Economic Growth by Innovative Development in Energy Sector: The Case of Oil and Gas Export in Russia

Hiển Nguyen Hoàng[1]*, A. I. Kashirin[2], V. V. Strenalyuk[3], A. S. Semenov[4], O. Y. Kazenkov[5], Yuri A. Chepurko[6]

[1]Faculty of State Management on Economic Affairs, National Academy of Public Administration, Vietnam, [2]Deputy Chariman of the Scientific-Technical Council of ROSTECH State Corporation, Chief of the Department of Innovative Management and International Activities of Peoples' Friendship University of Russia, Moscow, 117198, Russia, [3]Innovative Department of ROSTECH State Corporation, Department of Innovative Management and International Activities, Peoples' Friendship University of Russia, Moscow, 117198, Russia, [4]Department of Innovative Management and International Activities, Peoples' Friendship University of Russia, Moscow, 117198, Russia, [5]Department of Research Activities K.G. Razumovsky Moscow State University of Technologies and Management (the First Cossack University); Deputy Head of the Technopark "Polyus," Polyus Research Institute of M.F. Stelmakh, Russia, [6]Kuban State University, 350049, Russia. *Email: hiennh@napa.vn

ABSTRACT

The problem of the "Dutch disease" and the impact of the raw materials complex and its export component on the economic development of Russia are actualized today in the context of the pressure of international economic sanctions on the Russian economy, when the Russian society has to solve problems that were characteristic of the Soviet Union, we mean, first of all, import substitution. In this regard, we need to understand how negatively the impact of energy exports on the socio-economic development of Russia was, while answering the question, was this development abnormal or, if so, due to what factors? Obviously, the crises in Russia in the 1990 s and 2009–2011 had a nature weakly associated with raw material specialization. The purpose of this work is to identify the impact of energy exports on the economic development of Russia in retrospect with the construction of a long-term forecast of GDP growth in the Russian Federation in the context of the development of international economic sanctions. Accordingly, the objectives of the study include: to determine how economic growth in the post-Soviet period before the imposition of sanctions was affected by oil exports; secondly, to what extent oil exports influenced innovative development; thirdly, to create a predictive model for the growth of the Russian economy in the context of international sanctions (the situation with the embargo on Russian oil exports to the West). The subject of the study is the impact of oil exports on the socio-economic development of Russia, the object is the macroeconomic situation in Russia before and after international economic sanctions.

Keywords: Energy, Economic development, General spatial economics
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1. INTRODUCTION

The problem of the dependence of the Russian economy on oil and gas exports still attracts the attention of scientists, including primarily economists (Ross, 2015). What happened in Russia in the post-Soviet period in terms of the transformation of its

exports could be attributed to the "Dutch disease." It is true, that the "Dutch disease" still initially referred to a small economy represented by the Netherlands, when there was still an increase in energy prices (Corden and Neary, 1992). Sachs (2012) declares that in economic theory, in connection with the "Dutch disease," a discussion continued to develop on the subject of how the export of

raw materials affects the industrial and scientific and technological development of the country. But at the same time, Jeffrey Sachs emphasized the motivation to develop innovations in an economy with a specialization in raw materials, not paying enough attention to the problems of profitability and return on investment (Sachs, 2012). However, the issue of raw material specialization of the Russian economy is more complicated, since this specialization is already long-term in nature and the question of an alternative remains open. For example, other countries of the post-Soviet space that do not have such natural resources have achieved less results in economic development than Russia, this has not been given due attention in the scientific literature.

The oil and gas complex is associated with raw material specialization, and the latter is associated with the slowdown in the innovative development of the Russian economy and its deindustrialization. However, as the crisis of the 1990 s showed, deindustrialization was weakly associated with the export of energy resources; most likely, the latter had a positive impact on the preservation of at least part of the national industry, and not only the raw materials industries. At the same time, the alternative with a retrospective to the recent past is poorly considered in Russia (Yu and Shvedov, 2017).

2. RESEARCH BACKGOUND

By the end of the 2000 s, Russia began to become acutely aware of the need of transition to economic growth based on innovations, some researchers made it directly connected with getting rid of dependence on raw materials, that is, they considered the need to reduce the impact of oil and gas exports on the Russian economy (Vasilieva, 2018). Sukharev (2015) put forward in 2015 the conceptual idea that the model of the Russian economy was arranged in such a way that Russia was among the exporters of capital, with the exception of 2006–2007. Thus, the export of energy resources did not lead to a proportional increase in investments in the country. The situation in 2006–2007, when there was a net increase in investment in Russia, can be explained by the over accumulation of capital in the world before the global financial crisis, as well as by a number of internal factors in the Russian economy itself, in particular, an increase in labor costs, which required the introduction of more new technology into production in order to replace labor with capital. However, in 2006–2007 the Russian model of the economy showed reduced activity in the field of innovation.

The export of capital from Russia was subject not only to economic, but also to political factors, however, it is obvious that after 2000 the main thing here was that the Russian investor often did not find an application for his funds. A sharp jump in the indicator of capital exports from Russia in 2008 (Table 1) can be explained by the stock market panic in the autumn of the same year. In this regard, the relatively normal state of the economy, when the export of capital occurred to a greater extent for economic reasons, should be considered in 2010, namely, $ 30.8 billion. If it were not for the export of capital, which most economists consider a negative phenomenon, then an additional monetary "overhang" would form in Russia, which, undoubtedly,

would only increase inflation. The risk of such an "overhang" is now quite high, which is largely caused by the habit of investors to invest in the raw material complex, which has come under severe international economic sanctions.

Thus, the deviation of the Russian economy from the state of 2005–2008 (the prerequisites for the normalization of economic growth nevertheless arose by 2005, in 2008 economic growth continued under stable conditions) leads to a decrease in demand for investment, which leads to an unjustified increase in the money supply (if any really takes place), cash flows thus go to increase consumer spending, and this only spurs inflation, with a decrease in motivation to invest, firms will make less capital investments in high-tech industries and in R&D (Gorenko et al., 2018).

Russian companies are too conservative (especially in politically unstable situations) in terms of investment in R&D and new equipment, as all the practice of the post-Soviet period shows, which is reflected in Table 2, so the effect of the Kaldor-Verdoorn effect (Kaldor-Verdoorn effect), when the expansion of aggregate demand stimulates the growth of investment in innovative production, it does not work in Russia (Angeriz et al., 2009).

Table 1: Export of capital from Russia (2000–2021)

Year	Export volume, billion $
2000	23,1
2001	13,6
2002	7,0
2003	0,3
2004	8,6
2005	0,3
2006	0
2007	0
2008	133,6
2009	57,5
2010	30,8
2011	81,4
2012	53,9
2013	60,3
2014	152,1
2015	57,1
2016	18,5
2017	24,1
2018	65,5
2019	22,6
2020	50,4
2021	72,0

Capital outflow from Russia by years: 1994–2022 http://global-finances.ru/ottok-kapitala-iz-rossii-po-godam/

Table 2: R&D spending by years in Russia and some other countries, % of GDP

	2000	2008	2016	Change in p.p. share., 2016–2008	Change in p.p. share., 2016–2000
Russia	1,1	1,0	1,1	0,1	0,0
Great Britain	1,6	1,6	1,7	0,1	0,1
China	0,9	1,4	2,1	0,7	1,2
Germany	2,4	2,6	2,9	0,3	0,5
USA	2,6	2,8	2,7	-0,1	0,1

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Thus, the effect of economic growth in Russia turned out to be practically neutral for R&D, in terms of spending on this item in GDP. This indicates that the growth of the economy in the Russian Federation was in the 2000 s and 2010 s still more extensive than intensive character.

Was not the period of development of the Russian model of the economy focused on the export of energy carriers in 2006–2007 the time of reaching its normal state? We give a positive answer to this question in our work, but at the same time we admit that almost all the 2000 s, the Russian economy showed reduced innovation activity, which attracted the attention of the state. In this regard, the main working hypothesis of this study is that Russian economic growth achieves its "normality" if it occurs under the conditions of an energy export-oriented model of the national economy, with parameters close to the state of 2006–2007, the main of these parameters are: average world price for oil, investment in fixed assets, rate of return in the Russian economy, interest rate, average real wage, share of wages, investment and science-intensive products in GDP, the last parameter shows the demand for innovation. Deviations of the model from the values of these parameters in 2006–2007 show how the Russian economy is going under the influence of the consequences of the global financial crisis of 2008–2010 and the pressure of international sanctions, which the West began to introduce since the beginning of 2014, away from its normal state in the conditions of raw material specialization in the world market. Accordingly, the purpose of our article is to substantiate our hypothesis with the construction of a hypothetical forecast for the economic growth of the Russian economy and its innovative segments in the context of sanctions restrictions on the export of Russian energy resources.

Up to 50% of investments in the Russian economy before 2010 and after were accounted for by the oil and gas complex (OGC), which is largely explained not only by high profits from energy exports, but also by the relatively low profitability of companies in other segments of the Russian economy. The raw material specialization of the economy contributed (Popov and Leus, 2009) and argued by a number of authors to slow down the innovative and institutional development of Russia.

However, we would not exaggerate the negative impact of oil and gas on the innovative development of Russia, given that the former republics of the USSR, which do not have large volumes of energy resources, have shown a lag behind Russia in this area. We also do not agree with the conceptual idea of Tenyakov, I.M., that oil exports were and still are of lesser importance for the Russian economy than investments and monetization, however, about 50% of investments in the national economy of the Russian Federation recently fell on oil and gas companies. Such attractiveness of Russian oil and gas companies for investors was the result not only of the export of Russian energy resources, but also of the low profitability of heavy engineering and a number of other segments of the national economy. In the context of the process of sanctions limiting the entry of the Russian oil and gas complex into foreign energy markets, we must understand how the Russian economy will be transformed further, based on the notion that Russian oil and gas exports will fall below the level of 2005, but possibly also below the level of 2000.

Tenyakov (2009) argues that in a situation where the importance of oil and gas condensates in the Russian economy is declining, which, in his opinion, is what Russian society should strive for, investments stimulated by the soft state monetary and credit policy should act as a better substitute for oil as a driver of economic growth in the Russian Federation. However, we believe that this cannot happen quickly, given that the Russian economy remains a market economy. According to market laws, investments are largely determined by the demand for productive capital and competences. The higher the real wage, the greater the demand for productive capital, as firms tend to pursue a policy of labor replacement. Hence, the demand for innovative products is largely due to the labor costs of companies. The entry of Russian innovative products to the world market is also limited as a result of international economic sanctions, which reduces domestic demand for investment in innovative industries that manufacture products based on unique technological competencies. We can recall the Soviet experience of innovative development, when large investments in technologies and new products yielded modest results (Popov, 2019), with the exception, of course, of the military-industrial complex (before 1974–1976, the Soviet economy was weakly dependent on oil exports), this is largely explained by the labor surplus of the Soviet economy.

3. METHODOLOGY AND DATA

In this work, modeling and extrapolation methods are reflected, the first method is of primary importance for our study. Tenyakov's model in general form: $g = 0{,}965009 + 0{,}219198\ I* + 0{,}0465682\ Poil + 0{,}0729691\ (M*/P)$, where g is the growth rate of real GDP Π, $I*$ - growth rate of investments in fixed assets in comparable prices, $M*/P$–the rate of growth of real money supply, Poil is oil price. The numbers indicate the coefficients of significance of each indicator derived by the author for the growth of Russian GDP (Tenyakov, I.M, 2018). We intend to use Tenyakov's model, based on the realities associated with international economic sanctions, as well as our vision of the problem of the impact of the oil and gas complex on Russia's economic growth.

As we said above, the former republics of the USSR, which did not have energy resources in volumes that would allow fuel exports, lagged behind Russia in a number of macroeconomic parameters, the main one being per capita GDP, which we take into account for our analysis (Table 3), but basic at the beginning of reforms in the 1990s. The characteristics of national economies were approximately the same, if we do not take into account the availability of raw materials, of these characteristics, for the convenience of analysis, we take into consideration only the provision of production capital per capita (Table 4). We specifically do not take into consideration Azerbaijan, Kazakhstan and Central Asia, since these states are provided with energy raw materials, some of them themselves act as its exporters.

In terms of accumulation of fixed production assets, the former Soviet Baltic republics were closer to Russia before the start of

Table 3: GDP per capita in current dollars. Compiled by: Macroeconomic research

State/year	2000	2004	2005	2006	2007	2008	2009	2010	2014	2016	2019	2020
RU	1787	4142	5370	6971	9161	11708	8614	10732	14235	8789	11568	10166
UA	663	1424	1903	2401	3208	4075	2644	29700	2959	2088	3499	3557
BY	1 091	2488	3266	4015	4937	6644	5393	6075	8356	5052	6814	6377
MD	368	748	862	987	1279	1767	1593	1707	2335	1985	2961	2954
GE	737	1276	1602	1945	2568	3249	2749	2987	4368	3771	4373	3984
LT	3291	6691	7808	9135	12179	14891	11804	11889	16347	14887	19821	20772
AM	664	1271	1753	2301	3348	4277	3193	3432	3986	3592	4605	4266
LV	3338	6335	7550	9694	14129	16512	12315	11310	15508	14215	17993	17871
EE	4067	8907	10404	12622	16696	18143	14700	14665	2020	18273	23419	23106

Source: https://be5.biz/makroekonomika/index.html

Table 4: The cost of production fixed assets per capita in the Union republics, 1990, rubles, in comparable prices at the end of the year

Republic of the Foremr USSR	Average per capita cost of production assets, rub.
Former RSFSR	8304
Former Ukrainian SSR	5892
Former Belorusian SSR	6670
Former Moldavian SSR	5250
Former Lithuanian SSR	7300
Former Latvian SSR	7400
Former Estonian SSR	8100
Former Georgian SSR	5000

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liberal reforms, which can be explained by the predominance of industry in their economies. However, later Lithuania (former Lithuanian SSR), Latvia and Estonia gained access to EU finance, which significantly changed their socio-economic development, compared to Russia, in this regard, Belarus is closer to the latter. The starting conditions for Russia and Belarus in terms of production assets turned out to be closer than between Russia and Ukraine, the latter was in the category of such states as Moldova and Georgia by the beginning of the 1990 s, which is quite explainable by the significant predominance of the agricultural sector in the western regions of the former Ukrainian Soviet Republic. The gap in the cost of fixed production assets between Russia and Belarus by the beginning of the 1990 s. We can also explain it by the presence of the already sufficiently developed oil and gas complex in Russia SFR and the energy complex as a whole, when the extraction of energy raw materials on the territory of the BSSR remained, due to natural reasons, underdeveloped. In the future, the export of oil and gas gave Russia a great advantage over Belarus in terms of per capita GDP growth. Since 2000, Russia's per capita GDP has been almost a third greater than that of Belarus, and this is already a stable trend, which indicates a clear significant contribution of oil and gas companies to Russia's GDP growth in the long term (more than 20 years). If the growth of Russia's GDP would come mainly from financial and legal institutions more developed than those of Belarus, as was and is the case with the Baltic republics, then the gap in GDP between the two countries would not be so stable over such a number of years.

Thus, 35% of GDP growth (a figure hypothetically derived by us) is a "bonus" that Russia receives from energy exports, if we compare Russia and Belarus.

We accept the growth model of the Russian economy with the probability of a partial embargo on energy export. We believe, unlike Tenyakov, I.M. that such an indicator as world oil prices cannot be used to model the development of the Russian economy, since Russian oil is not always sold on them. Since 2013, contracts with China have played a significant role in Russian oil exports and pricing, and as political relations with the West become more complicated, these contracts become more and more important almost every year. In this regard, Chinese oil imports are an important parameter for us to build a model of Russian economic growth.

We argue above that 35% of Russia's economic growth is generated by the activities of the Russian oil and gas complex, this is already a constant that can change only under very unfavorable foreign policy conditions. Model assumptions:

1. We believe that in the foreseeable future, Russian oil exports will reach such indicators in the global geo-economic space as sales to China –80% of the annual volume of exports of the Russian Federation, 10–12% to the European Union and 8–10%-to post-Soviet countries and third world countries, this will allow Russian oil production and revenues from it to be kept at the level of the mid-zero years;

2. The optimal parameters of the Russian economy (in terms of proportions and key indicators, such as real wages) are those that were achieved in 2005–2008; the Russian economy has no other positive (non-crisis) experience in this sense, since how exactly during this period there was a normal demand for investments, which allowed Russia to develop after the start of the global financial crisis, its economy did not fall into a "tailspin", as after the August 1998 default;

3. Deviation from the second above assumption of our model may occur due to a decrease in the price of oil in the Chinese market, as well as due to a complete oil embargo against Russia by the EU (even according to conservative Bloomberg estimates, Russia's losses from the embargo should amount to 22 billion dollars (Gazeta.ru, 2022) (in total, oil was imported to the EU for about $58 billion in 2021), when China bought oil from Russia in the amount of $40.29 billion in 2021), China's imports of Russian oil will increase, albeit at a moderate pace, today China receives from Russia 1.3 mln. Dollars (TASS, 2022); the average price of Russian oil under contracts with the Chinese side in 2021 was almost $506 per ton, or about 80.5 us dollars per barrel, we consider this price to be quite probable for the next 3–5 years with some deviations, we will take this price for the model that

determines the Russian oil price abroad will be the Chinese market, however, as we understand it, there will be no radical growth in the import of Russian oil by China, the consumption of oil from the Russian Federation in the PRC will fluctuate around the level of 2021; in a word, the increase in oil prices in the foreseeable future will be zero for Russia;

Russia's losses from the embargo, judging by the amount estimated by Bloomberg, are approximately 20% of the potential dollar amount of oil exports, which means that instead of the traditional "bonus" in GDP growth of 35%, the Russian economy will receive 30% of the same "oil bonus" in GDP growth, which we reflect in our modification of Tenyakov's model (Tenyakov, 2019).

4. RESULTS AND DISCUSSION

The solution to the problem of the money "overhang" (see Introduction) is based on the premise that an increase in the money supply aggregate M2 by an average of 1% provokes an increase in inflation by approximately 0.3% (if we consider the trends in connection with the influence of the money supply on inflation in Russia in the 2010 s), we believe that investments that, in the absence of a strong influence of politics on the stock market of the Russian Federation, can be annually exported from the country-this is about $ 30.8 billion (a stable indicator in this sense in 2010), let's round this figure for convenience to $ 31 billion, which in terms of rubles at the current exchange rate is approximately 1.85 trillion. rub., or about 3% of the normal state of the M2 unit in Russia; thus, the formation of a monetary "overhang" in the context of an administrative ban on the export of capital in Russia and the deviation of the Russian economy from the parameters of 2005–2008 will give an increase in inflation of approximately 0.9–1.0% or a decrease in real GDP (g) by 1/100;

- we assume that the growth rate of investment in fixed assets will be about 5.7%, here we are based on the old forecasts of the Ministry of Economic Development for 2020, we believe that this indicator, with slight deviations, will also be relevant for the outlook in 2022–2024;
- As shown in 2021-the first half of 2022, the growth rate of real money supply is about 20%, this is a high growth rate, but there is a tendency for it to slow down, since the entire first half of 2022 M2 fluctuates around 66.3 trillion. rub., therefore, we assume that the growth of this aggregate will average 2% per year (the maximum possible figure under the conservative policy of the Bank of Russia).

Let us reformulate I. Tenyakov's model as follows for the state of deviation of the Russian economy in terms of key indicators from the state of 2005–2008 (we do not take into account the situation at the end of 2008, which was similar to the August 1998 default, that is, we mean the first three quarters of 2008): g = 0,965009 + 0,219198 I* + 0,0465682 Poil + 0,0729691 (M*/P) = 0,965009 + 0,219198 (5,7) + 0,0465682 (0) + 0,0729691 (2) = 6,7499799 + 0 + 0,1459382 = 6,896; then we reduce g by 1%, this is the loss of real GDP from inflation, due to the monetary "overhang", we conditionally give this concept the name of the coefficient «c» (see above). Then we need to subtract 20% from the resulting indicator, the losses from the embargo on oil exports to the EU, let

us conditionally give this concept the name of the coefficient «e», as a result, we get 5.46% of the annual increase in real GDP, our result is quite close to the 2021 indicator 4,7%, but that year the corona crisis exerted significant pressure on the Russian economy, however, the impact of the sanctions was significant.

5. CONCLUSION

Definitely our refinement of I. Tenyakov's model is hypothetical in natural, we do not exclude such a high probability that the money overhang in the Russian economy will increase quite seriously, due to the fact that it will be more difficult for investors to find objects for capital investment when oil and gas exports to be quite stable due to the Chinese market, but not to grow. As the entire experience of post-Soviet development shows, investments in innovative production and R&D are quite conservative, and investors are reluctant to invest in innovative segments of the national economy. True, we proceed in our reasoning from the fact that the scale of state participation in the innovation sphere will remain at the same level as in 2018–2021.

As the experience of the aerospace industry shows, the increased participation of the state in the development of national production in terms of increasing investment in innovative segments does not give a quick result, the consequences of Russia's long-term dependence on imports of high value-added products are affecting.

The desire of the Russian economy to the parameters of the "golden zero" would be positive, if not for such a factor as the new conditions of socio-economic development, requiring more attention to innovation. But even in today's difficult conditions, the Russian economy demonstrates high GDP growth rates, and we are convinced that this trend will continue.

REFERENCES

Angeriz, A., McCombie, J.S.L., Roberts, M. (2009), Increasing returns and the growth of industries in the EU Regions: Paradoxes and conundrums. Spatial Economic Analysis, 4(2), 127-148.

Corden, W.M., Neary, J.P. (1982), Booming sector and de-industrialisation in a small open economy. The Economic Journal, 92(368), 825-848.

Egorenko, S.N., Bondarenko, K.A., Solovyeva, S.V. (2018), The Report on the Human Development in Russian Federation. Aavailable from: https://www.publications.hse.ru/mirror/pubs/share/direct/228607056

GDP of Russia Per Year: 1991-2022. Available from: https://www.global-finances.ru/vvp-rossii-po-godam/

Money Supply (National Definition). Available from: https://cbr.ru/statistics/ms/

Oil Imports from Russia to China Fell by 4.5% in 2021. Available from: https://www.n.tass.ru/ekonomika/13474795?utm_source=yandex.ru&utm_medium=organic&utm_campaign=yandex.ru&utm_referrer=yandex.ru

Popov, G.G. (2019), The Crisis of Innovative Development of the Soviet Economy During the Period of "Stagnation" in the Understanding of the Leadership of the USSR and Contemporary Scientists of that Period. Questions of Theoretical Economics. No. 2. p136-146.

Popov, G.G., Leus, T.V. (2009), The social price of raw material specialization. Terra Economicus, 7(3), 91-102.

Ross, M. (2015), The Oil Curse: How Petroleum Wealth Shapes the Development of Nations. Moscow: Gaidar's Institute Publishing House.

Sachs, J. (2012), Reply to Acemoglu and Robinson's Response to My Book Review. Available from: http://www.jeffsachs.org/wp-content/uploads/2012/12/reply-to-acemoglu-and-robinson-december-1-2012_final.pdf

Sukharev, O.S. (2015), Economic Growth, Institutions and Technologies. 2nd ed. Revised M.: Finance and Statistics.

Tenyakov, I.M. (2018), Russian specificity of the factors of the economical growth: the experience of econometric modelling. Ekonomicheskaya Nauka Sovremennoj Rossii, 3(82), 22-35.

Tenyakov, I.M. (2018), Russian specifics of economic growth factors: Econometric modeling experience. Economic Science of Modern Russia, 3(82), 27.

The EU has Refused oil from Russia. Moscow will Lose or Earn on this. Available from: https://www.gazeta.ru/business/2022/05/31/14928896.shtml

Vasilieva, O.G. (2018), Problems of Natural Resources Valuation in Empirical Studies of the Resource Curse. Spatial Economics, 4, 67-91.

Yu, K.I., Shvedov, K.I. (2017), Resource Course: Overview of Points of View. Public Administration. Electronic Notes. p56-67.