DECOMPOSITION OF RUSSIA'S GDP GROWTH IN 1999–2014

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The Gaidar Institute developed a comprehensive methodology for decomposing the growth rate of Russia's GDP into its structural, foreign trade and situational components, which is based on the same decomposition algorithm as applied in the analysis of macroeconomic indicators of the developed countries (OECD), adjusted with due regard for the specificities of the Russian economy with its high dependency on foreign trade (more specifically, the movement of world prices for oil). On the basis of estimations yielded by this methodology we could identify several phases of economic growth in Russia over the period from 1999 through 2014: recovery growth (1999–2000); growth sustained by investment and capital load (2001–2003), and then growth sustained by favorable foreign trade conditions (2004–2008.); overheated economy and economic crisis (2008–2009), followed by a new, lower phase of the business cycle (2010–2014).

At present, Russia's expert community is involved in an active discussion of the issue as to how close the Russian economy has come to exhausting its production potential – and, consequently, if the measures designed to boost economic growth, including budgetary and monetary policy measures, are going to yield successful results in our current situation[1]. There exists an opinion that the previously applied economic growth model, which was oriented to favorable movement of world prices of energy carriers and relied on growth sustained by means of boosting domestic demand, is no longer viable[2]. Although oil prices are still high, they are no longer capable of providing the same impressive input into Russia's GDP growth rate as in the period 2000–2007. The cushion of high oil prices only softened the downfall of the Russian economy during the world crisis in 2008–2009[3], and nowadays their effect can only help Russia's economic growth rate to be kept slightly above zero[4].

To decompose the rate of economic growth into a number of different components, including those dependent on the situation in the sphere of foreign trade, is a difficult task. We offer a methodology based on decomposition of macroeconomic indexes into structural, foreign trade and situational components (the latter includes factors like business cycles and accidental shocks); this is the methodology applied in the developed countries (OECD) and adjusted to suit the specificity of the Russian economy. This specificity is essentially the national economy's high dependence on the conditions in the foreign trade sector, which are approximated by the index of the movement of world oil prices.

Following the logic of our calculations, the first stage in the decomposition of the GDP growth rate into its components consists in separating the structural component in accordance with the methodology practiced in the OECD countries.

The structural component of the economic growth index is the fundamental one. The most important property of the structural component is the slow movement of its value over time. In contrast to the structural component, the situational component, which is determined by a current situation in the market, is a rapidly changing value.

One of the most frequently cited examples of extraction of the structural component of the macroeconomic index is the estimate that describes the potential (structural) GDP index (as well as the output gap) which, in accordance with one of the existing

1 See, in particular, S. Drobyshevsky, P. Kadochnikov, S. Sinelnikov-Murylev. *Nekotorye voprosy denezhnoi i kursovoi politiki v Rossii v 2000–2006 godakh i na blizhaishuiu perspektivu* [Some Issues of Monetary and Exchange Rate Policy in Russia in 2000—2006 and in the Short-term Outlook] // *Voprosy economiki* [Issues of Economics]. 2007. No 2. P. 26–45; A. Ulyukaev, P. Kadochnikov, P. Trunin. Vzaimosviaz' fiskal'noi i denezhno-kreditnoi politiki (analiz al'ternativnykh sposobov upravleniia sredstvami SF RF [The Interaction of Fiscal and Monetary Policy (The Analysis of Alternative Methods of Stabilization Fund of RF Resources Management)] // *Ekonomicheskaia politika* [Economic Policy]. 2008. No 1. P. 29–38; A. Knobel. *Riski biudzhetnoi politiki v stranakh bogatykh prirodnymi resursami* [The budgetary policy risks faced by countries rich in natural resources] // *Ekonomicheskaia politika* [Economic Policy]. 2011. No 5. P. 29–38.

2 V. A. Mau. *Mezhdu modernizatsiei i zastoem: ekonomicheskaia politika 2012 goda* [Between Modernization and Stagnation: Economic Policy in 2012] // *Voprosy economiki* [Issues of Economics]. 2013. No 2. P. 4–23.

3 V. A. Mau. *Ekonomicheskaia politika 2009 goda: mezhdu krizisom i modernizatsiei* [Economic Policy in 2009: Between the Crisis and Modernization] // *Voprosy economiki* [Issues of Economics]. 2010. No 2. P. 4–25.

4 B. A. Zamaraev, A. M. Kiyutsevskaya, A. G. Nazarova, E. Yu. Sukhanov. *Zamedlenie ekonomicheskogo rosta v Rossii* [The Slowdown of the Russian Economy] // *Voprosy economiki* [Issues of Economics]. 2013. No 8. P. 4–34.

definitions of potential GDP, represents the maximum output level achieved when all production factors are used in full and the capacity load is at its normal level (60–65%). It should be noted that, in the framework of our decomposition methodology, the terms 'structural' and 'potential' will be applied as synonyms, with due regard for the existence of different interpretations of the notion of potential GDP.

In order to estimate the aggregate factor productivity index, the potential (structural) GDP, and the output gap, the OECD Economics Department applies the production function methodology[1], whereby it is possible to derive the potential GDP value by separately estimating the inputs of production factors into the rate of economic growth. This method applies the following log linear equation, where GDP is estimated on the basis of labor input, capital input and aggregate factor productivity (AFP) values (1)[2]:

$$\Delta \ln(Y_t) = \Delta \ln(E_t) + \\ +\alpha \Delta \ln(K_t) + (1-\alpha)\Delta \ln(L_t) \qquad (1)$$

where *Y* is actual GDP volume,

K is actual capital volume,

L is actual labor volume,

E is AFP,

α is elasticity of capital input in output; the value of returns to scale effect is assumed to be constant, i.e. $\alpha = 0.3$, and $1 - a = 0.7$[3].

Once the average estimated labor and capital inputs in GDP are found (the coefficients applied to logarithms of the variables of labor and capital inputs), the value of aggregate factor productivity can be found; its smoothed-curve representation is obtained by applying the Hodrick-Prescott filter, which demonstrates 'trend' or 'potential' factor productivity. Then the resulting value is once again entered in the production function equation alongside the values of actual capital reserves and the estimated 'potential' labor volume (based on the already known non-accelerating rate of unemployment (NAIRU)), and the resulting GDP growth rate is taken to be the potential GDP.

The Hodrick–Prescott filter was applied to the structural component of the GDP growth rate obtained by applying the method described above in order to remove the fluctuations that are difficult to explain in economic terms.

The second stage of Russia's GDP growth rate decomposition consists in separating its foreign trade component explainable by specific trade conditions, in particular the movement of world oil prices.

The theoretic substantiation for the hypothesis that explains the influence of the oil price growth rate and the price level on the growth rate of GDP relies on the mechanism whereby oil prices influence the rate of economic growth in the long run (cointegration ratio) and over short-term periods (error correction model)[4]; and on the analysis of household behavior in terms of changes in their inclination to save and to consume in response to temporary and constant increases in the level of household income (microeconomic level).

The dependence of the level of GDP on the movement of oil prices can be described by an investment mechanism within the framework of the Solow model, which works as follows: an improvement in trade conditions causes a transfer of income, which is subsequently invested, in its turn increasing the amount of capital and pushing up GDP. Thus, in a long run, a dependence can be observed between the levels of GDP and oil prices (or, which is the same thing, between the growth rate of GDP and the growth rate of oil prices). At the same time, over the entire period under consideration, we observe a rising level of world prices for oil and the transitional movement between different phases of economic development, with their specifically different rates of GDP growth. I other words, we follow the correlation between the level of world prices for oil and the growth rate of GDP (and not GDP level), which can be estimated by using cointegration ratios and the error correction model[5].

The strength of this dependence can be further enhanced by the effects of the mechanism of economic agents' response to changes in the level of income received by them. The logic of analysis of the effects of

1 Giorno C., Richardson P., Roseveare D. and van der Noord P. *Estimating Potential Output, Output Gaps and Structural Budget Balances // Economics Department Working Papers.* 1995. No. 152. OECD.

2 For the purpose of our calculation, this function is expressed as logarithmic increments, i.e., growth rates.

3 In our calculations, we apply the empirically obtained estimates of labor input elasticity and capital input elasticity for the developed countries, which are also compatible with Russia's statistics (for further detail, see Bessonov V. A. O dinamike sovokupnoi faktornoi proizvoditel'nosto v Rossiiskoi perekhodnoi ekonomike [On the Aggregate Factor Productivity Movement in the Russian Economy in Transition] // Ekonomicheskii zhurnal VShE [The Economics Journal of the National Research University Higher School of Economic]. 2004. No 4. P. 542–587.

4 For more detail, see Kazakova M., Sinelnikov-Murylev S. Kon"iunktura mirovogo rynka energonositelei i tempy ekonomicheskogo rosta v Rossii [Economic Situation on the World Energy Carriers Market and Rates of Economic Growth in Russia] // Ekonomicheskaia politika [Economic Policy]. 2009. No 5. P. 118–135.

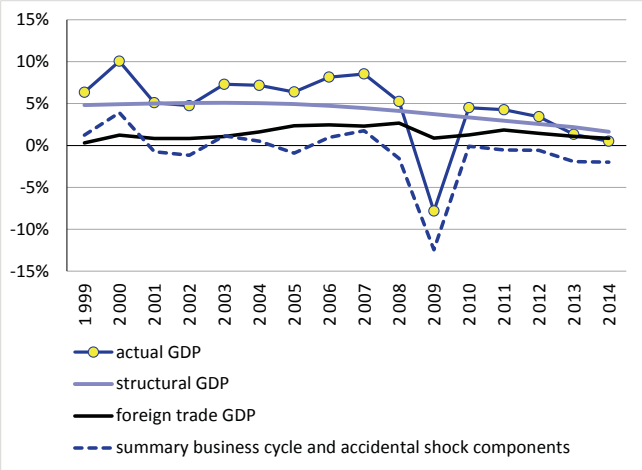
5 Kazakova M. V. Vklad neftegazovogo sektora v dinamiku ekonomicheskikh pokazatelei v Rossii i v mirovoi praktike [Input of the Oil and Gas Sector in the Movement of Economic Indexes in Russia and in the World Practices] // Rossiiskii vneshneekonomicheskii vestnik [Russian Foreign Trade Herald]. 2009. No 8. P. 66–72.

temporary and constant income increases corresponds to the permanent income hypothesis suggested by M. Friedman in 1957[1]. In case of an unexpected income increase, an individual considers it to be only a temporary phenomenon, and so a considerable portion of the income increment is saved instead of being spent on current consumption. If later on the income remains high, the individual adapts (get used) to this higher income level and begins to consume more, while the saving norm is reduced. Consequently, the inclination to consume is low if the increase in income is temporary. When this principle is applied to our mechanism of response to income movement, it means that economic agents, while adapting to new levels of oil prices, do not believe that this higher level of oil prices will stay over a long-term period (or become permanent)[2].

In our model, the logic employed in estimating the consequences of changes in the level of oil prices is analyzed in relative terms; in other words, the important factor is the starting oil price level before the onset of its growth/decline – that is, returns to scale related to the movement of oil prices. Thus, in order to identify the foreign trade component within the rate of GDP growth dependent on the deviation of the actual price of oil from its multiyear average estimate (i.e. trade conditions), it is feasible to estimate the interdependence between the 'residual values' after subtraction from the value of actual structural GDP growth (GDP growth unexplainable by the movement of the fundamental factors), , and the ratio of the actual price to its multiyear average:

$$\Delta Y_t^{resid} = \gamma_0 + \gamma_1 \frac{P\_oil_t}{P\_oil_t} + \tau_t \qquad (2)$$

The estimation derived from equation (2) makes it possible to identify the GDP growth component dependent on trade conditions, with due regard for the scale of deviation of the actual price of oil from its multiyear average. The foreign trade component of GDP growth rate, explainable by favorable trade conditions, is estimated by the theoretic significance of the relevant variable applied in the regression described above (2) (i.e., the theoretic significance of the difference between the actual and structural GDP growth rates at a given actual ratio of the current oil price to its multiyear average).



Source: Rosstat, authors' calculations.

Fig. 1. The Actual, Structural, Foreign Trade, and Situational (the Sum of the Business-cycle Component and the Shock Component) Components of the Growth Rate of GDP, As a Percentage of the Previous Year, 1999–2014

At the last stage of the decomposition of GDP growth rate into its components, its situational component is separated, which incorporates the business cycle component and the component of accidental shocks. This component can be interpreted as residuals in equation (2) obtained after subtraction from the actual GDP growth rate of its structural and foreign trade components.

As a result, the actual, structural and foreign trade components of Russia's GDP growth rate, as well as its situational component (i.e. the sum of the business-cycle component and the accidental shock component) – the calculated residuals of regression (2)), will appear to be as follows (*Fig. 1*).

On the basis of the results of decomposition of GDP growth rate into its components, we were able to estimate Russia's output gap, i.e., the deviation of the current GDP volume from its value derived by applying the structural GDP methodology described above – an index which, as shown earlier, in some conditions may be treated as the potential GDP volume (*Fig. 2*).

As can be seen from *Fig. 1*, in the period 2012–2014, the Russian economy entered the lower phase of the economic cycle after having been overheated and, consequently, the situational component shifted into the negative zone. The aggregate rate of economic growth is near zero, because the negative value of the situational component is set off against the positive foreign trade component.

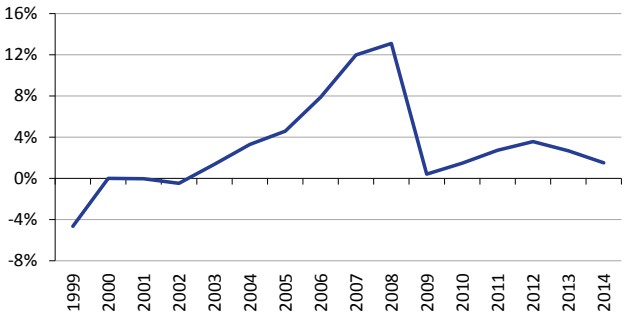
At the same time, over the period from 2010 through 2014, the situational component of the economic growth rate was negative, while the output gap was positive at the level of 2–3% – because the actual GDP level was higher than its structural level (*Fig. 2*).

1 Friedman, M. A Theory of the Consumption Function. Princeton. NJ: Princeton University Press, 1957. Ch. 2, 3.

2 For more detail, see Sinelnikov-Murylev S., Drobyshevsky S., Kazakova M. Dekompozistiia tempov rosta VVP Rossii v 1999–2014 godakh [Decomposition of Russian GDP Growth Rates in 1999-2014] // Ekonomicheskaia politika [Economic Policy]. 2014. No 5. P. 7–37.

Nevertheless, contrary to expectation, the economy was showing no signs of overheating, because the actual GDP growth rate was lower than its structural growth rate: when oil prices are high, the use of production factors amounts to 100%, and so they do not grow in volume.

For more detail on the methodology used to decompose the growth rate of Russia's GDP, as well as the interpretation of our results, see Sinelnikov-Murylev S., Drobyshevsky S., Kazakova M. Decomposition of Russian GDP Growth Rates in 1999–2014 // Economic Policy. 2014. No 5. P. 7–37; also see http://iep.ru/ru/publikatcii/7125/publication.html



Source: authors' calculations.

Fig. 2. Output Gap in the Russian Economy (%), 1999–2014