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# ENVIRONMENTAL CONSTRAINTS AS A NEW FACTOR OF INTERNATIONAL COMPETITIVENESS AND STRUCTURAL POWER IN THE GLOBAL ECONOMY

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## ЕКОЛОГІЧНІ ОБМЕЖЕННЯ ЯК НОВИЙ ФАКТОР МІЖНАРОДНОЇ КОНКУРЕНТОСПРОМОЖНОСТІ І СТРУКТУРНОЇ ВЛАДИ У ГЛОБАЛЬНІЙ ЕКОНОМІЦІ

**Мета статті полягає у теоретичному осмисленні екологічних обмежень як чинника міжнародної конкурентоспроможності, що передбачає уточнення їх економічного змісту та виявлення механізмів впливу екологічних стандартів і ресурсних вимог на умови участі країн у міжнародному поділі праці та глобальних ринках. У дослідженні обґрунтовано, що інтеграція кліматичних і ресурсних критеріїв у торговельні, інвестиційні та фінансові режими трансформує умови формування конкурентних переваг і змінює логіку розподілу доданої вартості у світовій економіці. Доведено, що показники вуглецевої інтенсивності, ресурсоефективності, відповідності екологічним стандартам і здатності до технологічної трансформації стають ключовими параметрами доступу до ринків і фінансових ресурсів. Показано, що екологічні вимоги поступово переходять із площини регуляторних обмежень у площину стратегічних інструментів формування конкурентних позицій і впливають на структуру виробництва, інвестиційні рішення та напрями технологічного розвитку.**

**У статті розмежовано поняття економічної конкурентоспроможності, сталої конкурентоспроможності і зеленої конкурентоспроможності та доведено їхню нетотожність. Показано, що стала конкурентоспроможність може забезпечувати довгострокову макроекономічну стабільність без пропорційного зниження екологічної інтенсивності виробництва, тоді як зелена конкурентоспроможність визначається здатністю інтегрувати екологічні стандарти і технологічні вимоги у виробничі процеси. Обґрунтовано доцільність введення категорії зеленої порівняльної переваги як здатності економіки формувати спеціалізацію на виробництві товарів і послуг із відносно нижчою екологічною інтенсивністю або з вищим рівнем відповідності міжнародним екологічним стандартам. Наголошено, що формування такої переваги залежить від поєднання ресурсного потенціалу, інституційної спроможності та доступу до екологічних інновацій, що визначає місце країни у нових сегментах глобального виробництва.**

**Розкрито роль екологічного неопротекціонізму як механізму перерозподілу конкурентних позицій між країнами через поєднання регуляторних, податкових і торговельних інструментів, а також через застосування санітарних і фітосанітарних заходів, режимів сертифікації, субсидування "зелених" секторів і контролю над стратегічною сировиною. Аргументовано, що зазначені процеси сприяють формуванню зеленого міжнародного поділу праці, який співіснує з традиційною та орієнтованою на макроекономічну стійкість моделями спеціалізації. Показано, що в умовах посилення екологічних стандартів відбувається зміщення центрів економічної влади до тих юрисдикцій, які формують правила доступу до ринків і контролюють технології екологічної модернізації.**

**Зроблено висновок про те, що екологічні обмеження стають визначальним чинником структурної диференціації світової економіки та формування нової конфігурації міжнародної конкурентоспроможності. Їх вплив проявляється у трансформації міжнародного поділу праці, зміні напрямів інвестиційних потоків і посиленні ролі стандартів як інструменту економічної ієрархізації.**





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The purpose of the article is to theoretically understand environmental constraints as a factor in international competitiveness, clarifying their economic content and identifying the mechanisms by which environmental standards and resource requirements influence countries' participation in the international division of labor and global markets. The study substantiates that integrating climate and resource criteria into trade, investment, and financial regimes transforms the conditions for the formation of competitive advantage and alters the logic of the distribution of added value in the world economy. It is proven that indicators of carbon intensity, resource efficiency, compliance with environmental standards, and the ability to undergo technological transformation become key parameters of access to markets and financial resources. The article distinguishes among economic competitiveness, sustainable competitiveness, and green competitiveness and demonstrates that they are not identical. Sustainable competitiveness can ensure long-term macroeconomic stability without a proportional decrease in the environmental intensity of production, whereas green competitiveness is determined by the ability to integrate environmental standards and technological requirements into production processes. The feasibility of introducing the category of green comparative advantage is justified by an economy's ability to specialize in the production of goods and services with relatively lower environmental intensity or higher compliance with international environmental standards.

The role of environmental neo-protectionism as a mechanism for redistributing competitive positions between countries through a combination of regulatory, tax, and trade instruments, as well as through the use of sanitary and phytosanitary measures (SPS measures), certification regimes, subsidizing "green" sectors, and control over strategic raw materials is revealed. It is argued that these processes contribute to the formation of a green international division of labor that coexists with traditional, macroeconomic-stability-oriented models of specialization. It is concluded that environmental constraints are becoming a determining factor in the structural differentiation of the world economy and the formation of a new configuration of international competitiveness.

*Key words: international trade, international division of labor, modernization, greening, green trade, regulation, standardization, imperative, resource efficiency, energy efficiency, energy resources, international competitiveness, green competitiveness, trade regimes, investment regimes, financial regimes, restrictions, tariffs, barriers, sanctions, incentives, environmental neo-protectionism.*

*Ключові слова: міжнародна торгівля, міжнародний поділ праці, модернізація, екологізація, зелена торгівля, регулювання, стандартизація, імператив, ресурсоефективність, енергоефективність, енергетичні ресурси, міжнародна конкурентоспроможність, зелена конкурентоспроможність, торговельні режими, інвестиційні режими, фінансові режими, обмеження, тарифи, бар'єри, санкції, стимули, екологічний неопротекціонізм.*

## PROBLEM STATEMENT

The relevance of the study lies in the fact that environmental parameters of development have ceased to be the exclusive domain of environmental policy and have become a factor in shaping international competitiveness and redistributing economic power. The limited availability of natural resources, increasing regulatory rigidity, and the integration of climate and resource criteria into financial and trade regimes are changing the conditions for the functioning of the world economy. Cost advantages, labor productivity, and technological level are no longer sufficient to ensure stable positions in global markets. Indicators of carbon intensity, resource efficiency, compliance with environmental standards, and the ability to undergo technological transformation are gaining additional importance. Strengthening environmental regulation forms a new configuration of competitive advantages. Manufacturers operating in jurisdictions with high environmental responsibility standards are forced to invest in modernizing production, increasing energy efficiency, and implementing environmental management systems. At the same time, these standards become a tool for structuring market access, creating barriers for companies and countries unable to quickly adapt to new requirements. Environmental criteria are gradually transforming from a limitation into a resource for the formation of economic power.

The changing nature of technological development reinforces this trend. The energy transition, digitalization, the development of electromobility, and new materials do not reduce dependence on natural resources but rather reorient it towards other raw materials and technologies. The demand for critical minerals, water, land, and bioresources is growing as "green" sectors expand. This means that the competitiveness of states and corporations increasingly depends on access to the material foundations of ecological transformation and on the ability to control key segments of production and financial chains. In such a situation, a new



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architecture of structural power is taking shape in the global economy. Control over clean energy technologies, environmental standards, "green" financing instruments, and regulatory regimes allows individual centers of influence to determine the terms of participation of other actors in international exchange. Environmental requirements are increasingly embedded in trade agreements, investment regimes, and financial risk assessment criteria, which transforms the very logic of global competition.

The problem is that existing approaches to the analysis of international competitiveness mainly focus on classical factors of production, institutional quality, and technological level, while paying insufficient attention to environmental constraints as a systemic factor in the structural transformation of the world economy. Environmental parameters are often considered additional regulatory conditions rather than elements in the formation of the economic hierarchy. As a result, their impact on the distribution of added value, on countries' positions in the international division of labor, and on the configuration of global dependence is underestimated.

The formulation of the research problem is based on the need for a theoretical understanding of environmental constraints as a new factor of international competitiveness and as a tool for the formation of structural power in the world economy. It is about clarifying how integrating environmental standards, technological requirements, and resource constraints into global economic processes alters states' positions in the world hierarchy, redistributes the benefits of international exchange, and creates new mechanisms of dependence. The research aims to rethink the relationship between environmental parameters of development and international competitiveness in the context of the transformation of the world economy. The relevance of the topic stems from the fact that it is precisely through environmental constraints that the rules of global interaction are being reformulated, within which access to markets, technologies, financial resources, and the material foundations of economic growth are determined.

## ANALYSIS OF RESEARCH AND PUBLICATIONS

The analysis of scientific approaches to environmental constraints in the international economy demonstrates the expansion of research focus from measuring regulatory parameters to understanding their impact on states' competitive positions. In the work of C. Brunel and A. Levinson, approaches for quantitatively measuring the rigidity of environmental regulation are proposed, allowing comparisons across countries based on institutional parameters of environmental policy and analyzing the impact of regulatory strictness on international specialization [1]. Indexing environmental rigidity creates a basis for interpreting environmental requirements as a factor in the formation of competitive advantages. The conceptualization of the "green economy" emphasizes its connection to the combination of economic development and reduced environmental burden, allowing for considering environmental transformation as a component of states' economic strategies [2].

Research on the relationship between environmental impacts and added value in supply chains demonstrates the uneven distribution of environmental costs across production stages and raises the issue of the balance between economic benefits and environmental burdens in the international division of labor [3]. Methodological approaches to the development of the "green" economy treat it as a systemic process of structural restructuring of production and consumption, which transforms national economies and their foreign economic relations [4]. In the context of the strategic development of states, the environmental factor is considered as a component of long-term international strategies that affect the positions of countries in the world economy [5]. Analysis of risks in global value chains indicates the growing importance of the sustainability of production processes and the management of external shocks, which strengthens the role of environmental parameters in the structure of competitiveness [6].

The concept of the "new normal" of the world economy emphasizes the rise in global risks and uncertainties, in which environmental and resource constraints become an element of macroeconomic reality [7]. International economic policy studies emphasize strengthening the role of standards and regulatory regimes in shaping market access, thereby creating the prerequisites for interpreting environmental requirements as a tool of structural influence [8]. Analysis of current trends in international trade and capital flows demonstrates the growing role of non-financial criteria in economic decision-making [9], while studies of global development asymmetries emphasize the unevenness of access to resources and technologies as a factor in shaping different models of competitiveness [10].

The environmental imperatives of globalization are considered a component of economic security





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and a factor in the transformation of international economic relations [11], and the transnationalization of production is interpreted as a process that increases resource use and requires integrating environmental requirements into global economic processes [12]. An assessment of macroeconomic transformations in the context of increasing turbulence in the world economy indicates an increased role of structural constraints to development, among which environmental parameters are gaining systemic importance [13]. Studies of the greening of international trade relations document the historical evolution of the inclusion of environmental standards in trade policy [14] and the development of scientific principles for the greening of global production and the economy [15; 16]. The generalization of these approaches indicates the growing role of environmental factors in international economic relations and, at the same time, indicates the need for further theoretical understanding of their impact on the transformation of the international division of labor and models of competitiveness.

## FORMULATION OF THE ARTICLE'S OBJECTIVES

The purpose of the article is to theoretically understand environmental constraints as a factor in international competitiveness, clarifying their economic content and identifying the mechanisms by which environmental standards and resource requirements influence countries' participation in the international division of labor and global markets.

## THE PAPER'S MAIN BODY

Environmental constraints are gradually integrated into the system of factors that determine the competitive positions of states and the nature of their participation in the international division of labor. If previously competitiveness was formed mainly through cost advantages, productivity, and technological parameters of production, now the ability of economies to operate under growing environmental requirements is added to this. Carbon intensity of production, resource efficiency, access to environmentally friendly technologies, and compliance with standards are becoming the determining parameters of access to markets and financial resources. As a result, a new logic of international competition is emerging, in which environmental parameters act not only as constraints but also as a source of economic power. In these conditions, there is a need to distinguish between the concepts of economic, sustainable, and green competitiveness. Economic competitiveness is traditionally associated with the ability to produce goods and services at a lower cost or at a higher quality than competitors. Sustainable competitiveness focuses on the long-term reproduction of economic potential without depleting the resource base or creating social disparities. Green competitiveness is based on the ability of production to meet environmental standards, reduce resource intensity, and integrate environmental innovations into production processes. These three dimensions are not identical. Economically efficient production can remain environmentally intensive, while environmentally modernized industries do not always provide short-term economic returns. Therefore, sustainable competitiveness is not always green, and green competitiveness does not always provide stable positions in the global economy.

The distinction between these categories allows for a new interpretation of the international division of labor. The classical model is based on the division of production according to relative costs and factor endowments. The sustainable international division of labor is oriented towards a long-term balance of resource use and socio-economic stability. The green international division of labor is shaped by environmental standards, resource constraints, and technological requirements, which determine which countries and sectors can integrate into new production chains. This means that the world economy operates simultaneously under several specialization logics that may not coincide. A country can be competitive in the traditional sense but lose ground in "green" market segments, or, conversely, gain advantages in the production of environmentally friendly technologies without dominating traditional industries.

Within the framework of such a transformation, it is appropriate to discuss the formation of a "green comparative advantage", defined as an economy's ability to produce goods and services with lower environmental intensity than competitors. Its sources are access to clean technologies, institutional capacity to implement environmental standards, resource base, and the ability to integrate into value chains that meet new requirements. A green comparative advantage can be built in both countries with high levels of technological development and economies with critical natural resources for a "green" transformation. As a result, the competitive positions of states are determined not only by traditional factors, but also by the ability to control or



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effectively use the material and technological foundations of environmental modernization.

The strengthening of the role of environmental criteria in international competition is accompanied by the intensification of environmental neoprotectionist policy. The strengthening of environmental requirements and technological standards changes the conditions for the functioning of national producers in many sectors of the world economy. In sectors where higher environmental standards are accompanied by rising costs for modernizing production and introducing cleaner technologies, production costs are growing faster than productivity. This leads to a decrease in producers' competitiveness not only in external markets but also in domestic demand. In such conditions, states increasingly use asymmetric regulatory and deregulatory instruments, tax burdens, sanctions, and incentives to support national producers. The implementation of a policy of economic neoprotectionism based on environmental criteria leads to a gradual deformation of existing comparative advantages and the formation of new configurations of competitiveness. The growth of international trade through electronic and mobile channels increases the need to control product quality and environmental characteristics, expanding the scope of regulatory mechanisms and creating additional barriers to market access.

Environmental neoprotectionism manifests itself in a complex of interrelated practices that include institutional regulation of climate policy, manipulation of standards, relocation of environmentally intensive production, and the use of trade instruments to redistribute the environmental burden. The institutional framework of international climate agreements creates conditions under which countries can vary the basis for assessing emission reductions, thereby maintaining economic growth without significantly reducing productive activity. Non-compliance with environmental commitments by individual countries is used as an argument for introducing carbon tariffs, offsets, or other import restrictions.

In parallel, practices such as relocating environmental- and energy-intensive industries to jurisdictions with lower regulatory standards, transporting hazardous waste, and concentrating resource-intensive industries in peripheral regions are emerging. The establishment of high environmental standards and the application of sanitary and phytosanitary measures are increasingly used as a tool to restrict access to domestic markets. Manipulation of environmental efficiency indicators, subsidizing alternative energy, restricting the export of strategic raw materials, and implementing programs to stimulate "green" demand form a multi-level system of environmentally motivated protectionism. In these conditions, the production, investment, and scientific and technical spheres of the world economy become a space for the implementation of new forms of structural influence, and regulatory instruments become mechanisms for shaping market conditions and redistributing competitive advantages between countries.

Environmental restrictions change not only the set of production requirements, but also the logic of the distribution of benefits and costs in the world economy. As environmental standards increase, the question of where environmental costs arise and where added value is concentrated becomes more important. In global value chains, environmentally intensive stages are more likely to be concentrated in the extraction, primary processing, and material-intensive production segments, while highly profitable functions of management, financing, design, and branding are concentrated in jurisdictions with the power to set rules and standards. This creates a structural asymmetry: environmental burdens and associated risks are tied to some territories, while economic benefits and control over markets are tied to others, making environmental parameters an element of the hierarchization of the international division of labor [17].

On this basis, environmental neo-protectionism becomes a mechanism for redistributing competitive advantages. High standards, sanitary and phytosanitary regimes, certification and traceability requirements, as well as asymmetrical combinations of regulation and deregulation, taxes and tax exemptions, sanctions and incentives, translate environmental criteria into the format of trade barriers and selective advantages. In sectors where costs grow faster than productivity due to modernization costs, state support and access to subsidies become crucial for maintaining producers' positions, while for external suppliers, environmental requirements serve as a filter for market access. As a result, a "green comparative advantage" is formed as the ability to withstand environmental rigor without losing efficiency, and at the same time a gap appears between "sustainable competitiveness" and "green competitiveness": an economy can demonstrate sustainability in a macroeconomic sense without being environmentally sound, or meet "green" criteria while remaining vulnerable in terms of costs, access to resources or technologies. This allows us to distinguish at least three models of the international





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division of labor — traditional, "sustainable", and "green", which set different criteria for specialization, different trajectories of structural adjustment, and different contours of economic power in the world economy.

The green international division of labor is not a simple continuation of traditional specialization but is shaped by a combination of resource constraints, technological requirements, and regulatory regimes. If, in the classical model, countries specialize according to the relative availability of labor, capital, or natural resources, then in the "green" configuration, the key issues are the environmental intensity of production and the ability to meet established standards. Specialization is increasingly determined not only by cost structure but also by product environmental profiles. In this logic, countries that control clean energy technologies, energy storage infrastructure, waste recycling systems, and digital resource management platforms form the core of the new division of labor. At the same time, states that maintain an orientation towards the export of fossil resources or material-intensive products with high carbon intensity risk becoming entrenched in the peripheral segments of the global economy. This does not mean the automatic decline of such economies but indicates their increasing dependence on external standards and market decisions made beyond their control [18]. Green comparative advantage in this context acquires strategic importance. It is determined not only by the availability of natural resources, but also by the institutional capacity to transform them into the basis of technological modernization. For example, access to lithium or rare earth metals creates the potential for integration into the production chains of batteries and electronics, but a real advantage is formed only if processing, engineering competencies, and financial infrastructure are developed. Thus, green comparative advantage is the result of a combination of resource, technological and regulatory factors.

Environmental neoprotectionism in this system performs a dual function. On the one hand, it stimulates the modernization of domestic production through subsidizing alternative energy, supporting environmental innovations, and introducing stricter standards. On the other hand, it restricts producers who do not meet the new requirements from accessing markets, thereby strengthening global stratification. The use of sanitary and phytosanitary measures, environmental certification, carbon adjustments to imports, and restrictions on the export of strategic raw materials turns environmental criteria into a tool for shaping market conditions. As a result, a situation is formed in which environmental restrictions simultaneously affect the production structure, investment flows, and trade policy. Countries that can integrate environmental standards into their own development strategies receive additional opportunities to set the rules of the game. Those who are forced to adapt to external requirements without sufficient technological and financial resources find themselves in a position of structural dependence. That is why environmental constraints should not be considered as a peripheral element of economic policy, but as a central factor in the formation of a new hierarchy of the world economy.

The coexistence of different dimensions of competitiveness enables us to clearly distinguish between sustainable and green competitiveness. Sustainable competitiveness is associated with the ability of an economy to maintain long-term productivity, macroeconomic stability, and adaptability to external shocks. It can be based on a diversified production structure, developed infrastructure, and institutional quality, but does not necessarily imply a decrease in the environmental intensity of production. The economy can demonstrate stable growth rates and high positions in global markets even under conditions of significant resource consumption or the transfer of environmental costs to external jurisdictions. In such a situation, sustainability is achieved through the redistribution of environmental burdens rather than their reduction.

Green competitiveness is shaped by a different logic. It is determined by producers' and economies' ability to integrate environmental standards into production processes, reduce the carbon and resource intensity of products, and meet the requirements of markets where environmental criteria are key conditions of access. Such competitiveness is based on technological modernization, the use of cleaner energy sources, the development of circular production models, and the implementation of environmental management systems. At the same time, it can be accompanied by increased costs and the need for significant investments, suggesting that there is no direct relationship between green and sustainable competitiveness. An economy can be environmentally efficient but financially or structurally vulnerable, just as it can be sustainable in the macroeconomic dimension while remaining environmentally intensive. In this context, green comparative advantage is defined as a country's ability to specialize in the production of goods and services with relatively lower environmental intensity or greater compliance



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with international environmental standards. Such an advantage is not derived only from natural conditions or the level of technology. It arises from a combination of institutional policies, access to financing for environmental modernization, integration into technological networks, and the ability to adapt to regulatory changes. The presence of a green comparative advantage determines whether an economy can occupy positions in segments of global production with high added value and low environmental intensity, or whether it will remain a supplier of resources and material-intensive products to other growth centers.

The distinction between sustainable competitiveness, green competitiveness, and green comparative advantage allows for a new interpretation of the international division of labor. In modern conditions, at least three of its models coexist simultaneously. The first is the traditional one, formed based on the relative provision of production factors and technological capabilities. The second is the division of labor focused on macroeconomic stability and risk diversification. The third is the green international division of labor, shaped by environmental standards, resource constraints, and decarbonization technologies. Each of these models sets its own criteria for efficiency and its own hierarchy of competitive positions. Ecological neoprotectionism in this system acts as a mechanism for redistributing positions between the above models. The introduction of high standards, certification requirements, carbon adjustments to imports, and support for "green" industries alters the structure of comparative advantage and determines the direction of investment flows. States that shape and control environmental market access rules gain the ability to consolidate their own competitive positions and influence the trajectories of structural transformation in other economies. As a result, environmental restrictions become a tool for shaping a new configuration of international competitiveness, within which the distribution of benefits from global exchange increasingly depends on the ability to adapt to a "green" regulatory and technological reality.

## CONCLUSIONS

In the process of achieving the set goal, we developed a theoretical understanding of environmental constraints as a factor in international competitiveness and as an element in the formation of structural power in the world economy. It was established that integrating environmental standards, resource requirements, and decarbonization technologies into trade, investment, and financial regimes alters the conditions for the functioning of national economies and the mechanisms for distributing added value within global value chains. Environmental parameters of development do not appear as external limitations on economic activity, but rather as structural factors in shaping states' competitive positions and the redistribution of economic power in the world economy.

The study showed that economic, sustainable, and green competitiveness reflect distinct dimensions of economies' participation in the international division of labor and are not identical categories. Sustainable competitiveness is associated with the ability of the economy to ensure long-term macroeconomic stability and reproduction of production potential, while green competitiveness is determined by the ability to integrate environmental standards, resource constraints, and technological requirements into production processes. It has been established that sustainable competitiveness does not always imply environmental efficiency, and green competitiveness does not guarantee economic sustainability in the short term. This has allowed us to develop an innovative approach to interpreting the relationship between these concepts and to demonstrate their functional differences in the system of modern global competition.

The feasibility of introducing the category of green comparative advantage as the ability of an economy to form specialization in the production of goods and services with a relatively lower environmental intensity or with a higher level of compliance with international environmental standards is substantiated. It is established that such an advantage arises at the intersection of resource capabilities, technological development, and institutional capacity to implement environmental requirements and to provide access to financing for environmental modernization. Its presence determines the positions of states in segments of global production with high added value and low environmental intensity.

The analysis shows that environmental neoprotectionism serves as a mechanism for redistributing competitive positions between countries, transforming traditional comparative advantages, and shaping the direction of investment and technological flows. The introduction of environmental standards, certification requirements, carbon adjustments to imports, subsidies for "green" industries, and control over strategic resources is shaping a new configuration of international competition, in which access to markets and technologies increasingly depends on the ability of economies to adapt to environmental constraints. This allowed us to conclude that a green international division of labor is emerging as a distinct specialization model that coexists with traditional and macroeconomic-stability-oriented configurations. In the modern world economy, several logics of international





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specialization operate simultaneously, each setting its own criteria for efficiency and competitive positions. Environmental constraints in this system are a determining factor in structural differentiation, in reformatting the global hierarchy, and in the formation of new mechanisms of economic dependence.

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