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**TÍTULO:** Llamadas del mundo moderno global: dialéctica del desarrollo científico y tecnológico y las relaciones de la propiedad.

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**RESUMEN:** Las relaciones de propiedad abarcan la unidad dialéctica de las relaciones de apropiación y alienación de los medios de producción, el trabajo y los resultados del trabajo en las fases de producción, distribución, intercambio y consumo del proceso de reproducción social. La transformación de las relaciones de propiedad es un proceso permanente de transformación del sistema de relaciones de propiedad, sus elementos y relaciones entre ellos, determinado por la dinámica del desarrollo de métodos de producción dentro de un sistema socioeconómico dado. Las industrias de alta tecnología e intensivas en conocimiento están en gran medida alejadas del desarrollo, lo que afecta negativamente la seguridad nacional y la realización de los intereses económicos nacionales en general. Estos aspectos se desarrollan en el artículo.

**PALABRAS CLAVES:** economía global, producción de alta tecnología, propiedad intelectual, relaciones de propiedad, tecnología NBIC.

**TITLE:** Calls of the global modern world: dialectics of the scientific and technological development and the relations of the property.

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**ABSTRACT:** Property relations encompass the dialectical unity of the relations of appropriation and alienation of the means of production, and the results of labor in the phases of production, distribution, exchange, and consumption in the process of social reproduction. The transformation of property relations is a permanent process of determined by the dynamics of development of production methods (both basic and additional) within a given socio-economic system. High-tech and knowledge-intensive industries are largely alienated from development, which negatively affects national security and the realization of national economic interests in general.

**KEY WORDS:** global economy, high-tech production, intellectual property, property relations, NBIC technology.

**INTRODUCTION.**

In the conditions of the global economic crisis, the last decade, the intensive development of NBIC technologies points out the birth of the new cycle of technological development, which can lead to

the significant expansion of the sales market as well as to the performatization of the world system of division of labor. During the last decade, a lot of industrially developed countries are actively implementing policies aimed at forming advanced national innovative systems. Due to the accelerated implementation of the NBIC technologies in industrial manufacturing, these systems will enable providing high rates of economic growth and the maximization of intellectual rent due to the implementation of advanced technologies (Bakhtizin, Evtushenko, Burenina, Gaisina, & Sagitov, 2016).

In the macroeconomic system, the production process is integral to the process of consuming its results. When considering economic growth from the point of view of their relationship, we distinguish material and spiritual human needs. Obviously, low incomes come out on top over material needs.

The dialectical point of view needs to distinguish quantitative and qualitative components, because for example, household appliances level of the 50s cannot satisfy people now. Therefore, quality material satisfaction results in high-tech products that require appropriate technology production. The quality-growth component of the material needs requires an appropriate volume of investments in scientific and technological progress. Growing quality material needs form a quality investment demand (Litvinenko, Solovykh, Smirnova, Kiyanova, & Mironova, 2019).

The basis of NBIC convergence is the informatization and miniaturization of technological processes. Any processes taking place in the living or non-living world or in the world of knowledge can turn into information. Thus, due to the information, it is possible to combine different previously incompatible elements; for example, genetic information contains codes that biosensors can decrypt and read. Information from the brain can be transmitted to a computer and vice versa. Miniaturization, which becomes possible thanks to nanoscience and nanotechnology,

allows creating super-devices to provide direct contact, for example, between the brain and the computer, between certain substances in the bloodstream and sensors, etc. (Akaev, 2014).

The implementation of Russian industrial policy to create competitive high-tech industries largely depends on the country's system of relations of appropriation and alienation (Gaisina, Bakhtizin, Mikhaylovskaya, Khairullina, Belonozhko, 2015). The place of Russia in the transformed system of international economic relations depends on the realization of property relations in the sphere of high-tech production. The role of the supplier of resources for the global economy while preserving the specifics of the peripheral economy or the exporter of high value-added products competitive in the world and regional markets is based on the convergence of nano-, bio-, information and cognitive technologies (Grigorenko, Klyuchnikov, Gridchina, Litvinenko, & Kolpak, 2016).

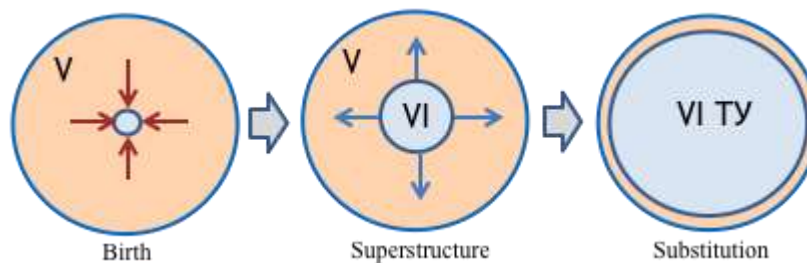
## **DEVELOPMENT.**

The paper discusses the features of NBIC technologies and the prospects for the influence of their intensive development on the transformation processes in the global economy. The features of the system of property relations in Russia in the context of global technological development and the main problems of property relations in terms of the implementation of an effective Russian industrial policy based on the development of NBIC technologies are revealed. The basic mechanisms for the correction of the system of relations of appropriation and alienation in order to ensure the effectiveness of innovative processes in the domestic industry are proposed.

The process of replacing a block of key technologies with the newest ones is defined differently in the economic literature, as either a change in technological patterns, or a change in technological paradigms, or a transition from one innovation pause to another. One thing unites these theories: technological development in the leading industrial countries is uneven; the period of intensive development of one group of technologies is replaced by slowing down their development and

introducing a new group of technologies reformatting the production structure at the global, macro and micro levels. In addition, changes in the relations of production are associated with the relations of appropriation and alienation in the process of social reproduction. The innovative modernization of industry on a global scale is becoming one of the determining factors in the transformation of property relations both within the framework of international relations and at the intra-national level, as well as at the level of individual enterprises.

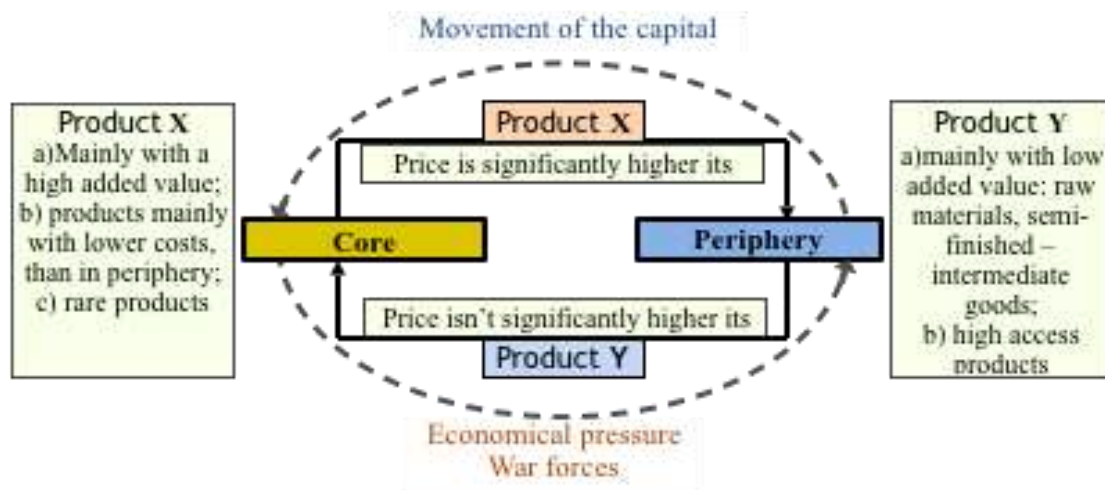
NBIC technologies form the backbone, the core of the new sixth technological paradigm. However, the new structure does not arise just like that based on the development of new technologies. It is realized due to their application based on existing productions of the previous structure, as shown in Figure 1. Thus, as industries in which NBIC technologies will be implemented, they determine all the major modern sectors of the economy such as instrumentation, automotive industry, aircraft industry, shipbuilding, machinery industry, nuclear, and solar electric power, metallurgy, chemical industry, mining, pharmaceuticals, medicine, horticulture, education, and others. The VI technological paradigm develops on the basis of the existing industries of the V paradigm: it is born, forms a specific superstructure over the industries of the V paradigm, forms its own technological, industrial, and marketing base, and develops steadily until it reaches the growth limits.



**Figure 1.** The emergence and development of a new technological structure. **Source:** Compiled by the authors.

The change of technological structures in the global economy creates uncertainty regarding global leadership: spontaneous new and not divided markets emerge, and the competition between national innovation and industrial systems for a leading position is becoming fiercer. Capturing new high-tech markets means unequal foreign trade - overpricing the product by the amount of intellectual rent due to the monopolistic possession of the relevant production technologies (Glazyev, 2010). As a result of the non-equivalent exchange, the center-peripheral system of world reproduction is constantly reproduced. The core of the system is the most technologically advanced countries whose value chains converge. The basis of this system is shown in Figure 2.

The process of changing the technological structure triggers a mechanism for reformatting core-peripheral relations: the countries of the periphery get a chance for development, and the countries of the core have the risk of losing global leadership.



**Figure 2.** Turnover in the center-periphery system. **Source:** Compiled by the authors.

The development of competitive technological production in the world market within the national economy of the VI technological paradigm implies two main points: innovation activity (generation of innovations and their implementation into production) and the availability of a sufficient amount of resources - financial, logistical and intellectual ones (Medovnikov & Rozmirovich, 2014). The concentration of all types of resources in the core countries of the current system (the USA, Japan,

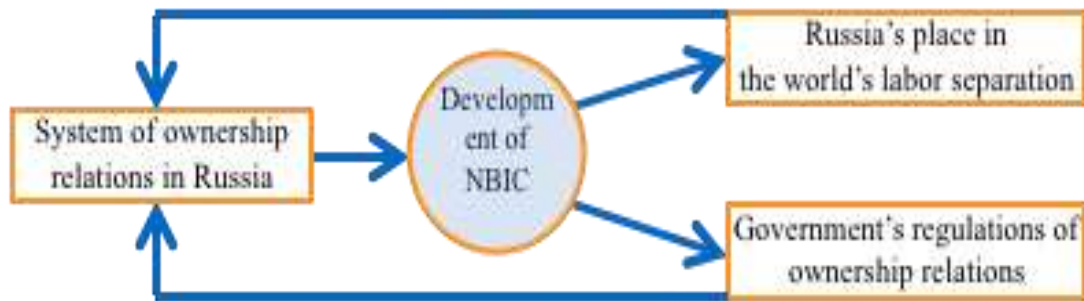
and the European Union countries) corresponds to large-scale national innovation development programs (Arhipova, 2014). According to the World Bank, in 2012, China (over \$ 500 billion), Germany, USA, Singapore, Japan, Korea and France (\$ 100-180 billion) were the leaders in terms of high-tech exports. Russia ranks 29th with a score of \$ 7 billion (The World Bank, 2014). Thus, China, Korea, and Singapore also have a significant resource in building an effective innovation system. In these countries, in addition to a developed industrial, scientific, and technical base, there is a high level of innovation activity (The Global Innovation Index, 2014).

In the conditions of competition of national innovation systems for the unfolding markets of new products, it is planned to restructure non-equivalent exchange relations in international trade, which may later lead to a restructuring of the center-peripheral system of global appropriation and alienation. There are three reformatting options: 1) that within the framework of preserving the current center of the system; 2) that with the transfer of the center of the system (the cluster of transnational corporations) to the countries of the Asia-Pacific region; 3) the disintegration of the global economy into regional divisions of labor with its financial infrastructure and sales markets (The World Bank, 2014).

The determination of the impact of the development of NBIC technologies on the transformation of property relations in the Russian Federation implies the consideration of the following groups of problems:

1. The prospects of the domestic socio-economic system in the process of transforming the global system of attitudes and alienation under the influence of the development of NBIC technologies;
2. The impact of the current system of property relations in Russia in the process of development of production of the VI technological paradigm;
3. The determination of the mechanisms of correction of the process of transformation of property relations in Russia with the aim of developing a competitive high-tech industry.

**Figure 3.** The interdependence of technological development and property relations in Russia.



**Source:** Compiled by the authors.

As shown in Figure 3, property relations in Russia are characterized by the interdependence with the development of modern "breakthrough" technologies. On the one hand, the development of NBIC technologies is determined by the peculiarities of the domestic system of property relations and Russia's place in the modern global division of labor. On the other hand, the need to develop high-tech industrial production determines the correction of the current system of relations of appropriation and alienation in Russia in order to provide high-tech industries with the necessary development resources. The level of development of domestic production based on NBIC technologies will determine competitiveness in new sales markets and Russia's place in the world system of attribution and alienation that is transformed in new economic conditions (Grigorenko et al., 2016).

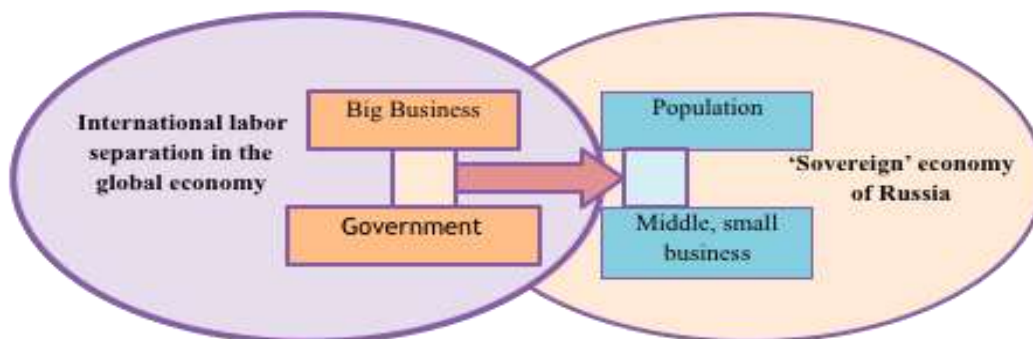
The global nature of pressing practical problems again exacerbates the need for a theoretical study of the general economic categories of so-called economic universals, labor and property, material and spiritual production, the cost and utility of benefits, the interaction of social and economic development, productive forces and production relations, science, technology, and production. In this regard, the question of changing the paradigm of economic theory, clarifying or revising its subject, and developing the method is raised (Glazyev, 2010).



The chairperson of the expert council of the Higher Attestation Commission of Russia on Economics points out in an analytical note that the formation of the subject of scientific activity in the political economy has not yet been completed. For these reasons, today, there is, firstly, the prevalence of “instrumentalism”; secondly, the almost complete disregard of the issues of high theory; thirdly, a decrease in the level of generalizations. Considering that, for many reasons, we do not fit into the framework of the “pro-Western” economic theory, we need to adjust the directions of scientific research towards general issues in order to develop and introduce a new economic paradigm into scientific circulation (Litvinenko et al., 2018).

When discovering the socio-economic consequences of scientific and technological progress, scientists focus on improving the efficiency of agricultural production, on bridging the gap in the technical equipment of industry and agriculture, the synthesis of these industries, the formation of the agro-industrial complex of the country. At the same time, the impact of scientific and technological progress on the change of public ownership is not enough studied (Arhipova, 2014).

The system of property relations in modern Russia is characterized by the presence of two contours of appropriation and alienation - as shown in Figure 4 - with a pronounced hierarchy. Large mining and primary processing enterprises built into the international system of division of labor, as well as the state represented by the bureaucracy representing the interests of these corporations, act as the primary contour (Moscow economic summit, 2014).

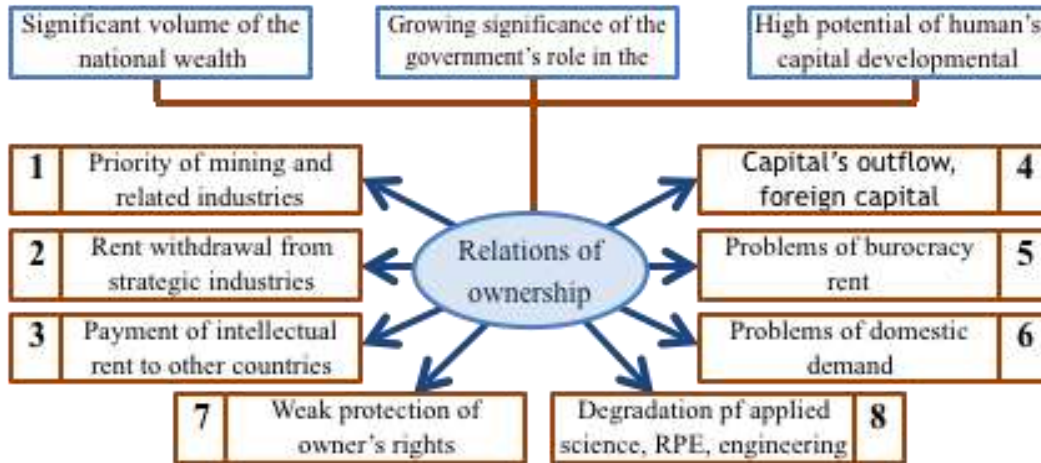


**Figure 4.** Bipolar modal of property relations of modern Russia. **Source:** Compiled by the authors.

The sovereign economy of Russia acts as the second contour: the products of the processing industry, agriculture and the sphere of reproduction of human capital. The basis of the hierarchy between the two contours is that the primary contour has specific rental income sources, namely: mining, export, monopoly, and bureaucratic rent. At the same time, rent is withdrawn from nationally oriented economic entities (Ministry of Education, 2013). The presence of significant sources of rental income eliminates the need for large enterprises for effective high-tech development and, therefore, for the institutional environment of such development (Arrighi, 1994). The domestic system of property relations has a pronounced predisposition to create (and partly recreate) high-tech industries based on NBIC technologies, mainly in relation to objects of property (resources for implementing industrial policy). The relations of appropriation and alienation regarding these objects themselves reveal a number of adverse factors that require minimizing their negative influence on the part of all three key subjects of relations - the state, business, and society - in accordance with the scheme presented in Figure 5 (Ministry of Education, 2013).

The favorable features of the domestic system of property relations include:

1. Significant amounts of national wealth (in terms of both natural resources and means of production and other assets).
2. The strengthening of the role of the state in the economy since the 2000s has contributed to greater controllability of innovation processes from both institutional support and direct regulation of the public sector (first of all, the defense, nuclear, and space industries as advanced high-tech industries).
3. High potential for the development of human and intellectual capital. Despite the degradation of the systems of education and science (including the applied one), the level of education in the country remains relatively high (13th place in the ranking of countries in terms of cognitive skills and education) (The Global Index of Cognitive Skills and Educational Attainment, 2014).



**Figure 5.** Factors of development of advanced production based on NBIC technologies in Russia from the current system of relations of appropriation and alienation. **Source:** Compiled by the authors.

However, in general, the system of property relations prevailing in Russia for the period of transformation (1980-2010) has not contributed to the creation (and partly the reconstruction) of high-tech industries based on NBIC technologies as the core of a new wave of global industrial development (Sokolov, 2014). The main negative factors associated with the features of the modern system of relations of appropriation and alienation in Russia are as follows:

1. The priority of the mining and primary processing industries expressed both in the implementation of rental relations in other industries (in relation to which the former act as suppliers of raw materials) and in the institutional structure of the domestic economy (the adaptation of the financial system for export-import relations and a high cost of long-term borrowed funds (mostly available to large enterprises)). The development of NBIC technology in the long term is under threat (Tolkachev, 2017).

The Russian export model, along with a depletion factor (and, first of all, an increase in the cost of extracting natural resources), needs the development of alternative energy technologies. So, in the long run, the domestic economy will be forced to reduce the share of mining and primary

processing of raw materials in the national economy (Frolov, 2013). Consequently, the creation of a competitive innovation-oriented industry is the primary strategic task of the national socio-economic system based on the logic of its internal development (Alpidovskaya, Gryaznova, & Sokolov, 2018).

2. The withdrawal of rent from the strategic industries of the new technological paradigm, from both the supplier companies and the bureaucracy.

3. The payment of intellectual rent to the countries supplying technology and high-tech products (in accordance with the model of non-equivalent exchange).

4. The group of problems associated with the outflow of capital and the negative impact of foreign capital. These include:

✓The problem of de-offshoring the economy, including, inter alia, the problem of increasing the attractiveness of Russian jurisdiction for doing business.

✓The problem of the outflow of intellectual capital.

✓High level of external debt in terms of corporate debt - \$ 674 billion according to the Central Bank of Russia (total government debt is \$ 731 billion), mainly a debt of large business with limited (as a result of sanctions) restructuring opportunities.

✓The negative impact of foreign capital (the lack of transfer of new technologies, the suppression of national producers because of more capital and focus on the outflow of financial resources to parent companies).

5. The problem of bureaucratic rent related to the high level of corruption in Russia is the pursuit of personal economic interests by the participants in the innovation process in the absence of a system of external and internal state financial control (NBIC-technologies, 2010).

6. The problem of domestic demand, which consists in the low incomes of the majority of the population (most of the funds go to the simple reproduction of the household - primarily for food, clothing, and utilities) and most of the small businesses. For the large-scale implementation of the NBIC development project, the domestic demand for new technologies and their availability to the average consumer are necessary (The Global Index, 2014).

7. The problem of protecting property rights is found both in the field of business property and in the field of intellectual property.

8. Degradation of applied science and engineering. This large group of problems is associated (in the context of property relations), mainly with the privatization processes of the past and the lack of demand from the economy based on the export of raw materials (alienation from development resources).

### **Theoretical and practical implications.**

The correction of alienation is supposed to be implemented at three functional levels: the resource support of the scientific and industrial development (redistribution of funds within the economic system in favor of developing industries); providing institutional development (the provision of financial and tax mechanisms, regulatory framework, and protection of property rights); ensuring control over the implementation of industrial policy (the system of internal and external state control, i.e. financial performance audit) (Kazancev & Rubvalter, 2012).

### **The First Level. Resource Provision.**

At this level of the correction of property relations, it seems appropriate to rationalize rental income of large businesses (natural, export, and monopolistic ones) in two directions:

- 1) Redirecting corporate super-profits to development needs of high-tech industry (by the functioning of a group of technologically related research centers; limiting commercial and administrative expenses and wage fund).
- 2) The partial exemption of the core of advanced industries from the payments. It is possible to develop mechanisms to reduce the share of the rent (except for the intellectual one) in the incomes of large corporations. For the resource supply group, the de-offshoring and the fight against the outflow of capital abroad are also included due to redirecting these financial flows into investments in the research and production sector (the priority of the incentive policy function in these areas above the fiscal one).

### **The Second Level. The Institutional Environment of the Most Innovative Development.**

In the context of regulating property relations, this section includes the development of an adequate financial policy: fiscal, tax, monetary, and investment ones. The main goal is to ensure the priority of the industrial breakthrough in relation to the entire socio-economic system. The objectives include providing tax incentives in selected areas of activity of business entities; providing an effective investment mechanism (preferential terms of borrowing and creating a system of financial instruments); the fiscal policy in terms of the redistribution of funds in the field of growth points. The protection of property rights, including in the field of intellectual property, is also included in this section (the development of an appropriate regulatory framework).

### **The Third Level. The Level of Control over the Implementation of Industrial Policy in the Field of Property Relations.**

This includes the creation of an effective system of internal and external control over the activities of the national institutions of the innovation system and basic industries (especially in relation to the public sector). The basic principles of such systems include the systemic principle (the coordination

of supervisory entities and departments of organizations); the elimination of authority duplication; the informational openness for society and business; the creation of a single information system of supervisory entities (on the basis of the latest IT technologies) allowing the monitoring with the minimum gap in time; the unity of control over the target use of funds and performance audit (performance audit implies the development, along with cost criteria, an adequate base of criteria).

## **CONCLUSIONS.**

NBIC technologies are a combination of convergent technologies in the field of nano-, bio-, information, and cognitive technologies.

The synergy resulting from the merger of several branches of knowledge accelerates the innovation process, the effect of the introduction of NBIC technologies, according to expert estimates, is comparable to the influence of the “computer revolution” of the 1980s and the proliferation of internal combustion engines and conveyor production in the 1930s.

National innovation systems formed in industrialized countries with the active participation of the state are of key importance in the development of NBIC technologies (The Fortaleza Declaration, 2014). The development of new high-tech productions contributes to both overcoming the crisis phenomena in the world economy and reformatting property relations in the global context (including due to the active industrial policy of the leading national economies of Asia).

The development of NBIC technologies and the transformation of property relations in modern Russia are interdependent processes (Central Bank of the Russian Federation, n.d.). On the one hand, the system of property relations existing in Russia determines the boundaries of the development of new technologies; on the other hand, the challenges of global technological development and the associated geo-economic threats necessitate the transformation of property relations in Russia in order to realize national economic interests. The priority of the national

industrial and innovation policy at the present stage of socio-economic development is overcoming the economic structure that is peripheral in relation to the global economy (and, in the long term, to regional systems of division of labor). The development of modern competitive industries is based on convergent NBIC technologies.

The domestic system of property relations, along with obvious advantages (rich resource base, high potential for the development of human capital, increasing the role of the state in the economy), is also characterized by a number of specific obstacles to accelerated technological development.

However, an effective state policy for the correction of attitudes and alienation and for ensuring the priority flow of capital into the core of scientific and industrial development cannot lead to the emergence of competitive industries of the new technological paradigm. It is also necessary to restructure the entire system of domestic property relations for the realization of national interests (first of all, in the field of national security).

The correction of property relations is proposed to be carried out in three directions: in the field of resource provision (the redirection of a part of rental flows to the core of industrial development, the creation of tax and monetary incentives for investment, cost reduction); in the institutional environment (through the implementation of appropriate financial policies and regulatory support in the field of protection of property rights and ensuring the compliance of private economic interests with the national ones); in the field of control over the implementation of industrial policy (the creation of an effective and coordinated system of external and internal control, information systems, and prevention of corruption mechanisms).

In terms of the national-oriented transformation of domestic property relations on the part of the state, business, and society, the strategy of accelerating the development of the VI technological paradigm acquires real outlines. In the long-term perspective, it is able to take Russia's socio-



economic system to a qualitatively different place in the global appropriation and alienation system of modern geo-economic and geopolitical transformations.

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