Thus, while the benchmark will adjust more rapidly to changing trends they can also result in greater expenditure volatility and possibly pro-cyclical fiscal policy.

11. The fiscal rule could target a surplus, informed by long-term fiscal considerations.[5] Rather than targeting a balance, the fiscal anchor should be a surplus that considers inter-generational equity. With the primary balance of zero, non-oil primary deficits are each year around 1 percentage point higher than the long-term fiscal benchmarks consistent with inter-generational equity.[6] Saving more through the fiscal target may be a more credible option than through accumulating savings through the reserve fund by assuming an artificially low oil price

[5]Using the intertemporal budget constraint criterion for fiscal sustainability under normal dynamic efficiency conditions (r-g>0, which should be the case in any well-defined steady state) the government's intertemporal budget constraint demands that existing debt be equal to the NPV of future surpluses (that is existing government debt must be backed by future surpluses). The NPV of zero being zero, the proposed rule violates any well-defined intertemporal budget constraint, see A Practical Guide to Public Debt Dynamics, Fiscal Sustainability, and Cyclical Adjustment of Budgetary Aggregates.

[6] Selected Issues Paper 2015

in the benchmark calculation. Finally, the choice of a primary balance target compared to overall balance is questionable, since should assumptions on interest rates or growth be incorrect, it may set debt on unsustainable path—either to zero or infinity.

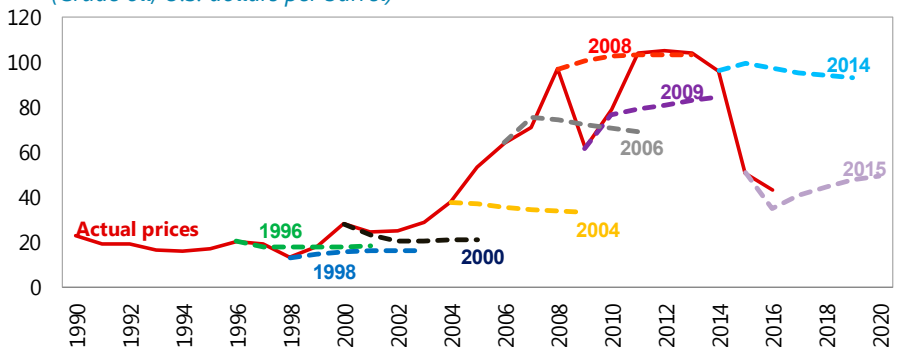
12. An additional target on spending could help avoid pro-cyclicality. Including a rule by which primary expenditures do not grow by more than the (estimated) long-term growth rate in real terms would address residual procyclicality inherent in a non-cyclically adjusted primary balance fiscal rule. Though a fixed-oil price benchmark eliminates the main element causing pro-cyclicality in the previous fiscal rules, i.e. volatile oil prices, the rule is not as good as a structural balance rule that would exclude the cyclical component of output beyond oil prices. Excluding the cyclical component of oil revenues by using a benchmark price (assuming this captures the "structural" price of oil) is a good approximation of a structural balance rule, if the if the oil price gap ("structural" price minus actual) is well correlated with the output gap. However, if demand shocks are unrelated to the oil price gap, then the authorities' primary balance rule would be procyclical.

Box 2. Determining a Benchmark Oil Price

Forecasting oil prices has become increasingly difficult as prices have become highly volatile. Establishing an oil price benchmark is further complicated by the less than obvious time series properties of oil prices. This complicates the task of separating observed oil price fluctuations into permanent and temporary components. Introducing future oil prices (as predictor of actual future oil prices) though helpful in allowing the budget to adjust to the new oil prices, may not be useful in anchoring long-term benchmark oil prices. Future oil prices (in levels) are strongly correlated with observed oil prices and thus, their gives more weight to current oil prices. If the current oil price is off its long-term equilibrium, the use of oil price futures to anchor the budget benchmark may not be optimal.

A Poor Record of Forecasting Oil Prices

(Crude oil, U.S. dollars per barrel)



Sources: IMF staff estimates and market projections. 2015 represents an estimate based on actual data for part of the year and future contracts.
Note: The solid line represents actual crude oil average prices for the year. 2015 represents an estimate based on actual data for part of the year and future contracts. The dashed lines are based on market projections for prices (future contracts).

Box 2. Determining a Benchmark Oil Price (concluded)

The proposed US$40 pb, a 50-year average, is an improvement compared to benchmarks in previous rules. An observation of the series suggests that large changes in the oil prices, whether positive or negative, tend to be persistent (Annex 2). Using 3, 5 and even 10 year averages (as in previous rules) as a proxy for long-term oil prices could result in a persistent overvaluation or undervaluation of the real effective exchange rate as the level of fiscal expenditures is tied to an oil price that is above or below the long-term oil price. Moreover, the shorter the period use to calculate the moving average, the more the benchmark oil price fluctuates—an undesirable property if the authorities' policy objective is macroeconomic stability.

An independent committee to establish the benchmark price of oil to include in the budget could be considered. An informed panel of experts would likely have a better guess on the persistent component of oil prices using different methodologies than applying a mechanistic formula, or using the current proposal of a fixed benchmark. The committee could put the oil price formula for review periodically or should oil prices move significantly, independently of the Ministry of Finance that could have political economy considerations in changing a benchmark.

13. The design of escape clauses should be strengthened to allow adjustment of the rule to persistently low oil prices. In the absence of an oil price rule that adjusts to persistently lower oil prices, escape clauses that cap withdrawals from the reserve fund are important for dealing with persistent drops in oil prices. Whenever escape clauses are triggered, expenditure should adjust down. This mechanism would be an automatic stabilizer if long term or structural oil prices turn out to be lower than the US$40 pb benchmark. Escape clauses should be complemented with borrowing constraints to insure permanent drops in oil prices are internalized in the budget process.

14. As an alternative, targeting a structural non-oil balance should be considered, once additional data is available. A structural primary non-oil balance (adjusting for the economic and commodity cycle) as a share of potential non-oil GDP, would reduce the pro-cyclicality currently embedded in the proposed rule i.e. a high (low) forecast of nominal GDP growth (especially non-oil GDP) would translate into higher (lower) cap on spending through higher non-oil revenues, regardless of Russia's economic cycle. Adjusting for the economic cycle is, however, complicated and subject to uncertainty, and cyclically adjusted balances are often revised ex-poste due to revisions to potential GDP. Notwithstanding the difficulties described in estimation, Russia should compile data on non-oil GDP to calculate a non-oil structural fiscal balance. Other sources of potential fluctuations in oil revenues—long-term projections on oil production and revenues—should be monitored. Profits from oil and gas producing companies should be excluded from non-oil revenues and included in oil revenues. The final objective should be to establish a rule that ensures a constant flow of oil revenues to the budget, as in Norway (See Table A1 that summarizes the design of fiscal rules in Chile and Norway).

C. Simulations of Fiscal Rules

15. In this section, we evaluate the authorities proposed fiscal rule against alternative fiscal rules:

- The authorities old rule, suspended in 2015 after the sharp fall in oil prices. Under the rule, the oil-price benchmark is set as the minimum of (i) a backward-looking moving average of up to ten years of Urals oil prices; and (ii) a three-year backward looking average. Federal expenditures were capped ex ante at the sum of projected non-oil revenues, oil revenues at a benchmark price (in US$) converted to ruble, and net financing of one percent of GDP.

- Staff's proposed rule that modifies two parameters of the old rule: i) it uses future prices to establish a benchmark oil price—the oil price rule is a 5-year average for the past and 5 years ahead futures prices (instead of the backward moving average)—to allow for a faster adjustment in fiscal policy in response to oil-price developments ii) it increases the target to a surplus of 1 percent of GDP (instead of a deficit of 1 percent of GDP) to generate more savings.

16. The IMF Flexible System of Global Models (FSGM) is used to illustrate fiscal and macroeconomic outcomes under alternative rules and different oil price shocks. First we conduct a counterfactual simulation between 2010–16, the time interval includes a period of high oil prices and the large negative oil price shock of 2014/15. The counterfactual has the advantage of accurately depicting the state of the economic cycle and the evolution of oil prices. In a second simulation, we assess rules under both temporary and persistent positive and negative oil supply shocks. Rules are assessed on their ability to build savings and their broader impact on the economy i.e. their effect on the real effective exchange rate and growth.

17. The impact of adjustment under a fiscal rule on the economy is determined by several assumptions in the model simulation (Annex I). As a first step, we calculate the non-resource primary deficits that would have prevailed had each of the three fiscal rules been in place. The fiscal adjustment needed to comply with the rule is measured by change in the non-oil primary deficit. We assume it is met by an equal cut to government transfers and government consumption.[7] Financing for the deviation of the fiscal path under the fiscal rules from the baseline is provided in the first instance by holdings in the reserve fund, with any residual financed by domestic borrowing. Consolidation does not have a large negative impact on growth it is achieved through cuts to transfers and government consumption, rather than investment which has a large fiscal multiplier.[8]

[7] Recently federal government spending cuts have been in the form of a nominal freeze of total spending. Previous rules did not define how spending would be cut across different expenditure categories. Other laws, however, prevent discretionary changes in categories of social spending and include a list of protected items i.e. wages, payment of court rulings, transfers to support poor regions' budgets, debt service, contributions to international organizations, and some other intra-budgetary transfers.

[8] The conventional assumption that capital spending has a higher fiscal multiplier than current spending may not hold in Russia. Current spending includes education and health spending, important for human capital accumulation,

In addition, monetary policy is supportive, whereby lower policy rates result in a more depreciated exchange rate—thus higher exports and GDP growth—offsetting any short term negative impact of consolidation on growth. Lower policy rates result from the expectation that debt will be lower in the future. Agents expect a credible debt reduction that leaves room for a future cut in distortionary government spending resulting in lower long term rates. There is a small negative impact of fiscal consolidation on potential output through the accumulation of capital, as real investment drops in the short run as a reaction to lower government consumption and the associated weaker demand outlook.

The Counterfactual

18. In a counterfactual simulation, we illustrate the economy would have been on sounder footing had fiscal rules been consistently implemented (Panel 1). The table shows the key parameter, the non-oil primary deficit under the counterfactual. All rules would have made fiscal policy more countercyclical—lower non-resource primary deficits in the first part of the sample (when oil prices are high) allowing for a looser fiscal stance after 2014 (when oil prices are low) (See table). Savings would be higher, with lower overall deficit and debt to GDP ratios. Russia would have more assets than liabilities under all fiscal rules, 16 percent on average, compared to actual liabilities of 4 percent at end-2014. Consolidations early in the sample, in tandem with a supportive monetary policy (policy rates are lower under the expectation of lower future debt) result in a more depreciated exchange rate and hence higher growth, offsetting any negative impact of consolidations on growth.[9] Hence growth and inflation dynamics are not compromised and remain close to actual under all fiscal rule scenarios (Figure 2).

	2010	2011	2012	2013	2014	2015	2016
Projected non-resource primary deficits							
1. Old rule	7.4	6.6	7.3	7.5	8.8	12.3	11.4
2. New rule (benchmark@40)	3.8	3.5	3.7	3.6	4.0	5.6	5.3
3. Proposed rule	7.1	6.8	6.3	5.7	6.1	7.3	5.0
Baseline	11.2	8.4	9.4	9.3	9.5	9.0	8.9

IMF staff estimates

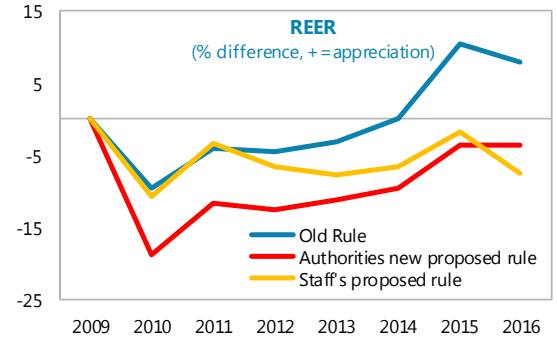
19. Comparing across rules, the simulation validates the reason for abandoning the old rule. Not only did the old rule result in the lowest savings and the highest spending (oil revenues at a benchmark price of US$79, almost equal to spot plus non-oil revenues) during high oil prices but it also results in the least competitive economy. Higher spending results in higher inflation which is moderated by raising short-term policy rates which puts upward pressure on the exchange rate. Furthermore, it would have led to a massive fiscal stimulus in the face of persistent drops in oil prices. This would have quickly depleted buffers, running down the RF to 3 percent of GDP and

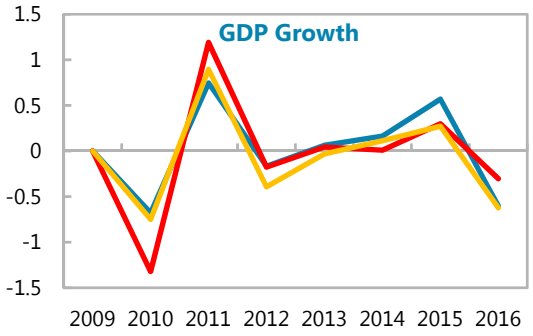
while public capital spending includes military spending, an item that might have a lower impact on growth than investment in infrastructure.

[9] In Russia, the main channel through which the budget negatively affects growth in the long term is by providing persistence to unwarrantedly appreciated or depreciated ruble and the associated volatility in real domestic interest rates.

ratcheting up gross debt to 15 percent of GDP by end-2016, leaving the economy no better off than actual outcomes, despite much higher initial buffers from savings when oil prices were high.

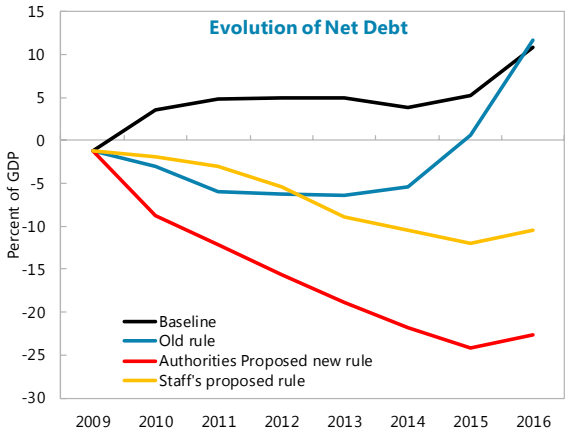
Figure 3. Counter Factual: Deviations from Actual Outcomes





Source: IMF staff estimates

20. The authorities' proposed new rule would have built more buffers, but staff's rule is more countercyclical. The simulation illustrates the tradeoff between countercyclicality and building buffers when designing fiscal rules. The new rule saves the most in the reserve fund through a conservative US$40 pb benchmark oil price (average actual oil prices are US$83 pb) and compared to an average benchmark of US$76 pb under the proposed rule. The proposed rule also results in substantial savings but rather through a more stringent fiscal target. The proposed rule, however allows a more countercyclical response to the large negative shock to oil prices. Output losses (in growth and levels) across the rules are similar and the differences in the debt trajectory derive from the extent of adjustment rather than growth differentials across rules. A caveat of the exercise is that we assume no reaction in Russia's country risk premium.



Source: IMF staff estimates.

Simulation under Oil Price Shocks

21. In a second simulation, we illustrate how alternative rules will perform under shocks to oil prices. The scenarios assume, positive and negative shocks to oil prices (temporary and persistent) are a result of changes in the supply of non-Russian oil producers (table). The simulations are calculated as deviations from the baseline projections for Russia included in the 2017 staff report. Under the baseline scenario, spending is

Oil Price Scenarios

	2018	2019	2020	2021	2022
Baseline	55.4	55.2	55.5	56.1	59.3
Persistent Low Oil	30.0	38.7	40.3	42.8	46.8
Temporary Low Oil	30.0	42.9	48.5	56.6	57.6
Persistent High Oil	80.0	71.8	71.8	70.6	72.9
Temporary High Oil	80.0	67.5	62.3	55.5	60.8

frozen per the authorities' medium-term budget plan and revenues are calculated at baseline oil prices. Implementation of the fiscal rules starts in 2018. As in the counterfactual we calculate three fiscal rule adjustment scenarios on projected non-resource primary deficits under the baseline oil prices and four shocks to oil prices (Table).

	2018	2019	2020	2021	2022	2023	2024
Projected non-resource primary deficits (Baseline)							
1. Old rule	5.6	5.5	5.8	5.6	5.5	5.4	5.4
2. New rule (benchmark@40)	4.7	4.7	4.6	4.5	4.5	4.4	4.4
3. Proposed rule	4.2	4.1	4.0	4.0	4.1	4.1	4.1
Baseline	6.5	5.6	4.8	4.8	4.9	4.6	4.6

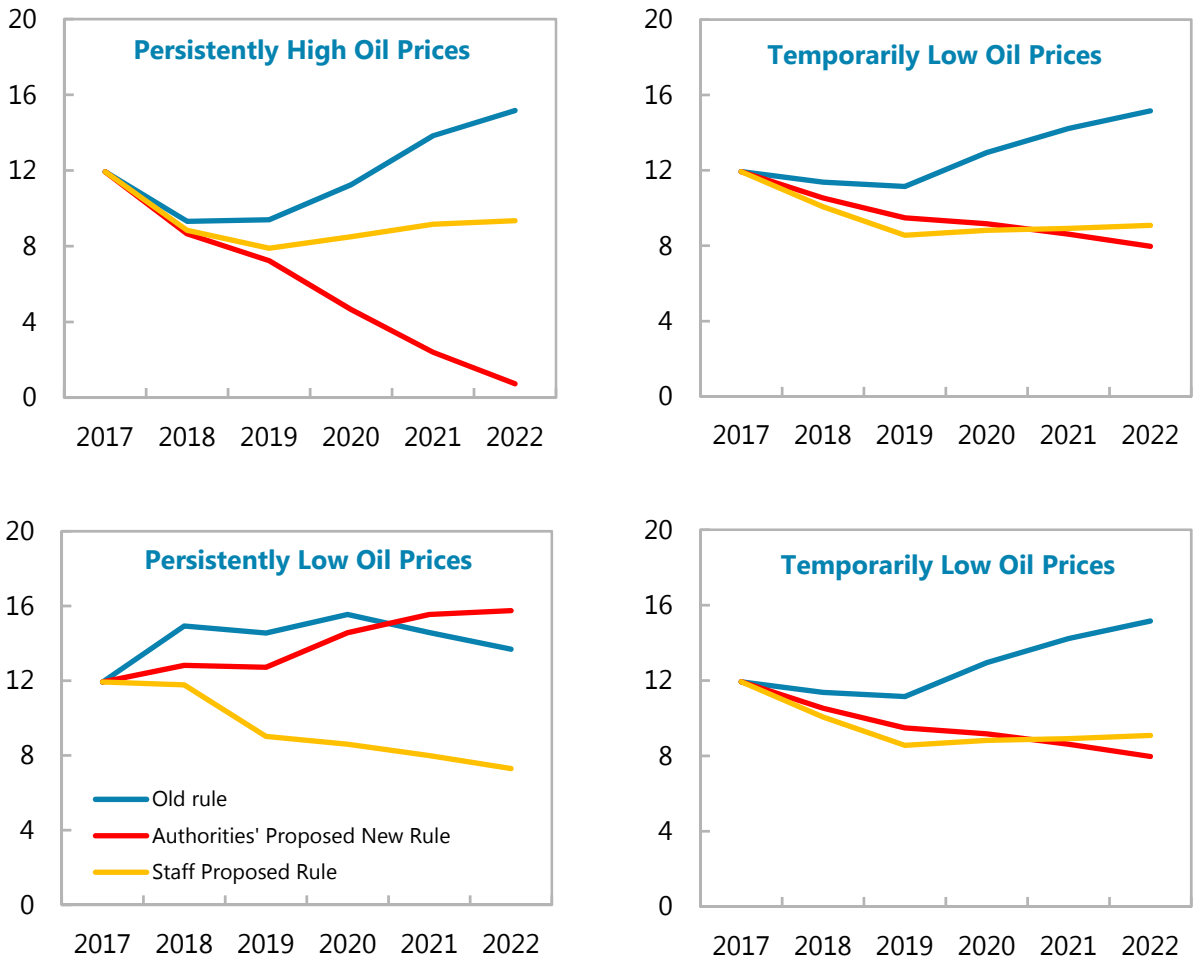
IMF staff estimates

22. Staff's proposed rule is preferred given the shocks that are considered (Figure 4).

- Under persistently high oil prices, the new rule results in the highest savings—net debt falls to zero, compared to 8 percentage points under the proposed rule. Should high oil prices prove to be temporary, however, the proposed rule begins to have higher overall savings. This is because although there is less savings generated by the oil-price rule, there is also less debt generated (the proposed rule targets a surplus, rather than a primary balance as in the new rule). When oil prices are high, the impact on the broader economy is similar under the new and proposed rules (Panel 3 and 4). Compared to the baseline, neither rule has a large negative impact on growth and both rules result in better outcomes on potential GDP. Inflation is contained and policy rates are low resulting in a more depreciated exchange rate, increased competitiveness and an improved current account.

- The persistent low price oil scenario illustrates the dangers of the authorities' new rule of getting the benchmark price wrong. Although the shock is persistent, the new rule doesn't adjust, spending at a benchmark price of US$40 despite permanently lower prices. This results in a rapid depletion of the RF and increasing debt dynamics with debt ratios that are around 2 percentage points higher every year throughout the projection horizon. The proposed rule adjusts quickest to the new reality of low oil prices, with net debt decreasing to 8 percent. However, should the negative shock be transitory, the proposed rule is tight and forces adjustment, when ex-post it was not necessary. Nonetheless, the impact of a tighter fiscal policy under the proposed rule to a temporary shock does not result in a significantly lower growth path compared to the new rule as looser monetary policy and the accompanied depreciated exchange rate offset the drag from a tighter fiscal policy (Panel 5 and 6).

Figure 4. Evolution of Net Debt: Oil Shock Scenarios
(In Percent of GDP)



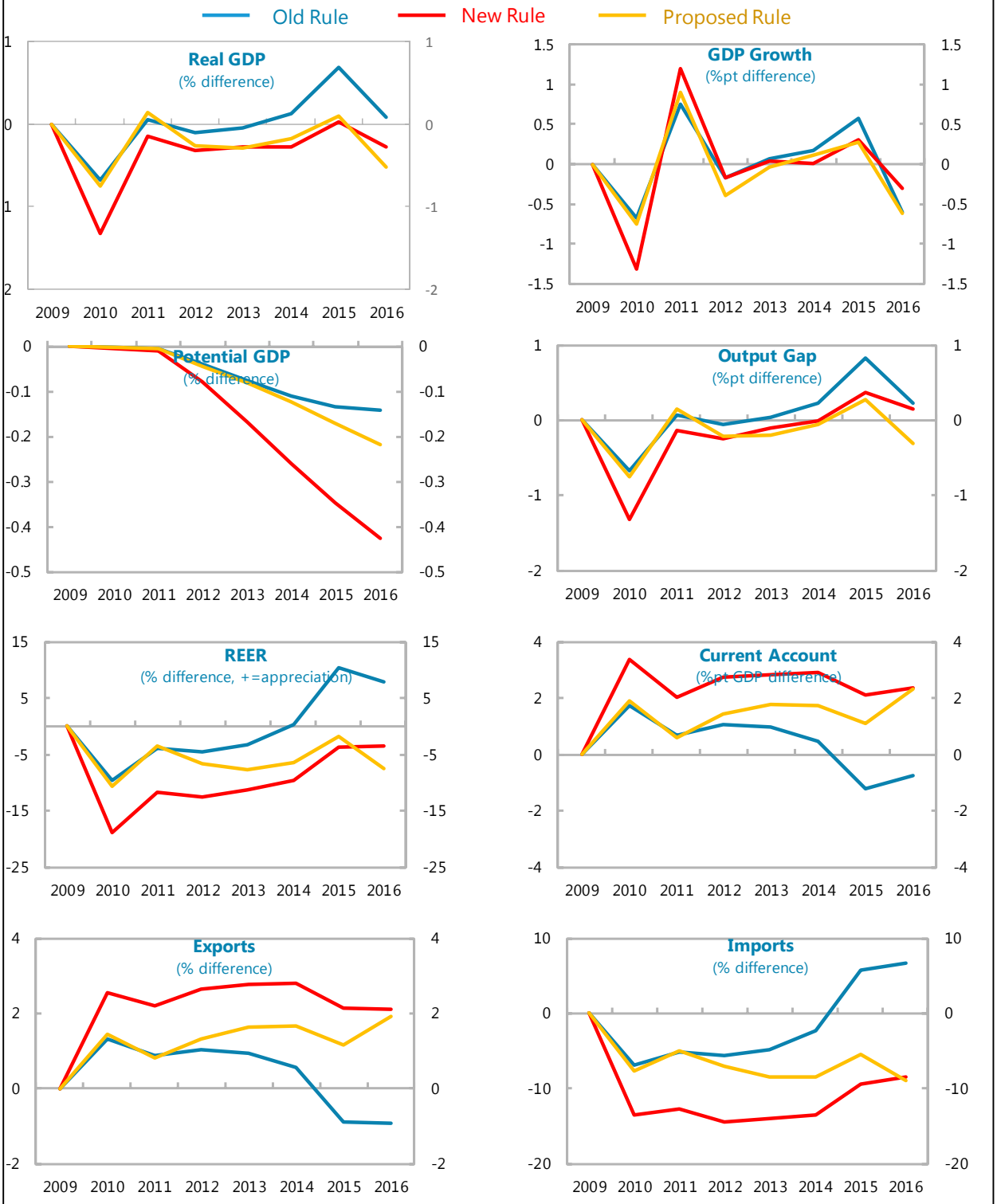
Sources: IMF staff estimates

Table A1: Parameters of Russian Fiscal Rule: Experience of Chile and Norway

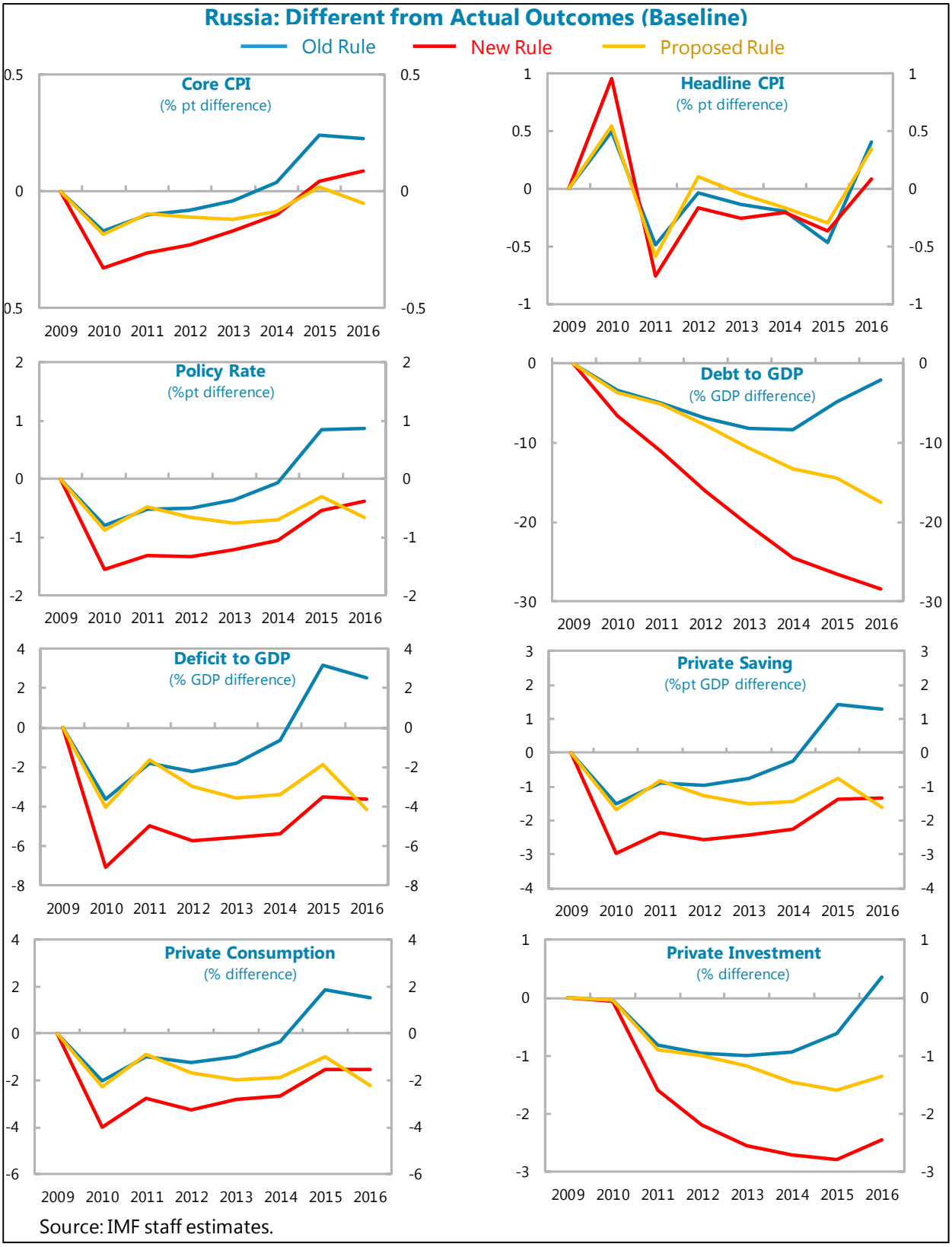
	Chile	Norway
Benchmark Price	Panel of independent experts establish long term price of copper for the budget. No guidelines published to choose price. This price fluctuates less than current prices, to whih it adjusts with a lag.	The use of a benchmark oil price in the budget is completely excluded. Norway's Government Pension Fund Global (GPFG) increases by oil revenues and decrease by the transfers from the GPFG (capped at 4 percent of the value of the fund) back to the budget.
Fiscal Target	The target is the structural balance of the federal budget.	The target sets the structural non-oil deficit to be equal to structural oil revenues, calculated to be equal to the annual value of the GPFG.
Cyclical Adjustment	The rule requires computation of cyclically adjusted aggregates. Output Gap assessed through a structural methodology (production function approach corrected for utilization of factors); long-term growth and output gaps are calculated for the non-copper GDP	The rule requires accounting for business cycle of non-oil GDP. Objective is to ensure appropriate capacity utilization and low unemployment. Forecasts are made three times a year and fed into the budget process. Models used emphasize need to maintain long-term profitability of tradable sector.
Intergenerational Equity	No references to intergenerational equity. Target surplus to address specific explicit and contingent liabilities (Central Bank quasi-fiscal deficit and contingent pension liabilities). No provision ensuring the budget receiving transfers from fiscal buffers after mineral resources are exhausted.	Best practice in terms of intergenerational equity. Transfers from the GPFG are targeted to be about equivalent to the permanent return from the underlying GPFS assets ensuring transfers to the budget even after oil resources are exhausted.
Sustainability of the Rule in view of contingent fiscal events	Earlier vintages established a 1 percent structural surplus to repay CBCH quasi-fiscal deficit and basic pension benefits. Target defined with no reference to any present value calculation.	Extractions from GPFS appear higher than warranted given expected pension and health costs, and have continuously increased as percentage of non-oil GDP, appreciating the RER and compromising competitiveness.
Long-term Debt Sustainability	The rule first targeted a structural balance of 1 percent of GDP. It was later reduced to 0.5 percent of GDP and then to zero. The positive structural primary balance ensures long-term debt sustainability.	The adoption of the rule in 2001 resulted in the accumulation of fiscal assets equivalent to 200 percent of mainland (non-oil) GDP. Despite issues related with contingent pension and health future off-balance sheet liabilities, Norway's rule ensures long-term debt sustainability.
Escape Clauses	The rule allows changes in the structural overall balance in exceptional circumstances. The structural surplus was decreased twice during the global financial crisis in order to stimulate the economy. It has been kept at zero thereafter.	The rule allows increasing/decreasing transfers to the budget from the GPFS to help stabilize the economy. The MoF appointed a commission to analyze the workings of the FR during 2002-15 to make recommendations to improve the rule.
Exchange Rate	Chile uses a projection for the current exchange rate to express copper-related revenues in Chilean pesos.	Norway uses a projection for the current exchange rate to express oil-related revenues in Norwegian Krone.

Source: IMF staff reports.

Russia: Different from Actual Outcomes (Baseline)

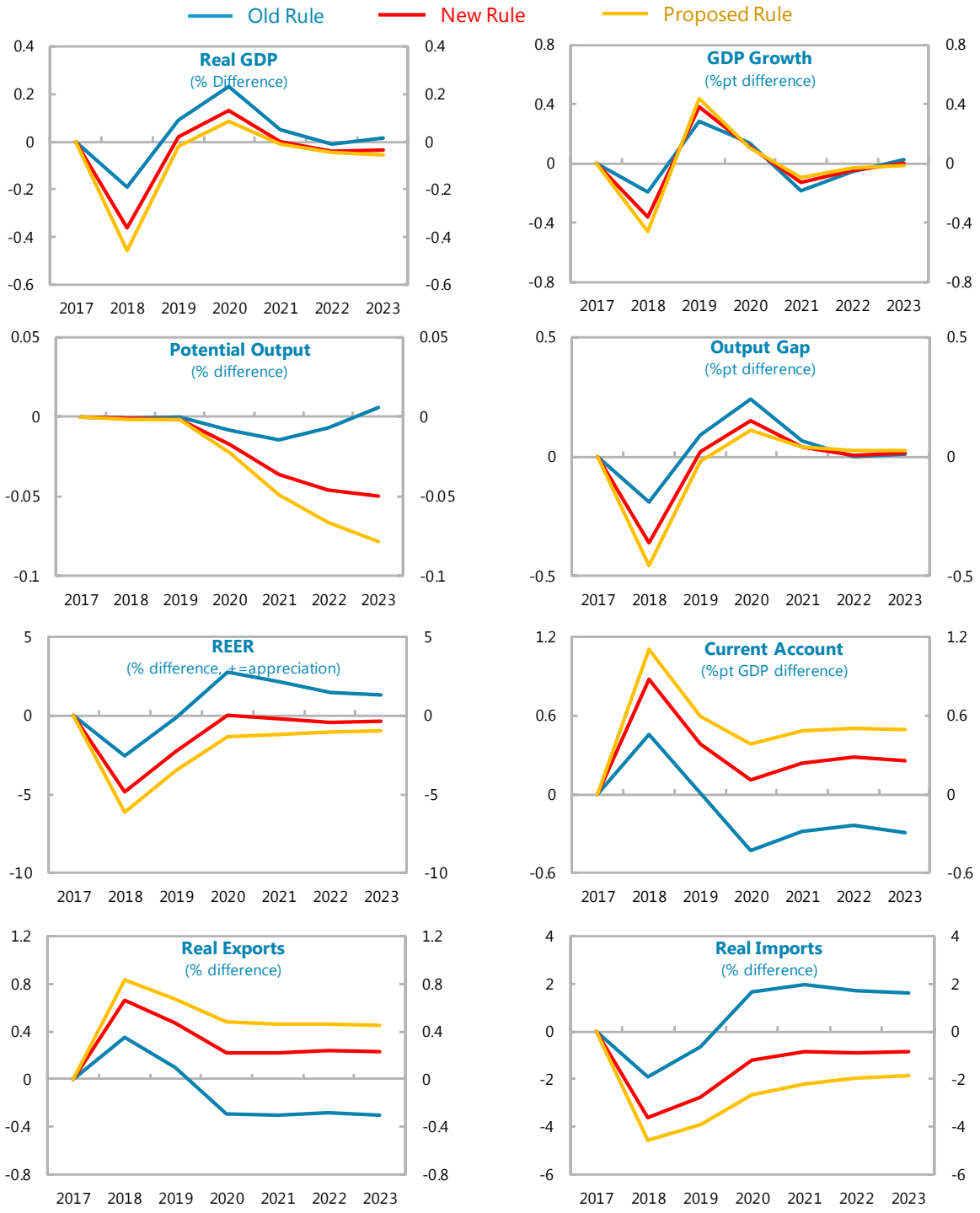


Source: IMF staff estimates.

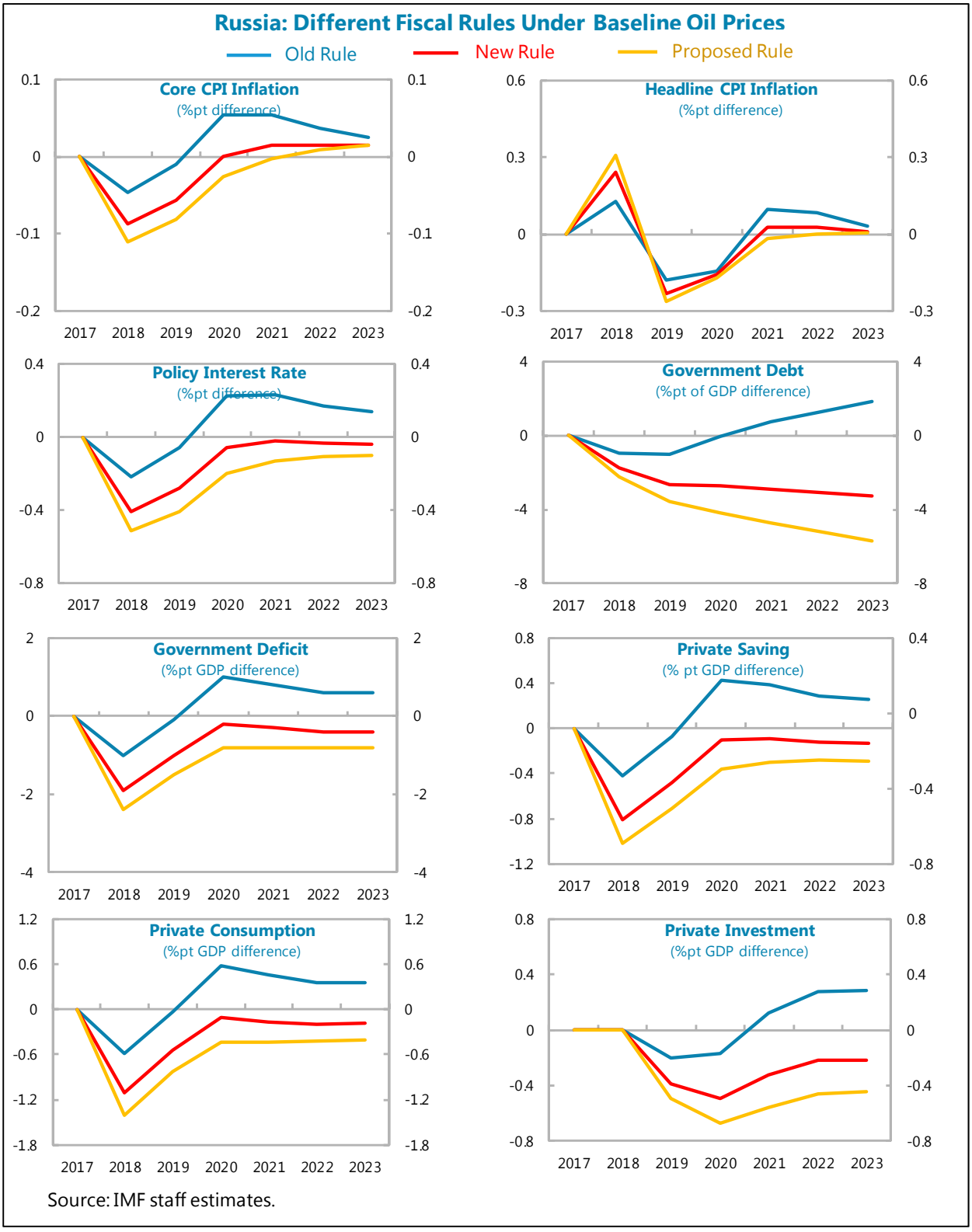


Source: IMF staff estimates.

Russia: Different Fiscal Rules Under Baseline Oil Prices

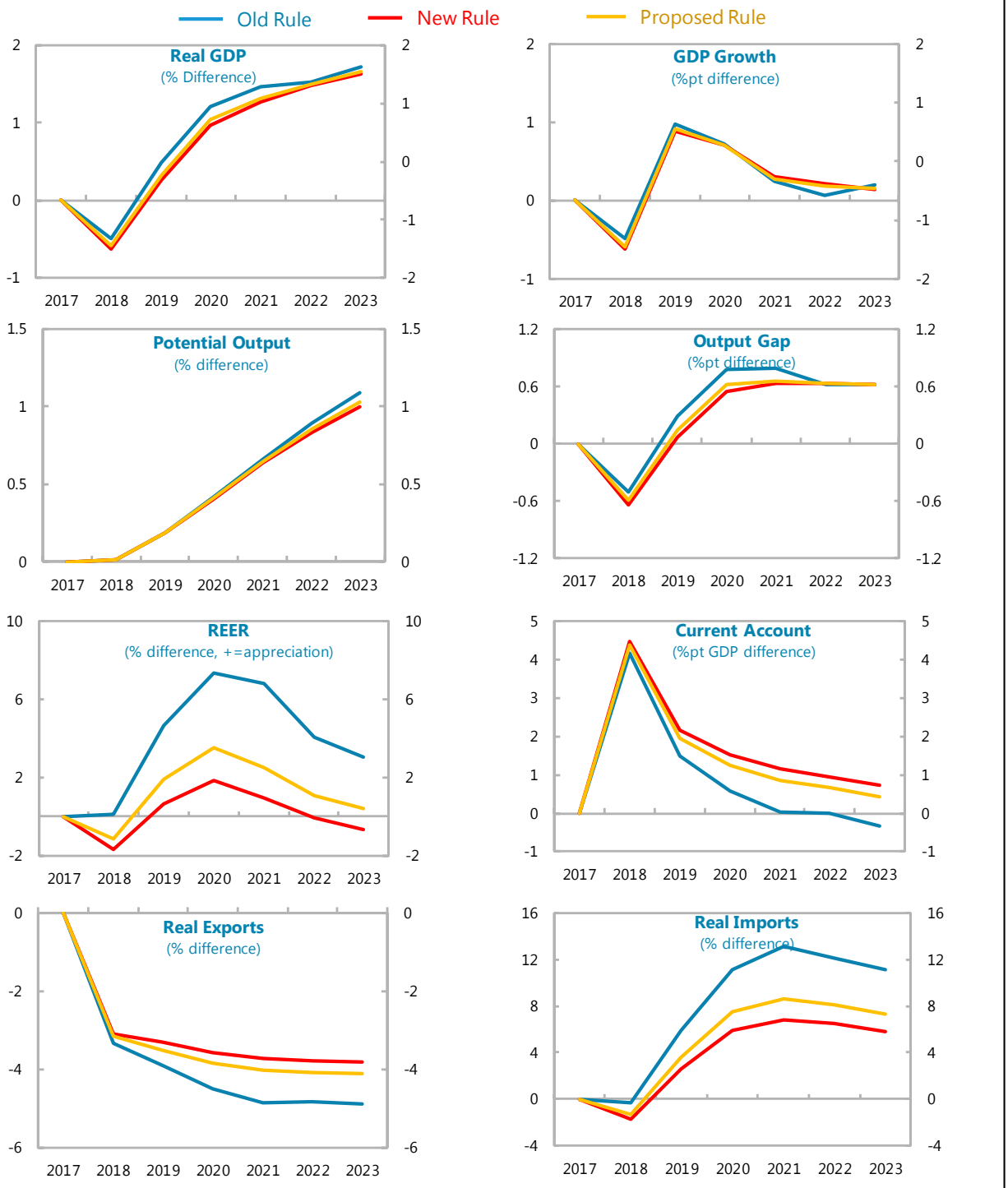


Source: IMF staff estimtes.



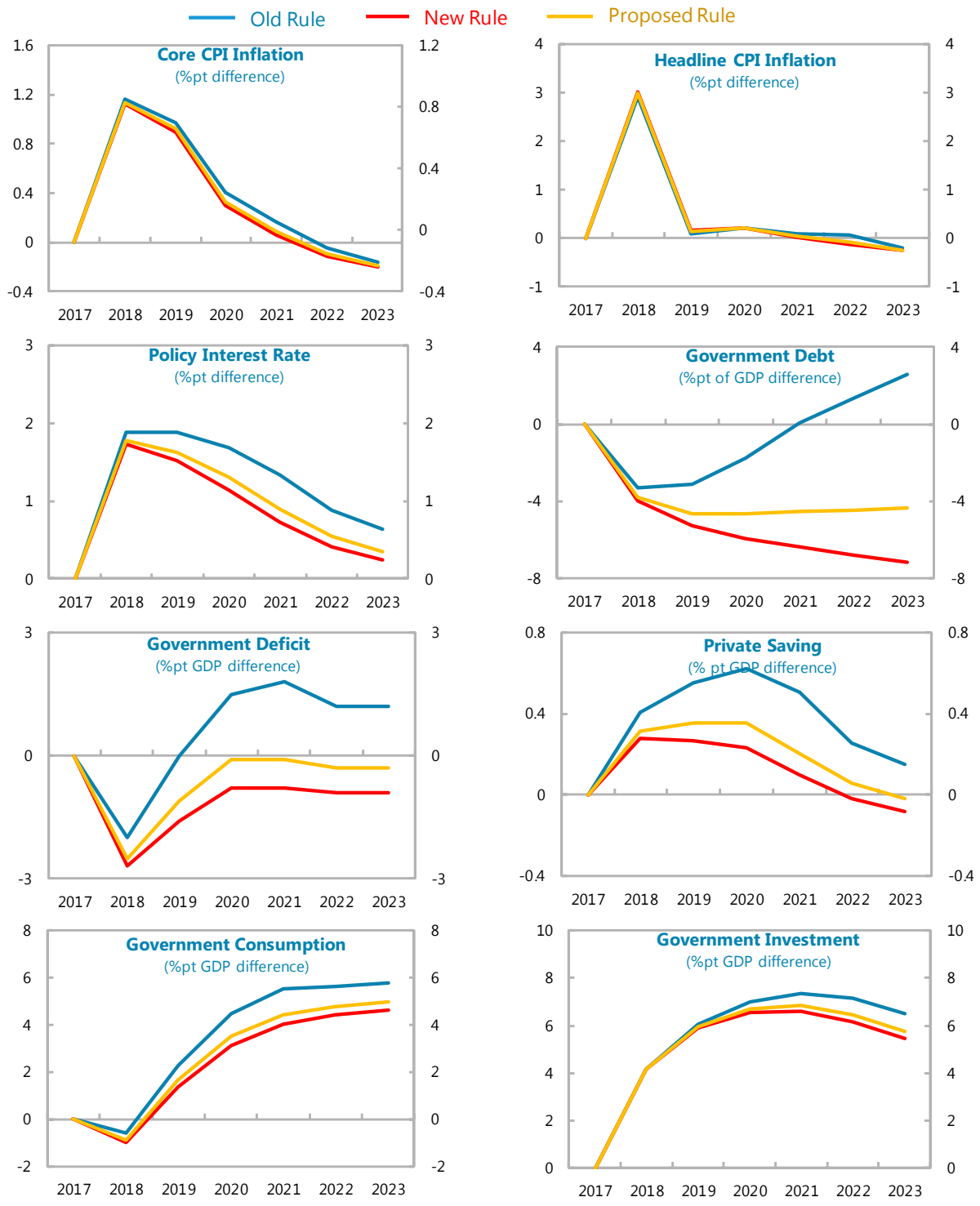
Source: IMF staff estimates.

Russia: Different Fiscal Rules Under Persistently Higher Oil Prices



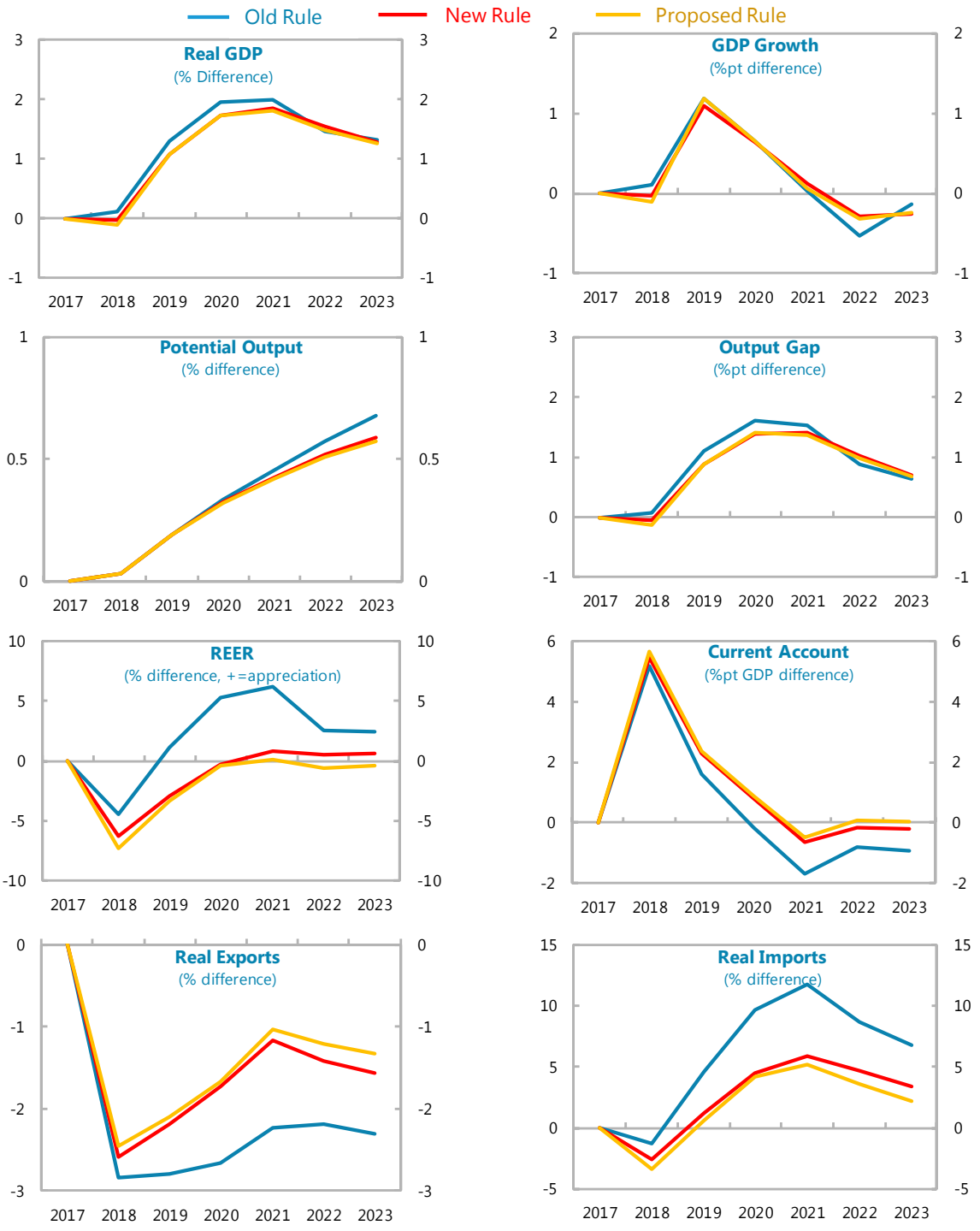
Source: IMF staff estimtes.

Russia: Different Fiscal Rules Under Persistently Higher Oil Prices



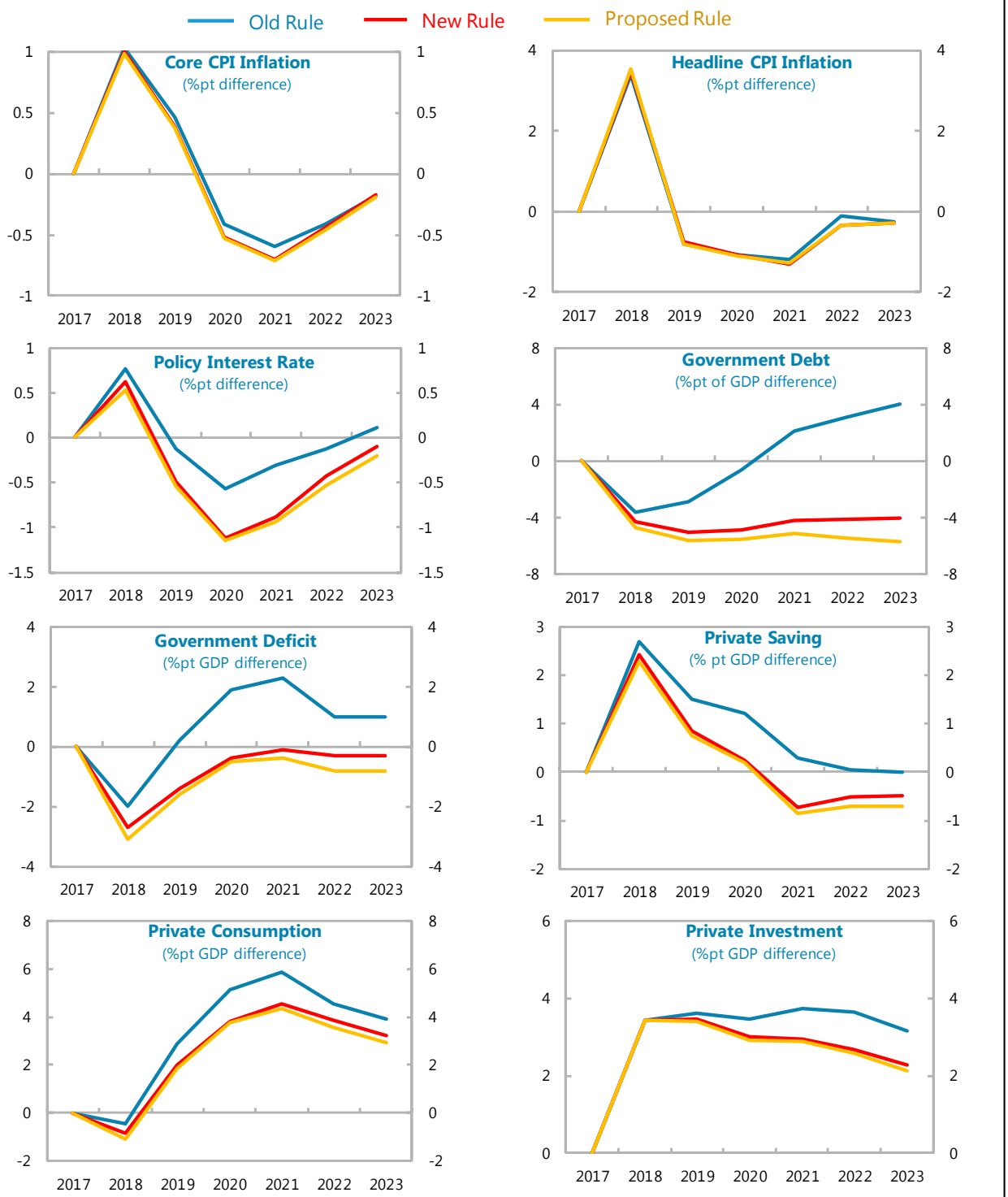
Source: IMF staff estimates.

Russia: Different Fiscal Rules Under Transitory Higher Oil Prices



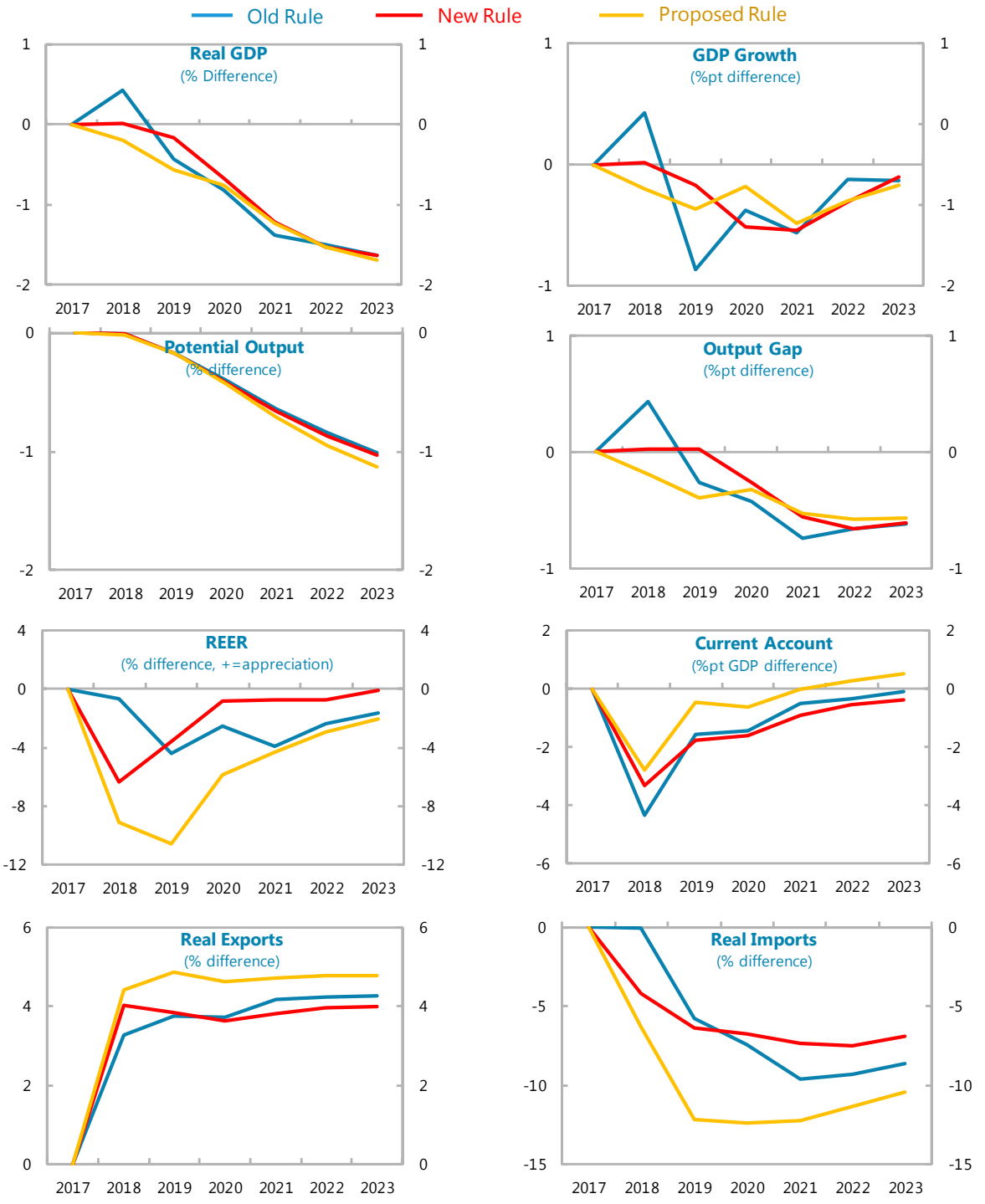
Source: IMF staff estimtes.

Russia: Different Fiscal Rules Under Transitory Higher Oil Prices



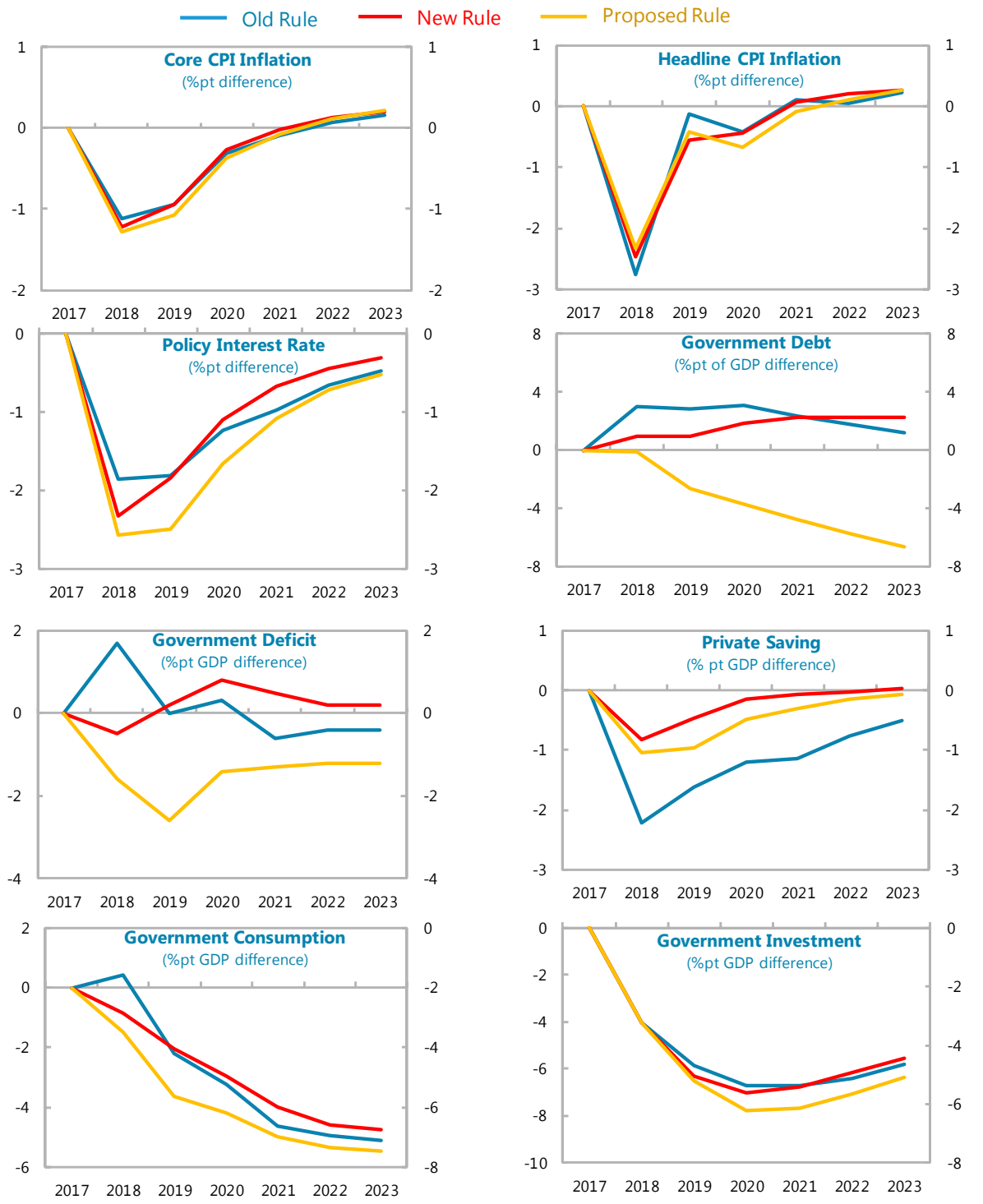
Source: IMF staff estimates.

Russia: Different Fiscal Rules Under Persistently Lower Oil Prices



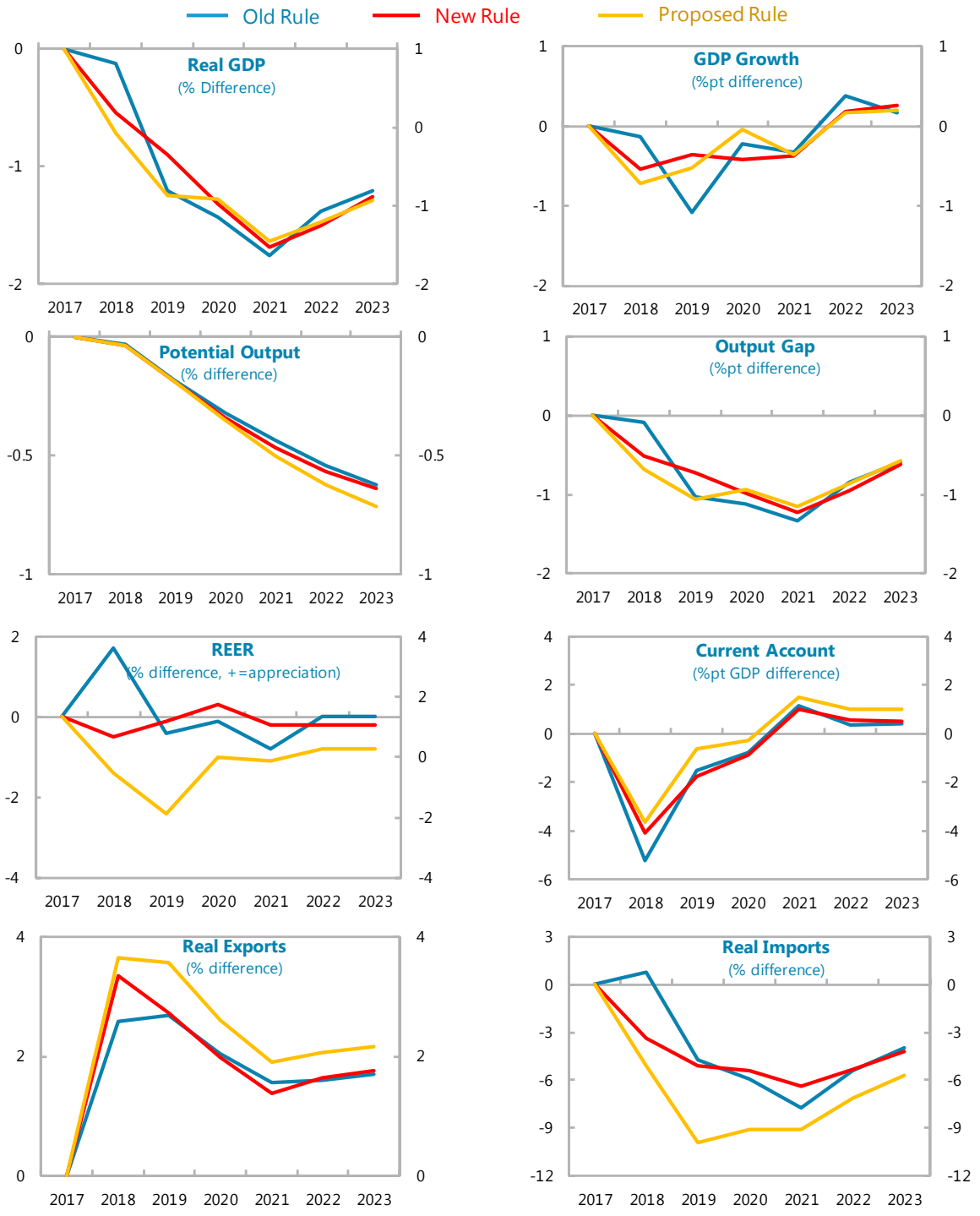
Source: IMF staff estimtes.

Russia: Different Fiscal Rules Under Peristently Lower Oil Prices

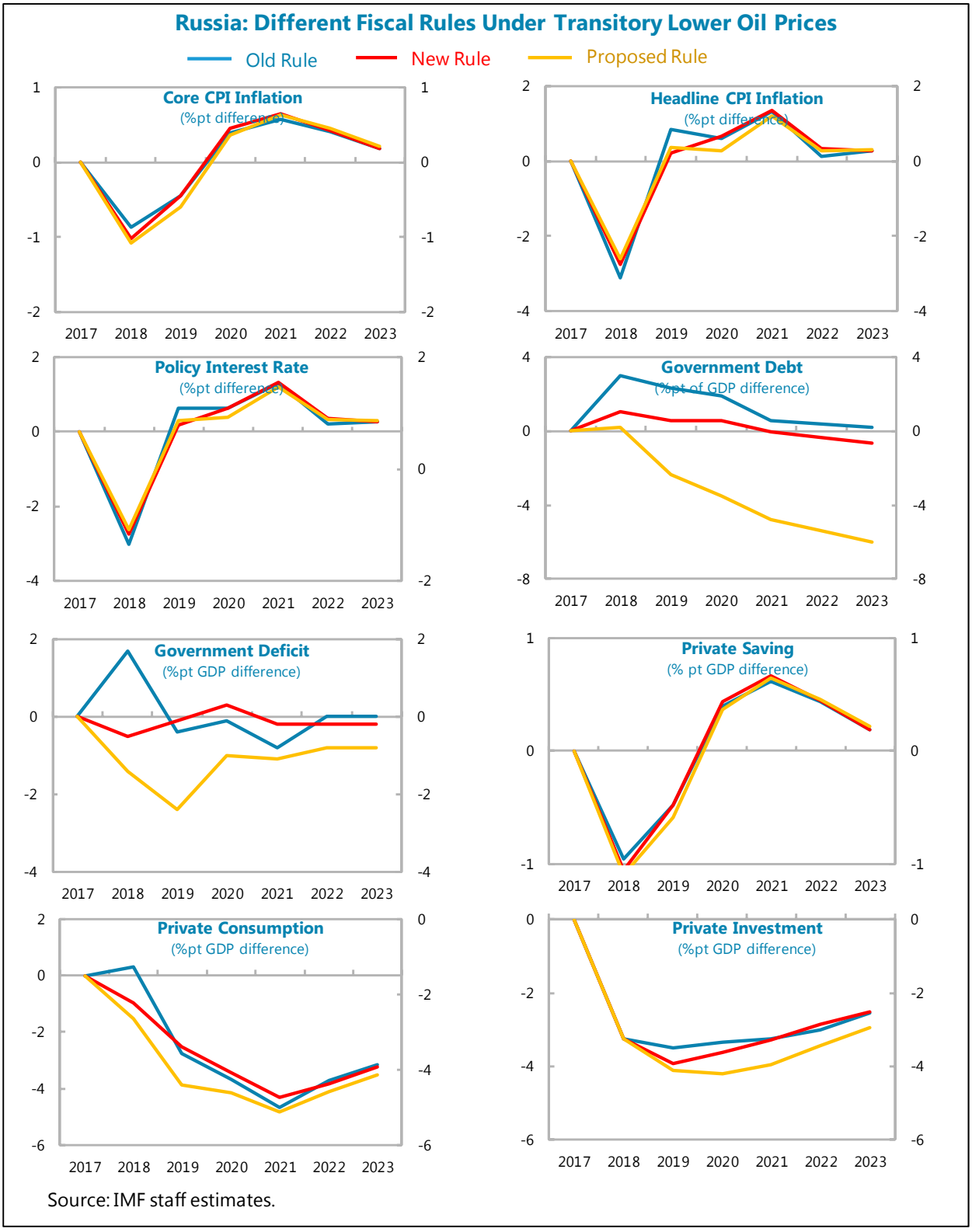


Source: IMF staff estimates.

Russia: Different Fiscal Rules Under Transitory Lower Oil Prices



Source: IMF staff estimtes.



Source: IMF staff estimates.

Annex I. FSGM for Russia

Simulations of the economy under the various fiscal rules are calibrated using the IMF's Flexible System of Global Models (FSGM). The model is an annual, multi-economy, forward-looking, model combining both micro-founded and reduced-form formulations of economic sectors (see Andrle and others 2015). Countries are distinguished from one another by their unique parameterizations. Each economy in the model is structurally identical (except for commodities), but with different steady-state ratios and behavioral parameters. Russia's parameters are strongly determined by the fact that its economy is dominated by oil. Characteristics of the model, including assumptions on specific parameters for Russia are outlined.

Consumption and investment are micro-founded. Consumption is given by overlapping-generations households that can save and smooth consumption, and liquidity-constrained households that must consume all their current income every period. Firms' investment is determined by a Tobin's Q model. Firms are net borrowers. Risk premia rise when the output gap is negative during periods of excess capacity, and fall when the output gap is positive, during booms (capturing the effect of falling/rising real debt burdens).

Trade is given by reduced-form equations. A function of a competitiveness indicator and domestic or foreign demand. The competitiveness indicator improves one-for-one with domestic prices—there is no local-market pricing. For Russia, most (90 percent) exports are oil and gas, so competitiveness changes play a small role in the model. Exports of oil respond largely to Russian production decisions.

Potential output is endogenous. It is modeled by a Cobb-Douglas production function with exogenous total factor productivity (TFP), and endogenous capital and labor. For Russia, Potential output moves one-for-one with the long-run average production of oil (but not cyclical swings in oil production).

Consumer price and wage inflation are modeled by reduced form Phillips' curves. They include weights on a lag and lead of inflation and the output gap. Consumer price inflation also has a weight on the real effective exchange rate and second-round effects from food and oil prices. As energy prices in Russia do not respond to global oil price developments, there is no feed-through from oil price changes to CPI inflation.

Monetary policy is governed by an interest rate reaction function. It is an inflation-forecast-based rule working to achieve a long-run inflation target through a risk-adjusted uncovered interest rate parity.

The model includes three commodities—oil, metals, and food. This allows to distinguish between headline and core consumer price inflation. The demand for commodities is driven by the world demand and is relatively price inelastic in the short run due to limited substitutability of the commodity classes considered. The supply of commodities is price inelastic in the short run.

Countries can trade in commodities, and households consume food and oil explicitly, allowing for the distinction between headline and core CPI inflation. All have global real prices determined by a global output gap (only a short-run effect), the overall level of global demand, and global production of the commodity in question. Commodities can function as a moderator of business cycle fluctuations. In times of excess aggregate demand, the upward pressure on commodities prices from sluggish adjustment in commodity supply relative to demand will put some downward pressure on demand. Similarly, if there is excess supply, falling commodities prices will ameliorate the deterioration.

Oil plays a dominant role in the calibration of Russia's model. Oil price fluctuations affect government revenues, but have little effect on household wealth as households have no direct ownership stake in the oil sector. Oil prices also have little effect on households' and firms' decisions, as oil prices are held fixed domestically.

Annex II. Russia's Proposed Oil Price Benchmark

The authorities new budget rule will use a benchmark oil price that is the average of the last 50 years (in 2015 terms) and that they will adjust such a price (on a yearly basis), by the variation of the US CPI (i.e., what implies assuming a constant relative price between oil and the US consumption basket going forward). This annex analyzes some of the implications of moving to such an oil rule for the Russian federal budget.

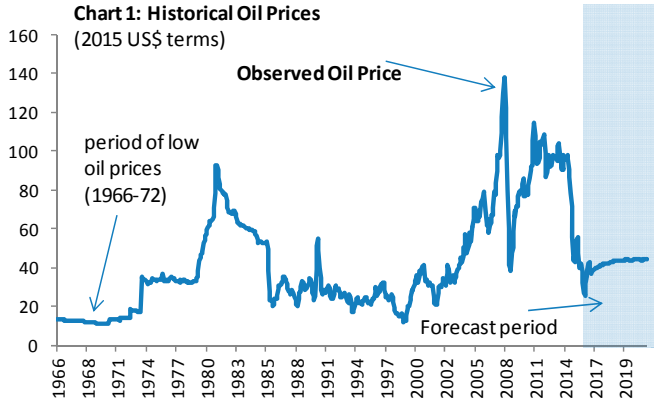
- We look at oil prices for the period 1923–2016 (in US$ nominal terms) and express them in 2015 US$ terms using the US CPI.

- We look at the implications of using different benchmarks for the oil price, based on moving averages (in 2015 US$ terms) of different lengths (i.e., 3, 10, 20, 25, 30, 40 and 50-year MAs).

- We extend the analysis into the next few years, using future oil prices (as of July 27, 2016) through 2021, and assume that US CPI inflation will gradually converge to 2 percent per year (from the current 1 percent), by end 2019.

Some Observations:

- The 50-year average (1966–2015) oil price in real terms (for the US imported oil basket) is US$42.6 in 2015 terms. It includes a period (1966–1972) of stable and relatively low oil prices in real terms (Chart 1). This is in the order of magnitude that the authorities plan to use.



- Using oil price benchmarks based on shorter-length moving averages (e.g., a 3-year MA), result in more "realistic" oil prices, but potentially in strong pro-cyclicality in periods of sustained increases or decreases of oil prices. At the same time, the use of short-length MAs does not generally result in extended periods in which observed oil prices are either far above or below benchmark prices. Define "far" to represent years in which observed oil prices (in real terms) were either higher (or lower) than the benchmark by +/- 25 percent. Using such criterion during 1972–2015, the longest period in which oil prices were "far" higher than the 3-year MA was 1.5 years. Conversely, the longest period in which observed oil prices were "far" lower than the 3-year MA was 2 years. The average period in which observed oil prices were either far above/below the 3-year MA was only 0.2 years (See Panel 1 and Table 1).

- Oil price benchmarks based in longer-length moving averages (e.g., a 50-year MA, as proposed by the authorities), would result in far less pro-cyclical government spending than shorter-length MAs. However, the use of long length MAs result in the observed oil prices to be "far" from benchmark oil prices for long periods of time. Defining "far" as above, observed oil prices were "far" above or below the 50-year MA during, an average, of 2.5 years in 1972–2015. The longest period in which observed oil prices was higher than the 50-year MA was about 12 years. However, the longest period in which observed oil prices were far lower than the 50-year MA was only 1.5 years; (See Panel 1 and Table 1). This asymmetry is due to the fact that the 50-year moving average oil price included throughout the period a long spell (before 1973) of low and stable oil prices in real terms. Even through 2015, the 50-year moving average still includes a period (1966–1972) of low and stable real oil prices (of about US$13/barrel in 2015 terms). Fixing the benchmark real oil price going forward at the 50-year average through 2015 should then be a relatively "safe" choice, not only due to its freezing at a relatively low level, but also due to the fact that the relative price of oil has increased during the last few decades (see more on this below).[1] Using a prudent oil price benchmark will likely result in avoiding long periods in which the government has to place debt to compensate for a negative difference between observed and benchmark oil prices. However, a rule in which observed oil prices may be higher than the budget benchmark for relatively long periods of time will require strong political will to stick to such rule while government net assets increase.

Table 1: Difference between Observed and Benchmark oil prices
(in years; 1972-2015)

	All Episodes		Price above Benchmark		Price below Benchmark	
	3-year	50-year	3-year	50-year	3-year	50-year
average	0.21	2.43	0.08	2.43	0.08	0.03
maximum	2.08	12.17	1.50	12.17	1.50	1.50

Source: IMF staff calculations

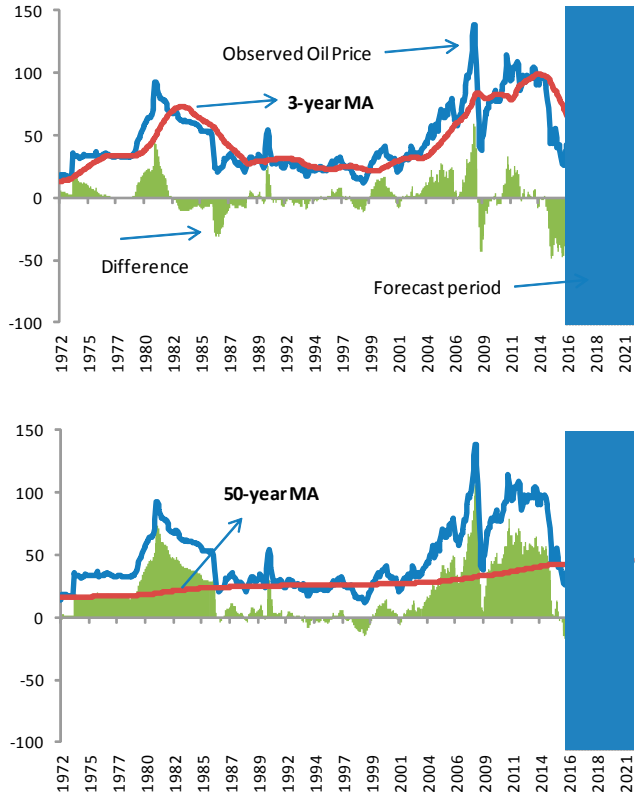
- Interestingly, using oil price benchmarks of intermediate length (e.g. 10-year MA –like in the previous fiscal rule, or 15-year MA), overlooks the fact that during the period 1972–2015 oil prices remained persistently low (after being high), or persistently high (after being low) for relatively long periods of time. Therefore, oil price benchmarks based on intermediate-length MAs result in relatively long periods in which observed oil prices are either "far" above, or "far" below the MA-benchmark (See Panel 2).[2] In particular, for periods in which the benchmark is above observed oil prices for a long period of time, may result in debt increases that exceed those that the market is willing to provide.

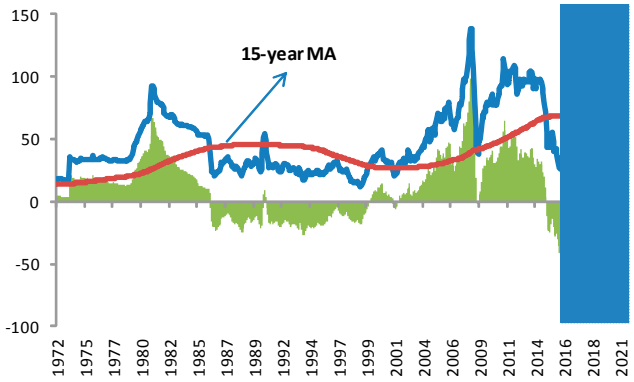
[1] Adopting a benchmark based in the 50-year MA (instead of "freezing" the relative price of oil going forward, as proposed by the authorities), would result in an increase in the oil price benchmark in the coming years, as the 1966–1972 period is substituted for more recent periods of higher real oil prices. For example, the 50-year moving average oil price through 2021 (using oil price futures through 2021) would be around US$46/barrel in 2015 terms, compared with US$42.6/barrel in 2015 terms in the rule proposed by the authorities.

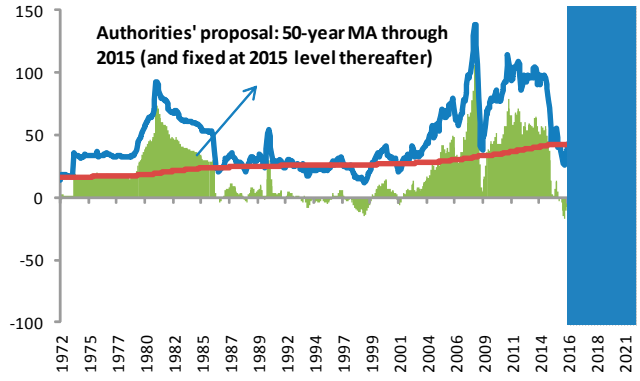
[2] There is an ample literature that analyzes whether oil prices are I(0) or I(1) with non-conclusive results. From a practical point of view, however, it is clear from Chart 1 that shocks to oil prices appear to be persistent, or in other words, if prices are mean reversing to trend, they do it slowly.

- As hinted above, the relative price of oil with respect to the US consumption basket during the period 1972–2015 increased by about 2.3 percent per year. Moreover, oil price futures (as of July 27, 2016), imply an average annual increase in such relative price of about 1.3 percent per year through 2021. Therefore, the authorities' proposal to "freeze" the oil price at the 50-year moving average in real terms at end-2015 also results in a "saving" bias.

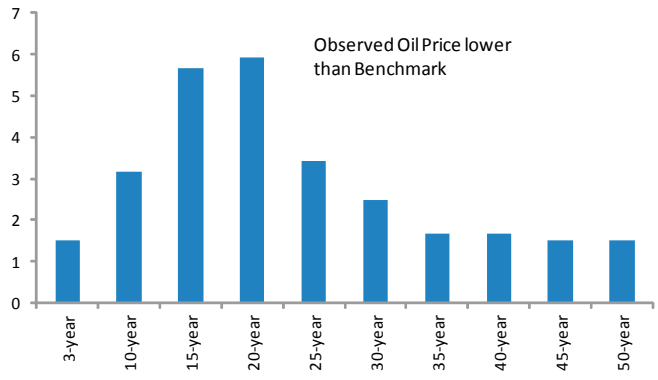
Panel 1. Oil Price Benchmarks of Different Lenghts
(Figures in US$ of 2015)

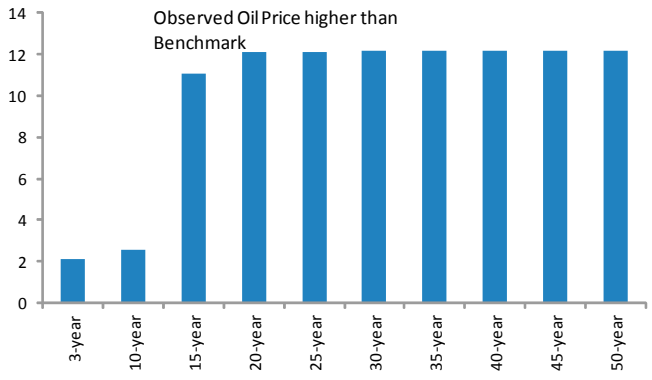






Panel 2. Longest length where difference of Observed and Benchmark Oil prices is Large
(In years. Oil price Benchmarks are MA of different lengths. "Large" defined as 25 percent or more during 1972-2015)





Source: IMF staff calculations

FISCAL FEDERALISM AND REGIONAL PERFORMANCE[1]

A. Introduction

1. Sound regional policies are essential for sustained and balanced economic growth. Russia is a federal state in which regions have the legal responsibility (either exclusively or shared with the federal government) for education, health, and infrastructure spending. The interaction of federal and regional policies together with cross-regional structural differences (e.g., natural resources, distance to markets, among other) affect human and physical capital formation, the business climate, private investment, market depth and competition. Policy pitfalls can contribute to geographically unbalanced development, which can manifest in persistent differences in regional per-capita income, dependence on federal transfers, and excessive geographic concentration.

2. Russia's fiscal constitution is more centralized than in other federal countries, and thus the federal government plays a significant role in shaping regional outcomes. Fiscal federalism defines the set of policy instruments with which the federal government can affect regional economic outcomes. Its main building blocks are a relatively centralized tax authority and a complex system of federal transfers. The latter have constituted the economic lifeline for lower per-capita income regions in the last 15 years, where tax bases are weaker. Consolidated federal transfers (through the budget or federal extra budgetary funds, EBFs) to the regions (including territorial EBFs) represented 3.5 percent of GDP in 2016 (about 65 percent of federal oil and gas revenues). Transfers finance a large share of regional fiscal spending, including almost 70 percent in the North Caucasus, and about 40 percent in the Far East. This dependence on federal resources adds to a list of earmarked transfers that also includes those to the pension system and other EBFs, some of which will likely mount as population ages. This decreases federal spending flexibility and creates other challenges, including for the design of a fiscal rule.[2]

3. A significant share of Russia's general government spending is executed at the sub-federal level. About 40 percent of consolidated general government spending occurs in regions and territorial medical extra budgetary funds (EBFs). This is lower than in Canada, the U.S., and Mexico, but similar to that in a number of other OECD countries including Belgium, Germany, and Spain. From a cyclical perspective, the large regional share in general government spending suggests that the fiscal stance is determined simultaneously by policies at the regional and federal level. Moreover, federal transfers may affect the degree of synchronization of regional growth, creating positive (or negative) spillovers for the effectiveness of monetary policy.

[1] Prepared by Oksana Dynnikova, Gabriel Di Bella, Tatiana Chernisheva and Nina Chebotareva.
[2] See accompanying Selected Issues Paper.

4. This paper summarizes the main elements of Russia´s fiscal federalism, analyzes the channels through which it operates, how effective it has been, and how sustainable its results are. The paper is organized as follows: Section II describes Russia's fiscal federalism and compares it with those of other federal countries; the analysis in this section relies on OECD (2016) and on a review of the legal framework for fiscal federalism in Russia; Section III discusses the effectiveness of federal transfers in reducing regional disparities in the provision of public services, and how sustainable those results are from a regional perspective. Section IV summarizes the findings, discusses possible policy implications, and identifies questions for further analysis.[3]

B. Russia's Fiscal Federalism in Context

5. Fiscal federalism arrangements in Russia are quite involved. There are three levels of government (federal, regional and local), with the local level further subdivided into a hierarchy of municipalities, which in total count more than 22,000. The Budget Code states that each of the three levels is autonomous and should be financially self-sustained. A complex system of intra-budgetary transfers (mostly flowing from the federal government) ensures that spending of most regions, territorial extra budgetary funds (EBFs) and federal EBFs remain broadly financed. A large network (counting more than 65,000) of budgetary, extra-budgetary, unitary enterprises, and joint stock companies (most of which operating at the regional level), adds to complexity.

6. A recent study (OECD, 2016) compares Russia's fiscal federalism with that of other federal countries. This analysis together with a reading of Russia's legal framework (see Appendix for further details) allows to understand the relative weight of the federal and regional governments in shaping cross-regional socio-economic outcomes. The cross-country comparison (based on the findings by Blochliger and Kantorowicz; OECD, 2016) assesses the framework for intergovernmental fiscal relations of several federal and quasi-federal countries and quantifies it along five categories: the autonomy of sub-national governments (SNGs); their responsibility for their own fiscal policies; their power to shape federal policy; the strength of budget frameworks; and, the overall system's stability. Each of these categories is then evaluated by looking at several sub-indicators.[4] As the analysis in OECD (2016) is, for some of the indicators, mainly *de jure,* the description below will note differences (when relevant) with *de facto* realities in Russia.

7. Russia's SNGs have lower tax than spending autonomy relative to other federal countries. Although this is the norm for both the average of advanced and emerging market economies in the sample in OECD (2016), the disparity appears larger in Russia. Tax autonomy is assessed by looking at each tax category and evaluating whether the federal government, SNGs, or both can affect tax rates, as well as with respect to the clarity with which the law assigns power between different levels of governments. Likewise spending autonomy is evaluated at each policy

[3] The Appendix provides further details about the distribution of revenue authority, sharing arrangements, intra-governmental transfers, spending jurisdictions among levels of government, and the limits imposed by the federal government on the regions' budgets.

[4] Each category and sub-category is quantified from 0 (low) to 1 (high).

area, and assessing the respective responsibilities of SNGs and the federal government. In other categories assessing SNGs' autonomy (namely borrowing and budgetary autonomy) Russia ranks below the average of advanced economies and similarly to the average of emerging economies (Figure 1).

8. The federal government plays a relatively more important role in regional fiscal policy in Russia than in both advanced and other emerging market economies analyzed in OECD (2016). Fiscal equalization policies are more the responsibility of the federal government than that that of SNGs, and stabilization policy is fully in the hands of the federal government. The intensity of federal grants (which may be underestimated in OECD (2016) as it is measured in terms of aggregate GDP rather than in terms of the GRP of recipient regions), also suggests an important role for the federal government in shaping regional outcomes. A *de jure* evaluation of the possibility of regional bail-outs or bankruptcies situates Russia in a better position than the average of advanced and emerging market economies, although *de facto* the federal government has recently resorted to *ad-hoc* transfers to ease the burden of public debt in some regions.

9. Russia's legal framework obtains higher marks than the average of advanced and emerging market economies in co-determination of federal policies, fiscal rules, and the stability of its fiscal constitution. However, *de jure* versus *de facto* considerations play a role in this assessment. For instance, although Russia's budget code has included some form of a fiscal rule since 2008, its parameters have changed, and its implementation has been suspended a few times. Regarding the stability of the legal framework, Russia has been characterized by numerous modifications of the operational framework establishing the relation between the federal and regional governments, including on tax sharing and transfers.

10. Russia's legal framework is consistent with an integrated fiscal constitution, as opposed to a decentralized one. A main conclusion in OECD (2016) is that through clustering of fiscal constitutions of similar features it is possible to classify countries in either those having integrated fiscal constitutions as opposed to those having decentralized ones. Decentralized fiscal constitutions (e.g., Canada and the United States) are consistent with more SNG autonomy, responsibility, low co-determination and relatively weak numerical budget rules and frameworks. Centralized (or integrated) fiscal frameworks are characterized by lower SNG autonomy and responsibility and, at least *de jure*, strong fiscal rules and frameworks.

C. Fiscal Federalism at Work: Achievements and Challenges

11. This section presents some stylized facts pertaining to the fiscal situation of regions. It then empirically analyzes the effectiveness of federal transfers in equalizing the provision of public services; in increasing the correlation of cross-regional growth rates; and in delivering sustainable results from the perspective of regional budgets.

12. The econometric analysis uses panel data of 79 regions covering a large variety of regional socio-economic variables, including economic activity, labor, fiscal, financial, and

structural. The data spans the period 2000–16, although some variables are available for shorter time periods (e.g., regional fiscal data for 2005–16, GRPs for 2000–15, GRPs' composition for 2004–15, etc.). The analysis is based on a cross-sectional bilateral dataset of regional differences in which each data point reflects some interaction (e.g., difference in growth rates or absolute terms, or the correlation, among other) of the value of a given variable (or the time series) for a pair of regions. This gives rise to more than 3000 observations.

Some Stylized Facts

13. Regional revenues are comprised by own revenues and federal transfers. Federal taxes (most importantly personal and corporate income tax) are the largest source of regional fiscal revenue, representing on average about 70 percent of own revenues. Tax sharing (or primary distribution) aims at reducing vertical fiscal inequality between government levels. It is performed directly in the regions where taxes are collected (on a tax by tax basis), at predetermined rates.[5] Sharing arrangements and rates are governed by the Budget Code, and in the case of the corporate income tax by the Tax Code. Rates tend to be adjusted frequently (See Appendix).

14. There is significant cross-regional difference in own revenues in real per capita terms. Real per capita fiscal revenues are generally positively associated with the share of the private sector in regional GRP; they are positively associated with the share of mining in GRP and negatively associated with the share of agriculture. More generally, regions with lower real per capita GRP have lower real per capita own revenues (Figure 2).

15. Intragovernmental transfers aim at leveling cross-regional (horizontal) fiscal inequality. The primary distribution of taxes results in large cross-regional dispersion of fiscal revenues, and thus vertical transfers (secondary distribution) of federal revenues to SNGs aim at reducing these disparities. Intragovernmental transfers include (i) non-earmarked and non-matching transfers (*dotatsii*, of which equalization grants are the most important); (ii) subsidies (earmarked matching transfers to finance spending priorities); (iii) subventions (earmarked non-matching transfers to finance devolved spending responsibilities); and (iv) other transfers. In addition, the Federal Medical Insurance Fund makes transfers to Territorial Medical Insurance Funds, which represented 1.7 percent of GDP in 2016.[6] Equalization grants constitute about 50 percent of federal government transfers (See Appendix).

16. Regions and municipalities are largely responsible for social policies as well as for some regional infrastructure. In 2016, regional spending represented 95 percent of general government expenditure for housing and utilities; 80 percent for education and cultural activities; and around 85 percent for health including spending by territorial extra-budgetary medical funds.

[5] Regional excises' shares are determined by the organic budget law with horizontal re-distribution.

[6] About 40 percent of these transfers are financed by contributions to the Federal Medical Fund from regional budgets on behalf of the non-working population.

Federal Transfers and Public Goods Supply Disparities

17. At a basic level, federal transfers have lifted real per capita fiscal spending in lower GRP per capita regions, and have reduced cross-regional spending dispersion. Disparities arising from the dispersion of regional tax bases and fiscal revenues were reduced through federal transfers, as real per capita grants flowing to regions with lower per capita income and own fiscal revenues have been relatively larger. This has contributed to a cross regional dispersion of real per capita expenditure that is lower than that net of transfers. Reductions in real per capita spending disparities were achieved mainly through grants, as subsidies and subventions in real per capita terms have been broadly allocated to regions with higher per-capita income (Figure 3).

18. Federal transfers have been associated with reductions in cross regional disparities in real per capita spending in education and health. Higher average transfers in 2005–16 (in real per capita terms) have been positively associated with larger increases in in real per capita annual spending in health and education (Figure 4). This has helped regions with initial lower real per capita GRP partially close the gap in real per capita spending in health and education.

19. Higher federal transfers have also been positively associated with stronger human capital accumulation in regions with initially lower real per capita income. Regional labor data for 2002–15 shows that regions with lower initial real per capita income and weaker educational attainment experienced faster increases in the years of education of the average worker than other regions. Educational attainment together with employment data allows constructing regional measures of human capital, using the methodology in Hall and Jones (1999), which assumes diminishing returns for additional years of education. The resulting human capital measures show that it has increased at relatively higher rates in regions that received higher average transfers (in regional GRP terms) during the last decade (Figure 4). This result, however, has been partially driven by cross-regional differences in labor supply.

20. Regions receiving larger federal transfers (in GRP terms) have generally experienced higher investment-to-GRP ratios, which resulted in higher growth rates of physical capital. The construction of regional capital stocks by means of the perpetual inventory method shows that physical capital accumulation in regions with initially lower per capita income and receiving larger transfers has been faster than in other regions (Figure 4). The very high investment ratios (in some cases to the order of 50 percent of GRP) highlight, however, that initial capital stocks in poorer regions were likely very low when compared with richer regions.

21. There is also evidence that federal transfers may have contributed to increased correlation of regional growth rates. To analyze the impact of transfers on cross-regional growth correlation, several models are estimated relating the correlation of cross-regional growth of real per capita GRP with the correlation of cross-regional growth of real per capita federal transfers (on aggregate and by type of transfer) and several other variables (including distance, GRP structure, footprint of the state, and international trade). Table 1 describes the variables in these models, while Table 2 shows alternative model specifications. The estimated coefficients show that aggregate

transfers do not have a strong or robust association with bilateral cross-regional growth correlation (Table 3). This masks different behavior by transfer type: while the correlation in the growth of grants (whose purpose is to reduce cross regional spending disparities) is not associated with the correlation of growth rates, subsidies and subventions are positively associated. Although these results should be taken with caution given possible endogeneity, they underline the different impact of transfer types in cross regional GRP growth rates correlation.[7]

22. The impact of transfers on cross regional growth correlation deserves a deeper analysis. Given the central role that the federal government plays in economic stabilization, the positive association between cross regional GRP growth correlations and those of subsidies and subventions can be either desirable or not, depending on whether federal fiscal policy has amplified or lessened the severity of overall economic cycles. Ideally, a federal policy that smooths out aggregate economic cycles and strengthens cross regional growth correlations, should have positive spillovers for the effectiveness of monetary policy.[8]

Federal Transfers and the Sustainability of Regional Budgets

23. Federal transfers have affected regional fiscal sustainability through different channels. These channels are explored by means of estimating a system of equations to assess direct and indirect effects of federal transfers on fiscal sustainability. Concretely, the system allows for interactions between the ratio of own regional revenues-to-expenditures (a proxy for fiscal sustainability), per capita GRP growth, GRP structure, and federal transfers. As before, Table 1 describes the variables used, while Table 4 shows the model specification and the identification restrictions.

24. Empirical analysis suggests that federal transfers have not positively impacted regional fiscal sustainability. Federal transfers appear to have resulted in a change in GRP structure, increasing the size of the public sector. However, while analyzing the impact on GRP growth, federal transfers appear to have had a direct positive impact (through stronger accumulation of production factors), and a negative indirect impact through a larger public sector (more on this below), with the negative impact more than offsetting the positive. For instance, a one-standard deviation difference in the level of federal transfers (about 17 percent of regional GRP) is associated with a negative cumulative bilateral difference in real per capita GRP growth (over 2005–15) of around 1.2 percentage points, an increase in the bilateral share of public sector in GRP of around 1.5 percentage points, and (own) revenue-to-expenditure ratio that stays around unchanged (indeed, a decrease in such ratio of about 0.1 percentage point). Given the positive association between own revenue-to-expenditure ratio and GRP growth, federal transfers have not resulted in

[7] Further analysis may be warranted, by which the cross regional growth correlation equation is estimated within a system allowing for endogeneity of some of the RHS variables. Further analysis can also differentiate between cycle and trend, although time series are short in Russia (See, e.g., Imbs, 2004).

[8] This is a similar argument to that made in the optimal currency area literature, of which the seminal work is Mundell (1961).

an improvement in regional fiscal sustainability. These results are particularly relevant for around 1/3 of Russia's regions (28 out of 79 in the sample), which receive federal transfers that are higher than the average by between 1 and 3 standard deviations.

25. Accordingly, regions receiving larger federal transfers have not been able to close (even partially) the gap between their expenditures and own revenues. Economic growth based on the expansion of government services did not result in an improvement in own revenue-to-GRP ratios, which (in levels) are positively correlated with the size of the private sector (Figure 2). Thus, the financial dependence of many of these regions on federal transfers has remained broadly unchanged, raising questions about their sustainability. This dependence is summarized by the fact that for many of them their own revenues are barely sufficient to finance health and education spending.

26. These results also suggest that, at least during the period analyzed, federal transfers were insufficient to jumpstart self-sustaining, private-sector led growth in regions receiving relatively more transfers. Federal transfers should, on impact, increase the size of the public sector; however, they should not necessarily result, *a priori*, in a long-term increase in the *share* of public sector in GRP.[9] Indeed, it should be expected that the increased supply of public goods (e.g. in the form of education and health), should result in positive spillovers for the private sector. This is not what is observed during the period analyzed. Interestingly, transfers flowed to regions not only with lower initial real per capita GRP, but also, with a relatively larger footprint of the state (measured as the number of per capita regional budget and non-budgetary entities, including state unitary enterprises and joint-stock companies).

27. This finding is supported by complementary analysis showing that total factor productivity (TFP) expanded at lower annual rates in regions receiving relatively high levels of federal transfers. Neutral TFP levels were recovered using a production function approach. Regional capital stocks were constructed using the perpetual inventory method and regional investment. Effective human capital (i.e., corrected for labor utilization) was constructed using educational attainment of the employed working age population. TFP levels for the period 2000–15 were then recovered using regional human and physical capital and assuming identical Cobb-Douglas production functions for all regions. The analysis suggests that cross-regional TFP growth differentials are negatively associated with cross-regional differences in average transfers; and thus, that the distance in productivity levels between low and high-income regions has increased in the last decade (Figure 5).[10]

[9] Public sector is defined as the sum of the share of public administration, military security, social insurance; education; health care and social services; and, other communal, social and personal services. Note that the 'private sector' is defined as sum of the rest of economic activities, despite of the fact that it will comprise the operation of SOEs in these activities.

[10] Additional analysis following Pedroni and Yao (2006) (not shown) suggests that during the period 1998–2015 there is no convergence in real per capita income across Russian regions. This supports the conclusion above that federal transfers have not helped speed up regional convergence.

28. Moreover, geographic population concentration has increased in the last 15 years. The population of the city of Moscow has increased by more than 30 percent since 2000, and by 10 percent in Saint Petersburg, against the backdrop of broadly constant total population. This implies that other less densely populated regions have experienced population decreases of 15–20 percent. Although concentration has some advantages for recipient regions and cities (increases economies of scale, supports firm localization, improves job matching, among other), it has symmetrical drawbacks for regions losing population, and results in increasing costs of per capita federal transfers. More broadly, it results in geographically unbalanced development, a critical issue for a continental-sized country like Russia. Federal transfers (and fiscal federalism more generally), appear not to take into consideration both the advantages or disadvantages related with increased concentration, as well as the unintended effects that current fiscal federalism institutions may be creating to that effect.

D. Conclusions and Issues for Discussion

29. Russia's fiscal federalism assigns a strong role to the federal government, but increased policy coordination with regions could be beneficial. The system evolved from a somewhat disorderly decentralization in the 1990s into a more centralized system in the last 15 years. Regions play an essential role in human and physical capital formation, but cross-country comparisons of fiscal constitutions suggest that they have less autonomy and exercise lower control on their own fiscal policy than in other federal countries. The system is quite complex and diversity of federal subjects along socio-economic dimensions is wide. Increased coordination between the federal and regional governments to tackle complexity, and to address cross-regional infrastructure and human capital bottlenecks could result in a more integrated national market with positive spillovers for inter-regional and international trade, and investment. Ongoing work to measure regional business climate differences with a view of strengthening institutions, should be pursued and deepened, avoiding stigma but promoting jurisdiction competition. Regional convergence can result in a growth dividend and in more balanced geographical development.

30. Appropriate federal macroeconomic and tax policies can contribute to the development of regional tax bases, supporting regional sustainability. The adoption of a fiscal rule along realistic parameters should promote a more stable and more aligned-with-fundamentals real exchange rate with positive spillovers for lower per-capita income regions, where agriculture (a tradable sector) represents a larger share of GRP. Current plans for a rebalancing of domestic taxes with a view to taxing labor less strongly, should support decreases in informality, which is likely more prevalent in low per-capita income regions as attested from weaker tax bases. From a macroeconomic perspective, the adoption of a fiscal rule should eliminate the role that fiscal policy has played in transmitting terms of trade shocks. Against this backdrop, the role of transfers in supporting correlation in regional growth should have positive spillovers for monetary policy.

31. Strengthening regional tax bases could improve regional sustainability and accountability. An option in this regard should be to expand the use of personal property taxes (OECD, 2016). Personal property taxes currently represent only 0.4 percent of the consolidated own

revenues of regions. In 2016, 28 regions started a transition to market value-based instead of accounting value-based taxation of property. For instance, the city of Moscow is projecting a five-fold increase in property tax collections by 2020 (with tax collection increasing by 55 percent in 2016). Stronger regional tax bases should also balance somewhat the strong *de jure* role of the federal government, and increase the accountability of regional governments.

32. Federal transfers have been effective in supporting factor accumulation in lower per capita income regions and increasing growth correlation, but less effective in supporting self-sustaining GRP growth and productivity increases. Given relatively rigid tax sharing arrangements, federal transfers constitute one of the main levers through which federal policy operates at the regional level. Transfers have expanded government services but have not been as effective in expanding productive activities. Accordingly, large cross sectional differences in own fiscal revenues (in per capita and GRP terms) have persisted, as well as the associated dependence on federal transfers. Importantly, federal transfers have flowed more strongly to regions where the footprint of the state is larger.

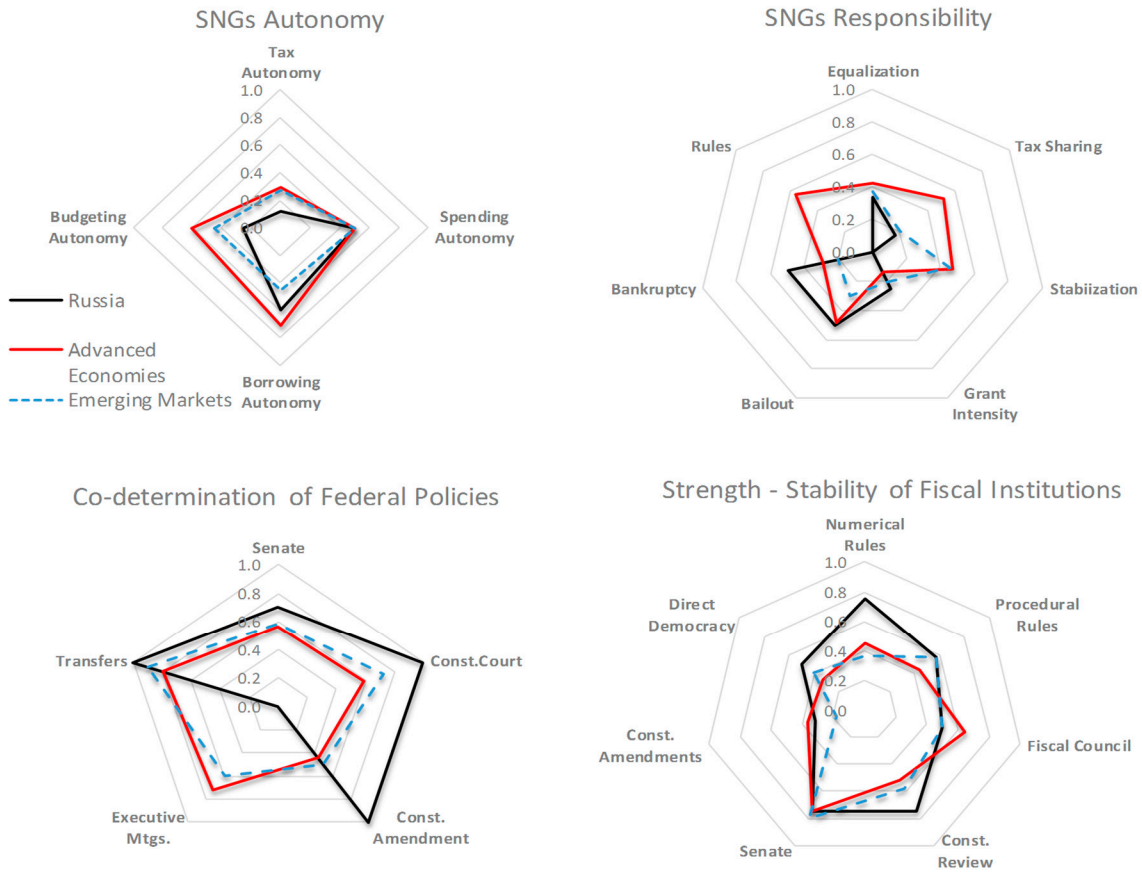
33. The most likely scenario going forward is one in which regional dependence on transfers decreases only slowly, which calls to revisit strategic objectives. From a regional perspective, equalization grants will likely keep their leading role. Sudden decreases or reallocations could create disruptions especially in the most financially dependent regions. The complete elimination of regional dispersion is unlikely. However, enhanced strategic direction could help increasing federal transfers' growth effectiveness. Open-ended transfers may have had the unintended effect of weakening regional incentives to enlarge their tax bases, further supporting a pattern of dependence. Thought should be given to include in the formulas defining grant allocation, gradually and in the margin, a measure of sustainability together with the current objective of equalization. Transition periods and reasonable time frames to achieve sustainability would be essential. From a macroeconomic perspective, the expected persistence of current volumes of transfers will add up to the existing earmarking of federal revenues that also includes transfers to EBFs. This may complicate somewhat addressing intertemporal equity considerations in the use of oil revenues.

34. There may be scope to increase the use of horizontal transfers in the margin. The large cross-regional dispersion of per capita own fiscal revenues may have contributed to economic and population concentration, which creates negative spillovers for regions with population outflows. Thought should be given to modify incentives for increased concentration to gradually slow down. The use of horizontal transfers, in the margin, may contribute to that effect, and support the use of improved levels of human and physical capital in lower per-capita income regions. In this regard, there may be room to gradually improve the primary distribution of corporate income tax, and of making more permanent the ongoing redistribution (by the federal government) of 1 percentage point of CIT to finance equalization grants.

35. There may be room to streamline, simplify and increase the transparency of transfers. Streamlining the number of transfers (especially subsidies), in particular for agriculture development,

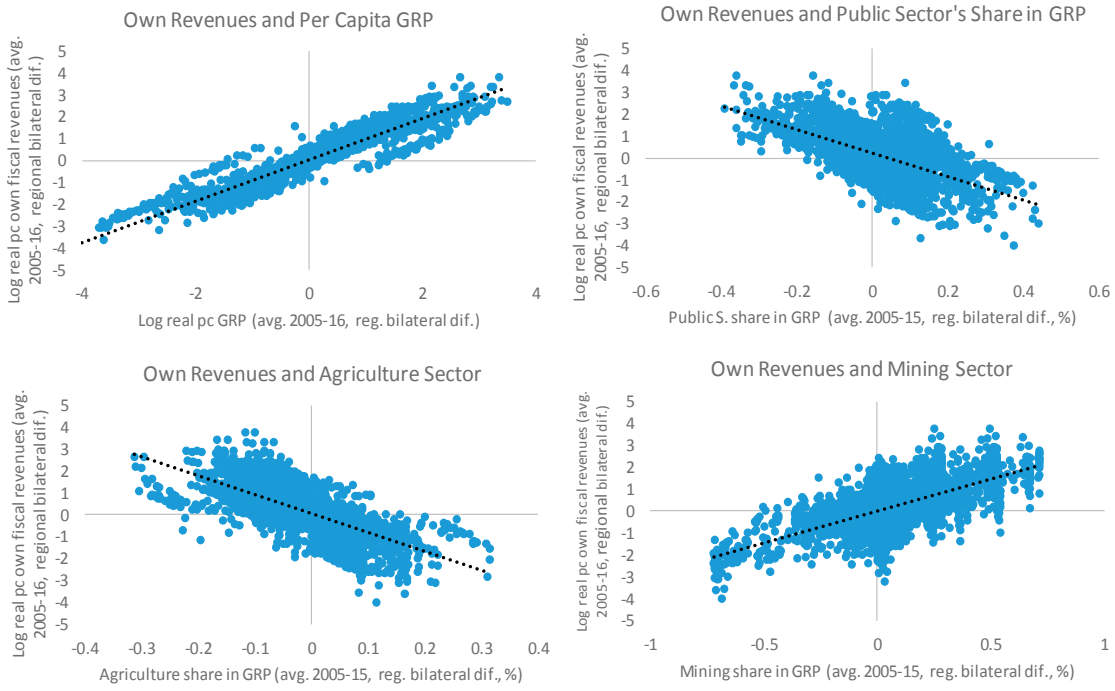
housing and utilities and education, and allocating them in appendices to the federal budget law; allocating subsidies one-to-one to government programs (or subprograms), instead of to a multiplicity of them; transforming and further consolidating "other transfers" into subsidies; and, regulating budget loans, which are increasingly used because of their concessional interest rates, should all result in a simpler, more transparent, and easy to administer system. Moreover, ongoing work towards streamlining the Budget Code should be pursued and finalized. Approved by the Federal Assembly in 1998, it has since been amended by 120 federal laws. The streamlining and simplification of the budget code provides an opportunity to increase the simplicity and transparency of transfers.

Figure 1. Features of Russia's Fiscal Federalism



Source: IMF staff calculations on the basis on data and analysis in OECD (2016)

Figure 2. Own Fiscal Revenues, Per Capita Income and GRP Composition

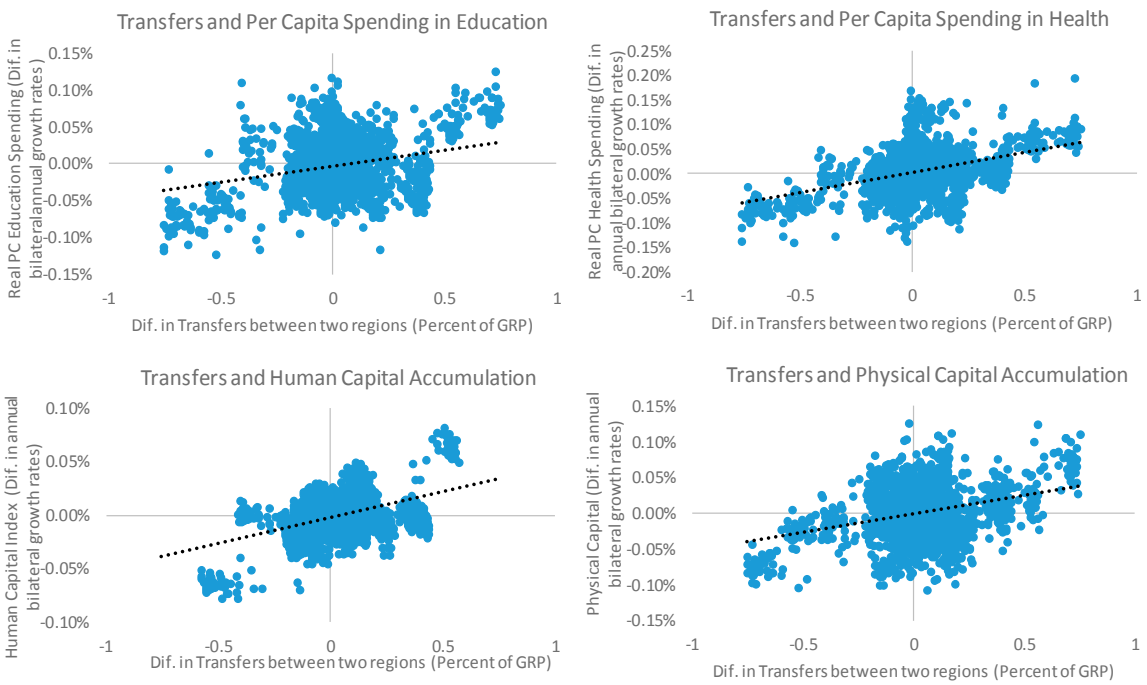


Source: IMF staff calculations based on official data

Figure 3. Russia: Federal Transfers and Per Capita Income

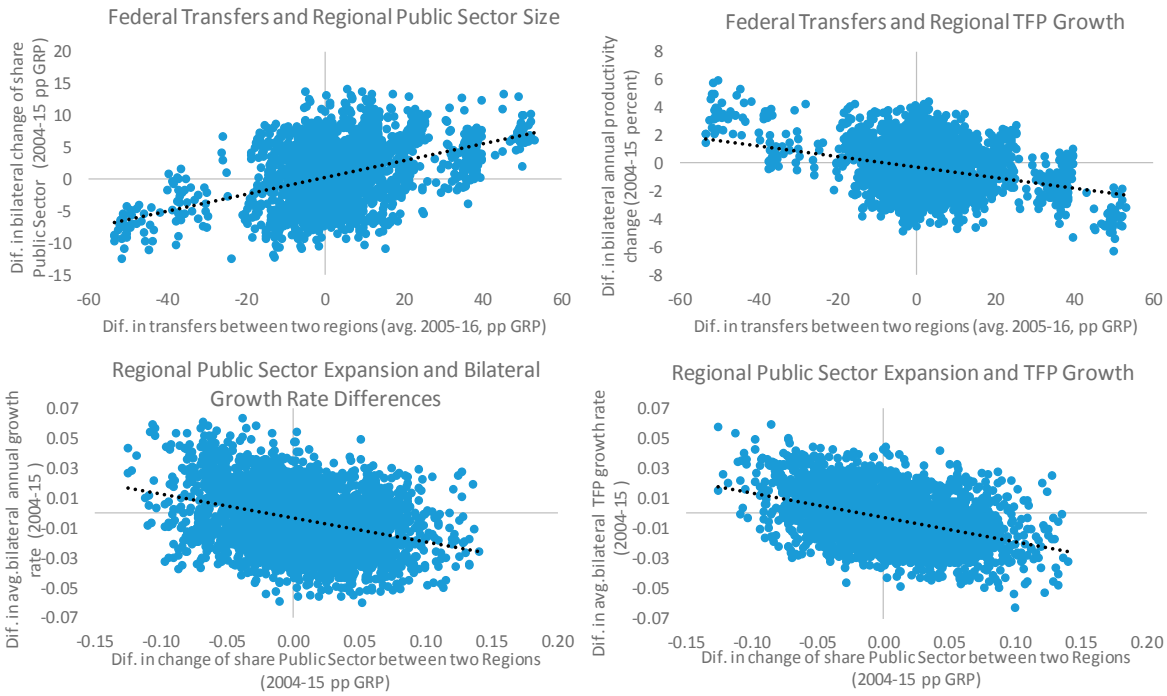
Source: IMF staff calculations based on official data

Figure 4. Russia: Federal Transfers and Accumulation of Factors of Production



Source: IMF staff calculations based on official data

Figure 5. Russia: Federal Transfers, Public Sector Expansions and TFP Increases



Source: IMF staff calculations based on official data

Table 1. Definition of Variables

Variable	Definition
Real per capita growth correlation	Bilateral regional correlation of real per capita GDP growth for 2005-15
Real per capita transfer growth correlation	Bilateral regional correlation of real per capita federal transfer growth for 2005-15 (excluding transfers to territorial EBFs)
Real per capita grant growth correlation	Bilateral regional correlation of real per capita federal grants growth for 2005-15
Real per capita subsidy growth correlation	Bilateral regional correlation of real per capita federal subsidies growth for 2005-15
Real per capita subvention growth correlation	Bilateral regional correlation of real per capita federal subventions growth for 2005-15
Share of public sector in GRP	Average share of public sector in GRP in 2004-15 (percent) 1/
Urbanization rates	Average urbanization rates for 2005-15 (percent) 1/
Foreign trade	Average Exports plus Imports over GRP for 2009-15 (percent) 1/
Revenue-to-expenditure ratio	Annual average change of the revenue-to-expenditure ratio in 2005-15 (percent) 1/
Real per capita growth	Annual average growth rate (Ln difference) of real per capita GRP in 2004-15 1/
Change in the share of public sector in GRP	Change in the share of public sector in GRP in 2004-15 (percent) 1/
Federal transfers-to-GRP ratio	Average federal transfers-to-GRP ratio in 2005-15 (percent) 1/
Initial real per capita GRP	Ln of real per capita GRP in 2003 1/
Share of mining in GRP	Average share of mining in GRP in 2004-15 (percent) 1/
Population	Ln of population (millions) in 2005 1/
Population density	Ln of population density (people per square kilometer) in 2005 1/
Common border	Dummy identifying regions sharing a common border 1/
Footprint of state	Ln of number of per capita budgetary and non-budgetary state institutions 1/

Source: IMF staff

Note

1/ They refer to the bilateral difference between any two regions of the variable being considered

Table 2. Regressions for Bilateral Regional Per Capita GDP Growth Correlations

Model	LHS	RHS 1/											
	Real per capita growth corr.	const.	Real PC transf. growth corr.	Real PC grant growth corr.	Real PC subs. growth corr.	Real PC subv. growth corr.	Initial real per capita GRP	common border	Share of public sector in GRP	footprint of state	Urb. rates	Foreign trade	stoch. term
1	1	c_1	c_2										ε_1
2	1	c_1	c_2				c_6						ε_2
3	1	c_1	c_2				c_6	c_7					ε_3
4	1	c_1	c_2				c_6	c_7	c_8				ε_4
5	1	c_1	c_2				c_6	c_7	c_8	c_9			ε_5
6	1	c_1	c_2				c_6	c_7	c_8	c_9	c_{10}		ε_6
7	1	c_1	c_2				c_6	c_7	c_8	c_9	c_{10}	c_{11}	ε_7
8	1	c_1		c_3			c_6	c_7	c_8	c_9	c_{10}	c_{11}	ε_8
9	1	c_1		c_3	c_4		c_6	c_7	c_8	c_9	c_{10}	c_{11}	ε_9
10	1	c_1		c_3	c_4	c_5	c_6	c_7	c_8	c_9	c_{10}	c_{11}	ε_{10}
11	1	c_1			c_4	c_5	c_6	c_7	c_8	c_9	c_{10}	c_{11}	ε_{11}

Source: IMF staff

Note:

1/ Variables are defined in Table 1. Estimated values for the coefficients are shown in Table 3

Table 3. Regressions for Bilateral Regional Per Capita GDP Growth Correlations: Results

Model	1	2	3	4	5	6	7	8	9	10	11
c_1	0.514 *	0.530 *	0.524 *	0.561 *	0.566 *	0.562 *	0.559 *	0.566 *	0.374 *	0.149 *	0.149 *
c_2	0.065 **	0.051 **	0.047 **	0.034 ***	0.021	0.023	0.025				
c_3								0.013	0.005	0.002	
c_4									0.264 *	0.209 *	0.209 *
c_5										0.356 *	0.356 *
c_6		-0.071 *	-0.069 *	-0.142 *	-0.124 *	-0.104 *	-0.101 *	-0.102 *	-0.096 *	-0.085 *	-0.085 *
c_7			0.126 *	0.086 *	0.088 *	0.096 *	0.097 *	0.098 *	0.088 *	0.070 *	0.070 *
c_8				-1.218 *	-0.784 *	-0.814 *	-0.853 *	-0.854 *	-0.807 *	-0.813 *	-0.812 *
c_9					-0.090 *	-0.097 *	-0.095 *	-0.096 *	-0.096 *	-0.083 *	-0.083 *
c_{10}						-0.155 *	-0.132 *	-0.132 *	-0.148 *	-0.189 *	-0.189 *
c_{11}							-0.043 **	-0.043 **	-0.041 **	-0.054 *	-0.054 *
R^2	0.003	0.030	0.038	0.136	0.160	0.164	0.166	0.166	0.177	0.209	0.209
Adj. R^2	0.003	0.029	0.037	0.135	0.159	0.163	0.164	0.164	0.175	0.207	0.207
Observations	3023	3023	3023	3023	3023	3023	3023	3023	3023	3023	3023

Source: IMF staff calculations

Note: *, **, ***, refer to coefficients that are statistically significant at 1, 5, and 10 percent levels, respectively.

Table 4. Federal Transfers in a Simultaneous Equations System

Endogenous Vector 1/					Exogenous Vector 1/							
	rev/exp ratio (%)	real per capita growth (logs)	change in share of public sector in GRP (%)	transfers (% GRP)	constant	Initial real per capita GRP	share of mining	population	pop. density	common border	footprint of state	stochastic terms
	1	$-c_{12}$	$c_{13}=0$	$c_{14}=0$	γ_{11}	$\gamma_{12}=0$	$\gamma_{13}=0$	$\gamma_{14}=0$	$\gamma_{15}=0$	$\gamma_{16}=0$	$\gamma_{17}=0$	ε_1
	$c_{21}=0$	1	$-c_{23}$	$-c_{24}$	γ_{21}	γ_{22}	$\gamma_{23}=0$	$\gamma_{24}=0$	γ_{25}	γ_{26}	$\gamma_{27}=0$	ε_2
	$c_{31}=0$	$-c_{32}$	1	$-c_{34}$	γ_{31}	$\gamma_{32}=0$	γ_{33}	$\gamma_{34}=0$	$\gamma_{35}=0$	$\gamma_{36}=0$	$\gamma_{37}=0$	ε_3
	$c_{41}=0$	$c_{42}=0$	$c_{43}=0$	1	γ_{41}	γ_{42}	$\gamma_{43}=0$	γ_{44}	$\gamma_{45}=0$	γ_{46}	γ_{47}	ε_4
	1	1	0	0	1	0	0	0	0	0	0	1
	0	1	1	1	1	1	0	0	1	1	0	1
	0	1	1	0	1	0	1	0	0	0	0	1
	0	0	0	1	1	1	0	1	0	1	1	1

Source: IMF staff

Note:

1/ Coefficients equal to zero refer to exclusion identification conditions. Variables are defined in Table 1. Estimated values for the coefficients are show

Table 5. Federal Transfers in a Simultaneous Equations System: Results

Equation	Coefficient	SUR	2SLS	3SLS	FIML	GMM
				Endogenous		
1	c_{12}	0.2799 *	0.7425 *	0.7165 *	1.0992 *	0.7539 *
2	c_{23}	-0.3204 *	-0.5044 *	-0.4314 *	-0.2364 *	-0.3726 *
2	c_{24}	0.0105 *	0.0509 *	0.0340 *	0.0232 *	0.0255 *
3	c_{32}	-1.3605 *	-0.6282 *	-0.5730 *	-0.5017 *	-0.6827 *
4	c_{34}	0.0827 *	0.1038 *	0.0900 *	0.0869 *	0.0994 *
				Exogenous		
1	γ_{11}	0.0023 *	0.0040 *	0.0039 *	0.0054 *	0.0041 *
2	γ_{21}	0.0005	0.0010 **	0.0008 ***	-0.0008 ***	0.0002
2	γ_{22}	-0.0096 *	-0.0074 *	-0.0106 *	-0.0089 *	-0.0111 *
2	γ_{25}	0.0008 *	0.0016 *	0.0007 *	0.0004 *	0.0006 *
2	γ_{26}	0.0001	0.0032 **	-0.0018 **	-0.0021 *	-0.0018 **
3	γ_{31}	0.0018 *	0.0038 *	0.0040 *	0.0044 *	0.0033 *
3	γ_{33}	-0.0530 *	-0.0465 *	-0.0408 *	-0.0422 *	-0.0418 *
4	γ_{41}	0.0220 *	0.0237 *	0.0229 *	0.0240 *	0.0206 *
4	γ_{42}	-0.0583 *	-0.0679 *	-0.0619 *	-0.0674 *	-0.0494 *
4	γ_{44}	-0.0456 *	-0.0480 *	-0.0435 *	-0.0431 *	-0.0391 *
4	γ_{46}	-0.0254 *	-0.0315 *	-0.0235 *	-0.0249 *	-0.0241 *
4	γ_{47}	0.0334 *	0.0314 *	0.0341 *	0.0337 *	0.0366 *

Source: IMF staff calculations

Note: *, **, ***, refer to coefficients that are statistically significant at 1, 5, and 10 percent levels, respectively.

Appendix I. Fiscal Federalis—Further Details

This appendix summarizes revenue sources (including sharing arrangements) (Table A1), and spending responsibilities by different government levels (Table A2). Concretely, Table A1 catalogues federal taxes, special tax regimes, regional taxes, local taxes, and federal non-tax revenues, including their tax sharing between different levels of government, as specified in the Russian Legal framework. In turn, Table 2, describes federal, regional/local and joint federal-regional spending responsibilities, and specifies devolved federal spending responsibilities to regions (clarifying which are financed by subventions and which not).

Table A1. Russia: Tax and Non-Tax Revenue Sharing Arrangements

Federal taxes	Rates (percent)	Share accruing to (in percent of total)		
		Federal	Regional	Municipal
VAT	18 (concessional rate 10 percent)	100		
PIT	13	0	85	15
CIT 1/	20	10	90	
MET (Oil and Gas)	Formula-based depending on oil price	100		
MET (Other subsoil resources, including diamonds)	Ad valorem and specific	40	60	
MET (Commonly occurring subsoil resources)	Ad valorem and specific		100	
MET (Diamonds)	8		100	
Water tax	Specific	100		
Excise tax on ethanol from edible raw material 2/	Specific	50	50	
Excise tax on ethanol from all material excluding edible 2/	Specific	100		
Excise tax on alcohol-containing products 2/	Specific	50	50	
Excise tax on spirits 2/	Specific	50	50	
Excise tax on wine, beer, other 2/ 3/	Specific		100	
Excise tax on tobacco 2/	Specific	100		
Excise tax on cars and motocycles 2/	Specific	100		
Excise on gasoline and motor oil 2/ 4/ 5/	Specific	12	88	
Excise tax on imported excisable goods 2/	Ad valorem and specific	100		
Fee (royalty) for exploitation of water biological resources	Specific	20	80	
Fee (royalty) for exploitation of animal resources	Specific		100	
Stamp duty 6/	Specific	100	100	100
Stamp duty via public multi-service centers		50	50	

Special Tax Regimes	Rates (percent)	Share accruing to (in percent of total)		
		Federal	Regional	Municipal
Single agricultural tax	6%			100
Single imputed income tax	15% (7.5-15)			100
Patent	6%			100
Simplified taxation regime	6% or 15%	100		
Taxes under Product sharing agreements		25	75	

Table A1. Russia: Tax and Non-Tax Revenue Sharing Arrangements (Cont.)

Federal Non-Tax Revenues	Rates (percent)	Share accruing to (in percent of total)		
		Federal	Regional	Municipal
Property income and earnings from paid services		100	100	100
License fees		100		
Customs duties and fees		100		
Forests		100	100	100
Water facilities		100	100	100
Environmental Fee 7/		5	40	55
Consular fees		100		
Disposal fee		100		
Subsoil royalty	Formula-based	40	60	
Proceeds from sale/lease of federal land ceded to region			50	50
Fees for record extracts		100	100	100
Fees for record extracts via public multi-service center		50	50	
Fines and penalties 8/				

Regional Taxes	Rates (percent)	Share accruing to (in percent of total)		
		Federal	Regional	Municipal
Corporate property tax	Capped at 2.2%		100	
Gambling tax	Specific		100	
Transport tax	Specific		100	

LocalTaxes	Rates (percent)	Share accruing to (in percent of total)		
		Federal	Regional	Municipal
Land tax	Capped at 0.3% and 1.5% for diff.types of land			100
Personal property tax	0.1% - 2%			100
Retail sales fee (so far implemented only in Moscow)	Specific, but no more than patent-based			100

Source: Russian Tax Code (articles 13-15; 18; 143-418); and, Russian Budget Code (articles 46, 56-64).

Notes:

1/ The CIT is the only tax whose rate is split between the federal and the regional levels in the Tax Code (sharing of other taxes is established in the budget code). Regions are authorized to adjust their portion of the CIT rate down, but no more than to 13.5 percent (12.5 percent in 2017-20). For 2017-20, the federal government will receive an additional 1 pp to be redistributed via equalization grants. This may result in a financing gap for some regions.

2/ The tax code sets the corresponding rates in Rubles for 2017-19

3/ As established in the Budget Code (article 56, 2.2). For 2017, the distribution of these revenues shall be governed by the Federal Budget Law.

4/ These shares are suspended for 2017-2020 by law 409-FZ of 30 November 2016

5/ Gasoline and diesel oil excise revenues shall be attributed to the federal budget according to the following shares: 38.3 percent in 2017, 42.6 percent in 2018, and 39.8 percent in 2019. The remaining portion will go to the regional budgets.

6/ Whenever share of federal, regional and local government is reported simultaneously as 100 it means that each of them receives the full share of the tax revenue in application to its own jurisdiction.

7/ 95 percent in Moscow, Saint Petersburg. The federal 5 percent is planned to be given over to municipalities in 2018.

8/ Numerous fines and penalties are distributed in various shares (including 100 percent) among different government levels

Table A2. Russia: Spending Responsibilities and Jurisdiction by level of Government 1/

Area	Federal	Joint Federal Regional	Regional / Local
General	Exclusive Federal Jurisdiction: Authority on federal property, regulation of social and economic development, federal energy systems, national defense and security, international relations, law enforcement; meteorology and statistics.	Areas of joint federal-regional jurisdiction: Public safety and law enforcement; administrative, labor, family, housing, land, subsoil, forest, water relations; environmental protection; emergencies and natural disasters; education, science, culture, sports; public health, social security. Responsibilities are usually divided based on jurisdictional attribution or relevance (e.g. regional roads or federal water facilities), but sometimes are shared between the two levels of government.	Exclusive Regional Jurisdiction: all other government responsibilities beyond those under the federal jurisdiction and joint federal-regional jurisdiction - as stipulated in regional constitutions and legislation. Local Governments' jurisdiction: Urban, rural settlements; electricity, heating, water, gas, fuel supply; roads; municipal housing; public transport; emergencies, fire safety; public amenities, eateries, retail trade; culture (local cultural heritage, folk art and crafts); physical culture, sports, public entertainment, recreation; archives; cemeteries; local resorts; public safety, rescue operations; waste management; support to agriculture and SMEs; terrorism/ extremism prevention; education (less vocational + vacations); public health.
Delegated federal Responsibilities *supported* by federal subventions			National Census and Agricultural Census; Prevention of homelessness; Housing for disabled, veterans, retired servicemen, etc.; Subsidization of housing and utility payments for veterans, disabled, radiation-exposed, etc.; payouts to radiation-exposed; unemployment benefits; maternity and childcare benefits; monthly compensation payouts to various categories, e.g. exposed to radiation, blood donors, etc.; water and forest relations: management (partial) of federal water facilities and forests; animal world, hunting, fishing (partial); protection and oversight of cultural heritage; education: oversight, licencing, accreditation (all partial); public health: licensing; procurement of drugs, mandatory medical insurance
Delegated federal Responsibilities *unsupported* by federal subventions			audit of construction plans and engineering surveys; environmental audit; land relations: provision of plots of land for construction, demolition of real estate, easement; R&D management;
Selected areas			
Education	Universities		Vocational, primary and secondary schools
Employment	Unemployment benefits (delegated - see above)		employment facilitation
Social security	Social support to war veterans, radiation victims (some responsibilities delegated - see above)		social support to senior citizens, disabled, orphans, labor veterans, low income households; payment of medical insurance contributions on behalf of non-workers
Industry support	For instance, Aviation		Support to agriculture (beyond that from federal programs) and to SMEs (since 2015)
Waste management	Radioactive waste		Solid waste

Source: Constitution of Russian Federation (Article 71-73, 130-133), Federal Laws N184 FZ (10/06/1999 amended 12/28/2016; and, N131 FZ (10/06/2003 amended 12/28/2016 and updated 02/17/2017); List of regional responsibilities (Ministry' of Justice website, http://minjust.ru/ru/razvitie-federativnyh-otnosheniy-i-mestnogo-samoupravleniya/razgranichenie-polnomochiy-mezhdu)

Note:

1/ Responsibilities of regional governments in areas of joint jurisdiction are stipulated in the following legislation/regulations: 114 responsibilities listed in the framework law (184 FZ of 1999); 61 responsibilities prescribed in various specific laws (e.g. 52 FZ On Sanitary and Epidemiological Safety); 20 responsibilities arising from Presidential decrees (in particular decrees of May 2012), e.g. social suppor to medical workers, their professional development, employment of disabled, housing, increase in salaries for teachers and cultural workers, etc.; 162 responsibilities according to GoR decrees (minor, many of them recommended, not mandated. Regional governments implement 55 federal government programs and federal special-purpose programs - according to GoR resolutions (financed with own funds and subsidies).

Limits imposed by the Federal Government on Regional Budgets

The Budget and Tax Codes establish several fiscal restrictions for sub-federal governments. Monitoring, reporting and transparency standards and requirements established by the federal government are high. Sanctions for rules violations might be imposed and include, among other, adjustments in the size of transfers (excluding subventions).

Budget balance requirements: the deficit or regions cannot exceed 15 percent of their own revenues (excluding grants). Rules are stricter if federal grants exceed 40 percent of the consolidated region budget revenues (excluding subventions).

Tax limits: Sub-federal governments can set tax rates and reliefs for regional and local taxes. For the CIT, regions can set rates for the regional part of the tax within the limits set by the Tax Code but not reliefs. Excise taxes on gasoline and alcohol are shared annually between regions and federal government. The Tax Code does not allow for regions to legislate on PIT, fees and charges, rates and reliefs, which constitute the remaining 40 percent of their revenues.

Expenditure limits: Regions with a share of federal grants exceeding 10 percent of consolidated region budget revenues (excluding subventions), cannot assume and execute expenditures assigned to regional governments by Constitution and federal laws; and to exceed federal norms for budgetary sector wages and regional government activity financing. Similar restrictions exist for municipalities getting equalization grants from regions.

Borrowing constraints: Domestic borrowing is not directly restricted; new foreign borrowing (for deficit financing or refinancing) is allowed only for regions that do not receive federal equalization transfers, do not have debt arrears, and have proper credit ratings from at least two international agencies. Regions receiving federal equalization transfers can borrow externally to refinance existing external debt, if no debt arrears and credit rating requirements are satisfied. Total yearly borrowing of regions and municipalities is bound up by deficit financing and debt amortization.

Debt levels and service: Debt is not allowed to exceed own annual revenues (excluding grants). Rules are stricter if federal grants share exceed 40 percent of consolidated region budget revenues (excluding subventions). Debt service (interest payments) should not exceed 15 percent of total expenditures (excluding subventions). Escape clauses introduce flexibility for regional budget implementation (budget credit financing, privatization, use of regional precautionary saving funds). Debt ceilings are currently allowed to be exceeded for an amount equal to federal budget credits.

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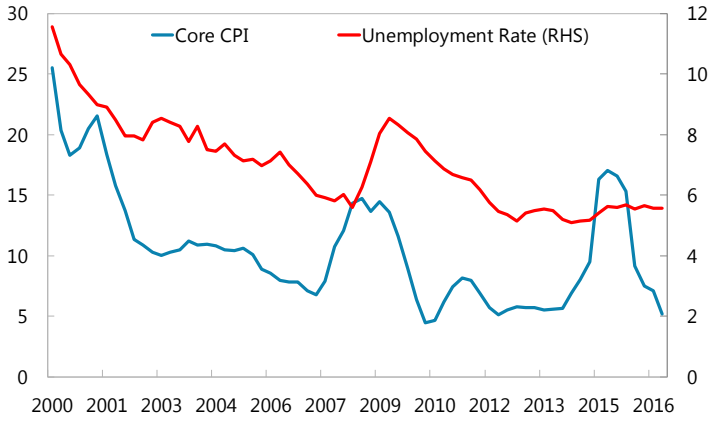
PUTTING THE CURVE BACK IN RUSSIA'S PHILIPS CURVE: A TIME-VARYING APPROACH[1] [2]

A. Introduction

1. The recent relationship between the labor market and inflation has been puzzling in Russia. While unemployment has stayed muted since 2013, inflation has been volatile, leading researchers to revisit the relationship between inflation and activity. If the role of import penetration, hysteresis for the long-term unemployed, and a potentially weaker relationship between inflation and slack have changed over time this would have significant implications for monetary policy. A better understanding of these relationships is especially relevant in the context of the transition to Inflation Targeting (IT) regime, which Central Bank of Russia (CBR) adopted in late 2014.

Figure 1. Inflation-Unemployment Trade-off
(Percent, year-on-year growth)



Sources: Haver Analytics; and IMF staff calculations.

2. In this study, we estimate a hybrid New Kenysian Philips curve for Russia's core inflation, in which the coefficients vary over time. The time-varying feature of the model helps policy makers to understand how the importance of various explanatory variables in the model has changed over time. We compare our findings to simpler bivariate estimations of the relationship between different measures of inflation and slack. We illustrate how bivariate relationship can be misleading and how an hybrid NK model for Phillips curve can help us to understand the transmission chanels better.

3. We find that the core inflation Philips curve in Russia is alive and the slope is expected to increase with the recovery. Our results illustrate that while the impact of cyclical unemployment on core inflation changes over time, it tends to increase during the normal-times and to decrease in the aftermath of crisis-times. We also find that the weight on the inflation expectation in the PC model has increased recently, thanks to the introduction of an IT regime. This implies that the CBR is on track in its effort in anchoring the long-run inflation expectation and gaining credibility. Turning to the slack in the economy, the model implied unemployment slack has been coming down fast

[1] Prepared by Marzie Taheri Sanjani.

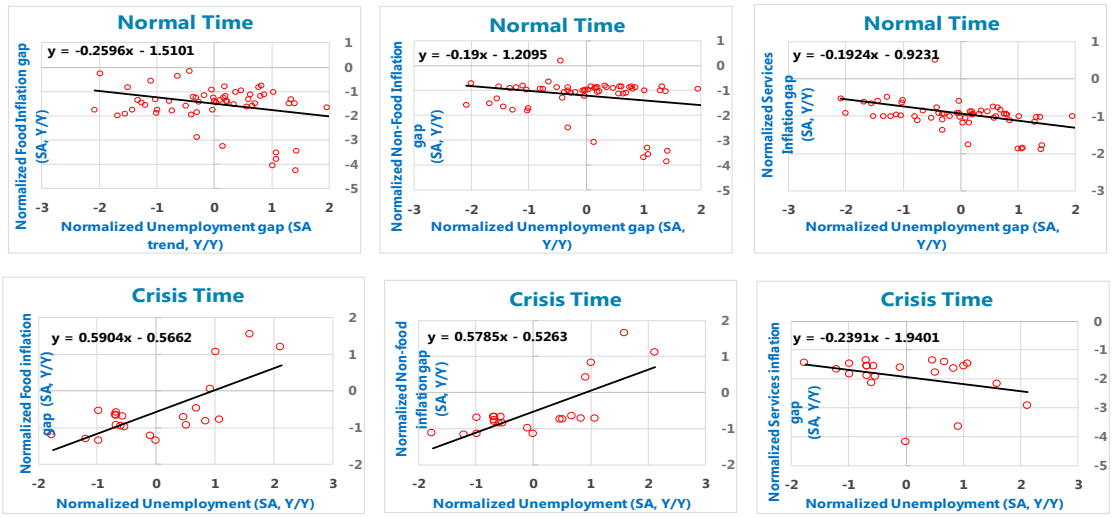
[2] I would like to thank Jingzhou Meng for her excellent research assistantship and Carlos Montes-Galdon for providing the Bayesian estimation module. I would also thank the seminar attendants of the Central bank of Russia. All the errors are my own. If there is any question, please email me: mtaherisanjani@imf.org

post-GFC, thanks to the flexible labor market conditions in Russia. Finally, by presenting the fitted value of the inflation, we show that PC is overall a good model in explaining inflation dynamics.

B. Avoid Bivariate Relationship and Adopt Multivariate Structural Model

4. Bivariate relationship between inflation and slack, as in the classic Phillips curve,can be enigmatic. Looking at the bivariate relationship between various price inflation measures and unemployment gap during the business cycle attests to the existence of this relationship in normal time but with the sign reversed in crisis episodes[3]. The negative correlation between the unemployment gap[4] and various price measures—headline CPI, Core CPI, Wages, and Unit Labour Costs (ULC), as well as subcomponents of CPI inflation—indicates that an appropriate specification of the Philips curve (PC) should exist in the data. Moreover, the reversal in the sign of the relationship during the crisis episodes is evidence of the open economy implications of PC specification and hence the role of the Real Effective Exchange Rate (REER) and import prices. The impact of commodity prices in Russia, as an oil exporter, is accounted for by the REER. Additionally, as depicted below, the dispersion in the estimated slopes, across different measures of inflation and different episodes of the business cycle highlights the shortcoming of the bivariate relationship in accounting for missing factors. This suggests that a multivariate relationship provides a better specification for PC.

Figure 2. Bivariate Relationship- Subcomponents of CPI Inflation (1996Q1-2016Q3)

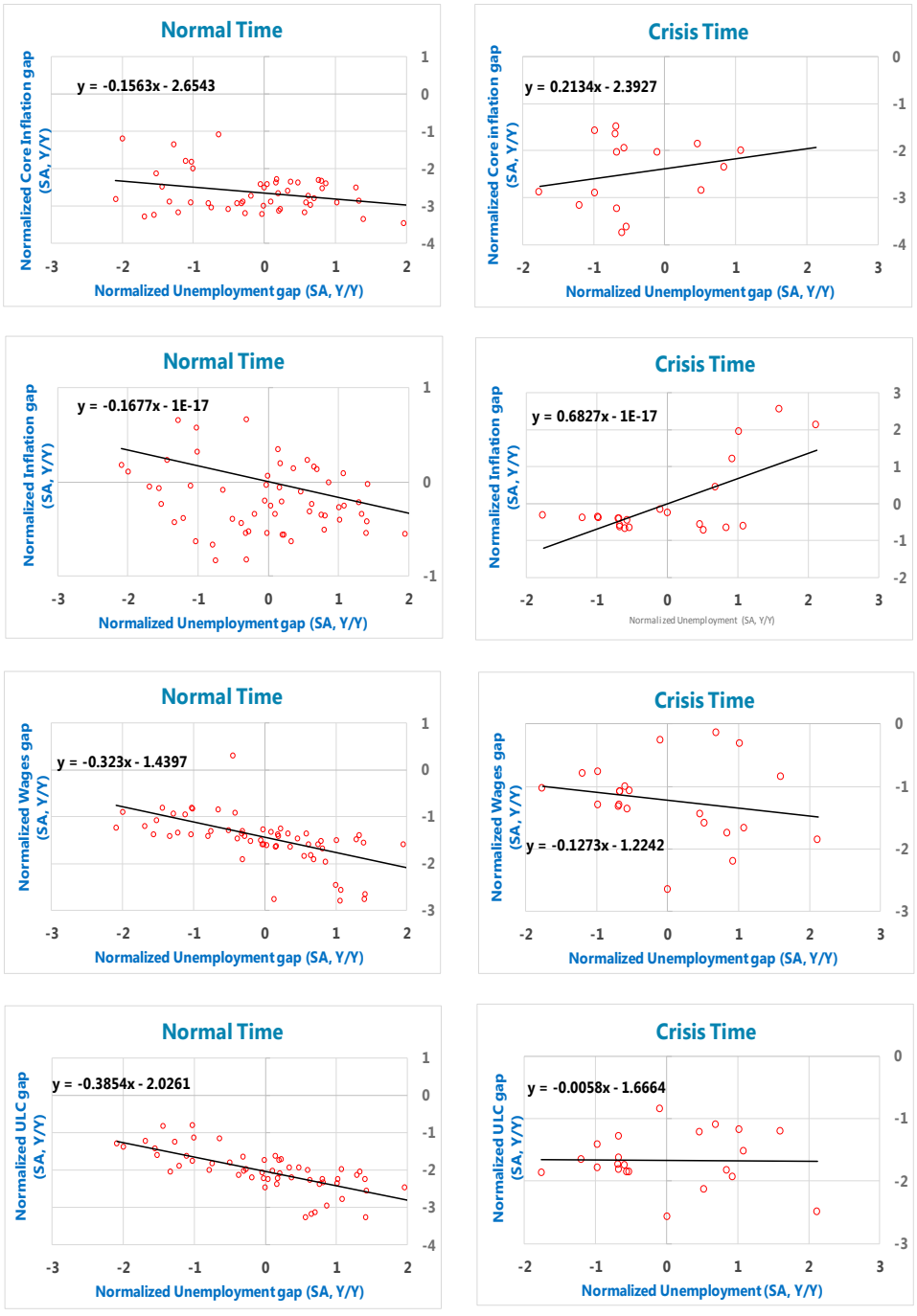


Sources: Haver Analytics; and IMF staff calculations.

[3] We use the following episodes for crisis time: 1998Q3–2000Q4, 2008Q4–2009Q4, 2015Q1–2016Q4.

[4] Russia doesn't have an official NAIRU data. Hence for our descriptive studies we use HP filter to calculate the unemployment gap, in which HP trend is considered as long run steady state of unemployment. Furthermore we estimate NAIRU as an unobserved variable implied by a time-varying parameters Phillips curve.

Figure 3. Bivariate Relationship- Various Inflation Measures (1996Q1-2016Q3)



Sources: Haver Analytics; and IMF staff calculations.

5. Our hybrid NK model of Phillips curve explicitly account for the role of imported inflation and the exchange rate on core inflation. With the above motivation in mind, we estimate a relationship between inflation, expected and lagged core inflation, unemployment rate,

lagged relative import price inflation and lagged REER over the sample of quarterly data starting from 2000Q1 to 2016Q3. The estimated model is as following:

$$\pi_t = -0.37u_{t-1} - 0.13\pi_t^e + 0.96\pi_{t-1} - 0.03\pi_{m,t-1} - 0.007reer_{t-1} + \varepsilon_t$$

Where $\pi_{m,t}$ is inflation in the relative price of imports—defined as the import price deflator relative to the GDP deflator—to account for the impact of import prices, including commodity prices, on domestic consumer prices. $\pi^e{}_t$ is the long-run inflation expectation (defined as a 5-year forward-looking forecast of inflation and is based on the WEO vintage database (1993–2016))[5]. We discuss the fit of the model in annex 2 by analyzing various statistical properties of this regression. We show that the overall fit of the model is relatively good based on the residuals and the RMSE. The above regression demonstrates the presence of a PC, with strong hysteresis (in this case lagged inflation), and mild impact of import price inflation. However, the coefficients of REER and inflation expectation are not significant, when they are estimated over the whole sample period; this fact shows that these coefficients have gone through significant changes over time and a constant time parameter model can't simply capture such changes. These time variations come from the establishment of inflation targeting framework in 2014 and the adoption of a free-floating exchange rate regime in November 2014.

This leads us to conclude that estimating a PC with constant coefficients can't guide policy makers about the "*dynamic*" relationship between inflation and slack. In the context of transition to a fully established IT regime[6], investigating how the dynamic relationships between inflation and slacks and external factors evolved over time will shed light on transmission channels of monetary policy. To assess time-variation in the Philips curve there are three approaches in the literature: regime switching and conditional forecast—for an example of a recent work on the U.S. Phillips curves see, Laseen and Taheri Sanjani (2016), and time-varying parameters—for an example of a recent work on the E.U. Phillips curve see, Ciccarelli and Osbat (2017).

6. How has the dynamic of Phillips curve evolved over time? We estimate a hybrid NKPC specification which allows for both the natural rate of unemployment and the coefficients to change over time. The model is based on Matheson and Stavrev (2013), which has also been used in Blanchard, Cerutti, and Summers (2015), ECB occasional paper (2017), and Chapter 3 WEO (2016)[7]. It comprises of the following equations:

[5] Ideally we would like to have a survey-based expectation measures starting from 2000, however Russia doesn't have a long enough inflation expectation time series. Recently the authorities have begun conducting a survey to measure 1-year ahead inflation which is a short-term forecast horizon.

[6] CBR has adopted an IT regime in 2014 with the target headline inflation of 4 percent by the end of 2017.

[7] It also has been used in panel remarks by Vítor Constâncio, Vice-President of the ECB at the Jackson Hole Economic Policy Symposium, August 2015. Additionally Szafranek (2016) and Oinonen and Paloviita,(2014) similarly use a TVP model.

$$\pi_t = \theta_{1t}(u_{t-1} - u^*_{t-1}) + \theta_{2t}\pi^e_t + (1-\theta_{2t})\pi_{t-1} + \theta_{3t}\pi_{m,t-1} + \theta_{4t}xr_{t-1} + \varepsilon_t \quad (1)$$

$$u_t - u^*_t = \rho(u_{t-1} - u^*_{t-1}) + \eta_t \quad (2)$$

$$u^*_t = bu^*_{t-1} + (1-b)u_{t-1} + \nu_t \quad (3)$$

Equation (1) is the hybrid NK Phillips Curve, in terms of the slack, unemployment gap ($u_t - u^*_t$), π^e_t is long-run inflation expectations[8], π_{t-1} year-over-year[9] core CPI inflation (lagged one quarter), and θ_{2t} is a time-varying weight attached to long-run inflation expectations that reflects the stability of inflation expectations, π_m relative import price inflation and the real effective exchange rate is xr. In this model, the slope coefficients in equation (1) are time varying, and they are assumed to follow a random walk process,

$$\theta_t = \theta_{t-1} + \epsilon_t \quad (4)$$

The natural rate of unemployment in Russia is not available; hence we estimate it within the model. Equation (2) determines the law of motion of the unemployment gap with persistence ρ. Equation (3) determines the dynamics of the natural rate of unemployment, as an unobservable. The coefficient b determines the level of hysteresis in the natural rate. All the three shocks, ε_t, η_t and ν_t, in the model are normal and i.i.d (uncorrelated). This assumption implies that the model is Gaussian however, it is not linear in the latent states.

Data (2000-2016, quarterly) and Transformation		
Mnemonic	**Description**	**Transformation**
HICPXEF	Core Consumer Price Index, SA (Dec.2000=100)	YoY Growth Rate
UR	Unemployment Rate, SA	Level
IMPXdef	Imports Deflator/GDP Deflator (SA, 2011=100)	YoY Growth Rate
REER	Real Broad Effective Exchange Rate Index, CPI Based (2010=100), SA	Annualized log difference
LTEXP	Long-term Inflation expectation	YoY Growth Rate

7. Our identification assumptions imply some constraints on the coefficients. More precisely the slope on the unemployment gap is negative, the coefficient of import price inflation

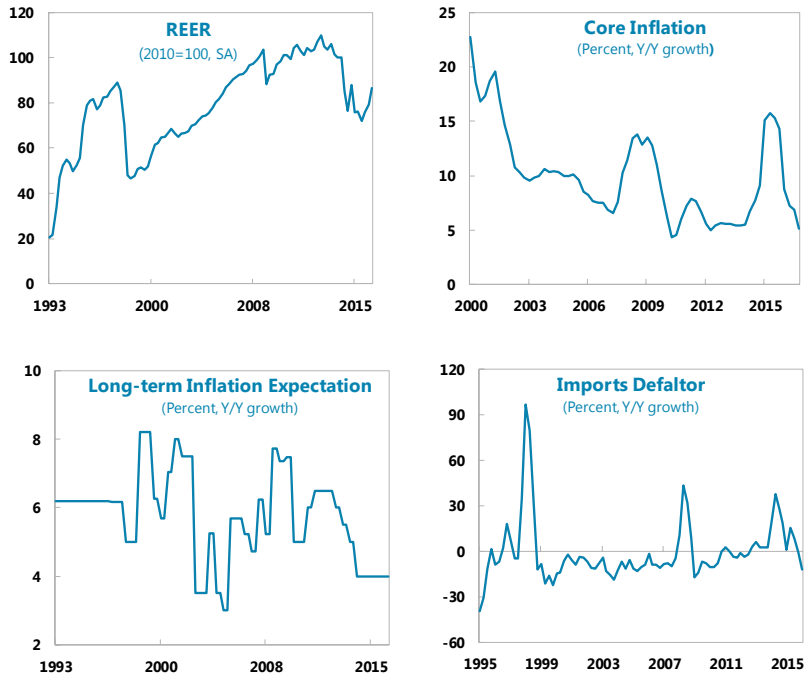
[8]The long run inflation expectation data is a 5-year forward-looking forecast and is based on the WEO vintage database (1993–2016). Firstly, we downloaded inflation data from two WEO vintage database for each year. Then we took the inflation data in WEO Spring vintage (WEO April or WEO May) as the Q1 and Q2 expectation, and data in Fall vintage (WEO September or October) as the Q3 and Q4 expectation. For example, inflation projection of 2021 in 2016 WEO April vintage is taken as the 5-year inflation expectation in 2016Q1 and 2016Q2; and 2021 projection in 2016 WEO October vintage is taken as the inflation expectation in 2016Q3 and 2016Q4. Lastly, we calculate the Y/Y growth rate based on the index.

[9] The reason we choose this transformation, as oppose to qoq annualized, is the consistency with our measure of inflation expectation which is yoy.

must be positive, the weight of inflation expectations is between 0 and 1, and the slope of the exchange rate is restricted to be negative. Thus, a standard Kalman Filter cannot be used to perform the estimation, and instead, we estimate the model using a Constrained Extended Kalman Filter.

8. The data is measured at the quarterly frequency and covers 2000Q1 to 2016Q3. They are seasonally adjusted. The relative price of imports is the import-price deflator relative to the GDP deflator. The series for long-run inflation expectations is a 5-years-ahead forecast of inflation from WEO quarterly vintages. The table above summarize the data that was used.

Figure 4. Data



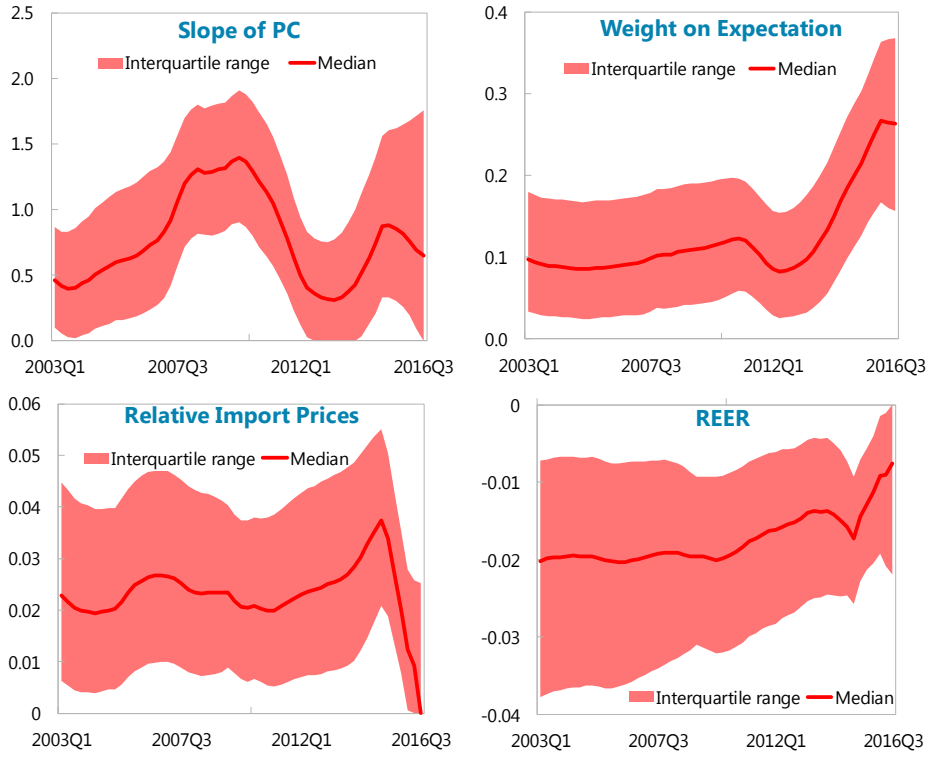
Sources: Haver Analytics; and IMF staff calculations.

C. Results—How Does the Philips Curve Evolved Over Time?

9. The slope of core inflation Phillips curve is not flat and the slope is steeper in normal business cycle time. Below we present the estimated coefficients of the model, finding that the weight on long-run expected inflation (as opposed to the coefficient on lagged inflation) has increased since 2012, thanks to the CBR's effort in anchoring inflation expectations. This explains in large part why we have not seen inflation spiral in the aftermath of the recent inflationary recession, despite the large movement in the exchange rate. However,, the coefficient on inflation expectations is lower than the ones typically found in Advanced Economies with well-established IT regimes (i.e., for the US it hovers around 0.7). This is an intuitive result considering the transitioning nature of IT regime in Russia, as it takes a long time to established credibility.

We also find clear evidence that the effect of the unemployment gap on inflation increases before crisis episodes and goes down post-crisis with some lag; while the slope of the PC has flattened in the aftermath of GFC, it started to recover 2012 until the beginning of the recent crisis in 2015. This suggests that we can expect another episode of slope-sharpening as the recovery gets underway[10].

Figure 5. Time-varying Parameters of Phillips Curve



Sources: Haver Analytics; and IMF staff calculations.

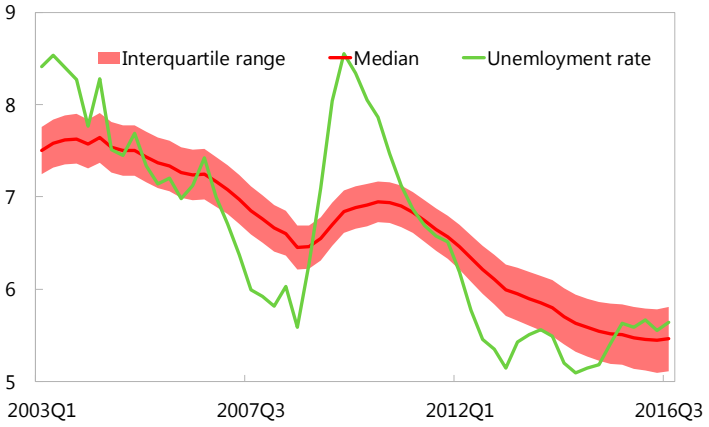
The results show that the importance of import price inflation has increased over time upto the onset of the sanctions, consistent with rising import penetration and globalization. In 2015 onward, the sanctions on some foods, and the compression of consumption and expenditure switching impacted imports of goods, and hence the inflation elasticity to import prices. The impact of REER on core inflation has been mostly steady and small until the 2014 move to a floating exchange rate regime, which has lowered the absolute value of this coefficient.

10. The Philips curve implied slack is decreasing. Turning to the estimated time-varying NAIRU as an unobservable, the PC-implied NAIRU is smoother than unemployment by construction. Russia's estimated NAIRU has been declining since 2000 on average, thanks to the flexibility in Russia's labor market, even though it has risen during crisis episodes. Recently it has manifested a positive but small

[10] Annex 3 compares the slope of headline inflation with the core inflation.

gap (Figure 6). The wage-structure in the Russian economy makes the labor market flexible. More specifically, the wages have two components: a flexible and a fixed component. The flexible component is cyclical and adjust during the business cycle, both upward and downward.[11]

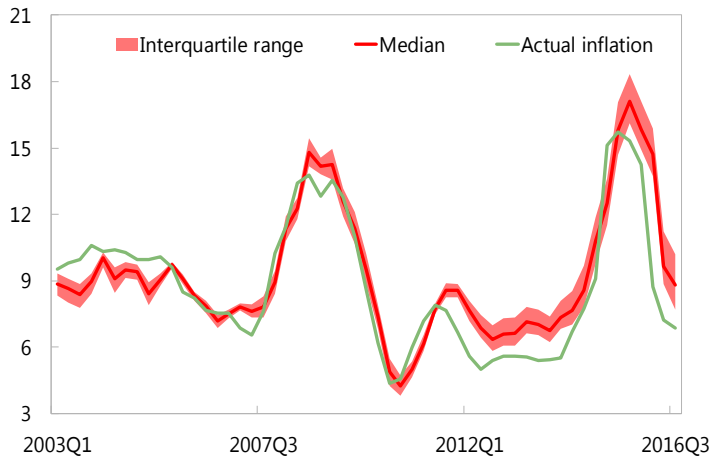
Figure 6. Unemployment Rate and NAIRU



Sources: Haver Analytics; and IMF staff calculations.

11. The Phillips curve fits the inflation data reasonably well. The predicted values of the inflation implied by the Phillips curve model, fit the data well, except for a few episodes with particularly large inflation spikes. However, from 2012 onward the model implied inflation slightly lags the actual inflation. The goodness of the fit, implies that one can use the model to forecast inflation.

Figure 7. Inflation and Fitted Value



Sources: Haver Analytics; and IMF staff calculations.

[11] To study monetary policy trade-off between slacks and inflation in the economy and its implication for interest rate setting one needs a GE model, see Furlaneto, Gelain and Taheri Sanjani (2014).

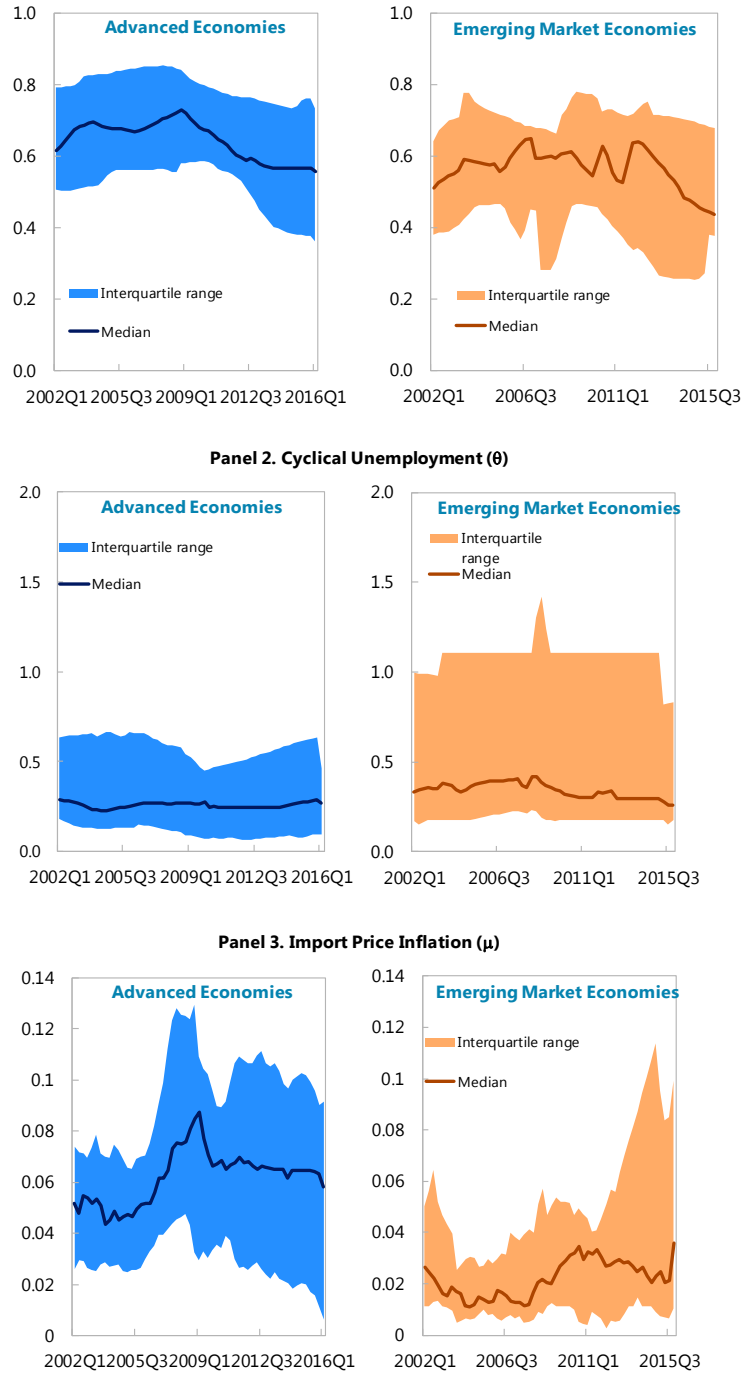
12. How does Russia's estimate compare to the ones of Emerging Markets (EMs) and Advanced economies (AEs)? The figure below shows the analysis presented in October 2016 WEO, chapter 3, using similar TVP PC model. In the right-hand side, the panel summarizes the average EMs estimates and in the left-hand side the panel shows the average AEs estimates both for *headline* inflations. Comparing the weights on various variables in the model to the ones of Russia one can draw the following points:

1) **Weight on Inflation expectation in EMs is lower than AEs.** This is because AEs' central banks have relatively more mature IT framework in place. After establishing the IT regime in Russia, the weight of the inflation expectations in PC has risen. The overall weight is aligned with the average of EMs.

2) **The slope of PC is steeper in Russia than on average in EMs.** The reaction to cyclical unemployment in Russia, on average over the sample period, is higher than f in other EMs. This would imply monetary policy should be more watchful of slack in the economy.

3) **Historically the weight on Russia's relative import price inflation is in line with the others in EMs**. The weight of relative import price on

Figure 8. Phillips Curve Estimations in Russia, AEs and EMs



Sources: Consensus Economies; Haver Analytics; Organization for Economic Cooperation and Development; and IMF staff calculations.

inflation in AEs is larger than EMs, thanks to the higher import penetration in AEs. Note that the scales for both EMs and AEs are small. In Russia, this weight has decline after the imposition of the sanctions in 2014. Therefore, it implies that in Russia import prices inflation have a smaller impact on the domestic inflation.

D. Conclusion

13. In this paper, we estimate a time-varying parameters hybrid NK Phillips curve using Russian data between 2000 to 2016. We analyze how the coefficients have evolved over time. Our estimates suggest that the Philips curve is alive and the slope is expected to increase as the recovery is underway; this would emphasize on the role of slack in underpinning the monetary policy decision. Our results illustrate how the weight on inflation expectation has increased recently, thanks to successful establishment of the IT regime in Russia. As a bi-product of our analysis, we estimate the PC-implied Nairu, and we show that the slack has been coming down fast post-GFC, thanks to a flexible labor market in Russia. Finally, by presenting the fitted value of the inflation, we show that PC is overall a good model in explaining the dynamic of inflation.

Annex I. Identification and Bayesian Estimation

This technical appendix describes some of the Bayesian estimation challenges—such as non-linearity in Kalman filter, calibration of some parameters, prior variance of latent variables and finally sign restrictions—that algorithm of Montes-Galdon addresses.

Constrained Extended Kalman Filter is a nonlinear version of the standard Kalman Filter, with two modifications: The Jacobian of equation (1) is required to update the covariance in the filter. When we run the filter, we check the constraints at each step and if the constraints are not satisfied, a minimization procedure is performed to obtain a constrained estimate of the states.

We calibrate two parameters. One is the hysteresis parameter, b. A higher value of this coefficient will produce smoother estimates of the natural rate, while a small value will generate a natural rate which follows more closely the observed unemployment rate. The second parameter is the variance of the natural rate of unemployment for which we calibrate the signal to noise ratio between the variance of the unemployment gap and the natural rate.

Time varying parameters models are highly sensitive to the choice of the prior variance of the latent time varying slopes. To calibrate this prior, we examined three different options:

1. By using user-defined priors
2. By using a calibrated prior variance from a rolling or full sample estimation of the model with constant slopes, using Constrained Maximum Likelihood.
3. Calibrate the variance from the Constrained Maximum Likelihood, either from a rolling or full sample regression and do not estimate it (this is the methodology in the Matheson and Stavrev (2013)).

We use sign restrictions as our identification assumption. To identify signs of the coefficients we impose sign restrictions on coefficients. Hence the draws with wrong sign are discarded. The constraints should be passed as: $Dx \leq d$. By setting the values of matrix D and vector d, we specify the sign restrictions. The dimension of the D matrix should be $r \times k$, where r is the number of restrictions and k is the total number of latent states in the model. The vector d is $r \times 1$.

Suppose that we only want the first slope to be negative. Then, we have the restriction:

$$x_1 \leq 0$$

Since we have six states, the matrices should be:

$$D = [1\ 0\ 0\ 0\ 0\ 0]$$

$$d = 0$$

If we want also that the third coefficient is positive, then, we have that $-x_3 \leq 0$, and the matrices now become,

$$D = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -1 & 0 & 0 & 0 \end{bmatrix}$$

$$d = [0\ 0]'$$

Finally, suppose that we want the second coefficient to be restricted between 0 and 1. This generates two restrictions,

$$x \geq 0$$

$$x \leq 1$$

Or,

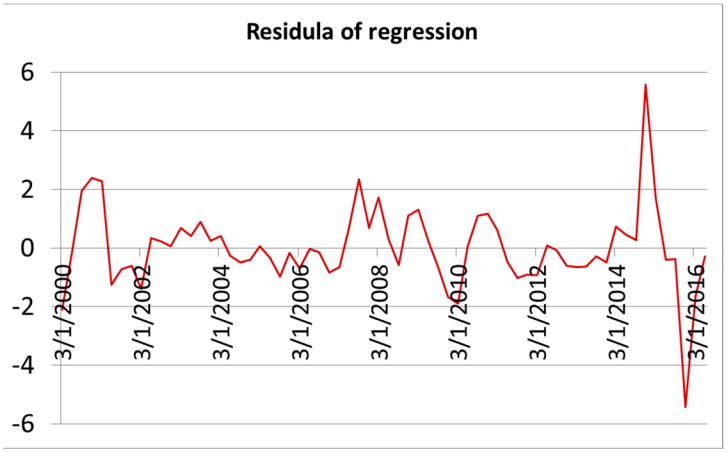
$$-x \leq 0$$

$$x \leq 1$$

These two restrictions can be entered as the previous ones.

Annex II. Fit of the Constant Time Coefficient Model

The R-square statistic of the model is estimated 87 percent and an estimate of the error variance of the model is 2. The R-squared measures how close the data are to the fitted regression line and it is between 0 to 100 percent and the higher the R-squared, the better the model fits the data. While the R-squared of 87 percent shows a good fit, this statistic cannot determine whether the coefficient estimates and predictions are biased, which is why we assess the residual plots next. If the points in a residual plot are randomly dispersed over time, our linear regression model is appropriate for the data; otherwise, a non-linear model is more appropriate. In the chart below we plot the residuals from the model, in orange, and the plot shows a fairly random pattern, except the last quarter of 2014 and 2015 which present outliers in the regression.



Estimated Coefficients and Statistics

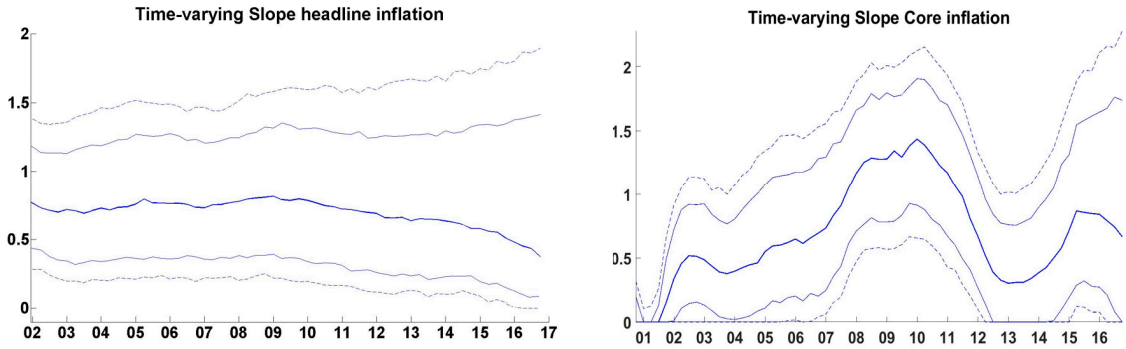
	Estimate	SE	tStat	pValue
Lagged unemployment	-0.3686	0.195	-1.8903	0.0635
Inflation Expectation	-0.1258	0.1324	-0.9507	0.3456
Lagged inflation	0.9586	0.0605	15.855	0
Import inflation	-0.0255	0.0145	-1.7626	0.0831
REER	-0.0079	0.0095	-0.8297	0.41

Root Mean Squared Error: 1.43
R-squared: 0.87, Adjusted R-Squared 0.86
F-statistic vs. constant model: 83, p-value = 1.19e-25

Another statistic that we assess is the error variance which is a more accurate statistic in measuring the fit of the model. It is the square of the root of mean square error (or MSE) represents the average distance that the observed values fall from the regression line. Smaller values of MSE are better as it means that the observations are closer to the fitted line. In this case, MSE of our regression is around 2.05 which means approximately 95 percent of the observations should fall within plus/minus 2*standard error of the regression from the regression line, hence this is also an approximation of a 95 percent prediction interval.

The *p*-value for the F statistic of the hypotheses test that the corresponding coefficient is equal to zero or not. For example, the *p*-value of the F-statistic for inflation expectation and REER is greater than 0.1, so this term is not significant at the 10 percent significance level given the other terms in the model.

Annex III. Time-variation in Slope, Headline versus Core



How much time variation is there in the slope of the Phillips curve? The discussion on the steepening or flattening of the Phillips curve depends on the measure of inflation that is used. We take an agnostic view on the origins of the time-variation and estimate a hybrid NKPC with time-varying parameters for core CPI inflation and headline CPI. As it is demonstrated in the above panel chart the slope of headline inflation had a general tendency to decrease after 2010 and at the same time the fan chart widens, which implies more uncertainty around the estimated coefficients (see the left-hand chart). For core inflation, the slope is more volatile and it goes up during the normal business cycle episodes and go down post recessions (see the right-hand chart).

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