
MACROECONOMIC PROBLEMS

Key Tasks and Development Prospects for the Russian Economy in the Context of Kondratiev's Long Cycles

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Abstract—The rationale behind the key tasks in the development of Russia's fuel and energy complex, agroindustrial complex, defense industry, and machinery industry and construction complexes has been presented using the apparatus of Kondratiev's long cycles, i.e., upward and downward waves in the production and export of oil, grain, arms, cars, etc. as well as in the supply of new housing. The trends have been analyzed using Rosstat data for a 100-year period. The analysis has shown how the past rates of development and proportions affect the present and future growth of Russia's economy. Some of the main tasks have been formulated for the future development of Russia's economy until 2030. The processes of import substitution and the replacement of oil exports with grain, arms, and cars have been discussed. The issue of the social and economic significance of solving the housing problem in Russia has been raised.

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In its most condensed form, Nikolai Kondratiev's theory of long cycles can be formulated in a few statements that show the prospects of socioeconomic development [1, 2]. If you smooth the time series of an economic indicator and remove all of its seasonal and other one-time fluctuations, you can obtain the main trend of its changes over time. The deviation of empirical data series from the trend characterizes the acceleration (deceleration) of their dynamics, or a long-term change in the economic climate. By summarizing huge amounts of statistical data, Kondratiev concluded that there are upward and downward waves in the long cycles of the world economy. Since these and other waves are projected onto future development, Kondratiev's theory possesses predictive power. This theory perceives future development as socioeconomic genesis, including three types of processes, i.e., inertial growth (heredity), spontaneous change (variability), and the directed impact of the government on both.

Trends in oil production and exports. A key characteristic feature of the Russian economy is the amounts of oil production and exports. Within a long, almost 70-year cycle of oil production, one can identify two upward and one downward waves at the various stages in the country's development (Table 1).

The modern history of oil production in Russia began in the 1950s–1960s with the development of oil deposits in Western Siberia, the Volga region, and Kazakhstan, along with other new deposits. In the Soviet Union, the 1950s–1980s stands out as a long

upward trend in oil-production growth. At the beginning of this period (1950s–1960s), the average annual increase in oil production was 10 million tons. In the next decade (1960s–1970s), the growth rate increased to 17 million tons per year. The world energy crisis contributed to a further increase in oil production growth in the 1970s–1980s up to 26 million tons on average per year. Over a 30-year period, oil production in the Soviet Union increased by a factor of 30, from 18 million tons in 1950 to 547 million tons in 1980, a prize year of oil production. In 2016, oil production was 549 million tons, i.e., on par with Soviet production in 1980. Therefore, the entire subsequent history of Russia's oil industry, with its ups and downs, represents a struggle to maintain the level of production achieved in 1980.

With the collapse of the Soviet Union and the separation of oil deposits in Azerbaijan, Kazakhstan, and Ukraine, oil production decreased by a factor of 1.7 from 516 million tons in 1990 (Soviet Union) to 305 million tons in 1999 (Russia).

A new upward wave emerged during the years of economic recovery and expensive oil. In 2000–2010, the oil production growth in Russia amounted to 18 million tons on average per year. In the next six years, despite the oil price crash, the production growth continued, albeit at a smaller rate of 7 million tons. Therefore, in 2016, the oil production reached the precrisis level and even surpassed it slightly.

Table 1. Long cycle and waves in the development of oil production in Russia

Period (years)	Characteristic	Average annual increase in production, million tons	Wave pattern
1950–1960	Development of oil deposits	10	Upward
1960–1970	Development of new oil deposits	17	
1970–1980	World energy crisis	26	
1980–1991	Precrisis period	–3	Downward
1992–1999	Crisis	–19	
2000–2014	High oil prices	18	Upward
2015–2017	2014 oil price crash	7	
2018–2030	Forecast	~0	Neutral

In recent years (2012–2016), the oil production growth hit a minimum of about 1% per year. This trend suggests that the growth curve has approached saturation level. The production has virtually ceased to grow, but not yet begun to decline. This trend can be called neutral. Forecasts confirm that the depletion of the traditional deposits in Western Siberia and the European part of Russia will eventually lead to a new downward wave in oil production.

Researchers at the Institute of Economic Forecasting, Russian Academy of Sciences, predict that given favorable conditions on the world market, Russia will maintain the achieved level of oil production through 2030 [3]. However, a subsequent downward wave will inevitably occur that should be prepared for in advance; the decline in oil production should be compensated for by increasing human capital through additional investments in health and education and by increasing innovative capacity through investments in science and innovation.

Exports of crude oil and refined oil products have been a major source of growth on the Russian economy for more than half a century. Russia exports three-quarters of the oil produced. Revenues from oil and oil product exports account for more than half of Russia's total export revenues. Over the past quarter century, the former increased by a factor of 19. However, after the world crash in oil prices, they dropped in 2015 by almost half.

Table 2. Cyclic waves of the oil and oil product exports, \$ billion

Period (years)	Average annual exports			Wave pattern
	oil	oil products	total	
1991–1999	12.2	5.3	17.5	Neutral
2000–2013	101.4	50.2	151.6	Upward
2014–2015	121.7	91.6	213.3	Upward

Table 2 presents the cyclic waves of the oil and oil product exports in the Russian economy of the post-Soviet period.

The post-Soviet history of Russia's oil industry began with a severe transformation crisis of 1990–1999. It was preceded by a long period of rising oil prices, which began with the world energy crisis of the 1970s. During the crisis of the 1990s, oil prices showed some stability. The average annual foreign exchange earnings were \$17.5 billion. The stable oil export prices made it easier for Russia to survive the severe crisis of the 1990s.

During the economic recovery of 2000–2013, oil prices were rising monotonically (except for the crisis year 2009) from \$175 per ton in 2000 to \$734 per ton in 2013. The monotone growth of world oil prices was the secret to Russia's economic recovery in the 2000s. The average annual export earnings from the foreign sales of oil and oil products surged in 2000–2013 by a factor of almost 9 from \$17.5 to \$151.6 billion. Compared with the previous period, the export share of refined oil products increased slightly (from 30 to 33%).

A landmark event in the following three years (2014–2016) was the oil price crash. The average annual export prices came down by 60%, to \$289 per ton of oil in 2016. The export share of oil products in this period continued to grow, reaching 43%. However, the export revenues from oil and oil products in 2015 were substantially lower than in the previous year. The average annual exports of oil and oil products in 2014–2015 kept growing compared to the previous period. The upward wave continued on due to inertia. This inertia helped the economy recover from the crisis.

What foreign currency earnings from oil and oil product exports can the economy count on until 2030? This is the deciding question for the Russian economy is as follows: The answer depends on the price of oil and the volume of future exports. One cannot predict the dynamics of oil prices so far in advance. Forecasts for the export volumes give a clue about trends in future revenues from oil and oil product exports in the

Table 3. Grain harvesting and the balance of foreign trade in grain

Period (years)	Average annual grain harvests, million tons per year	Foreign trade balance, million t	Wave pattern
1992–1999	74.2	1990 –14.9 } 2000 –3.4 }	Upward
2000–2013	76.2	2001 +1.9 } 2002 +11.3 } 2013 +17.5 }	Upward
2014–2016	110.2	+29.2	Upward

case where the prices remain unchanged. Based on the forecasts of the IEF RAS [2], in 2030, one can expect an increase in crude oil exports to 265 million tons (from 244 million tons in 2016). However, the forecasts also predict plummeting (by more than 50%) exports of refined oil products (from 172 to 70–75 million tons). This decrease is explained by the forthcoming decrease in production: “In view of the expected peak in oil production and its transition to a declining phase, one should not take decisive steps towards expanding the capacity of the oil refining industry to increase oil product exports” [2, p. 232]. Given an onset of a downward wave in the export revenues from oil and oil products, it will be increasingly relevant to replace the exports of oil and oil products by other Russian commodities, including grain.

Grain harvests and exports. Since the late 1950s, the amounts of grain exports from the Soviet Union fell sharply. By that time, with the increase in oil production, the country gained an opportunity for importing grain. In the 1960s–1990s, Soviet grain imports exceeded the exports. The Soviet Union, with its unique stock of agricultural land and fresh water reserves, coupled with the production of chemical fertilizers, became a major importer of grain on the world market. In 1980, grain imports in the Soviet Union were 15.5 million tons; in 1990, they were 16.9 million tons. It is estimated that half of the 54 years between 1945 and 1999 (i.e., 27 years) had insufficient grain harvests. At the same time, grain was used inefficiently to fatten livestock and poultry. The consumption of bread and pastries was higher than in developed countries.

When the Soviet Union collapsed in 1991, the country lost two generous breadbaskets, i.e., Ukraine and Kazakhstan.

A.A. Nikonov presented a detailed analysis of the “spiral of a centuries-old drama” of Russian agriculture, which turned the country into a major consumer of American grain [4]. Russia lost its food security, which is no less real than military defense.

Table 3 shows the average annual grain harvest in Russia and the balance of foreign trade in grain over the last quarter century. The average annual grain harvest in the post-Soviet Russia has been growing. In

1992–1999, despite a severe crisis, there was a reduction in the negative balance of foreign trade in grain. In 2000–2013, the balance of foreign trade in grain became positive. The year of the great turn appears to have been 2002, when the positive balance reached a two-digit figure, and the grain exports had an economically significant positive impact on the development of the national economy. In 2014–2016, despite the crisis, the grain harvests and exports broke a record. All three waves demonstrated an upward pattern. Apparently, the centuries-old drama of Russian agriculture was over.

What is the reason for this turn in the trend? The climate could not have been a decisive factor because we use averaged indicators for large time intervals, which rules out seasonal fluctuations. Could it be an error in the statistical data? This is impossible because the statistics on grain harvesting and sales have been tested over centuries and are known to be most reliable. We can only guess that it was the consequence of previous economic reforms.

Grain exports are growing every year. In 2012, they were 22.5 million t, and in 2014–2015, they exceeded 30 million tons. The value of Russian grain exports, including wheat, barley, and corn, amounted to \$4.7 billion in 2013 and \$7.1 billion in 2014. The increase in the grain supply in the world market caused a decline in prices for Russian grain from \$291 per ton in 2013 to \$219 per ton in 2015. Therefore, the export earnings from grain sales dropped to \$5.6 billion in 2015. These export volumes lead us to believe that the grain import substitution has transformed into the substitution of grain exports for oil and oil product exports.

What is the future of grain production and exports? In 2017, Russia produced a record-breaking harvest, but the demand in the world market is lagging behind the supply. Hence, one can expect a further decline in grain prices.

Is it possible to forecast the changes in the grain market for a more distant future? Summarizing the forecasting experience of Russia, the United States, Argentina, and Australia, a leading analyst of the grain market R. Bulavin answers this question in the negative [5]. It is not possible to predict the future due the

Table 4. Cycles and waves in the production of weapons

Period (years)	Period characterization	GDP share of defense expenditure, %	Wave pattern
1960–1991	Arms race	19–20	Upward
1992–1999	Economic crisis and conversion	5.2	Downward
2000–2014	Modernization of weapons	3.9	Upward
2015–2017	Economic crisis	4.9 } 2017 –3.3 }	Upward
2018–2030	End of modernization; conversion	2018 –3.0 } 2019 –2.9 }	Downward

high volatility of prices in the grain market because one cannot predict weather conditions for a lengthy period. Weather surprises cause serious changes in gross grain production and in grain prices. It is difficult to forecast the harvest, even for a year in advance although Russia and the United States have special space-sensing technology.

In our opinion, prerequisites do exist in Russia for substantial growth in grain harvesting and exports as follows:

- unique agricultural lands and freshwater resources, including the availability of chemical fertilizers;

- the rehabilitation and modernization of the domestic production of tractors, combine harvesters, and other agricultural machinery;

- the government, finally convinced in the efficiency of agriculture investments, intends to further increase its agricultural funding;

- the low ruble exchange rate facilitates the export of grain and other agricultural products.

In conclusion, let us compare the effects of the natural factor on the development of two raw materials industries—oil and grain—in Russia. A growth of oil production leads to a depletion of oil deposits. In contrast, if based on science, the development of the grain industry does not lead to the depletion of soils and water sources. At the same time, the two raw materials industries can develop independently from each other. At the very least, it is possible that the volatility of world oil prices may not be an obstacle to increasing grain harvests and exports.

Production and export of weapons. In addition to Russian oil and grain, there is also worldwide demand for Russian weapons, including Kalashnikov rifles, fighter jets and bombers, various types of missiles, submarines, tanks, and other military equipment.

Table 4 presents five cyclical waves in the development of the defense industry over the 70-year period of 1960–2030. To characterize the waves, we used the GDP share of defense expenditures and their absolute

value, which determines the military burden on the economy.

1960–1991. The upward wave during the entire period of the arms race was characterized by an extremely high share of military spending in the GDP. The Soviet leaders admitted, during the perestroika, that it reached 19–20%.

The Soviet Union achieved military parity with the United States. The numerical force of the Soviet army and the volume of production of weapons in the Soviet Union were much higher than those in the United States. For example, based on the US data, in 1989, the Soviet Union and the United States produced 1700 and 725 tanks, 665 and 470 bombers, 140 and 9 inter-continental missiles, and 9 and 6 submarines, respectively. In terms of technology, the Soviet Union was the leader in 5 out of 31 types of weapons, including chemical and bacteriological weapons, ballistic missiles, surface-to-air missiles, and antisatellite weapons. Parity was achieved in 9 types of weapons, while in the remaining 17, the Soviet Union lagged behind [6].

According to Yu. V. Yaremenko, “In this period, the buildup of the military–industrial complex became utterly disproportionate to the country’s economic capacity. The efforts to level the home front, i.e., the civilian industry, were unsuccessful, leading to its technological backwardness” [7, p. 39]. A downward wave in the development of the defense industry was inevitable.

1992–1999. This was a period of transition amidst an economic crisis and a downward wave in the production of weapons. The share of defense spending in the GDP fell to 5%. Furthermore, the GDP itself collapsed. In 1992, the volume of government procurement of weapons dropped by 67%.

In 1994, compared with 1991, the volume of arms production decreased from 900 to 40 vehicles for tanks, from 30 to 0 for bombers, from 3000 to 400 for infantry combat vehicles, from 225 to 50 for attack and fighter aircraft, from 100 to 25 for strategic missiles, etc. By 1997, the volume of arms production plummeted by about a factor of 10. The number of employees in the defense industry decreased by a factor of 5,

and the amount of investments decreased by a factor of 13 [8].

The main threat to the defense industry was the loss of scientific and technical capabilities. In 1994, the R&D in the defense industry decreased by 29% in military and by 20% in civil fields. However, the expected increase in the production of high-tech civilian goods did not materialize. Neither did the great hopes for the transition. Thus, considering the results of the military operations in Chechnya, NATO experts renounced their previous high ratings for Russia's defense capacity [9].

2000–2014. The need to restore defense sufficiency required an upward wave in arms production. Provided that the GDP was growing, the share of defense spending in this period was on average 3.9%.

In 2011, the government adopted an arms development program for the period until 2020. It is planned to increase the share of new weapons to 70%. The fleet of missiles will be updated by 80%. The program focuses its main stakes on sea-based nuclear forces, rather than ground-based missiles. The main nuclear shield will be formed by ten submarine missile carriers. The modernization of military aviation involves the production of 1500 new aircraft and the modernization of 400 operating aircraft. The program involves establishing military bases in the Kara Sea and the design of new nuclear icebreakers. The defense industry will maintain a leadership position in the development of antimissile defenses. There are no analogues to the S-400 missile systems, Pantsir' S-1, Iskander-M ballistic missiles, SU-35 fighter aircraft, K-52 helicopters, Yasen' submarines, and many other types of weapons supplied to the army within the modernization program.

2015–2017. The upward wave of arms production kept on during the crisis. Among the oil-exporting countries, Russia was among the few where the oil price crash caused no cuts in military spending, which even increased. In 2016, the share of military spending in the GDP reached a maximum of 5.7%. The same situation was observed in the previous crisis years, i.e., 2009 and 2015, when oil prices were falling, but the Russian military spending was growing. One of the possible reasons for the high inertia of Russia's defense budget is the large proportion of complex military equipment, such as aircraft and missile ships. The long cycles of their development and manufacture limit the opportunities for mobile adjustment of the arms production program depending on the current changes in oil prices [10].

2018–2030. As far as can be expected, given the volatility of the current situation, the defense industry will face a downward wave of arms production after the completion of the 2020 program of rearmament with high-technology equipment. There is a plan to increase the share of civilian production in the defense industry from 16 to 50% and reduce the share of military spending in the GDP to an optimal level of 3%.

A serious challenge for the future of the Russian defense industry is the restructuring of its facilities to produce civilian products. Is it a feasible task? Today we can only point out the existing groundwork and some of the actual achievements in this area, including

- the aircraft industry and the production of civil aircraft.

- shipbuilding and the development of the capacity to produce ships and platforms for the oil industry.

- the nuclear industry and the production of equipment, nuclear fuel, and finished units of nuclear power plants, by both Russian and foreign companies.

The defense industry has the capacity to manufacture many technologically sophisticated products, e.g., gas industry equipment, gas pipelines, spare parts for airbuses and other imported aircraft (the experience of China), pneumatics, hydraulics, electric appliances for the assembly of foreign cars in Russia, etc.

In the future, we can expect that the upward trend in the export of Russian weapons will continue as the demand for them may grow due to the increasing welfare of China, India, and other countries that import Russian weapons. However, the complex challenges faced by the Russian defense industry require substantial support from the government.

Housing construction. Over the past century, the housing issue has been, perhaps, the most acute of all social challenges in Russia. In the first half of the 20th century, the supply of new housing was 100–130 m² of gross floor area per year per 1000 population. Given this level of housing construction, a person could count on no more than 9 m² in 70 years of life, i.e., a part of a room in a communal apartment.

The accumulated housing deficit mutated into an ugly form of overpopulated communal apartments, which lacked basic amenities, such as bathrooms, sewerage, hot water supply, or even any water supply whatsoever.

An attempt was made to address the housing issue in the 1960s. The upward wave of housing construction was then based on the transition to accelerated industrialized housebuilding on the basis of prefabricated concrete structures (panels). The so-called *khreshchevskas*, or the Khrushchev-era houses, built in the 1960s, were designed for limited service lives. Therefore, in 2017, a new upward wave emerged in housing construction aimed at resettlement and the demolition of the dilapidated low-rise houses built in 1957–1968. Table 5 presents data on housing construction in post-Soviet Russia.

During the crisis of 1991–1999, the commissioning of new homes amounted to 310 m² of gross floor area per 1000 population per year. Given that the average size of an apartment was 71 m² (2015), the annual supply of new housing was 4.4 apartments per 1000 people. For the average citizen, the virtual list for a new home grew to a mythical 200 years or even longer.

Table 5. Cycles and waves of new housing supply

Period (years)	Period characterization	Average annual new housing supply, million m ²	Supply of gross floor area per 1000 people, m ²	Wave pattern
1992–1999	Crisis	44.3	310	Downward
2000–2015	Recovery	65.2	446	Upward
2016–2030	Forecast	120	850	Upward
2016–2020		141	1000	
2021–2030				

In the years of expensive oil and economic recovery in Russia (2000–2015), the average annual supply of new housing increased by almost 50%. In 2015, the commissioning of new homes reached 85.3 million square meters. However, this breakthrough was not sufficient to eliminate the backlog accumulated in the past. The amount of dilapidated housing continued to grow from 65.6 million square meters in 2000 to 88 million square meters in 2015.

The forecast of the Institute of Economic Forecasting until 2030 [2] provides the rationale for the possible doubling of new housing supply in 2016–2020 and, in subsequent years, for an average annual supply of 1 m² per capita.

In our opinion, at least two conditions should be met to resolve the housing issue in Russia: (a) the elimination of dilapidated housing and (b) an increase in the per capita housing area to 40 m², i.e., nearly to the level of Germany, France, and Finland at the end of the 20th century. In 2015, this indicator was 24.4 m² in Russia.

Is it realistic to set this task for the period until 2030? Judging by the previous experience, the minimum necessary decommissioning of housing over the entire forecast period should be 3% of the housing stock at the beginning of the forecast period. This is 107 million m². On top of it, there are 88 million m² of old and dilapidated housing. In total, the new supply needed to compensate for the decommissioned housing in the forecast period is 195 million m². With a population of 147.3 million people (the Rosstat forecast, medium variant), achieving a per capita housing area of 40 m² by 2030 will require an increase in the national housing stock to 5892 million m². The existing housing stock should grow by 2311 million m². Thus, to solve the housing issue once and for all, the total supply of new housing in the forecast period should amount to 2506 million m². How realistic does this seem?

The forecast of the Institute of Economic Forecasting. The maximum variant foresees a new housing supply of 2000 m² in 2016–2030. Hence, the amount of housing construction required to resolve the housing issue in Russia should increase by another 25%, to 2500 m².

Additional opportunities to increase housing construction come from the increased affordability of homes. The classical indicator of housing affordability is the ratio of the average market price of a standard two-room apartment to the average annual income of a family of three. In recent years, this indicator in Russia has decreased by half [11]. The affordability of housing has increased substantially, creating prospects for further growth in housing construction by raising money from households.

Manufacture of passenger cars. The state of manufacture of passenger cars is a key characteristic of a country's industrial development, and the car park per 100 households is a key characteristic of the living standard. The entire period before World War II in the Soviet Union is characterized by one long downward wave in the domestic production of cars and increasing backwardness compared with developed economies both in the production of cars and their use in everyday life. In the first postwar years, the Soviet Union launched the production of its own car models (Volga, etc.), which were largely based on captured German cars.

The biggest success came from the acquisition from FIAT of a turn-key factory to produce Lada cars. This project gave rise to an upward wave in the production of domestic cars from 257000 vehicles in 1970 to 1 million in 1975. Lada still holds about 14% in deliveries (in 2015) and 34.5% in the operating car park (46% in 1999). Table 6 shows data on the production and deliveries of passenger cars in post-Soviet Russia.

To characterize the waves in Table 6, we chose trends in deliveries composed of both the domestic production of motor vehicles (plus assembly production and minus exports) and imports. Moreover, the growth of domestic production has pushed imports from the domestic car market (import substitution) and vice versa.

Passenger cars are an expensive commodity with the possibility of deferred demand. Therefore, the demand for cars is closely related to the current state of the economy. During the crisis of 1992–1999, car production decreased from about 1 million to 800000 cars and, by 2000, it again increased to 1 million. Cars only

Table 6. Cycles and waves in the production and deliveries of passenger cars, thousand items

Period (years) and its characterization	Average annual indicator			Wave pattern
	production	import	deliveries	
1992–1999 Crisis	1028	–	1019	Downward
2000–2013 Recovery	1253	709	1859	Upward
2014–2016 Crisis	1343	440	1685	Downward

Table 7. Long cycles and waves in the production of the key products of the Russian economy (+ upward trend, – downward trend, and + – neutral trend)

Cycle (years)	Characterization	Oil	Grain	Arms	Cars	Housing
1992–1999	Transition period	–	+	–	– +	–
2000–2014	Market economy	+	+	+	+	+
2015–2017	Crisis	+ –	+	+	–	+
2018–2030	Forecast	+ –	+	–	+	+

began to be imported in significant amounts at the very end of the period.

In the good years of economic recovery, an upward wave emerged in the car market when car deliveries increased from 1 million in 2000 to 2 million in 2005 and to almost 4 million in 2008. The upward wave of 2000–2013 was boosted by the growth of assembly production of foreign cars and the modernization and expansion of the production of domestic car brands coupled with explosive growth of foreign cars imports, which exceeded in 2008 a threshold of 2 million, but subsequently decreased.

According to foreign estimates, the average service life of a car is 12 years. In Russia, it is probably longer; therefore, the 2000–2013 upward wave in the car park growth will induce a surge of car renewal in no less than 12–15 years.

In 2014–2016, the crash of oil prices, devaluation of the ruble, rise in import prices, the crisis, and the decline in household incomes caused a collapse of the Russian car market. What are the prospects for its recovery? The Russian passenger car park, which cleared a 40-million threshold in 2015, will expand with the increase in the country's welfare and population. An upward wave is possible. Autostat's forecasts predict a 2–3% annual growth in the car park in the coming years.

CONCLUSIONS

Table 7 summarizes the trends in the production of the five key products of the Russian economy (oil, grain, arms, cars, and housing) over the past century (1917–2017) and for the period until 2030. Three cycles of past development have been identified: the transition economy (1992–1999), the market economy (2000–2014), and the oil price crisis and sanctions (2015–2017).

Based on an analysis of the past developments, we formulated normative concepts of the key tasks for the economy for the next 12 years (2018–2030), which are consistent with Kondratiev's genetic ideas of heredity and inertial growth.

The development of the production of each product within each cycle is characterized by an upward or downward wave.

Oil production and exports are affected to varying degrees by the chain of interindustry interactions, as well as the production and consumption of other products. To what extent are the production of grain and arms and the demand in the car and housing markets independent variables with respect to oil?

Grain harvests and exports do not depend directly on oil. Statistics show that a short-term decline in oil prices makes it possible to compensate for their influence on arms production. In the short run, arms production can develop independently of oil. Long waves, e.g., the crisis of the 1990s, inevitably lead to a decrease in arms production. Therefore, the government can use upward waves to modernize the armed forces in order to reduce the defense burden on the economy at a time of low oil prices.

Oil production and exports have a decisive effect on the domestic market of passenger cars. In the future, car exports may partly compensate for the decline in oil exports, like grain exports do today (export substitution). The housing market may also cushion the impact of oil price fluctuations. In crisis years, the demand for housing may increase because of the savings people accumulated in previous years.

In the 1960s, upward waves emerged in oil and arms production, and today's economy is still influenced by these waves. Among the achievements of this period, the upward wave of industrialized housebuild-

ing based on prefabricated reinforced concrete structures is noteworthy.

The transition period (1992–1999) with its inherent transformation crisis showed no improvements in any of the five key products of the Russian economy. Due to the contraction of defense R&D and arms production, Russia faced the threat of losing military and strategic parity with the United States.

The years of expensive oil and the rise of the Russian economy (2000–2014) were accompanied by an upward wave in the production and supplies of all the five key products. The country reached the front lines in oil production and exports, grain harvests and exports, arms exports, and new housing supply and made a substantial progress in recovering its defense capabilities and in increasing the vehicle-to-population ratio.

The oil price crash; the devaluation of the ruble; diminishing imports, especially technology; and the sanctions in 2015–2017 have not yet affected the production of the five products, except for the collapse of the car market. Grain harvests and exports have even increased. Oil production has also been growing, albeit at a slow pace due to the depletion of the most accessible fields.

Based on the forecast estimates for 2018–2030, we can wager that the oil production will remain at the achieved level, or even slightly increase. Arms production is expected to decrease with the completion of the 2020 program for modernizing the armed forces (the new State Armaments Program for 2018–2027 envisages no reduction of production costs). One can expect upward waves in grain harvesting, car production, and the new housing supply. Meanwhile, in our view, the key tasks for the Russian economy until 2030 are as follows:

- keeping oil production at the current levels;
- expanding the production of civilian products at defense enterprises to compensate for the reduction of the government procurement of arms;
- resolving the housing issue;

—restoring the domestic car market and increasing the exports of cars;

—achieving a substantial increase in grain harvests and exports.

Special consideration, which goes beyond the scope of this article, should be given to the development of the digital economy in Russia.

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