The Impact of Oil-Shocks, Counter-Shock Policies and Institutions on the Decreasing Growth in Russia

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Abstract

This paper presents an analysis of the impact of oil prices, total factor productivity (TFP) and institutional weakness on the present growth retardation in Russia. First, the impact of oil prices and TFP on growth is analysed using the estimation of regressions for the GDP & manufacturing - oil nexus and production function. The relationship between TFP and growth in the present Russian economy is investigated. Second, the elusive impact of institutional weakness on Russia’s growth is considered in a global context, using panel data analyses based on the World Bank’s governance indicators (WGI) and the United Nations’ GDP data of 192 countries/regions.

JEL classification: C23, P23, P28

1. Present situation of the impact of oil prices and TFP

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1 Part of this paper is an updated version of Kuboniwa (2015). I thank Professor Michael Alexeev of Indiana University for his helpful comments on an earlier version of this paper.
Figure 1 shows the seasonally adjusted quarterly real GDP of Russia, with quarterly nominal Urals oil prices for 1995Q1–2015Q3. As shown by this figure, Russia faced a 5.2 per cent contraction of GDP in 1998 during the Russian financial crisis, with falling oil prices. Russia recovered quickly from its recession partially due to import substitution arising from depreciated forex of rubles. Then it showed a steady growth with increasing oil prices for 2000–7. During this period, Russia grew at an annual average rate of 6.7 per cent. In 2009, due to the world financial crisis coupled with the collapse of the oil bubble, Russia showed a large decline in its GDP, minus 7.8 per cent. Russia witnessed a rather strong recovery immediately after the world financial crisis in 2008–9. However, it has begun to show growth retardation with a growth rate of 1.3 per cent and 0.6 per cent in 2013 and 2014, respectively. For January-September of 2015, finally, with rapid decreasing oil prices, despite the federal government’s efforts, Russia has fallen into a negative growth rate of minus 3.7 per cent.

FIGURE 1 ABOUT HERE

Using DOLS (dynamic OLS) with lead=1 and lag=0 for the sample 1995Q3–2015Q3,

\[ gdp = 0.184oil + 0.0054t + 3.872 \text{ (annualized trend rate of 2.2%), Adj. } R^2 = 0.950, \]

\[ [6.074] \quad [5.824] \quad [49.814] \]

where \( gdp = \text{log(real GDP)}, \quad oil = \text{log(oil price)}, \quad t = \text{a linear time trend and } [.] \text{ denotes } t-\text{statistic.} \] Well cointegrating equation 1 shows the long-run relationship between changes in real GDP and nominal Urals oil prices, that is to say, \( \{gdp, oil\} \). Oil prices for Russia

\[ ^2 \text{ Q1, Q2 etc denote the first quarter of the year, the second quarter etc.} \]
are Urals oil prices which are determined based on Brent oil prices with correlation coefficient of 0.999.

It follows from equation 1 that a 10 per cent increase in oil prices leads to about a 1.84 per cent increase in Russia’s GDP. The underlying annualized growth trend of about 2.2 per cent approximately corresponds to the TFP growth, which must have largely reflected Russia’s modernization processes except for oil shocks. Equation 1 thus shows the long-run relationship between growth in total factor productivity, oil prices and GDP. Both oil prices and TFP largely contributed to economic growth in the 2000s (Kuboniwa 2012, 2014).

When using DOLS for sample (adjusted) 2008Q3–2015Q3 with lead=1 and lag=2, the well cointegrating equation is

\[ gdp = 0.116oil + 0.0034t + 3.872 \text{ (annualized trend rate of 1.4%), Adj.R}^2 = 0.983. \]

Equation 2 implies that a 10 per cent increase in oil prices leads to only a 1.2 per cent increase in GDP growth. The underlying annualized growth trend of about 1.4 per cent is much less than the 2.2 per cent over the whole period for 1995-2015. Both elasticity with respect to oil prices and TFP fell down markedly during these several years.

Considering that the oil price decreased by 2.2 per cent in 2013, equation 2 well approximates the growth result in 2013 (0.116*−2.2 per cent +1.4 per cent = 1.1 per cent). Also, equation 2 rather well reflects the growth result in 2014 because the fitted growth rate with a falling rate of oil prices, 9.4 per cent is 0.3 per cent in contrast to the actual positive GDP growth rate of 0.6%. In 2015, the fitted growth rate of minus 4.1
per cent due to the decline of oil prices of 47.5 per cent for whole the year is relatively close to an actual GDP growth rate of minus 3.8 per cent estimated by IMF’s *World Economic Outlook*. October 2015 and the author as well. Despite a large decline of oil elasticity along with a marked decrease in TFP, Russian growth retardation heavily relies on reverse oil shocks.

Consider a Cobb-Douglas production function with a steady technical progress: $Y = A\exp(\lambda t)K^\alpha L^{1-\alpha}$, where $Y =$ real GDP, $K =$ capital stock adjusted for utilization based on the REB (Russian Economic Barometer), $L =$ actual employment, $\lambda =$ TFP, $\alpha =$ capital distribution ratio, and $A =$ a constant. I estimate the linear regression: $y = ak + \lambda t + \log A$, where $y = \log(Y/L)$ and $k=\log(K/L)$. Data on fixed capital adjusted for utilization and employment are shown by Figure 2. Using canonical cointegrating regression (CCR) for sample (adjusted) 1995Q2–2014Q2 based on the data compilation method in Kuboniwa (2011),

$$y = 0.324k + 0.0069t \text{ (annualized trend rate of 2.8%)}. \quad (3)$$

That is to say, $\alpha = 0.324$ and $\lambda = 0.0069$. This implies that the capital distribution ratio accounts for 32 per cent, which corresponds to a conventional ratio, while the annualized rate of $\lambda$ (TFP) accounts for 2.8 per cent, which corresponds to a time trend coefficient of equation 1. With the sample 2009Q1–2013Q4, productivity becomes

$$y = 0.207k + 0.0036t \text{ (annualized trend rate of 1.4%)}. \quad (4)$$
Both the capital distribution ratio and TFP show marked decreases. TFP in equation 4 corresponds to that in equation 2. This implies that the present growth retardation has been caused by large decreases in the elasticity of the capital-labor ratio (capital contribution) and overall TFP as well. As shown by Figure 1, we can witness some counter effect against reverse oil shocks in the Quarter 3 of 2015. While whether this will continue or not would depend on the last quarter, in particular the last month growth in 2015, despite negative growth rates with successive fallings in oil prices, the present recession might be likely to be made stable.

FIGURE 2 ABOUT HERE

It is helpful to look at manufacturing output to rightly understand Russia’s dependence on oil. Figure 3 presents data on the real monthly manufacturing output of Russia for 1995M01–2015M11 with Hodrick-Prescott filter trend (\( \lambda = 14400 \)). Monthly data on Russia’s manufacturing output for 1995–98 are estimated by using the regression based on the official data on manufacturing output for 1999–2014 and the data on industrial output of IMF’s International Financial Statistics (IFS) for 1995–2015. It should be noted that IMF’s monthly data on Russian industrial output for 1995–98 was inconsistent with official annual data. Upon author’s request, IMF revised its monthly data on Russian industrial output for 1995-1998 in February 2015, which is now consistent with official annual data for the period. Russian manufacturing recovered

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3 Russian official data are seasonally adjusted by X-13. X-13ARIMA-SEATS is a seasonal adjustment software developed by the United States Census Bureau.
after the world crisis and reached its pre-crisis peak level in 2013M11. Surprisingly, as shown by Table 1, despite large decreases in oil prices and the US and EU sanction on Russian military intervention in Ukraine, manufacturing output, including machinery industry, in December 2014 showed a remarkable increase (non-seasonally adjusted base). It is noteworthy that the marked growth of transportation equipment was largely supported by the growth of transportation means of “Water, Air, Space Crafts & Others” with the non-seasonable rate of 50.9 per cent in December, 2014 compared to the previous month (CEIC database). This might be due to complex effects of military expansion, import substitution (due to a large depreciation of ruble currency) and some non-specified factors. These counter-effects in December 2014 need further investigation. Already, domestic production of foreign make automobiles ceased to be a growth engine. Domestic production of other foreign make consumer durables such as washing machines becomes also a negative growth factor in 2015 (based on CEIC database, domestic production of washing machines is expected to be at most a growth rate of negative 8 per cent in 2015).

FIGURE 3 ABOUT HERE

TABLE 1 ABOUT HERE

Using DOLS for sample (adjusted) for 1995M10-2015M11 (lead=1 and lag=0), we obtain

\[
manu = 0.202oil + 0.0017t + 3.872 \text{ (annualized trend rate of 2.0%), adj.R}^2=0.950, \quad (5)
\]

\[
[8.747] \quad [6.956] \quad [6.272]
\]

4 M stands for month. M01 is January; M11 is November, etc.
where $manu = \log \text{(real manufacturing output)}$. Cointegrating equation 5 also shows a strongly positive relationship between changes in oil prices and manufacturing output for 1995–2015. It follows from this equation that a 10 per cent increase in oil prices leads to a 2 per cent increase in Russia’s manufacturing growth. The underlying annualized trend rate of 2 per cent reflects TFP in manufacturing. The elasticity of manufacturing with respect to oil prices is larger than that of GDP, whereas the underlying trend of manufacturing is smaller than that of GDP.

However, for the sample 2008M10-2015M12 (lead=lag=0)

$$manu = 0.158oil + 0.0027t + 3.828\text{ (annualized trend rate of 3.2%)}, \text{ adj.R}^2=0.928. \quad (6)$$

Unlike GDP-oil nexus, despite the smaller elasticity in equation 6 than in equation 5, the underlying trend rate for 2010–15 in the equation 6 is much greater than that for the whole sample. This suggests that recent growth retardation might have been brought about through TFP losses in the mining and trade sectors other than manufacturing. However, as manufacturing output movements may not reflect its technical progress, this also needs further investigation. Anyhow, using equation 6, I approximate a manufacturing output growth of 1.8 per cent in 2014 (0.158*-9.4 per cent + 3.2 per cent = 1.8 per cent) that is rather close to the actual figure of 2.1 per cent. The fitted manufacturing output using equation 6 in 2015 (0.158*-.41.7 per cent+ 3.2 per cent = -4.3 percent) may approximate an estimated actual figure of -5 to -6 per cent without sufficient goodness. As can be seen from the Figure, effects of counter reverse oil shocks were observed for the 3rd quarter of 2015, while this was not sustainable. Even
though a rapid recovery of machinery sectors in December 2015 as in 2014 will be expected, this will not offset a negative movement of manufacturing.

2. The impact of institutional quality

Figure 4 shows the net capital inflow/outflow of Russian private sector. As is well known, a large capital outflow occurred during the world financial crisis. This reflects the institutional weakness of the Russian economy. After some recovery of growth, Russia’s capital inflow/outflow has shown a negative trend with rather sloppy movements. Note that the capital outflow of about USD 60 billion in 2013 was largely brought about by Rosneft’s absorption of TNK-BP.5 Recent movements of net capital outflow clearly demonstrate an increasing trend.

FIGURE 4 ABOUT HERE

A well-known indicator of institutional quality is the Worldwide Governance Indicators (WGI) that are the research dataset summarizing the views of the quality of governance provided by a large number of enterprises, citizen and expert survey respondents in an

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5 This point was suggested by Professor Shinichiro Tabata.
economy (Kaufmann et al. 2010). Russia has shown an absolutely low level of worldwide governance (rule of law) which is ranked at the 160th out of 212 countries/regions in 2013 (the 2014 edition of WGI) and ranked at 154th out of 209 in 2014 (the 2015 edition of WGI). The top ranking countries are placed by Nordic countries including Finland, Denmark and Norway (an oil/gas rich country). India, Brazil and China are 101st, 102nd and 128th respectively in 2014, and 94th, 96th and 120th respectively in 2015. Russia shows an improvement during the world crisis in 2009 and for the present recession in 2014. While generally, this indicator is not sufficient to analyse a short run dynamics of an economy, it may be useful to consider a long run movement, say for a decade as suggested by the website of WGI. For analytical convenience, I shift annual WGI to WGI* = WGI + 3. For a small annual sample 2002–13 of Russia, I have

\[ gdp = -1.5 wgi^* + 0.05t, \text{ Adj. } R^2 = 0.942, \]  

\[ [-4.095] \quad [11.235] \]

where \( wgi^* \) denotes log(WGI*) and \([\cdot]\) denotes t-statistics derived from White heteroskedasticity-consistent standard errors. The underlying annual time trend of 5 per cent reflects many other factors including terms-of-trade effects. When considering a
linear time trend, Russia’s GDP growth has a strongly negative relationship with the WGI growth that shall reflect the developments in quality of the institution.

Another well-known indicator of the quality of a country’s investment climate is the ease of doing business (EoDB) index provided by the World Bank website. A high ranking on this index means that the regulatory environment is more conducive to starting and operating a local firm. This index averages the country’s percentile rankings on 10 topics, made up of a variety of indicators, giving equal weight to each topic. The latest ranking is benchmarked to June 2014.

Table 2 shows this index for Russia and other BRIC countries. The 2014 edition presented new opportunities for foreign companies and investors, bearing in mind that Russia reached the 62nd rank of 189 countries/regions in 2014 moved up 30 places from 2013 to 2014 and 19 places from 2012 to 2013. Russia is the top-ranked BRIC country, coming out ahead of China (90th), Brazil (120th) and India (142nd). These change pleased President Vladimir Putin, and many expected a higher growth for 2013-2015. RT (Russia Today, October 29, 2014; http://www.rt.com) reported that in 2012 Putin set the goal of raising the country’s position in the EoDB ranking to number 20 by 2018.
However, the growth results in 2014 and the first nine months of 2015 were rather disappointing. Russia’s moving up in 2013 was due to a large improvement of ‘getting electricity’ from the worst (184th) place in 2012 to the 117th place in 2013. After the break-up of the Unified Energy System, there are many players including the generator, local governments, and private distributors’ intermediate, and ‘getting electricity’ is not a transparent process. For instance, Nissan in St. Petersburg was forced to pay USD five million to get electricity (author’s interview at Nissan in Japan). The ranking of “getting electricity” moved back to the 143rd in 2014 whereas that of “stating business” moved up 54 places from 2013 to 2014. Also, account of improvements in “contract enforcement,” and “property registration” contributed to step-ups of improvements in EoDB in 2014. In addition to “getting electricity”, “dealing with construction permits” (ranked 156th) and “trading across borders” (ranked 155th) in 2014 suggest that Russian companies are still facing serious obstacles for their business (Dabrowski, 2015).

Anyway, this indicator does not reflect a country’s growth and investment opportunities in the short run. In general, it is complicated to design a good index of the quality of institutions in relation to the economic growth of a single country.

TABLE 2 ABOUT HERE
3. Institutional quality, growth and per capita income in the global context

We employ the United Nations (UN) main aggregate data of GDP (both real growth and current per capita GDP) on the UN website as of January 2015.

Figure 5 shows a weakly negative relationship between the arithmetic average score level of WGI (rule of law) and the geometric average real GDP growth rates of 192 countries/regions for 2000-2013.\(^6\) Russia’s position of (WGI, growth rate) of (-0.88, 4.4%) locates on a neighbourhood of the linear regression line. Roughly, a lower level of the institutional quality captured by WGI levels may result in a higher economic growth. This result might support Wedeman (2012) and Ahmad et al. (2012).\(^7\) Up to some development level, the deepening of the institutional badness such as corruption of a country is likely to increase economic growth.\(^8\) However, employing an increasing

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\(^6\) Taiwan is included into 192. We employ the average growth rate based on Taiwan’s official data for 2000-2013 in the CEIC database.

\(^7\) Wedeman (2012: 178) found a weakly hump-shaped relationship between the Transparency International Corruption Perceptions Index (CPI) score (inverted) or national corruption and the average growth of many countries for 1992–2008, although he regarded China as an outlier with a much higher growth than other countries with similar levels of corruption. Ahmad et al. (2012) also statistically found the existence of a hump-shaped relationship between corruption and long-run economic growth, using the International Country Risk Guide corruption index of 71 countries.

\(^8\) This point was suggested by Professor Katsuji Nakagane (University of Tokyo).
improvement rate of WGI in place of its level, I have a quite different result. Figure 6
demonstrates a positive relationship between the gross increasing improvement rate of
WGI* and the average growth rates for 2000-2013. Russia (1.84 times, 4.4%) is just on
the regression line.

FIGURE 5 ABOUT HERE

FIGURE 6 ABOUT HERE

Figure 7 demonstrates a strongly positive relationship between the average score levels
of WGI and the per capita GDP of the 192 countries/regions. Clearly, a better quality of
the institution of a country captured by WGI levels leads to its higher per capita income.
Russia’s position of (WGI, GDP per capita) of (-0.88, USD 6,464) locates on a
neighbourhood of the exponential regression line. China’s position of
(-0.43, USD 2,525) cannot be an outlier in the space of (WGI, GDP per capita). There
are several outliers in this space, including Monaco, Luxembourg and Norway.

FIGURE 7 ABOUT HERE
The goodness of fit in Figures 5 and 6 is very low even though the coefficients of
variables are at the 1 per cent significance level with Durbin-Watson statistics just near
2. Further investigation on the relationships between institutional improvements and
economic growth or per capita income needs a panel data analysis with cross sections
including 192 countries/regions and multiple periods of 14 years for 2000-2013. Tables
3 and 4 present results of panel data analyses.

Table 3 of my panel data analyses of real growth and institutional improvement shows
that the cross-section effect should be fixed one. The period effect can be fixed or
random one although, in view of goodness of fit, a fixed effect model is better.

TABLE 3 ABOUT HERE

TABLE 4 ABOUT HERE

Table 4 of my panel data analyses of current per capita income and institutional
improvement shows that the cross-section effect should be fixed one and that the period
effect can be fixed or random one. The goodness of fit in Table 4 is very high, 0.98.
Equation 11 and 15 using estimator IV (TSLS) suggest that so called endogeneity problems do not matter for panel data analyses presented here.

Unlike simple two-dimensional regressions, Figures 5-7, my panel data analyses determine strong positive relationships between institutional improvements, GDP growth and per capita GDP with rather high goodness of fit in a global context. Even though Russia still remains at a developing stage with a mutually complementary or dependent relation of institutional deficiency and growth, we can state that, anyhow, Russia’s growth and catch-up with advanced countries decisively need a radical evolution in its institutional quality in the long-run. Putin’s hop-step-jump policy for the EoDB ranking, which may have a positive impact on growth to some extent, will not straightforwardly lead to general improvements in Russia’s institutional quality.

4. Concluding remarks

Russia’s recent economic slowdown has been analysed from the perspectives of oil prices, TFP and institutional quality. Overall declining growth can be captured by the impact of oil prices and TFP, whereas the estimated TFP decline does not well explain
the growth of output in manufacturing. Indexes of quality of institutions including WGI and the ranking in the World Banks’s EoDB are not sufficient to capture the output performance in present Russia. It is rather difficult to find some major breakthrough leading to a further diversification development of the Russian economy. Furthermore, in spite of president Putin’s presence strongly supported by Russia’s “elusive and invisible nationalism” (a key factor of its informal institutions), Russia’s recent domestically less development in institutions and internationally worse situation including declining oil prices and Ukrainian problems may deepen Russia’s growth recession more than what was expected at the beginning of 2015.

References


Figure 1. GDP and oil price: 1995Q1-2015Q3

Notes: Author's compilation based on Rosstat website and Bloomberg-Thomson Reuters.
Figure 2. Capital and employment for 1995Q1-2014Q4

Sources: Rosstat website and Russian Economic Barometer website.

Notes: Author's estimate based on the methodology in Kuboniwa (2011).
Figure 3. Manufacturing output and oil price: 1995M01-2015M07

Notes: Author's compilation based on IFS (revised industrial production index), CEIC database and Bloomberg-Thomson Reuters.
Table 1. Large growth of manufacturing in December, 2014

<table>
<thead>
<tr>
<th>Overall manufacturing</th>
<th>Machinery &amp; Equipment</th>
<th>Electrical, Electronic &amp; Optical Equipment</th>
<th>Transportation Equipment</th>
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<td>2013M12</td>
<td>1.8</td>
<td>-1.6</td>
<td>11.3</td>
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<td>2014M12</td>
<td>9.2</td>
<td>29.8</td>
<td>41.6</td>
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Sources: CEIC (Rosstat) database.

Notes: Data are not seasonally adjusted.

Table 2. EoDB (Ease of doing business) as of June 2014 (of 189 countries/regions)

<table>
<thead>
<tr>
<th>EoDB Rank</th>
<th>Russia 2014</th>
<th>Russia 2013</th>
<th>Russia 2012</th>
<th>China 2014</th>
<th>Brazil 2014</th>
<th>India 2014</th>
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<td>88</td>
<td>101</td>
<td>128</td>
<td>167</td>
<td>158</td>
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<td>Dealing with Construction Permits</td>
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<td>178</td>
<td>179</td>
<td>174</td>
<td>184</td>
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<td>Getting Electricity</td>
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<td>117</td>
<td>184</td>
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Source: [http://www.doingbusiness.org/rankings](http://www.doingbusiness.org/rankings)

Notes: Average scores are author's calculations.
Figure 4. Net capital outflow in Russia: private sector

Notes: Author's calculations based on the data of CEIC (Bank of Russia).
Figure 5. Average growth rate and institutional quality (WGI's level) for 2000-2013 (192 countries/regions)

\[
growth \text{ rate} = 0.135 \times \text{WGI's change} + 3.773 \\
adj. R^2 = 0.018, \text{ DW}=2.115
\]

Figure 6. Average growth rate and institutional improvements (WGI*'s growth) for 2000-2013 (192 countries/regions)

Notes: Author's calculation based on World Bank (WGI) and UN (GDP).
Figure 7. Per capita GDP and institutional quality (WGI level)

Notes: Author's calculation based on World Bank (WGI) and UN (GDP).
Table 3. Panel data analyses of growth and institutional improvement in quality

Sample: 2000-2013; Cross-sections included: 192;

Total panel (balanced) observations: 2688

<table>
<thead>
<tr>
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<th>OLS</th>
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Effects Test

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<td>Prob.</td>
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Table 4. Panel data analyses of current per capita GDP and institutional quality

Sample: 2000-2013; Cross-sections included: 192;

Total panel (balanced) observations: 2688

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<td>Dependent valuable log(GDPpc)</td>
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