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THE WORLD ECONOMY IN THE ERA OF TURBULENCE

This article presents primary findings of the ERI RAS scenario forecast for the development of the global and Russian energy sector up to 2050. The scenarios presented in this article are not normative, but descriptive, illustrating the evolution of the global energy sector with specific assumptions. The study contains forecasts of the volume and composition of energy consumption across countries and regions globally, categorized by energy type and end-use sector, power generation, greenhouse gas emissions, energy production, global trade, and fuel prices. Under the assumption of slower economic growth and slower population growth, the growth rates of primary energy consumption and electricity consumption are expected to decrease in all the scenarios considered. The most substantial growth in energy consumption is anticipated to originate in Asian developing countries, which are projected to exhibit the highest per capita GDP growth rates over the forecast period. The electric power industry is undergoing a rapid transformation. The energy end-use sectors are undergoing a gradual process of electrification. The era of active competition between various fuels in the transportation sector is now starting. Among fossil fuels, only natural gas will represent a relatively stable share in the global energy mix, accompanied by an increase in consumption volumes. Conversely, the shares of coal and oil will decline. Global greenhouse gas emissions from the combustion of fuels, including biofuels, will peak in all scenarios in the middle of the projection period, when excluding capture and storage. To a significant extent, by 2050, the energy intensity of the global economy, specific energy emissions, and progress toward the Sustainable Development Goals, including energy poverty, will be contingent upon the capacity of states to collaborate with one another, as well as upon policies pertaining to trade barriers and technology transfer. The increased utilization of intermittent RES will result in elevated volatility in the prices of natural gas and coal, and increased demand for backup and storage systems. The Middle East, North America, and CIS will collectively retain their position as the world's primary oil and gas producers, accounting for over 70% of global production.

In 2024, a series of reports from international and private research institutions offered a cautious and rational analysis of the global economic situation. The complicated economic growth of 2011-2019 was followed by the turmoil of 2020-2023. In the midst of geopolitical conflicts, the global economy has entered a phase of uneven recovery. The current situation should be considered as a shift in the socio-economic development regime. In these circumstances almost all major actors—from the head of the IMF to the Pope—see some certain risks and threats in world processes. Positive GDP dynamic has been restored, but at a level

INTERNATIONAL INTEGRATION

This article seeks to clarify the potential for digital collaboration between the Republic of Singapore and its partners in ASEAN within the framework of the ASEAN Economic Community (AEC) as a means of stimulating economic growth in Singapore. The paper traces the features of economic modernization of the Republic of Singapore and assesses the efficiency of its approach to digital transformation of its economy. The article reveals Singapore's approach to the integration initiatives undertaken by ASEAN, with a special focus on AEC. It also identifies the possibilities of providing effective digital support for multilateral trans-boundary economic projects within the ASEAN framework. The latter is analyzed through the prism of infrastructure development and digital competencies in ASEAN countries, as well as the specifics of their regulation of cross-border digital flows and the development of data centers. Special attention is paid to the role of global value chains in Southeast Asia as a key success factor behind ASEAN cross-border digital projects. The authors argue that negative integration, a cornerstone of ASEAN economic regionalism initiatives, undermines the digital transformation of the ongoing projects. This ultimately constrains Singapore's capacity to leverage the cooperative frameworks and mechanisms established with its AEC partners to diversify and strengthen the foundations of its domestic economic growth. The study's relevance is premised upon two factors: the timeliness of its focus on the digital cooperation between ASEAN countries ahead of the second completion of the ASEAN Economic Community establishment, scheduled for 2025, and the limitations of the modernization strategy implemented by the Republic of Singapore amidst its sixtieth anniversary of independence. The scientific and practical significance of the study stems from its focus, as the possibilities of "resetting" the Singaporean version of new industrialism in synergy with the policy of the Republic of Singapore towards the AEC, as well as the implementation of multilateral cross-border digital projects by the Association, have not yet been an area of research by Russian and foreign scholars.

Navigating digitalization necessitates a delicate equilibrium between risk mitigation and opportunity maximization. As individuals and businesses embrace digital transformation, establishing protective measures to instill user confidence becomes paramount. Foundational policies encompassing data privacy regulations, cybersecurity protocols, and robust institutional frameworks are imperative to cultivate resilient, interconnected digital ecosystems. Advanced systems should not only verify identities but also facilitate secure, expedient transactions while promoting responsible data sharing. Asia, among the most dynamic and rapidly evolving regions, epitomizes the expansive progress within the global digital economy. This article's main focus is on the remarkable advancements observed within the Southeast Asia region, collectively constituting a focal point of burgeoning digitalization.

REVIEWS

Global and Russian Energy Outlook Up to 2050

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Keywords: energy markets, long-term forecasting, energy demand, oil and gas markets, renewable energy sources.

Abstract

This article presents primary findings of the ERI RAS scenario forecast for the development of the global and Russian energy sector up to 2050. The scenarios presented in this article are not normative, but descriptive, illustrating the evolution of the global energy sector with specific assumptions.

The study contains forecasts of the volume and composition of energy consumption across countries and regions globally, categorized by energy type and end-use sector, power generation, greenhouse gas emissions, energy production, global trade, and fuel prices.

Under the assumption of slower economic growth (1.4–1.8 times in 2022–2050 compared to 1990–2021) and slower population growth (2 times compared to the 2021 level), the growth rates of primary energy consumption (2.5–3 times) and electricity consumption (1.3–2.5 times) are expected to decrease in all the scenarios considered. The most substantial growth in energy consumption is anticipated to originate in Asian developing countries, which are projected to exhibit the highest per capita GDP growth rates over the forecast period.

The electric power industry is undergoing a rapid transformation, with the share of renewable energy sources (RES) and nuclear energy projected to increase to 57–70% by the end of the forecast period. The energy end-use sectors are undergoing a gradual process of electrification. The era of active competition between various fuels in the transportation sector is now starting. Among fossil fuels, only natural gas will represent a relatively stable share in the global energy mix, accompanied by an increase in consumption volumes. Conversely, the shares of coal and oil will decline. Global greenhouse gas emissions from the combustion of fuels, including biofuels, will peak in all scenarios in the middle of the projection period, when excluding capture and storage. To a significant extent, by 2050, the energy intensity of the global economy, specific energy emissions, and progress toward the Sustainable Development Goals, including energy poverty, will be contingent upon the capacity of states to collaborate with one another, as well as upon policies pertaining to trade barriers and technology transfer.

The increased utilization of intermittent RES will result in elevated volatility in the prices of natural gas and coal, and increased demand for backup and storage systems. The Middle East, North America, and the Commonwealth of Independent States (CIS) will collectively retain their position as the world's primary oil and gas producers, accounting for over 70% of global production.

Introduction

The global energy industry is entering a new phase of its development, which will be defined by a number of key characteristics.

These include:

- Active competition at the level of different fuels and within each production segment, which will be driven by rapid scientific and technological progress (STP).
- Increasing energy impacts from government energy policy and emissions regulation, which influence priorities in energy supply decisions and trade flows.
- A transition from the mono-fuel markets of individual energy resources to a unified energy market with high interdependence between energy sources.
- Changes in the structure of energy balances with electrification of end-use sectors and increased use of renewable energy sources (RES), especially in the power sector.

The global energy sector will be significantly influenced by geopolitical factors, which will determine opportunities for technology transfers, trade restrictions, and the capacity to develop collaborative approaches to market regulation.

The efficacy of decisions made in the present regarding investments in the fuel and energy sector, research and development priorities, the allocation of resources for training specialists, the development of certain territories, and the repositioning of others hinges on the accurate delineation of prospective transformations in the energy sector.

The findings of the research described in the article enable us to ascertain the nature of the transformation of the energy sector up to 2050, taking into account the diverse economic, technological, and geopolitical conditions of development.

1. Scenario assumptions and calculation methodology

The long-term outlook of global and Russian energy sector development presented in this paper is the result of research conducted by the Energy Research Institute of the Russian Academy of Sciences (ERI RAS). The forecasting toolkit used by the Institute is continuously evolving and incorporates a range of economic and mathematical techniques, including econometric, cluster analysis, optimization, simulation, and multi-criteria modeling. The optimization models for fuel markets consist of over 200 nodes, which contain information on over 2,000 fields and groups of carbon fuel fields, as well as on processing facilities and transport infrastructure. In these models, the objective is the minimization of the cost of meeting global demand, and more than 5,000 routes are employed to calculate the supply of energy resources [Grushevenko 2023; System Research in Energy... 2018; Prospects for the development of world energy... 2020].

The forecast considers three scenarios of world energy development which consider trading conditions in addition to economic growth, the priorities of state energy policies, and the course of STP. Currently, developed countries are predominantly more motivated to implement trade barriers (e.g., in the form of a border carbon offset mechanism) [Makarov 2023]. The *Fog* scenario posits that global trade will continue to be conducted with certain restrictions, that global development issues will be of secondary concern, that efforts to develop international regulation will have limited efficacy, and that countries will be predominantly self-interested in climate policy. The transfer of technology will continue to be constrained. The primary objective of energy policy will be to ensure affordable access to energy, both economically and physically. The price of carbon dioxide (CO_2) in developed countries will continue to increase at a relatively slow rate, with an estimated value of 120–135 USD 2023/t by 2050. In contrast, the price of CO_2 in developing countries is expected to be between 35–60 USD 2023/t by the same year. In the *Split* scenario, significant trade restrictions are established between two poles, within which trade is unrestricted. Some countries remain outside the aforementioned poles. By the year 2050, the price of carbon dioxide in developed countries is estimated to be between 100–150 USD 2023/t, while prices in developing countries will remain at negligible levels. In the *Key* scenario, states are able to establish mechanisms that facilitate collective action on global development issues, including climate-related concerns. The projected CO_2 prices in developed countries by 2050 are

estimated to be between 180–200 USD 2023/t, while in developing countries, it is set at a range of 70–150 USD 2023/t [Global and Russian Energy Outlook 2024].

In all scenarios, a single population forecast was adopted: the average scenario of the UN forecast [UN 2022] and, for Russia, the average scenario of the demographic forecast of Rosstat until 2046 with an extension [Rosstat 2023].

It is assumed that economic growth rates will be relatively modest: 1.9% in the *Fog* scenario, 2.2% in the *Split* scenario, and 2.5% in the *Key* scenario, in the period leading up to 2050. This corresponds to a deceleration of 1.4–1.8 times compared to the previous 30-year period (in 1990–2021 the world economy grew by an average of 3.5% per year, in 2023 by 3%). Some studies, for example those conducted by the World Bank [Kose et al. 2024] and the IMF [Bolhuis et al. 2023], indicate that the global economy may experience an even greater slowdown before the end of this decade. Additionally, these studies model the potential economic growth losses associated with the possibility of global economic fragmentation.

The calculations were based on statistical data on GDP from the International Monetary Fund (IMF) [IMF 2023], energy statistics from the International Energy Agency (IEA) [IEA 2023], and national statistical reports from countries included in the databases used for modeling.

2. Main results of scenario calculations of long-term development of the energy sector in the world and Russia

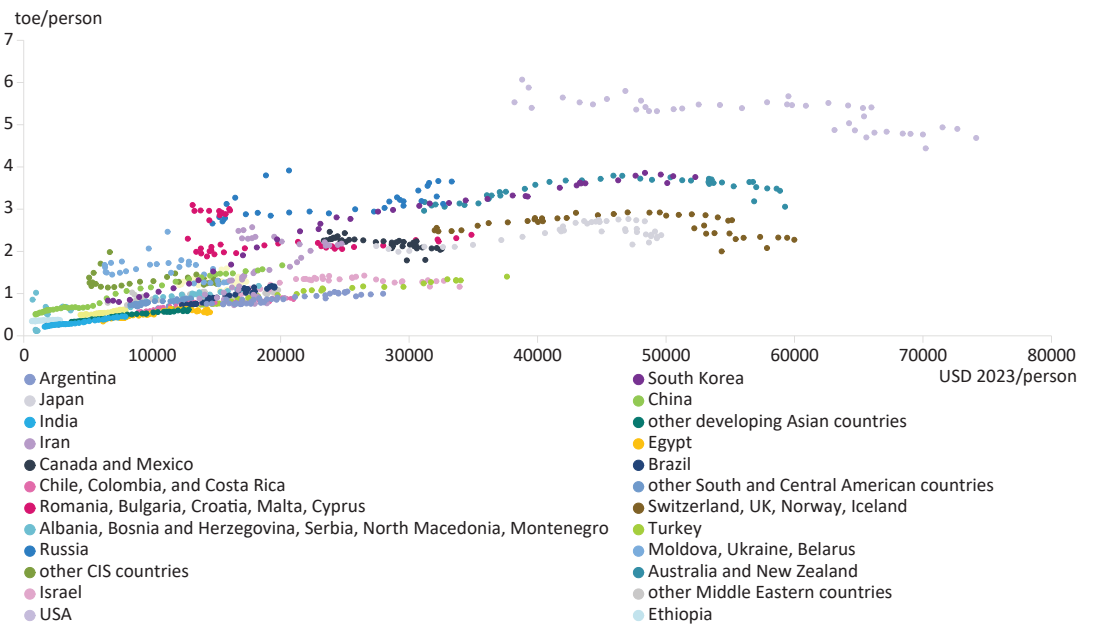
Energy consumption in final sectors

The rapid advancement of technology is continuously transforming all facets of the energy sector, including end-use segments. The solutions being developed for this sector are becoming more convenient, efficient, environmentally friendly, and easier to manage. Furthermore, the trend towards electrification is becoming increasingly common. The development of more cost-effective energy storage technologies will further encourage the use of such technologies by end consumers. Energy consumption is correlated with wealth. As per capita GDP rises, per capita final energy consumption tends to rise, then peak and decline (see Figure 1 on p. 10). A number of OECD countries have already passed the peak of per capita final energy consumption at relatively high levels of per capita GDP (40–50 thousand USD 2021/person) and levels of per capita final energy consumption (3–6 tons of oil equivalent/person). Technological advancement enables other states to reach a similar level of saturation at a lower per capita GDP. However, it should be noted that the per capita GDP level in non-OECD countries in the scenarios is 20–25 thousand USD 2021/person, per capita energy demand remains largely insolvent, with considerable differentiation within the group.

It is projected that final energy consumption will continue to grow in all sectors over the course of the forecast period, reaching 11.9–12.6 billion tons of oil equivalent by 2050. This represents an increase from the 10.0 billion tons of oil equivalent consumed in 2021. The transportation sector will experience the most rapid growth in demand (1.1–1.3% per year), while the commercial and residential sectors will experience the slowest growth

in consumption (0.1–0.4% per year). In the regional context, the greatest absolute growth in final energy consumption will be observed in developing Asian countries, while the greatest growth rates will be observed in African countries. In OECD countries, final energy consumption is projected to decline in all scenarios.

Figure 1. Per capita final energy consumption and per capita GDP in 1980–2021 by world countries and country groups



Source: ERI RAS calculations.

Electricity consumption and production

Electricity consumption, the most convenient form of energy for consumers in most segments and a strong indicator of welfare, was found to be more sensitive to economic growth rates and other scenario parameters. In the long run, it was observed to increase by 0.4–1.5% annually under various scenarios. For comparison's sake, the growth of final energy consumption was found to vary in a narrower range and to increase by 0.6–0.8% annually under various scenarios. The growth of electricity consumption was observed in almost all countries, although a growing number of developed countries reached a peak in their consumption in the second half of the forecast period. It is estimated that between two-thirds and three-quarters of the global growth in electricity consumption will be provided by developing Asian countries, which are the region with the fastest growing per capita GDP over the forecast period.

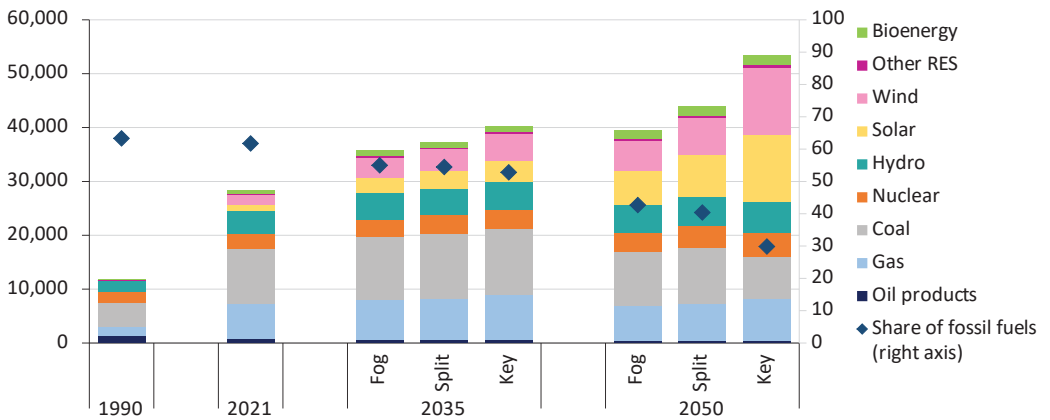
The global electricity sector is undergoing a significant transformation. The dynamic growth in demand will be supported not only by the increasing prosperity and electrification, but also by the increasing affordability of power generation technologies which are mainly based on RES. Wind and solar power generation is

becoming increasingly competitive in many countries around the world, and in most cases, there are initial niches for RES. The weighted average cost of electricity generation from 2010 to 2022 for solar plants decreased from USD 0.43 to USD 0.08 per kilowatt-hour (kWh). By 2050, analysis of technology development indicates the potential for a further reduction in costs by 30%. Similarly, onshore wind farms have reduced costs from USD 0.11 to USD 0.07 2023/kWh over the 2010–2022 period, a further 10% reduction is expected by 2050. Offshore wind farms have also seen cost reductions, from USD 0.20 to USD 0.11 2023/kWh, and another 30% reduction is expected. The cost of generating electricity from large hydropower plants remains the lowest among alternatives and was estimated to be USD 0.01 2023/kWh. However, the natural potential for utilizing hydropower on a global scale is constrained, and the costs associated with small, medium, and micro hydropower plants are prohibitively high. Additionally, nuclear power has the potential to reduce production costs. Nuclear power plants in most countries are more expensive than gas and coal in terms of electricity generation. Renewable energy sources in the context of a rapid reduction in their costs also begin to show better performance in terms of production costs. At the same time, nuclear power plants, in contrast with renewable energy sources, are capable of providing a predictable and constant supply of electricity, which allows for a reliable coverage of the baseload consumption, or, through the use of storage with daily loads to be integrated into the main operational modes of the system. The electricity costs of coal and gas-fired power plants have the potential to be reduced by improving plant efficiency, but will depend on the price of coal and gas supply. Consequently, until the middle of the forecast period, the volumes of electricity generated from gas and coal will continue to increase, albeit at the expense of their share in the generation structure. Conversely, in the second half of the forecast period, the absolute volumes of generation from these power plants will also decrease, and their use in standby mode will become more prevalent due to the intermittency of generation from RES power plants. By 2050, global electricity consumption is projected to increase by 11,000–25,000 TWh (from 28,400 TWh in 2021), including 8,800–22,000 TWh due to increased generation at wind and solar power plants, 900–1,600 TWh at nuclear power plants, and 800–1,450 TWh at hydropower plants. By the year 2050, more than two-thirds of the world's nuclear power plant electricity production will be accounted for four countries: China, the United States, France, and Russia, with China providing 54% of this growth. The non-OECD countries will account for most of the increase in electricity production from hydroelectric power plants (92–93%), wind power plants (74–75%), and solar power plants (80%). The proportion of RES in electricity generation is projected to increase from 38% to 57–70% by the end of the forecast period (see Figure 2 on p. 12).

In the transition to exclusively carbon-free sources of electricity generation, the digitalization of the sector will enable efficient management of a more complex grid. Furthermore, solutions to intermittent generation from renewable energy plants, including the use of batteries and hydrogen for electricity storage, are technically feasible. However, the system costs of energy supply are rising rapidly as the share of renewables increases. Depending on the region, such a transition could lead to by 3–7 times higher costs of supplying electricity to consumers. Ultimately, each country's electricity

generation mix will be determined largely by the availability of technologies, local and imported energy resources, and the ambition of electricity decarbonization targets.

Figure 2. World electricity production volumes by type of energy resources in different scenarios, TWh (left axis) and share of oil products, gas and coal in electricity production, % (right axis)

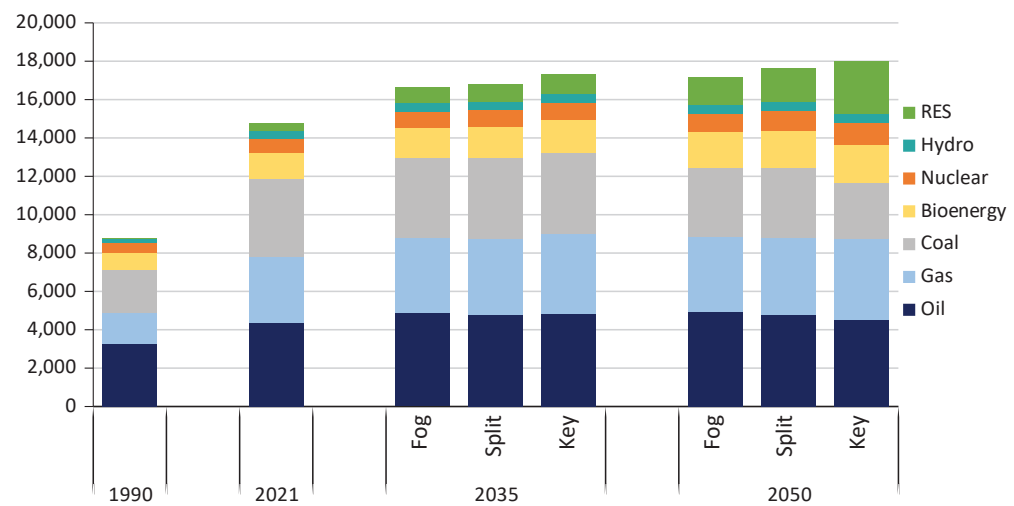


Source: ERI RAS calculations.

Primary energy consumption

The growth of total global primary energy consumption has slowed significantly compared to the previous 30-year period, as evidenced by Figure 3 (p. 12). In countries

Figure 3. Volumes of primary energy consumption in the world by types of energy resources under the scenarios, million tons of oil equivalent



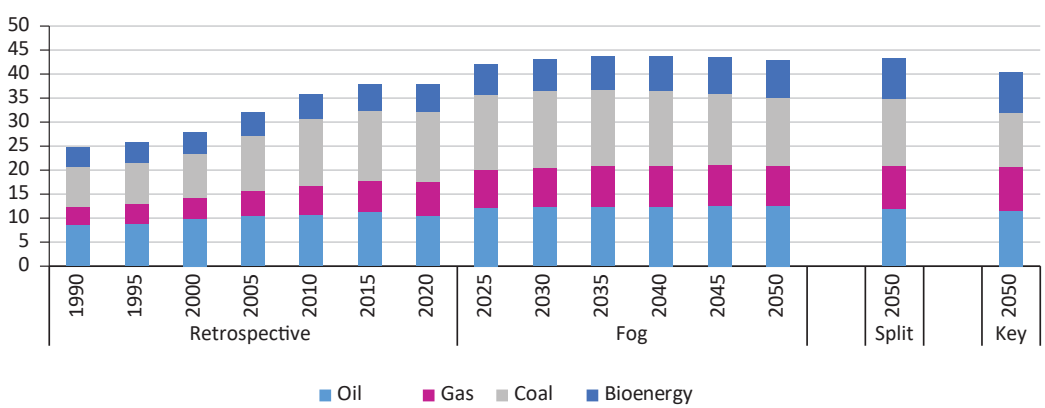
Source: ERI RAS calculations.

of Organization for Economic Co-operation and Development (OECD), the rate of decline is 0.3% per year over the forecast period. In non-OECD countries, the rate of increase is 0.9% to 1.1%. Global coal consumption will have passed its peak before the middle of the forecast period. In the *Split* and *Key* scenarios, the consumption of oil will reach its peak. Global gas consumption will continue to grow throughout the forecast period, albeit at a slower rate than global energy consumption. Technological advancement will facilitate the increased utilization of carbon-free energy sources for energy supply. The proportion of RES and nuclear energy is projected to reach 27–35% by 2050.

Greenhouse gas emissions

Global greenhouse gas emissions from fuel combustion in all scenarios under consideration will peak in 2034–2036. In absolute terms, it will amount to 37–38 billion t CO_2 -eq., or 44–45 billion t CO_2 -eq. if bioenergy combustion is considered (excluding possible capture, utilization and storage) (see Figure 4 on p. 13).

Figure 4. Global greenhouse gas emissions by type of fuel combusted, billion tons CO_2 -eq.



Note: Emissions from fuel combustion are shown without taking into account possible capture, utilization, and storage.

Source: ERI RAS calculations.

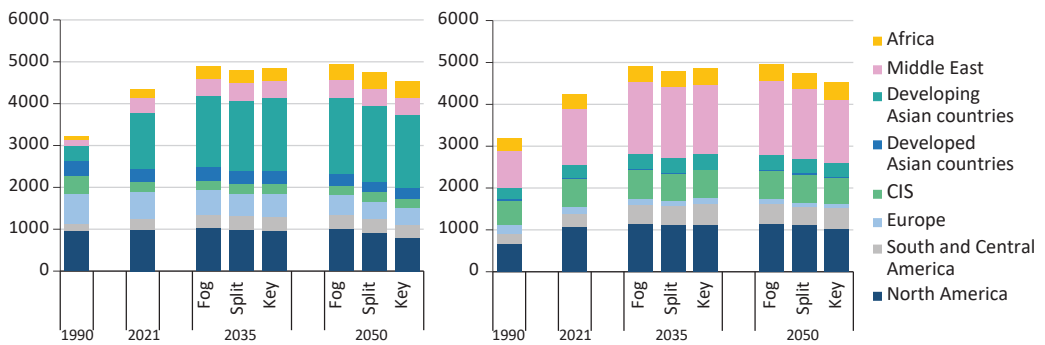
Key is a rational scenario in terms of balancing the objectives of energy supply affordability and greenhouse gas emission reductions within given parameters of technological and socio-economic development. Deepening decarbonization requires a dramatic increase in investment and conflicts with the ability to sustain this rate of global economic growth.

Liquid fuels market

By 2050, the share of non-OECD countries in liquid fuels consumption will continue to grow against a background of declining absolute consumption in OECD countries. By

2035, China will overtake the US in terms of consumption, India will consume more liquid fuels than the EU after 2030, and liquid fuel consumption in the Middle East, Africa and other developing countries in Asia will grow significantly (see Figure 5 on p. 14).

Figure 5. Consumption of oil products, including own use by industry (left) and production of crude oil (right), by world region under the scenarios, million tons of oil equivalent



Source: ERI RAS calculations.

The structure of consumption of oil products by type will change significantly: global consumption of kerosene will increase in aviation, motor gasoline will increase in road transport, demand for diesel fuel will remain stable, and consumption of dark petroleum products will continue to decline. These changes will require significant investment to modernize oil refining capacities. In addition, the limited use of plastics in refining is expected thanks to waste reduction programs.

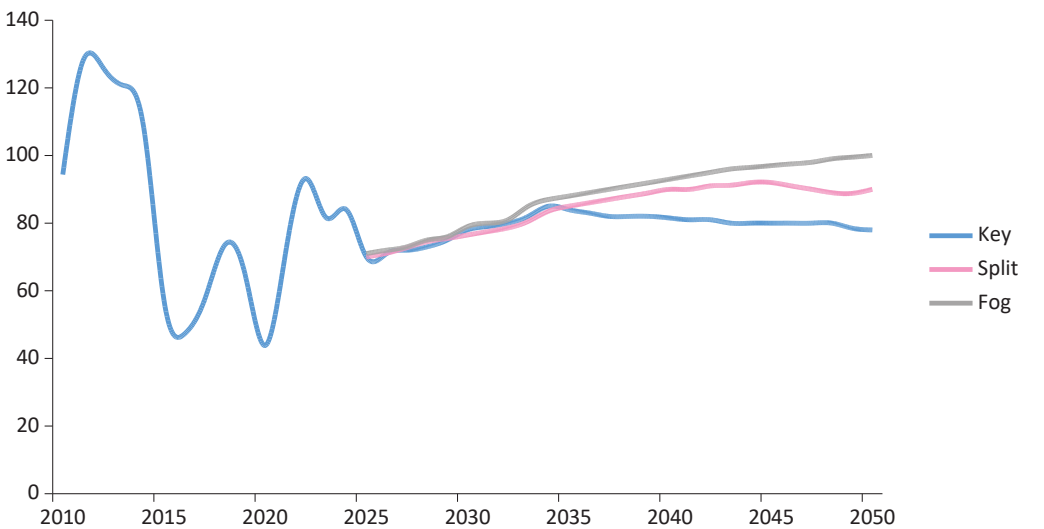
In 2016–2017, the world passed an intermediate peak in conventional oil production, which was offset by growth in unconventional oil production and gas condensate supply. Going forward, new conventional and unconventional oil reserves will need to be developed to maintain required production levels. The Middle East will remain the world's largest oil producer, with production rising to 1.5–1.8 trillion tons (1.3 trillion tons in 2021). In North America, oil production will be fairly stable: in the first half of the forecast period, consisting mainly of US shale oil and Canadian heavy oil, while in the second half of the forecast period, the decline in their production will be offset by production growth from offshore fields in Mexico and from fields on the northern coasts of the US and Canada.

Production in the CIS countries will be sensitive to the scenario parameters, in particular trade restrictions and market accessibility, in 2050 it will be 682 million tons in the *Fog* scenario, and in the *Key* scenario it will gradually decline to the 2021 level (621 million tons), in the *Split* scenario it will be 675 million tons.

In the *Fog* scenario, which is characterized by the highest demand, the equilibrium oil supply and demand prices reach USD 100 2023/bbl by 2050. In the *Key* scenario, they would fall below USD 80 2023/bbl. In the *Split* scenario, they would end up at a global

average of USD 90 2023/bbl, but would vary between the geoeconomic poles depending on the availability of supply in each (see Figure 6 on p. 15). Market prices would be volatile and may temporarily deviate significantly from equilibrium prices. During the forecast period, it is unlikely that equilibrium oil prices will escape the USD 50–120 2023/bbl range for more than 2–3 years (barring critical external factors) because exceeding the upper limit accelerates the transition to alternative fuels and consumption technologies (e.g., biofuels, electric transportation, plastics recycling) and improves fuel saving, while exceeding the lower limit significantly increases the risks of underinvestment in new production projects and makes a significant portion of oil production, especially unconventional oil, uneconomical.

Figure 6. Oil prices under the scenarios, USD 2023/bbl.

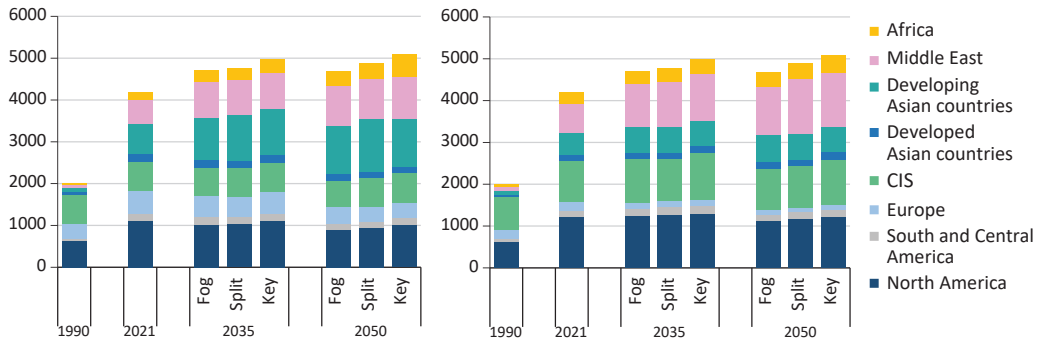


Source: ERI RAS calculations.

Gas market

According to the scenarios, world gas consumption will increase to 4.7–5.1 trillion cubic meters by 2050 (4.2 trillion cubic meters in 2021, 2.0 trillion cubic meters in 1990). Over the past 30 years, large gas markets have emerged in developing countries in Asia, Africa, and the Middle East (gas consumption in these regions grew from 0.2 to 1.4 trillion cubic meters between 1990 and 2021), and they will continue to grow strongly over the next 30 years, reaching 2.4–2.7 trillion cubic meters. Consumption in OECD countries will decline by 0.7–0.9% per year. The CIS, the Middle East, and North America will remain the largest gas and oil producing regions. The Middle East countries (Saudi Arabia, Iran, and Qatar) will provide the largest increase in gas production volumes, both for their own domestic markets and for global supply (see Figure 7 on p. 16).

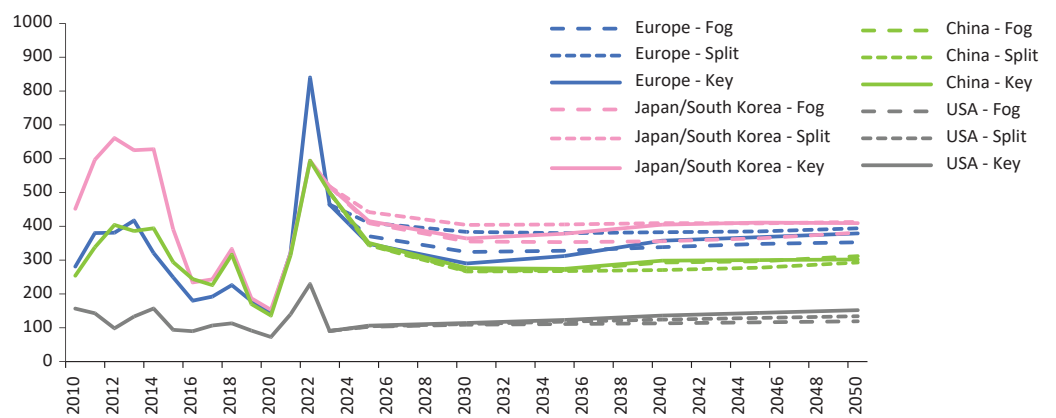
Figure 7. Gas consumption (left) and production (right) by world regions under scenarios, billion cubic meters



Source: ERI RAS calculations.

The results of the optimization calculations show that meeting the projected demand for gas will not require a significant increase in world trade (which is about 1.2 trillion cubic meters) due to increased demand in countries with their own gas resources. However, the share of liquefied natural gas (LNG) in world trade will increase significantly by 2035, reaching about 70% by 2050. More than 80% of interregional gas supplies will be provided by the largest gas producers: CIS, Middle East, and North America. Supplies from Nigeria, Mozambique, and Tanzania will increase, while the prospects for gas exports from Iran are highly uncertain. China and India will be the largest gas importers. Following the commissioning of LNG production facilities currently under construction, weighted average gas prices in the main importing regions—Europe and Asia—are expected to fall significantly by 2030. Thereafter, gas prices will rise moderately as production costs increase due to the need to bring more complex reserves into production (see Figure 8 on p. 16).

Figure 8. Weighted average regional gas prices under the scenarios, USD 2023/ thousand cubic meters

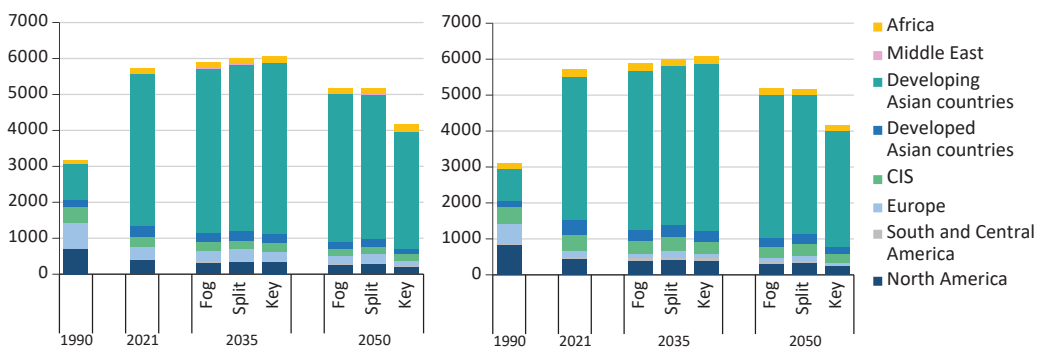


Source: ERI RAS calculations.

Coal market

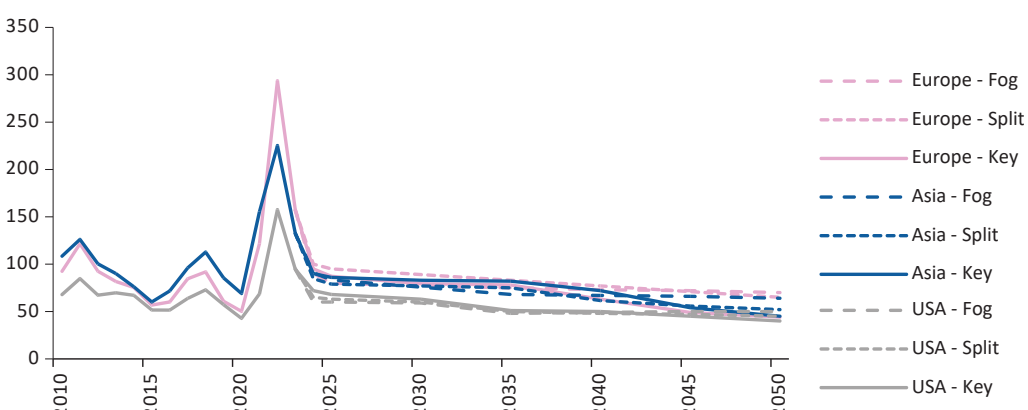
The global coal market has changed rapidly over the past 30 years. Coal consumption in Europe, North America and the CIS almost halved between 1990 and 2021 due to substitution by alternatives in the industrial and power sectors and improvements in energy efficiency. During this period, coal consumption in developing Asia has more than quadrupled, fueling its rapid economic growth (see Figure 9 on p. 17). Nearly two-thirds of global coal consumption is used for power generation. Increased inter-fuel competition in the power sector, even in the absence of high CO_2 prices in developing countries, will cause coal consumption growth before 2035 to be replaced by a decline after 2035. Coal consumption declines most rapidly in the *Key* scenario due to stricter environmental regulations and the highest scenario CO_2 prices.

Figure 9. Coal consumption (left) and production (right) by world regions under scenarios, million tons of coal equivalent



Source: ERI RAS calculations.

Figure 10. Weighted average regional coal prices under the scenarios, US$ 2023/t



Source: ERI RAS calculations.

The reduction of coal consumption in the OECD and the concentration of its use in countries that are largely self-sufficient will lead to a gradual decline in world trade—by a factor of 1.9 to 4.5, depending on the scenario.

Coal prices in coal-importing regions will remain at relatively high levels in the first half of the projection period and then gradually decline as demand falls. In the *Split* scenario, prices in the European market are set at a premium to the Asian market due to the limited coal supply resulting from the scenario's trade restrictions (see Figure 10 on p. 17).

Development of Russia's energy sector

The growth of GDP and per capita income of the population will demand energy. However, this demand will be offset by the realization of energy savings potential.

Energy consumption in the commercial and residential sectors will grow moderately, peaking in the middle of the forecast period as a result of increasing energy efficiency in electricity and heat supply systems. Consumption in the transport and industry sectors will also continue to grow, but at a much slower rate than in the previous period.

The electricity sector will account for the largest increase in energy demand: electricity consumption will increase by 1.1–1.4 times, driven by the ongoing electrification of end-use sectors. Natural gas will retain its key role in the power sector in the scenarios considered, while the generation volumes of gas-fired power plants, nuclear power plants and RES power plants will gradually increase and those of coal-fired power plants will decrease (especially in the *Key* scenario, taking into account the assumptions on regulatory measures, including emission charges). By 2050, the share of RES and nuclear power in electricity generation under the scenarios considered will be 40–46% (it was 40% in 2021).

The growth of the total primary energy consumption in Russia in the considered scenarios will slow down until 2050: the average annual rate will be 0.1–0.3%. The use of individual fuels will decrease (coal, in all scenarios; oil, in the *Fog* and *Key* scenarios in the second half of the forecast period). The share of RES and nuclear energy in the fuel and energy balance will increase from 10% to 11–14%, while the share of gas will remain stable at 54–56%.

The growth of demand for petroleum products in Russia in the first half of the forecast period will be supported by the growing need for mobility and the development of the petrochemical industry, while in the second half of the forecast period this growth will be offset by the expansion of the alternative transport fleet and energy efficiency in the transport sector, electrification in the commercial and household sectors. As importing countries begin to focus on importing oil for further refining at their own facilities, the niches for exporting petroleum products will shrink significantly in all scenarios. At the same time, domestic demand for gasoline will not decline in absolute terms. Thus, against the background of the expected decline in oil refining in Russia, it will be necessary to ensure moderately growing volumes of motor gasoline production, which will require significant investments in the modernization of domestic refining capacities. Shifting demand from gasoline to diesel fuel, LPG, natural gas and electricity may partially solve

the problem. Exports of oil and gas condensate from Russia will be able to compensate for the decline in external supplies of oil products and will be primarily focused on Asian markets. The share of complex reserves in oil production will continue to grow. Maintaining the required level of production and export competitiveness will require the expansion of flexible regulation and preferential taxation.

In the Russian coal industry, production volumes will become even more dependent on niches in export markets against the backdrop of declining coal consumption in both the power sector and end-use sectors. Export volumes, in turn, may fluctuate 2–3 times due to decisions of major coal consumers on the structure of their fuel basket and plans for their own production, and will also be sensitive to the dynamics of world prices due to the long transportation shoulder.

Gas demand on the Russian domestic market will continue to grow moderately in all scenarios considered, reaching 520–574 billion m^3 by 2050. The largest increase in gas demand is expected in the *Key* scenario, due to higher economic growth, increased gas use in the power industry, including in the east of the country, as well as expenditures for the industry's own needs associated with the volume of export supplies. Pipeline gas supplies to the European market are economically attractive and will occupy a natural niche in this market in the absence of geopolitical restrictions. Pipeline gas supplies to Asia will increase within the framework of the agreements being reached. Gas exports in the form of LNG are expected to increase from the European part of Russia and the Arctic and, if resources are available, from the east of the country. In order to maintain the required level of gas production, it will be necessary to develop new complex reserves far from consumption centers, which will be associated with higher costs. There will be a growing need to adjust the fiscal regulation of the industry, not only to maintain the competitiveness of gas supplies to foreign markets, but also to ensure a sustainable energy supply to the domestic economy.

A more flexible energy policy will be required to facilitate the active adaptation of the Russian fuel and energy complex to changes in domestic and foreign markets. In export markets, the primary focus should be on the creation of infrastructure and related mechanisms (insurance, financial, etc.) to ensure the viability of promising supply routes, international support for the establishment of liquid trading platforms and reasonable price indicators in new major consumption centers, increase of operational flexibility in the fuel markets to respond to price and volume fluctuations in the context of growing use of intermittent RES generation through schemes involving logistical optimization of trade using different resource bases. It is important to note that the energy sector encompasses not only fuel supplies but also significant markets for equipment and services. These markets are not inferior in terms of financial turnover to fuel markets. Expansion of operations in these markets will not only bring additional revenues but also provide contracts for industry and stimulate R&D.

Despite the interest in exports, the primary objective of the Russian fuel and energy complex is the sustainable supply of the domestic market. It is thus necessary to complete the process of ensuring technological sovereignty, at least in terms of key equipment and software, modernization of energy sector and consumption segments to improve the efficiency of resource use, synchronization of territorial development plans with plans

to launch new energy facilities. It is of the utmost importance to ensure self-sufficiency of domestic energy markets, create conditions for the development of competition and the formation of objective price indicators.

Conclusion

The global energy sector will undergo a significant transformation in the period up to 2050, in the context of a notable deceleration in the growth of primary energy consumption. The substantial potential for energy demand in low-income countries will remain largely unrealized due to the insufficient ability to pay. In developed countries, which are distinguished by high levels of per capita energy consumption, absolute energy consumption is anticipated to decline. Developing countries with average and above-average levels of per capita income will be the primary drivers of growth in global energy demand. Over the next 30 years, the world will pass the cumulative peak in fossil fuel consumption. By the conclusion of the projected period, fossil fuels will account for 65–73% of global energy consumption, a notable shift from the 80% recorded in 2021. This transformation can be regarded as a significant qualitative shift within the global energy sector, particularly when considering the extended lifespan of many energy-consuming systems and infrastructure. Additionally, the peaks in greenhouse gas emissions from fuel combustion are also projected to be surpassed during this period.

Annual electricity consumption growth will be increasingly covered by renewable energy sources, in particular due to their growing economic efficiency. By 2050, wind and solar generation will account for almost all of the increase in global electricity consumption. The proportion of renewable and nuclear energy sources is projected to reach 57–70% in the scenarios addressed, up from 38% in 2021. In conjunction with fossil fuels, they will constitute supplementary components of the prospective energy system. The technical feasibility of achieving 100% carbon-free sources in electricity generation is also a possibility. However, as their role in electricity supply grows, system costs increase disproportionately fast, in particular due to the need to utilize electricity storage systems and to expand grid capacity at different sites. The ultimate system costs of switching to carbon-free sources are contingent upon a number of factors, including the region in question, the availability of energy resources, import possibilities, the dynamics and level of demand, the ability to pay, the requirements for power supply stability, and the possibilities for synchronization with neighboring power systems.

The role of gas and coal as reserve fuels in the power sector will contribute to their increased price volatility. The transportation sector, which plays a pivotal role in the oil industry, is entering an era of rapidly evolving inter-fuel competition. It is anticipated that LNG, ammonia, and methanol will experience growth in the maritime transport sector, while use of electricity, gas, and biofuels will expand in road transport.

The world's potential to achieve high levels of economic growth and to address global challenges, including climate policy and achievement of the Sustainable Development Goals, will be contingent upon the ability of countries to move away from practice of trade barriers and increasing restrictions and towards the implementation of harmonized mechanisms to address emerging challenges.

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The Spring of Reckoning: How International Economic Organizations Are Changing Their Vision of the Future of the Global Economy

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The global medium-term prospects are not all doom and gloom.
International Monetary Fund [IMF 2024, April. P. 78]

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Abstract
In 2024, a series of reports from international and private research institutions offered a cautious and rational analysis of the global economic situation. The complicated economic growth of 2011-2019 was followed by the turmoil of 2020-2023. In the midst of geopolitical conflicts, the global economy has entered a phase of uneven recovery. The current situation should be considered as a shift in the socio-economic development regime. In these circumstances almost all major actors—from the head of the IMF to the Pope—see some certain risks and threats in world processes. Positive GDP dynamic has been restored, but at a level lower than at the beginning of the 21st century. China supports the momentum of global economic growth.

The current global landscape can be pictured as follows: emerging and low-income economies are lagging behind the developed economies in terms of economic,

growth with no signs of convergence; the EU economy is essentially stagnant, with risks of further deterioration in the economic outlook; and only the US has hardly managed to return to its conventional economic growth rates. Sluggish global growth is accompanied by a significant divergence in the economic dynamics among the major players. With low revenue growth, the resources available to governments have shrunk, especially in the face of an increasingly complex set of challenges. While the cyclical recovery appears weak, its drivers over the next two to three years (investments in renewable energy, electric vehicles and artificial intelligence) may provide some additional impetus, albeit not very strong. Generally, the world has finally taken a look at its current position, but the conclusions and solutions remain unclear.

Introduction

The economic and geopolitical upheavals of recent years are forging a new pattern of global economic development: there are changes in macroeconomic dynamics by continent, country and sectoral economic structure, trade patterns, structural shifts in industry, infrastructure and energy. Global regulatory institutions, which are in decline since the 2008-2010 global financial crisis, have been shattered by geopolitical contradictions. The slowdown in economic growth has already triggered a competition for resources between poor countries and the impoverished classes in developed countries, with the latter apparently winning. The macroeconomic parameters of the recovery (economic growth, unemployment and inflation rates) could be considered well within acceptable historical norms for advanced economies, except for two circumstances. The first is the associated risks and uncertainties. The threat of collapses in various sectors of the economy and the emergence of crises are both creating a sense of insecurity among the major players, which is reflected in the current global media, causing politicians to remain depressed and anxious at the same time. The second factor is geopolitical contradictions: negotiation processes are taking place between parties with different and even divergent interests, which are in conflict on several levels. On top of this, there are elections and the expectation of elections for parliaments, presidents and other governmental bodies and levels. The segmentation of global financial markets, growing inequalities between countries and societies, crises and conflicts—this is a vivid manifestation of the fragmentation of the socio-economic "fabric" of the world and the reason why hopes for the attainability of the Sustainable Development Goals are fading.

This paper describes the main features of the global economy development at its current state. The first section includes analysis of the general framework of the economic development: the steady stationary regime of 2020-2023 and later that has been unfolding before our eyes. The second section discusses the cyclical component of modern economic development. The final section examines the drivers of economic growth and structural shifts beyond the current conjuncture. The paper considers what might influence the pace and nature of global socioeconomic development in

the years ahead (2024-2026), assuming the absence of new major financial, energy or geopolitical shocks.

1. A forgotten familiar regime

The current period of 2023-2025 is the years of economic recovery, albeit moderate. After the end of the COVID-19 pandemic crisis, a prolonged inflation, which was largely caused by the anti-crisis fiscal stimulus and large fiscal injections, has been slowed down in 2023. However, the nature of the recovery is somewhat reminiscent of the early 1980s: inflation is significantly higher than in the previous decade and economic growth is uneven amid high oil prices [Grigoryev and Ivashchenko 2011]. During that period economic growth declined in both the EU and Japan, while now it is declining in the EU and China. The parameters of the decline were much more dramatic then, but nowadays we observe similar economic dynamic and macro concerns.

2023-2024 we perceive as a period of relatively high interest rates "regime" relying on the fact of the stability of the Fed and ECB policies (key interest rates are around 5%), the forecasts of international organizations and the ongoing scientific debate. Inflation, the second parameter of such regime, has declined in the US and the EU due to the reduced contribution of the energy and food sectors, and core inflation (excluding energy and food prices) remains relatively low at 2-3%. Since 2020, however, cumulative inflation (three-year CPI) is high: 17.5% in the US and 19.7% in the EU (see Table 1 on p. 25). Nevertheless, the key challenge is not the current level of monthly inflation, but the intensity of the growth of unit labor costs or, in the politicians' words, the inertial growth of nominal wages [Grigoryev et al. 2024]. With the instability of geopolitical factors, there is a high probability of the future fluctuations in commodity prices. The inertia of wage and service price growth in the developed world has the unpleasant peculiarity of the grassroot fire—with a gust of inflationary wind, inflation might soar again. The central banks' cautious approach to the monetary policy is explained not as much by model calculations—there are simply not enough statistical data for that—but by the fear of missing the return of inflation.

Minimum wage systems, employment contracts, and corporate relationships are adapting to the realities of the current labor market environment. Economists typically view rational interests and decisions as the primary and determining factors of the actions of firms and financial authorities. But in the context of frequent elections, the outcome of which is unknown and now depends on the unstable preferences of fragmented electorate groups, the logic of politicians is changing. We may see "non-optimal" decisions not only on the world arena, with sanctions distorting the market logic of governments' and companies' decisions, but also caution on the part of central banks, finance authorities and governments regarding social policy decisions and regional issues solutions. The frequency of elections on various important issues in a stable regime is an important factor to consider regarding the electorate preferences. With crisis events, alarming forecasts, conflicts of party interests, and electoral media activity, the priorities of economic agents shift from basic profit maximization, efficiency improvement and risk-taking to caution. This

does not stop economic growth and capital investments but reduces their intensity. It is complicated to calculate the damage caused by one or another aspect of macro policy during recovery period, when even the mistakes (explicit or implied) that led to crises in the past are difficult to assess in terms of GDP losses.

Table 1. GDP and CPI dynamics (%), 2019-2025

Annual growth rate of the CPI (%)							
	2019	**2020**	**2021**	**2022**	**2023**	**2024 (f)**	**2025 (f)**
US	1.8	1.3	4.7	7.8	4.1	2.8	2.4
China	2.9	2.5	0.9	1.9	0.7	1.7	2.2
EU-27	1.4	0.7	2.9	9.3	6.5	3.7	2.4
Developed economies	1.4	0.7	3.1	7.3	4.6	3.0	2.2
Developing economies	5.1	5.2	5.9	9.8	8.5	7.8	6.2
Annual growth rate - core CPI (%)							
US	2.2	1.7	3.6	6.2	4.9	-	-
China	2.9	2.5	0.9	1.9	0.8	-	-
EU-27	1.2	1.1	1.8	4.7	5.7	-	-
Economic growth, % of real GDP							
US	2.3	-3.4	5.6	2.1	2.5	2.1	1.7
China	6.1	2.3	8.1	3.0	5.2	4.6	4.1
EU-27	1.2	-7.2	5.2	3.3	0.5	0.9	1.7
Developed economies	1.7	-4.9	5.0	2.6	1.6	1.5	1.8
Developing economies	3.7	-2.4	6.5	4.1	4.1	4.1	4.2

Source: compiled by the author according to IMF, OECD, Eurostat, Trading Economics, National Bureau of China.

A year ago, we pointed out that the difficult transition to the recovery phase took place [Grigoryev 2023], despite the fact that the crisis of 2020 was not "cyclical" in terms of the depth and nature of the financial turmoil. We can now note with satisfaction that we managed to avoid a massive "trap" and a critical downturn of the world economy in 2023. The high interest rates of the Fed and the ECB are gradually pushing up 10-year bonds yields, which in return leads to higher cost of public debt financing and firms' capital investment.

Global economic growth fluctuations are largely mediated by international flows of migrants, goods and finance. Recent years—since the outbreak of COVID-19—have shown some peculiar shifts in these linking and constitutive areas of globalization. First, migration to developed countries has increased dramatically [Economist 2024]—after a shock in 2020, both the US and the EU have seen massive inflows of low-wage labor. In 2023, the number of people entered US exceed the number of people left by 3.3 million, in Canada this metric stood at 1.9 million people, in UK at 1.2 million people, and in Australia at 0.74 million people, meaning that the Anglo-Saxon countries alone gained about

7 million people. The EU is also breaking records in terms of the number of immigrants. Given the complex (due to aging) demographic situation in the developed world, the influx of labor at relatively low cost and to the lower social strata appears to be advantageous, even if the payoff is not immediate. We would reserve this point for closer examination in the coming years, particularly regarding the migration of educated workers. At least the US benefited in terms of economic activity and employment in the current period.

The large-scale inflow of migrants coming from different cultures, lifestyles, nationalities, and often religions leads to the development of social imbalances and potentially to political and electoral tensions (especially given the complicated naturalization rules). The rise of right-wing parties in Europe and the deepening split over migration issues in the US suggest that the demographic and labor market gains and the social and political problems of immigration may diverge over time, with problems becoming more acute over time. It is worth noting that this has become an ongoing factor and will have an increasing impact on government spending, political program platforms, and the configuration of government coalitions and policies for the foreseeable future. This is an example of how social issues that have always been significant, but in the new environment of geopolitical tensions and lower medium-term economic growth rates are turning into a source of increased social instability.

At the international level, the "Global South" and especially the expanded BRICS are becoming the new key development factor and the focus of analysts' attention. The inertia of quasi-liberal global governance has been eroding since the global financial crisis of 2008-2009. The April IMF review cites data on the expansion of industrial policy measures (mainly export support) since 2009: 6,000 measures in developing countries against 5,000 in developed countries [IMF 2024. P. 103, Fig. 4.1.1], with a significant impact on developing economies. However, there is no clear assessment of the size and impact of export subsidies in developed countries. In fact, we observe the use of industrial policies beyond catch-up development. For a significant number of medium-developed countries (with GDP per capita of $15,000 PPP 2017 and above), the issues of completing physical infrastructure, developing human capital, and raising labor productivity remain very important (as they are, of course, for less developed countries). The example of China points out the need to maintain the efficient use of a high savings rate over time. Maintaining high economic growth rates by a group of countries with significant balance of payments surpluses and high levels of public and private remittances (e.g. from the Gulf countries to India and Egypt) could lead the BRICS countries to use their own financial resources more intensively in the future.

Changing the global financial architecture to ensure stable economic growth in developing countries remained nothing more than a buzzword at conferences for a long time. Now, economic growth and investments are slowing down at the same time, and competition for financial resources for energy transition and climate policy is intensifying. Poverty reduction, social and economic development, and, in particular, the catching-up development of middle-income countries require well-organized financial resources along the entire "value chain": from the choice of spending priorities to reliable sources of financing, access to technology, and process organization. Decades have been spent on direct fight for poverty reduction, and now the focus is on the climate change.

Recent geopolitical environment has sparked a new round of action in climate change mitigation. The Atlantic Council and the Policy Center for the New South project of April this year has proposed 5 points [Canuto et al. 2024. P. 11] to increased climate and the SDGs finance. Presumably, this is a set of tools for a permanent interaction between the West and the South, something that the Bretton Woods institutions have conventionally been responsible for. This makes the outcome more interesting:

1. Multilateral development banks (MDBs) should focus on financing national public goods aimed at climate change adaptation.
2. A Green Bank should be established within the World Bank Group with the goal of climate change mitigation.
3. Efforts to create a carbon market should be redoubled.
4. MDBs balance sheet management should be optimized.
5. There should be a general capital increase for the World Bank and other MDBs and a substantial replenishment of concessional lending resources to their units.

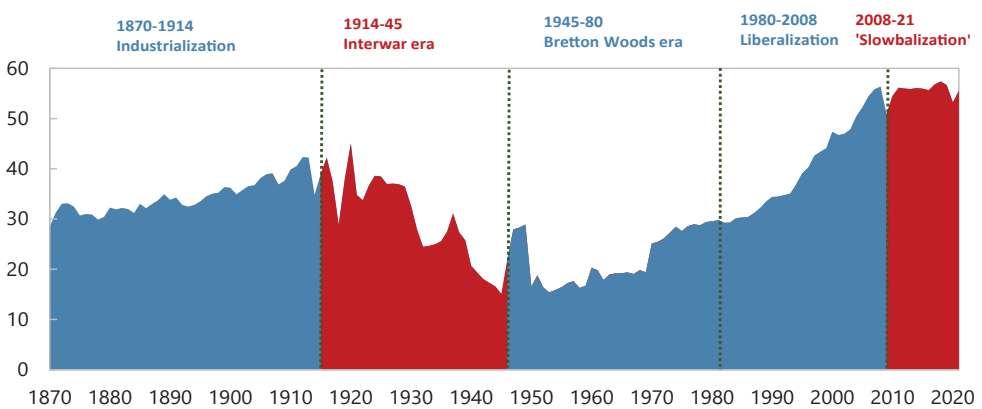
The proposed set of measures is straightforward and falls within the "classic" mix of development banks and private initiative. It also includes various ideas for debt relief for less developed countries, mainly linked to the climate policies. International finance institutions (IFIs) typically connect green finance to human capital and infrastructure development (creating energy-efficient infrastructure, human capital in innovative green industries, etc.). However, de facto there is a need for more integrated and coordinated approach to development—linking finance mainly to the climate agenda put off the human capital development, physical infrastructure and other SDG goals "for later"—after the energy transition [Bobylev & Grigoryev 2020; Grigoryev & Medzhidova 2020]. We question whether it is realistic to achieve climate goals in the short term (especially before 2030) without global development coordination. In these challenging times, we should expect a strengthening of the UN and the entire SDG movement. In the fall of 2023, a new report on the SDGs was released with the striking title: "Times of Crisis, Times of Change" [United Nations 2023]. Its publication went relatively unnoticed, and its influence was rather limited, as the report was lost among other UN decisions and documents.

The world community has lost a lot of time in 2020-2023. The recently proposed steps even regarding the creation of new institutions, as we have shown by the example of the Financial Report, are promising. Although, it is not certain that such meausure can become adequate solutions to the complex, interrelated and seemingly escalating challenges. Moreover, virtually all these problems involve complex negotiations, difficult agreements, large resource requirements, and inevitable difficulties in setting priorities across countries and sectors. The definition of a working institution is the norm and a way of enforcing its performance. So far, we have seen an increase in the intensity of developed country trade disputes with China, affecting a significant component of "climate mitigation goods" for which China has become a mass exporter, including renewable energy equipment and electric vehicles. But restrictions on Chinese exports in this segment could slow down emissions reduction. Geopolitical fragmentation and the current system of global institutions are incompatible partners, and time is running out to solve global problems.

In general, the expectations of the global community in the coming years can be gauged from the IMF's regular reviews of the global economy. In January 2023, fears of recession were very strong, and the main focus was on the geoeconomic fragmentation of the world economy. In 2024, the tone of the assessment of the state of the economy has softened a little. However, in June 2023 IMF assessed fragmentation losses as very significant: "Trade disruptions poses losses to global living standards as severe as those from COVID-19" [Bolhuis et al. 2023. P. 35]. The worst-case scenario did not materialize, but the protracted difficulties also had a depressive effect.

Overall, the prospects for the return of globalization would be generally good, provided that stability in international affairs returns, tensions are reduced, and the intensity of sanctions is reduced. We note the IMF's classification of the world development periods from 1870 to 2021, which highlights periods of increasing and decreasing trade openness. We would record another small period of the second half of the 1970s – early 1980s, which is flat in Figure 1 (p. 28) [IMF 2023. P. 6], following the 1973-1975 crisis. Perhaps the slowdown in globalization after the global financial crisis and at the moment are phenomena of a similar order. But this is not a reason for optimism in the current situation, since global problems and the need for resources have become more acute and the geopolitical situation in the world has not improved.

Figure 1. Trade openness (% of GDP), 1870-2021



Source: IMF, 2023. *World Economic Outlook: Geoeconomic Fragmentation and the Future of Multilateralism*. Washington, DC: International Monetary Fund. P. 6.

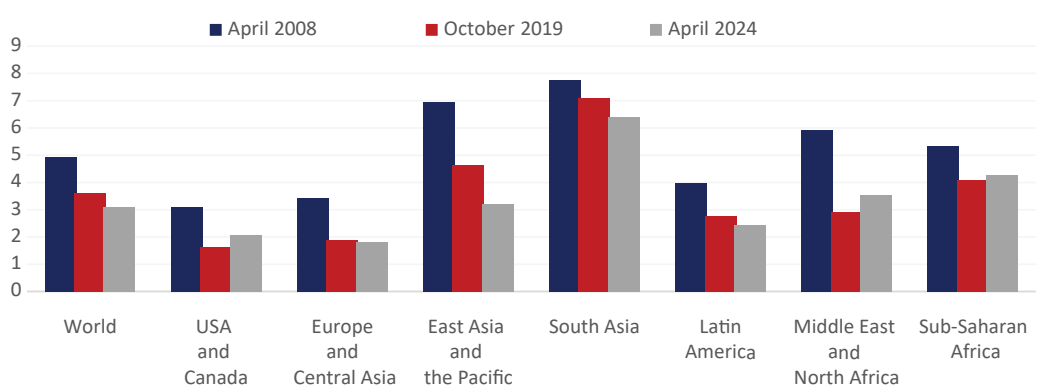
The IMF's April 2024 review gives the impression of a "sigh of relief" as 2023 passed without a sharp economic downturn, although geopolitical risks remain, and economic growth is still slow. Among the highlighted risk factors and future growth slowdowns, we will point out a fundamental issue that is currently difficult to specify and remains uncertain for the future: growing geoeconomic fragmentation [IMF 2023].

The sustainability of global economic growth, albeit at a slower pace, depends on the US, the EU, China, and the Middle East (i.e. oil prices). This framework defines the global outlook for the next two years, which enlightened observers see quite similarly.

The differences lie in their assessments of the impact of several elections, geopolitical factors and risks, the trajectory of the Chinese economy, and the energy transition. The expected low (relative to previous decades) average annual GDP growth rate of 3.1% over the next five years is not a technical feature of the system but a reflection of a significant decline in the growth of resources available to address domestic, structural and global challenges. As well as increased political competition for the resources available to governments.

The world is in a period of nervous but relentless growth. The debate about the future of the world, the paths of its development, and the solutions to the world's problems is unfolding before our eyes. The broader issue of sustainable development has been somewhat overshadowed, although energy and climate remain at the center of political attention. At the same time, industrial policy has made a comeback (as discussed in this year's IMF April Review). The debate in the academic mainstream, however, no longer looks like a cry against the all-conquering neoliberalism, as Nobel laureate J. Stiglitz points out: "Populist nationalism is on the rise, often shepherding to power authoritarian leaders. And yet the neoliberal orthodoxy—government downsizing, tax cuts, deregulation—that took hold some 40 years ago in the West was supposed to strengthen democracy, not weaken it. What went wrong? Part of the answer is economic: neoliberalism simply did not deliver what it promised" [Stiglitz 2024].

Figure 2. Five-year real GDP forecasts by region from IMF surveys, April 2008, October 2019, and April 2024 (%)



Source: International Monetary Fund, 2024. *World Economic Outlook—Steady but Slow: Resilience amid Divergence*. Washington, DC. P. 67.

Inequalities between countries and social strata and unresolved global problems dominate. Geoeconomic fragmentation has already cost the world several percentage points of GDP growth. Rising military spending and its likely further increases will also divert some of the funds and resources that could have been used to address

global challenges. Expected regional economic growth rates in the coming years are significantly lower than at previous reference points (see Figure 2 on p. 29). The erosion of global development coordination raises questions about the ability of the world community to solve global problems and the future of development as a whole, which will be a key agenda in the coming years. It can be said that any increase in geopolitical tensions raises the temperature of the planet, both figuratively (politically) and literally.

2. Divergence in the growth phase

The world's economic dynamics consist of the internal development of many countries and their interaction in the trade and financial sectors. In terms of growth drivers (and the composition of statistics), the world depends on the economies of US, China, and the European Union, which, firstly, produce, export, and finance more than others; secondly, they fight inflation and set interest rates; and thirdly, their demand dominates energy markets. The interdependence and competition of these three major economies define practical, rather than declared, problem-solving principles.

The expansion of the BRICS and the reorganization of world trade in the midst of geopolitical shocks have unleashed an outpouring of concern from international organizations and national governments about the Global South with an intensity not seen few years ago. The problem of reorganizing global finance as a tool for socio-economic development in the absence of country coordination seems difficult to implement and will take years. Thus, the entire global institutional system is undergoing a general "slow speed" reorganization within the framework of the existing complex relations between the key players. It would make sense to develop a trajectory for 2024-2026 for its reorganization and the directions of compromise seeking in order to return to the usual business cycle. But geopolitical fragmentation and a multitude of electoral events complicate decision-making and agreement among the leading players.

We believe, however, that we need to start looking at the global dynamics from the perspective of the world's poorest countries, about which policymakers in the leading countries are formally concerned. The International Development Association (IDA), a division of the World Bank, covers the 75 least developed countries. They make up a very significant voting bloc at the UN, so in addition to being concerned about global development or the world's poor, a number of countries have a very pragmatic interest in this story. After the liberation of the colonies, many new countries set out to develop: some succeeded, few went ahead, especially in Asia.

The debate about cross-country convergence has been going on for decades, and a large body of literature has been accumulated. Meanwhile, the success of developing countries in reaching the economic level of developed countries has generally fallen short of the expectations of the Bretton Woods Institutions [Easterly 2001] and academia, as well as developing countries themselves. But hope has been regularly renewed with theories and programs that have largely served the interests of donors [Morozkina 2019]. Perhaps it is time to abandon the concept of economic convergence of countries, at least

with respect to most countries and the timing—many decades of catch-up development are needed [Grigoryev and Maykhrovitch 2023].

The events of the 2020s have led not only to economic growth slowdown in the world and its less developed parts, but also to the recognition of the changing tendency of developing countries to outpace economic growth compared to developed countries. The feasibility of achieving SDG 10 (Reducing Inequality) in terms of inequality across countries depends on this trend. The latest IMF survey [IMF 2024] recognizes the turn towards divergence in recent years, and the World Bank has published a report, "The Great Reversal," which notes that countries (IDA) are lagging behind more developed countries. Note that the concentration of efforts in recent years has been focused on energy and climate policy, as we noted back in 2020 [Grigoryev, Medzhidova 2020]. So economic growth in the less developed part of the world has stalled, even with significant external support. And the world will once again have to grapple with the fundamental question of whether poor countries are morally, economically, and politically important.

The Chinese economy, regularly portrayed in the Western media as having intractable problems, continues to grow at a rate of 5-6%, a pace unrivaled by almost any other country except India. The country's complex housing sector problems are the result of huge urban and social development programs. With a high degree of conditionality, they can be classified as a "middle development" problem, but not a "trap." The formation of a "new normal" is, in fact, a path away from the achieved average level of per capita income of about USD20,000 in PPP terms. It should be noted that China's methods of accelerated development over the past three decades have been hybrid in nature, using natural resources and natural advantages with the creation of entrepreneurial institutions and the use of an open world market [Grigoryev, Zharonkina 2024]. In the foreseeable future, China will face new challenges: increasing personal consumption with decreasing inequality, resolving the accumulated debt problems in the real estate sector, and supplying the world with electric vehicle cars and equipment for renewables production at a very competitive prices.

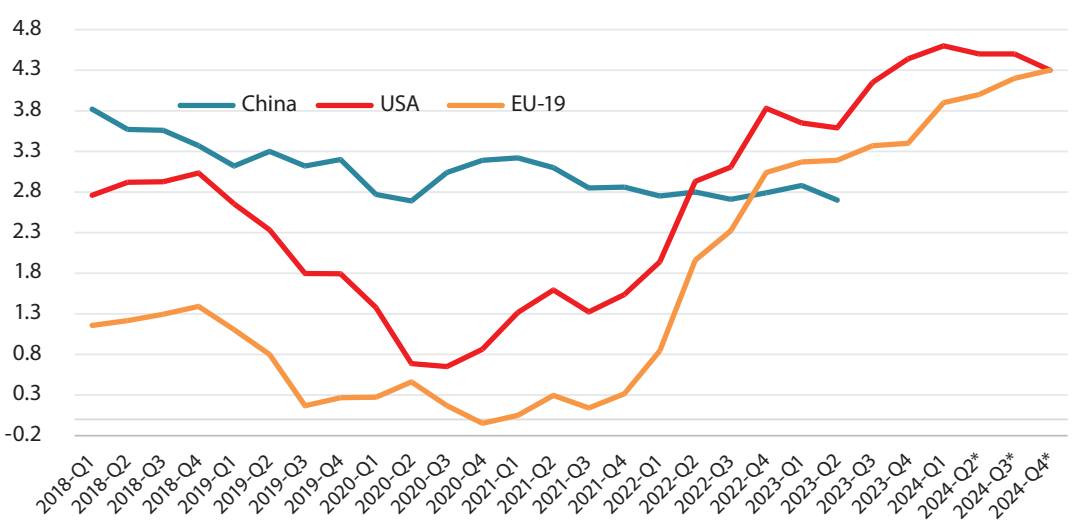
In terms of the global economic cycle, China will remain a growth leader with the prospect of reaching the income level of developed countries within a decade. China's economic development goal was set by President Xi Jinping in 2019 to double its GDP per capita in 16 years, i.e. by 2035. China's economic stability and growth are of paramount importance to the global economy. Country's positive impact on global development has been significant and perhaps unfairly underestimated. Now IMF forecasts for the coming years de-facto are counting on China's economic development impact, although at the same time OECD countries, especially US, are opposing China's industrial policy in some export-related dimensions.

The US economy, as it happened before, is experiencing greater fluctuations than most of the world, but is nevertheless returning to its traditional growth dynamics. In a sense, it is a huge economic system that is evolving according to its internal logic of development. The recovery from the COVID-19 pandemic has been completed, and the savings surpluses of 2020-2021 have mostly shrunk. Core inflation growth still persists, so the Fed rates are still high. The US economy has been service-led in the post-pandemic era, so the unemployment rate is low (in an election year, by the way). Capital investment

growth rates have reached roughly the rate of GDP over the past year, with an unusual concentration in the manufacturing sector, which may be a reaction to the legislation and envisioning of the domestic industries development in the future. The dramatic gesture of raising tariffs on Chinese electric vehicles imports echoes something similar in the past regarding Japanese car exports to the US. So an industrial policy that for so long has not been recommended to anyone is taking over.

Three percent growth in US GDP, with intermittent crises, is the historical norm. The country has embarked on a growth trajectory out of very unusual circumstances. The massive debt problem has disappeared but has been put off to the "post-election" period, with the old "cheap" ten-year bonds being replaced by more expensive ones (short bonds have also appeared) (see Figure 3 on p. 32). Whatever the outcome of the 2024 elections, we can expect the problem of the rising cost of servicing the US federal debt to become a thorny issue in partisan relations again through the 2026 election and beyond. For now, we see a very cautious Fed policy: with core inflation still quite high by historical standards, Fed rate cut could cause inflation to move from a low base "smoldering" state to a high inflation state. So one of the unusual features of this recovery in the US is that it is occurring with high rate of prices growth, high interest rates and low unemployment—usually it has been the other way around.

Figure 3. Long-term interest rates on government bonds maturing in ten years (% p.a.), Q1 2018 - Q4 2024.



Source: compiled by the author on the basis of OECD data.

The EU economy has become a byword: How could a prosperous continent be dragged into near stagnation for several years with only modest economic prospects for the future? It is clear that tourism-dependent France, Italy and Spain have been the main victims of the lockdowns, but tourism revenues are up again now, with not so great economic growth. Germany is conducting several costly experiments on itself at once in

energy, trade restrictions and automotive industry. The Economist recently listed three shocks threatening Europe's economy that we would like to comment on [Carr 2024]. The first is the energy crisis, which the author linked to the Ukrainian conflict. It should be noted that the EU created an energy system that failed under the conditions of natural shocks in 2021, leading to a price increase. Since then, the EU has incurred additional costs for energy imports, despite the consumption squeeze. In addition, there are new investment costs linkes to the need for rebuilding the energy system—especially with ambitious plans for climate programs, reinforced by the urgent ban of direct supplies from Russia. At the same time, rising energy prices are not a crisis itself—supplies have not been interrupted. Gas and oil (and coal) prices have stabilized and are now affecting competitiveness, especially in Germany.

The second shock is the wave of Chinese goods inflow into the EU, seen as an attempt by China to export "its slowdown." In fact, European complaints about the export of Chinese renewable energy equipment and China's consolidation in the global market are in sharp dissonance with the EU's position on accelerated greenhouse gas emission reductions. Liberalism is clearly becoming inconvenient, but no radical means of accelerating exports from the EU are yet in sight, with Russia under sanctions, China a major exporter, and the US merely pulling production from the EU to itself. These "geo-trade" conspiracies are usually discussed as part of theories of development, trade or political relations. We would like to add that the EU has been facing a growth problem for five years now, and all its own solutions have failed to produce quick results. We point out that the EU's difficulties in competing with the US and China have already become common topic and a recurring theme in the newspapers. The New York Times, for example, wrote on 5 June 2024 about the "competitiveness crisis" of the EU, which capital investments, income and productivity lag behind the two giant competitors [Cohen 2024].

Finally, the third looming shock is the possibility of Donald Trump being reelected as US president, which could lead to an increase in import tariffs from the EU. This raises legitimate concerns that unsuccessful tariff relugation by leading countries and alliances could prove to be a "remedy worse than the disease." Overall, the EU, with its large social programs and climate ambitions, appears to be an economic organism designed for smaller commitments at higher rates of resource growth. Unless the EU gets on a trajectory closer to 3% of GDP growth, all the plans of Brussels and Berlin in the areas of energy, climate and social problems will face severe budgetary constraints and will be perceived more painfully by the electorate.

Against this backdrop, the ECB continues to keep interest rates high (see Figure 3 on p. 32), using much the same logic as the Fed: "Slowing down is bitter, but stimulating is scary." To some extent, the European Union's behavior seems to depend on the cource of affairs on external energy markets, China's political decisions, and the "American roulette" of the presidential elections. It is likely that many European countries will wait until November to make further decisions on how to stimulate economic growth.

China plays a huge role in international trade, but the country is not immune to the business cycle and trade policies of leading partner countries. China's trade flows in

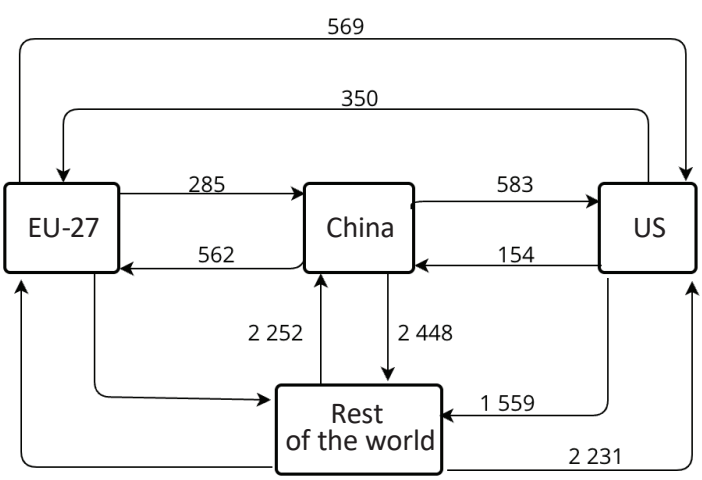
2023 were largely driven by its relationship with the US and the EU (see Table 2 on p. 34, Figure 4 on p. 34). The decline in imports from China by the two trading giants, the US and the EU, has created some difficulties for the latter. De facto, the world has reached a situation of a "slowly growing shared pie" and fluctuations in importers' demand have a conjunctural impact on exporters.

Table 2. Trade and flows in 2019-2023

Importer	2019	2020	2021	2022	2023
Exports of Chinese products, billion USD					
US	419	452	577	583	502
EU-27	367	391	519	562	502
The rest of the world	1 712	1 745	2 266	2 448	2 385
Exports of US products, billion USD					
China	106	124	151	154	148
EU-27	268	232	272	350	370
The rest of the world	1 268	1 068	1 330	1 559	1 502
European exports, billion USD					
China	253	259	310	285	282
US	462	425	503	569	590

Source: compiled by the author based on Trade Map data.

Figure 4. China's export flows between leading countries in 2022



Source: compiled by the author based on Trade Map data.

The return of the world economy to trade openness and the acceleration of global growth through trade is only possible if restrictions on the flow of goods are eased and the intensity of industrial policies (in particular export subsidies) is curbed. For the

time being, this remains an elusive dream, especially for the European Union. The global economic recovery is therefore unfolding with significant differences in growth rates and domestic drivers in the US, the EU, and China. The recovery parameters for 2024-2026 appear as "moderate recovery with moderate pessimism" to both market commentators and the IMF. According to our classification [Grigoryev 2023. P. 4], the current phase can be classified as type "F - broad back of upturn." However, it is uneven across regions, characterized by high inflation, tighter monetary policy, and, as noted by the IMF, a dangerous development of geopolitical conflicts. We should also consider potential natural disasters (including those caused by rising temperatures) in some regions and armed conflicts (Sudan, Haiti) in others, which also increase risks and limit resources for further addressing socio-economic development issues.

3. Looking for structural drivers

Historically, major crises have led the global economy to a different type of growth through the asset obsolescence. The global financial crisis of 2008-2009 had led to a tighter banking control, a slowdown in the investments under low interest rates and low inflation [Grigoryev et al. 2022. Chapter 2]. Now we are witnessing industrial policies of developed countries in the form of subsidies, sanctions, merger bans, forced sales of companies, lawsuits, special R&D programs, which, without entering textbooks, have returned to actual business practice.

Instead of a cyclical boom in capital investments, there is a decline in trade openness, high interest rates, which generally does not contribute to a rapid recovery. Hope lies in the energy sector, especially renewable energy, electric vehicles, and artificial intelligence (AI), to the extent that their development can be discerned on the horizon of a conventional multi-year boom. In this paper, we do not look far into the future, as strategies are still being formulated and their success will largely be dependent on the sustainability of economic growth in the coming years.

The US business cycle model has autonomously generated volatility for the rest of the world for at least a century, although the model itself is significantly affected by the world through trade and capital flows. In the current period, the US economy has already experienced a brief but intense housing boom. Now, due to cheap energy and other factors, energy-intensive industry has been pulled from the European Union into the US. In other words, the drivers of post-crisis growth are working, even if interest rates and the inflation fight are not fueling the pace of that growth. Structural shifts will move towards the use of AI, but large-scale effects in this area will not occur quickly, given the fact that the labor force is constantly migrating into the country which enables labor price restraint. The use of AI in many areas, as it happened before with bygone innovations, can lead to improved product quality (diagnoses in medicine), increased consumer reach (as well as government influence), reliability of systems, and so on. These subtle effects do not necessarily lead to significant increases in consumption levels for the relatively poorer groups of society in both developed and developing countries.

A number of recent actions by President Biden (including imposing a 100% import tariff on Chinese electric vehicles) have been characterized by the press as industrial

policy, which is debatable—but these debates relate more to the content, rather than the nature of the policy itself. Similarly, the US has complaints about China's industrial policy. But the days of fighting against the principle of industrial policy, which was taking place in 1990-2008 and influenced Russia's domestic reforms, are over. We now live in a world of shrinking trade openness, sanctions, and export subsidies. One must assume that the power of export subsidies of developed countries is now higher than that of developing countries. This goes against the whole logic and letter of open world trade in general and the WTO in particular. Combined with sanctions and growing protectionism, it completely changes the nature of world trade.

China's industrial policy is being projected outward through exports of renewable energy equipment and electric vehicles. This is a "zero-sum game" that simultaneously involves conflicts of interest and cognitive dissonance. The zero-sum situation stems from the desire of EU and US countries to produce adequate renewable energy equipment themselves in order to achieve the goal of 100% decarbonization of the economy by 2050. We see a conflict of interest between their own producers (supported by green parties) and the suffering countries and regions of the world: the latter need to reduce emissions as soon as possible to keep global temperature rise within 1.5-2° C. The EU has been and remains the leader of the movement, but China produces a disproportionately large amount of the equipment needed for this industrial policy.

Accusations against China are growing before our eyes in parallel with the strengthening of industrial policy in the Western countries themselves. In a recent New York Times article, China was accused of spending 1.7% each of the years 2017-2019 to support manufacturing. Note that the accusation boils down to the fact that this is far more than other countries are spending, so the accusation is about scale, not principle: "The West's adoption of industrial policy is a departure from the ideology of open markets and minimal government intervention that the US and its allies previously championed" [Cohen et al. 2024]. As a result, China is simply to blame for being ahead of other countries in implementing industrial policy, which does not require commentary. And the cognitive dissonance is that only China can provide the equipment at affordable prices to implement global climate policy now, not sometime in the future. So the West's anti-China industrial policy is simultaneously trying to curb China's high-tech breakthroughs in the upper levels of technological progress, its massive exports of technological goods, and its economic growth, while at the same time trying to carve out a place for Western goods through tariffs (even if that means wasting time on urgent climate policy).

The trillions of dollars that COP-28, held in Dubai in December 2023, expected the world to raise to mitigate climate change are still materializing quite slowly. Developing countries have not received the long-promised $100 billion per year until 2023. The choice between climate and income is now very clear. And it is about growth drivers in the years ahead, which the current trade wars are disrupting. Note that the total cost of achieving zero emissions by 2050 was estimated in the McKinsey 2022 report [McKinsey 2022] at $275 trillion, or 7.5% of global GDP over that period. This figure seems realistic in its scale and indicates that the world community has not yet really begun to tackle the climate issue.

The problem of the EU falling behind the US and the competitive threat from China is nothing new to academia and the media. We highlight negative trends in labor

productivity in the EU [Arse, Sondermann 2024]. The scale and risks of this issue for the EU have become clear by 2024. Accordingly, the question of "what to do" arises. Perhaps the most detailed and colorful are the analyses and recommendations of McKinsey in their report of 16 January 2024 [Giordano et al. 2024]. The report shows that the EU is lagging far behind the US and needs urgent solutions to a whole range of issues with a horizon of 2030. The list is striking in its scope and radicalism:

- A sharp increase in corporate spending on innovation;
- 2-3-fold decrease in electricity and gas prices;
- Increased capital investment of 400 billion euros and 200 billion more in new renewable energy projects;
- A two-fold increase in the size of European firms;
- Retraining 18 million workers and industrial automation;
- Supply chain change with increased import independence;
- Government regulation and strong industrial policy.

The list itself is adequate enough to solve the problem of the 27% lag in per capita income from the US. The question is how the 27 EU countries can raise the funds and organize the whole package, because the EU is not China in terms of industrial policy coordination.

The issue of climate change mitigation has several related aspects. First, investments in renewable energy are designed to increase energy capacity to meet growing energy demand, especially in developing countries. This reduces potential emissions but not always actual emissions. For example, the growing share of renewables in Germany's fuel and energy mix in recent years has replaced the phase-out of nuclear power, while the share of coal has remained almost unchanged. In developed countries, the introduction of renewable energy in many cases represents a substitution of traditional capacity—expenditure without increasing energy consumption for the goods or services production. This is inevitable at this stage of the energy transition, but it leaves open the question of the speed of substitution and the demand growth for primary energy. At this point, naive ideas of 2020 regarding the rapid disappearance of coal, oil and even natural gas from the energy mix by 2020 have already "cooled off." Preserving the planet's climate is realistic only with huge expenditures, a focus on developing countries, coordination of logistics, investments, production of appropriate equipment, and cooperation among major powers. Every step taken to increase geopolitical tensions is, in essence, literally heating up the planet.

The world energy forecast by Russian authors Kulagin et al. (2024) presents three global energy development scenarios, assuming no massive investment in climate programs. In all scenarios, significant oil and gas consumption remains, mainly as a result of growing demand from developing countries. The International Energy Forum report concludes: "Annual upstream investment will need to increase by $135 billion to a total of $738 billion by 2030 to ensure adequate supplies. This estimate for 2030 is 15% higher than we assessed a year ago and 41% higher than assessed two years ago due to rising costs and a stronger demand outlook. A cumulative $4.3 trillion will be needed between 2025 and 2030, even as demand growth slows toward a plateau" [IEF 2024. P. 4].

In practice, this means that investment in renewables, even on a very large scale, does not occur through a simple redirection of financial flows from oil and gas companies;

a more complex and lengthy process is underway and will continue in the future. In terms of economic recovery, we see that the traditional energy industries continue to operate at a level that supports recovery but does not trigger a large-scale boom. They are competing with green energy for funding.

A combination of structural changes typically plays the role of recovery driver in traditional business cycles, along with cheap loans, energy and labor. In the current situation, this role is being played by energy-climate programs designed to replace traditional energy capacity and save energy while meeting the world's growing consumer needs. The production of energy-efficient and environmentally friendly equipment is certainly a stimulating factor. But declining investments in conventional energy capacities and underinvestment in energy in developing countries make us think about the cumulative effects. Achieving the Sustainable Development Goals by 2030 seems unlikely. Cyclical factors alone look sluggish: energy is still not cheap. Interest rates will remain high to curb inflation, which the authorities are trying to bring down to 2010-2019 levels.

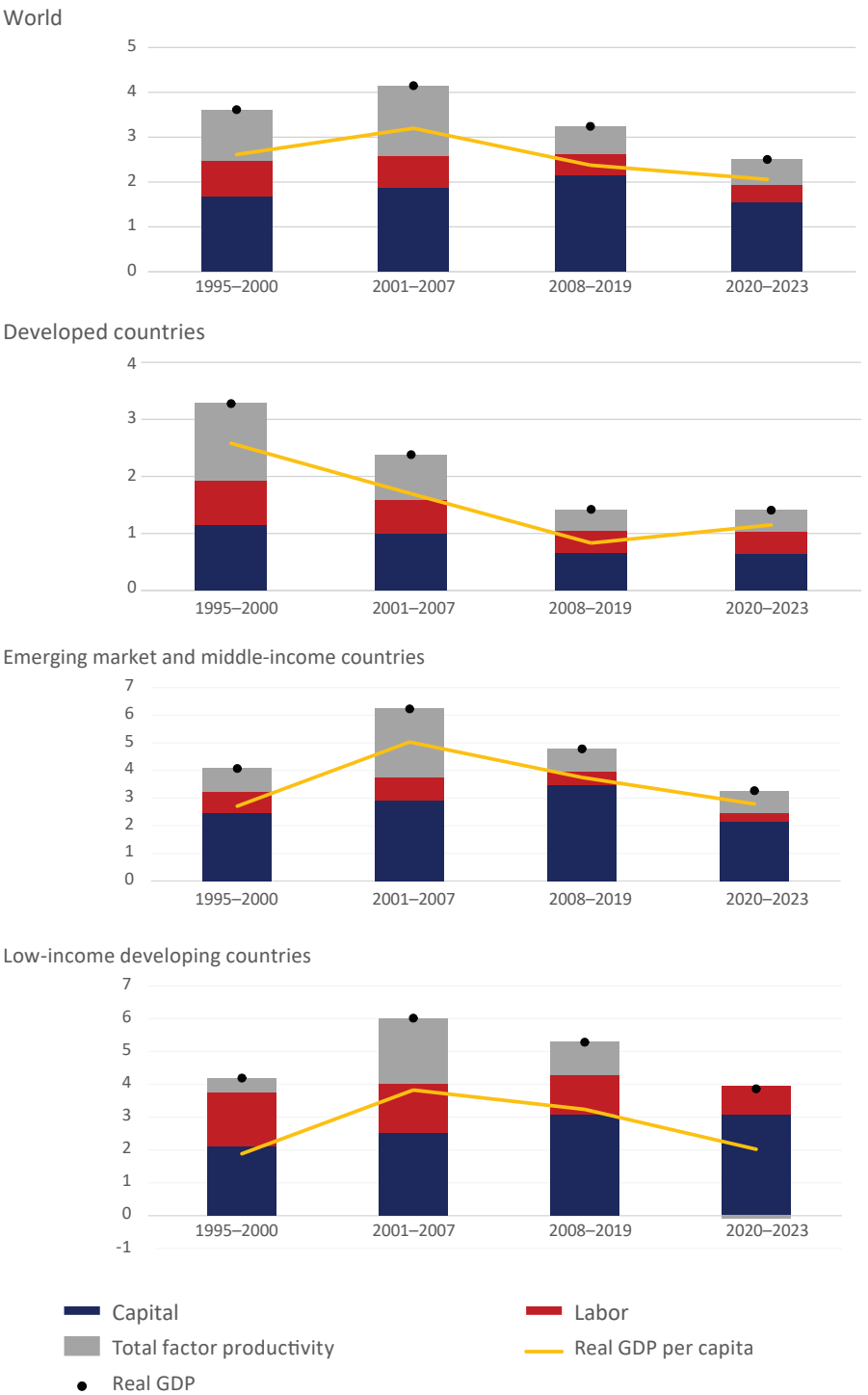
Social problems are likely to worsen in the coming years; in particular, coal miners will have to be employed as part of any radical program to reduce coal production while cutting consumption. There will be increased competition between the poor in the developed countries and the "outsiders"—the developing countries. Military spending will increase, once it gets into a spiral of escalation. And solutions and funding will continue to be sought for the costly challenges of the coming years:

- financing the poorest countries development;
- climate programs financing;
- financing social equalization in the EU and the US;
- financing aging physical infrastructure in developed countries;
- financing growing military expenditures;
- financing national and regional programs in developed countries related to regular elections.

Figure 5 (p. 39) illustrates an important aspect of global developments over the past decade and a half—the declining role of real capital investments in advanced economies' economic growth. Emerging and middle-income countries, especially China, have been the driver of global economic growth, largely due to return on capital investments. This pattern raises the question of the importance of this countries group in the future. Support for low-income countries will be required in terms of stimulating the growth of overall factor productivity, which has been stagnant over the past four years. The observed two percent growth in GDP per capita for this group of countries implies a very slow pull towards more developed countries.

Options that take into account the positive effects of AI have begun to appear in forecasts. In general, we are eagerly awaiting an increase in the quality of medical care, diagnostics, and individualized treatment, but only in developed countries. The process has just begun and it will certainly be costly, both in terms of invention and in terms of expansion of application. But for now, it is an early stage in the development of the industry and the spread of a new kind of service. On the horizon of 2024-2026, it does not look like AI could change the direction of economic dynamics in the medium term.

Figure 5. Contribution of components to GDP growth, 1995-2023 (%)



Note: Growth decomposition sample includes 140 countries

Source: IMF (2024). World Economic Outlook: Steady but Slow. Resilience amid Divergence. Washington, DC: International Monetary Fund. P. 68.

Conclusion: The glass is half full of optimism and half full of pessimism, or vice versa!

By the beginning of 2024, the formation of a complex and not particularly favorable regime of socio-economic development in the world had become recognized by most policy makers and analysts. The emergence from recession into an uneven nervous upswing leaves observers with an uneasy choice between cautious medium-term optimism or pessimism, depending on the country, profession, or political disposition. One can rely on IMF head K. Georgieva's three possible paths for the world in the 2020s: "Making the right policy choices will define the future of the world economy. It will define how this decade is remembered—will it go down in history as

- *the 'Turbulent Twenties,'* a time of disturbance and divergence in economic fortunes;
- *the 'Tepid Twenties,'* a time of slow growth and popular discontent; or
- *the 'Transformational Twenties,'* a time of rapid technological advancements for the good of humanity?"

Our work, as it seems to us, indicates that the global economy is in a state of "turbulence" and that global actors are aware of this and are scrambling to extricate themselves from it. So far, at best, it is moving into a "no-fun" state. K. Georgieva's hope for a "transformational" path seems very distant, especially since she only refers to technological happiness. International financial institutions never make bad predictions—they only recommend good policy choices. But the issue today 'should not just be about the rapid technological advances that are gradually becoming available to the wealthy in both the developed and developing world. It is, clearly, about social and geopolitical stability and the coordination of the global community's efforts, about removing geopolitical obstacles to solving global problems.

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The Impact of Transitional Climate Risks on Exports: Empirical Evidence from Russian Regions

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Abstract

In the face of the government's exclusive attention to the issues of export development, the investigation of the determinants of export operations of Russian regions comes to the forefront. Exporting companies face the following limiting factors: technological backwardness, inconsistency of goods quality with international demand, complexity of customs procedures. In the context of the modern climate agenda, there is a new type of economic risks for exporters— transitional climate risks. This group of risks is emerging as a result of states' intentions to achieve the environmental goals set out in the Paris Agreement and move towards low-carbon development. Transition risks for exporters can appear in the form of trade restrictions, environmental requirements for goods, and the willingness of importing countries to substitute less environmentally friendly exported products. Evaluating the export development of Russian regions

in the context of transitional climate risks is a nontrivial task. The global energy transition can generate both risks and opportunities for Russian exports. The purpose of this paper is to model the impact of transitional climate risks on the dynamics of Russian regional exports based on data for the period 2013-2021 using an extended gravity model of international trade. The study has two distinctive features: a comprehensive analysis is conducted, introducing transition risks from three different aspects; regional factors determining the sign of the impact of transitional climate risks on export volumes are identified. The study reveals that the impact of transitional climate risks on the export performance of Russian regions is diverse. Firstly, environmental regulation of trading partners poses risks for many Russian regions, but promotes exports from regions with the most favorable socio-economic conditions for innovation and active regional environmental policies. Secondly, the production of alternative energy sources in partner countries reduces reliance on Russian energy imports, which jeopardizes the sustainability of the economies of regions specializing in the extraction of traditional energy resources. Meanwhile, Russian mineral-rich regions are making a significant contribution to global energy transition trends as suppliers of critical mineral resources and are increasing their exports.

Introduction

Export development represents a critical challenge for the Russian economy. In 2018, the government unveiled the ambitious "International Cooperation and Export" initiative, which aims to significantly boost exports by 2030.[1] It is widely acknowledged that the intensification of a country's export activity is associated with the strengthening of its economic position in the international arena. This is achieved by building long-term relationships and providing unique products to the foreign market. Furthermore, export activity contributes to the growth of the national economy by expanding production, increasing labor productivity, creating new jobs, as well as the inflow and redistribution of budgetary funds and foreign currency [Kadochnikov & Fedyunina 2013; Islam et al. 2022; Fedyunina et al. 2023]. In light of the ongoing economic crisis in Russia, an examination of potential factors influencing export growth in different regions is a crucial area of research.

Exporters and companies in Russia that are planning to enter international markets are confronted with a number of internal and external constraints. The group of internal constraints includes high production costs, technological backwardness, limited assortment, inconsistency of goods quality with international demand, complexity of national customs procedures, ineffective national trade policy, and an

[1] How state support helps exporters overcome borders and barriers// https://www.vedomosti.ru/partner/articles/2023/10/19/1000547-gospodderzhka-pomogaet-eksporteram (accessed December 2023).

unfavorable institutional environment.[2] Conversely, the list of external constraints includes the requirements of host markets, trade restrictions, and geopolitical risks [Volchkova 2013; Glazatova and Daniltsev 2020]. The aforementioned factors have been extensively examined in the existing literature, and strategies to overcome them have been partially incorporated into export development strategies.

Additionally, the global climate agenda and the energy transition process can be considered international challenges faced by Russian companies when exporting. Consequently, the intentions of countries to achieve the goals of the Paris Agreement give rise to a novel category of economic risks: transitional climate risks. The primary distinction between transitional climate risks and physical risks is that companies' financial losses are not a direct consequence of climate change per se, but rather the result of public and private sector initiatives aimed at mitigating these changes.

The relevance of transitional climate risks for exporters, especially those countries that have not adapted to the new low-carbon paradigm, is determined by the following facts. First, export flows may become subject to regulation due to the peculiarities of the GHG accounting system, which does not distinguish between producers and consumers, exporters and importers. Countries tend to shift responsibility to exporters, as they are direct emitters of greenhouse gases [Makarov and Sokolova 2014]. Secondly, the international community holds the view that it is impossible to resolve the issue of global climate change without the involvement of all countries worldwide in the climate agenda, achieved through the comprehensive dissemination of carbon regulation and the unification of standards. In light of the current challenges to establishing a unified global regulatory framework, the most viable approach for activating national climate policies is through the utilization of carbon regulatory instruments in international trade [Nordhaus 2015]. Thirdly, the utilization of trade mechanisms to attain carbon neutrality is also substantiated by the fact that the absence of national climate regulation serves as a means of sustaining competitive advantages in the international market. It is postulated that exporters of states with weak climate regulation do not incur supplementary costs associated with environmental protection and are thus able to maintain prices at a low level [Makarov and Shuranova 2023]. In other words, the phenomenon of "environmental protectionism" or "benevolent protectionism" is becoming increasingly prevalent [Kutyrev et al. 2021; Makarov 2023].

In light of the structure of export supplies and the specific characteristics of national climate regulation, the transitional climate risks facing Russian exporters can be broadly classified into three key components: carbon regulation, the development of alternative energy sources, and the electrification of transportation. Consequently, the implementation of carbon regulation gives rise to the emergence of trade barriers, which impose partial or complete restrictions on export flows. Additionally, the introduction of requirements for Russian products directly impacts the capacity of goods to compete in international markets [Shirov and Kolpakov 2016; Porfir'ev et al. 2020]. The development of renewable energy and the transition to electric vehicles, in

[2] What hinders Russian export: the results of a survey of enterprises (analytical note) // https://cbr.ru/StaticHtml/File/120062/analytic_note_apr21_dip.pdf (accessed December 2023); Exporters are confused by internal problems // https://www.kommersant.ru/doc/4763204 (accessed December 2023).

turn, affects the demand for Russian traditional energy, which accounts for the majority of the country's exports [Saenko and Kolpakov 2021; Albert 2021]. Conversely, recent literature indicates that the global energy transition presents novel opportunities for export growth for countries endowed with mineral resources.[3] It is well established that the production of renewable energy capacity, including solar panels and wind turbines, is dependent on the availability of rare earth elements and base metals [Elshkaki et al. 2016; Valero et al. 2018; Islam et al. 2022; Islam and Sohag 2023; Andersen et al. 2024; Harpprecht et al. 2024]. Russia plays a pivotal role in the global energy transition, given its status as the leading producer of numerous critical minerals, including cobalt, nickel, lithium, iridium, palladium, platinum, zinc, copper, and uranium. In light of Russia's substantial resource endowments, a number of regions stand to considerably augment their export revenues [Chupina 2022].

Since the Paris Agreement was signed, the vulnerability of the Russian economy and exports to the global energy transition has begun to emerge. This is due to the significant share of the fuel and energy sector in GDP and the high carbon footprint of exports [Makarov et al. 2020]. However, in the wake of the political upheaval that unfolded in February 2022, there has been a notable intensification of transitional climate risks for the Russian economy. Western states have accelerated their plans to restrict Russia's carbon-intensive exports and reduce their reliance on Russian energy imports.[4]

Furthermore, the redirection of export flows from unfriendly to friendly states will not fully mitigate the aforementioned transitional climate risks. Firstly, in states with which Russia has friendly relations, there has been an intensification of climate policy and the introduction of carbon regulation instruments (a case in point being China, Kazakhstan, and Turkey[5]) [Makarov and Shuranova 2023]. Secondly, the conclusion of export contracts, for example those pertaining to the supply of Russian energy, may prove challenging due to the absence of the requisite infrastructure. Third, the markets of friendly states are relatively limited in capacity, and their solvency may be affected by the imposition of sanctions by Western states. Fourth, the calculation of emissions across the entire value chain will result in direct purchasers of Russian goods demanding a carbon footprint if they are to enter global markets with their products.

In light of the prevailing geopolitical circumstances, the question of how to effectively oversee the export activities of Russian regions, with due consideration for the transitional climate risks, has become a pressing concern. The objective of this study is to examine the impact of various aspects of transitional climate risks on the

[3] Minerals for Climate Action: the Mineral Intensity of the Clean Energy Transition // https://elperiodicodelaenergia.com/wp-content/uploads/2020/05/20200510-WORLD-BANK-GROUP-Rprt-MineralsforClimateAction-Transition.pdf (accessed December 2023).

[4] EU completely stops buying Russian coal // https://www.rbc.ru/politics/10/08/2022/62e229b39a794791f3187fe3 (accessed December 2023); EU approves plan to reduce dependence on Russian energy // https://www.kommersant.ru/doc/5356577 (accessed December 2023); Carbon tax is still here // https://www.kommersant.ru/doc/6097901 (accessed December 2023).

[5] Carbon Pricing Dashboard // https://carbonpricingdashboard.worldbank.org/ (accessed December 2023).

export volumes of Russian regions using econometric tools. Furthermore, the study seeks to elucidate the regional characteristics that determine the direction of the impact of the global energy transition on export performance.

In order to address the aforementioned objectives, the study considers three groups of variables related to the global energy transition. These are: the stringency of environmental regulation (which can be considered a proxy variable for carbon regulation), alternative energy production, and countries' readiness for energy transition. Secondly, given that regional characteristics may potentially exert an influence on the impact of the global energy transition on territories, the Russian regions are divided into subsamples based on their mineral endowment, an index of socio-economic conditions for innovation, and an index of the region's openness to the Green Deal.

To the best of our knowledge, no previous study has examined the intricate relationship between the global energy transition and export performance for Russian regions in sufficient detail. This paper addresses this gap in the literature and contributes to the existing body of knowledge by investigating the relationship between the global energy transition and export performance using the gravity model of international trade and estimating it using the FE PPML method based on data for regions and partner countries for the period 2013-2021. Furthermore, while previous studies have tended to generalize the findings on exports of the Russian economy, this study focuses on the heterogeneity of the impact of transition risks on export volumes by dividing regions into subsamples.

This paper is comprised of four sections. The first section provides an overview of the concept of transitional climate risks. The second section offers an analysis of Russia's economic and export development in the context of the global energy transition. The third section presents the empirical model utilized in the study. The fourth section analyzes the empirical results obtained. The conclusion follows.

1. Transitional climate risks: classification and impact on foreign economic activity

The concept of climate risk gained prominence on the international stage between 2017 and 2019, largely due to the efforts of the Task Force on Climate-Related Financial Disclosures (TCFD), an initiative spearheaded by the G20.[6]

Risks pertaining to the environment are classified into two categories: environmental and climate (see Figure 1 on p. 48). Environmental risks pertain to the consequences of environmental degradation, depletion of natural resources, increased emissions of pollutants, reduction of biodiversity, and inefficient waste management. Climate risks, in contrast, refer to losses resulting from climate change and measures undertaken by states to mitigate its effects.

The conventional presentation of climate risks is in the form of physical climate risks, which may be the consequence of abrupt extreme climate conditions (emergency

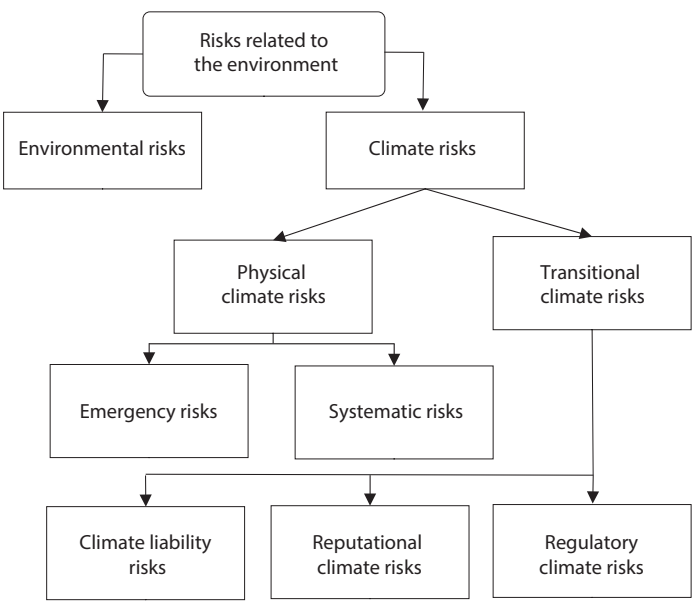
[6] Task Force on Climate-related Financial Disclosures // https://www.fsb-tcfd.org/ (accessed December 2023).

risks) or gradual alterations in the climate system (systematic risks). A salient characteristic of physical climate risks is their direct impact on the tangible assets of companies and the state, as well as the quality of life of the population [Weezel 2020; Buhaug et al. 2023].

A relatively novel category of climate risks pertains to the financial implications of societal and governmental efforts to mitigate alterations in the Earth's climate system. These risks may manifest in various ways, including lawsuits and fines against companies that fail to implement active measures to achieve carbon neutrality (climate liability risks), or the "boycotting" of firms that emit significant amounts of greenhouse gases by state entities, investors, and the public (reputational climate risks), or the need to bear additional costs associated with the tightening of national climate regulations (regulatory climate risks) [Sanderson and Stridsland 2022].

This is inextricably linked to the plans of states to shift to low-carbon development. This involves actively producing alternative energy sources and limiting the consumption of traditional energy resources, both at the national and global levels. It also involves integrating "green" technologies into the daily practices of businesses. This is especially the case through climate regulation and government support for manufacturers. It further involves shifting preferences towards electric power and reducing the use of alternative energy sources. Those countries, sectors, and enterprises that are associated with fossil fuels or dirty production are most vulnerable to the risks inherent in the transition process.

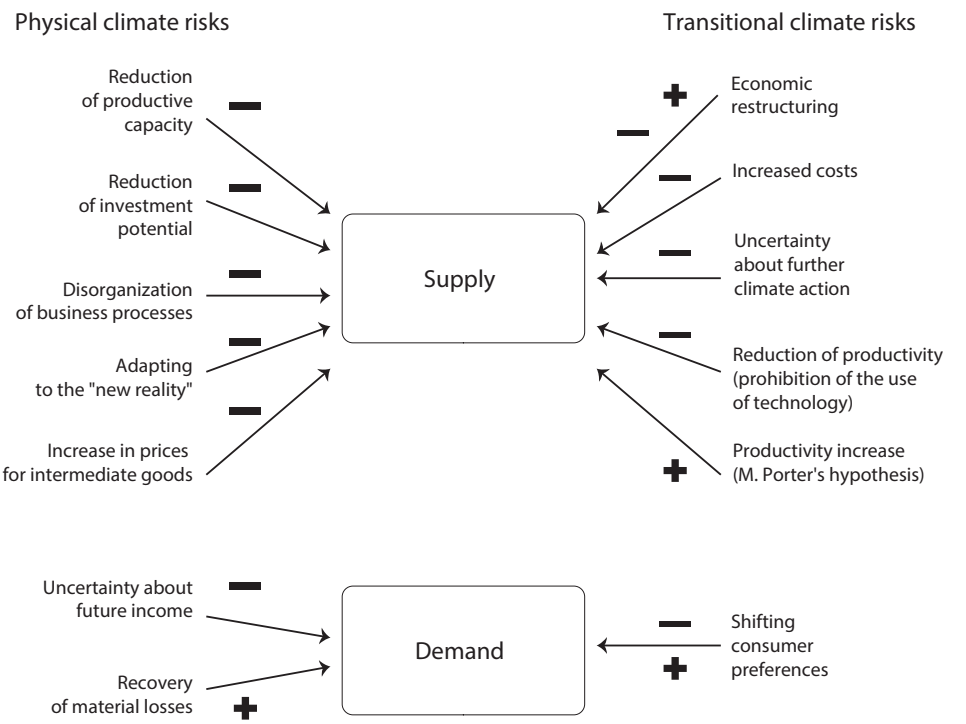
Figure 1. Classification of climate risks



Source: compiled by the author from Task Force on Climate-related Financial Disclosures (URL: https://www.fsb-tcfd.org/, accessed December 2023), Bank of Russia (URL: https://cbr.ru/Content/Document/File/143643/Consultation_Paper_21122022.pdf, accessed December 2023).

The impact of climate risks on foreign economic activity can be effectively analyzed in terms of the impact of these risks on supply and demand (see Figure 2 on p. 49). A negative impact on exports is a possibility due to the reduction of the country's export potential, which is driven by cost increases, higher prices for intermediate goods, disorganization of business processes, reduced demand from host markets, logistical problems, and the emergence of trade barriers [Sheng et al. 2022; Carattini et al. 2023]. An increase in exports is also a possibility, due to the rise in productivity (as postulated by Michael Porter) and the recovery of material losses in importing countries, which will lead to an increase in demand. Furthermore, diversification of exports is likely to occur [Porter 1995; Gong et al. 2020; Wang et al. 2021; Chen et al. 2022; Hamaguchi 2023; Yu and Zheng 2024].

Figure 2. Channels of climate risk impact on supply and demand



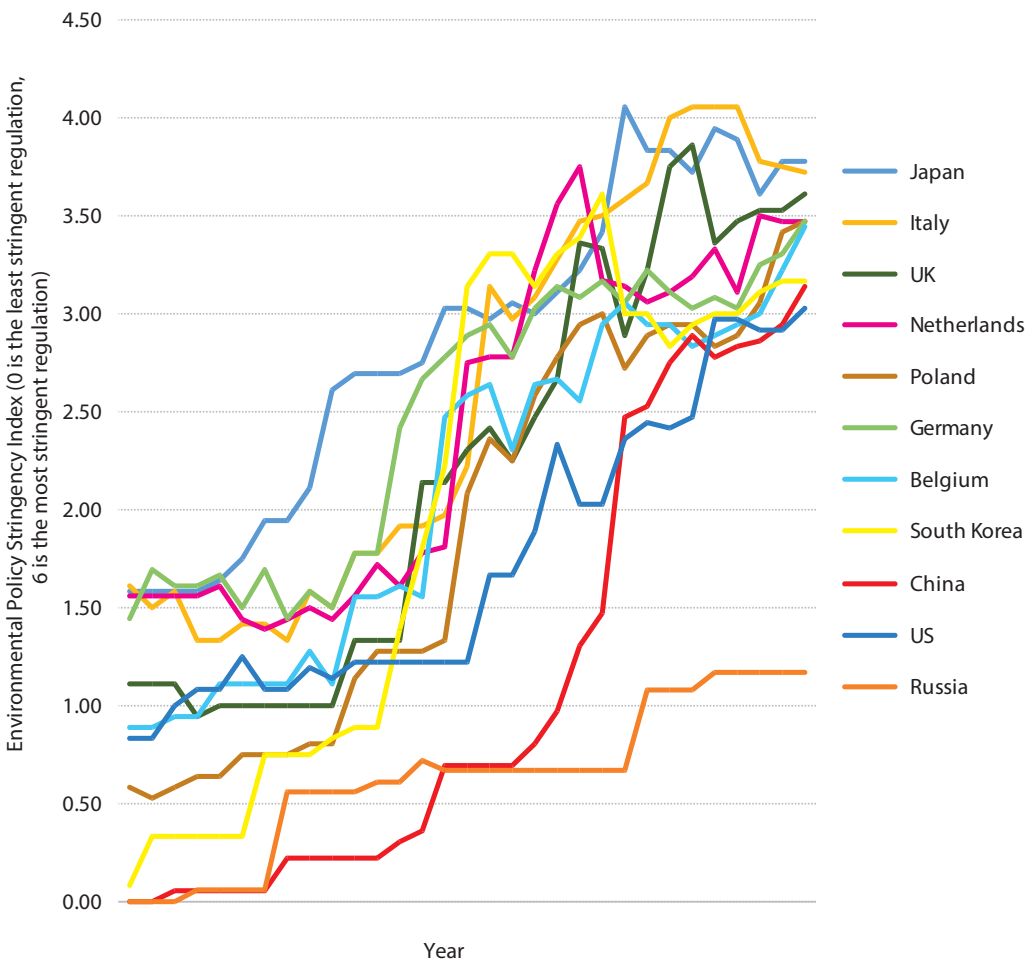
Source: compiled by the author from Task Force on Climate-related Financial Disclosures (URL: https://www.fsb-tcfd.org/, accessed December 2023), Bank of Russia (URL: https://cbr.ru/Content/Document/File/143643/Consultation_Paper_21122022.pdf, accessed December 2023).

2. Russian and regional exports under transitional climate risks: constraints and opportunities

The assessment of export potential in Russian regions, taking into account the impact of transitional climate risks, represents a significant challenge. Russia is among the world's leading emitters of carbon dioxide on an annual basis. Up to 20%

of the country's emissions are attributable to the production of export goods. The geographical structure of Russian CO_2 exports is characterized by the prevalence of groups of countries that have adopted an active stance on environmental issues and climate policy: the G20 countries, the Organization for Economic Co-operation and Development (OECD), and the European Union (see Figure 3 on p. 50). However, Russia's national climate policy is lagging behind, prompting trading partners to intensify efforts to achieve global climate goals, including through carbon trading mechanisms [Makarov and Stepanov 2017].

Figure 3. Dynamics of the Environmental Policy Stringency Index of Russia's trading partner countries in 1990-2020

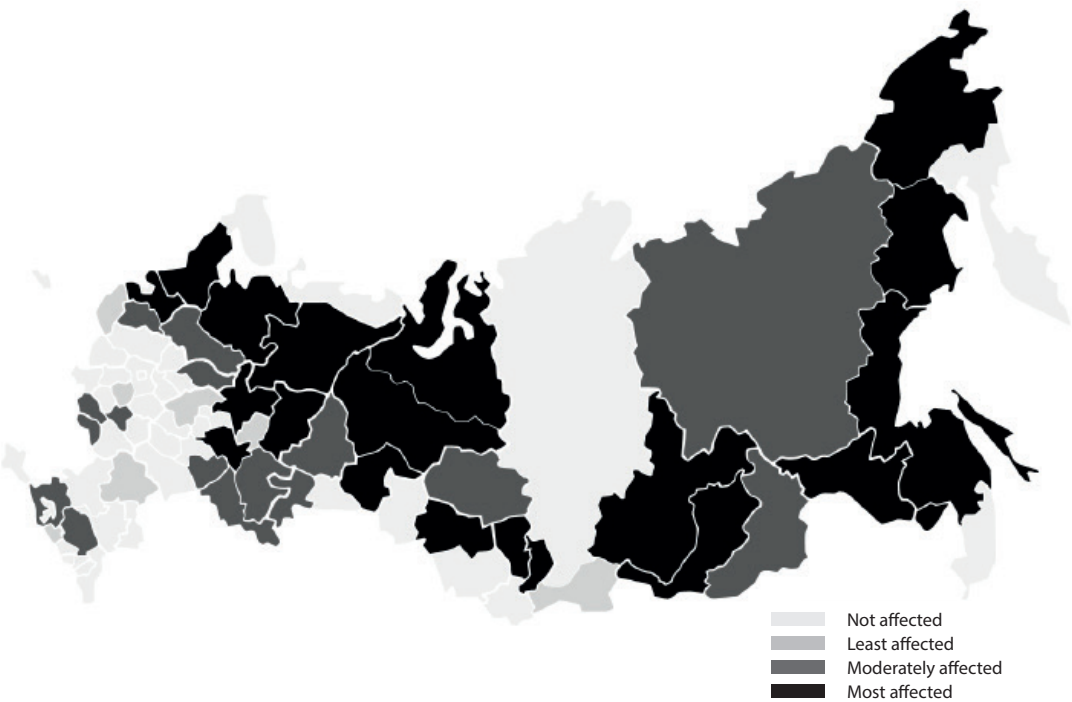


Source: compiled by the author on the basis of OECDstat (URL: https://stats.oecd.org/Index.aspx?DataSetCode=EPS, accessed December 2023).

In consideration of the commodity and geographical structure of exports, the vulnerability of exports of Russian regions to carbon regulation of trading partner countries can be defined as follows, as illustrated in Figure 4 (p. 51). Conversely, as

postulated by Porter, trade restrictions and regulations may serve as a catalyst for the growth of exports from Russian regions, particularly those specializing in the production of environmentally sensitive goods.

Figure 4. Vulnerability of Russian regions to climate regulation of trading partner countries: statistical analysis of commodity and geographical structure of exports of the regions



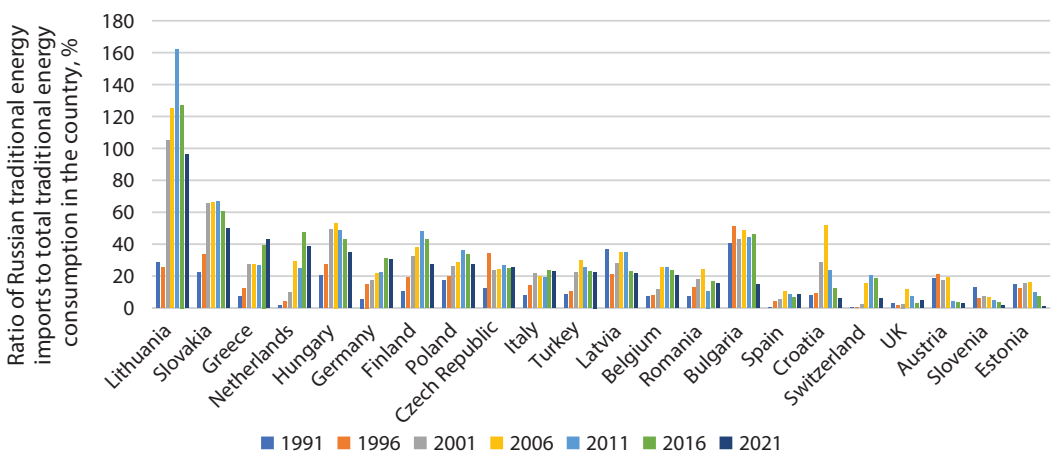
Note: the figure was constructed as follows. First, having identified environmentally "sensitive" export industries and analyzed the commodity structure of exports of Russian regions in 2013-2020, three groups of regions were identified: regions with absolute dominance of "sensitive" industries, subjects where the share is in the average range, and those where the share is minimal. It turned out that, according to the analysis of the export structure, the environmental agenda is not a challenge for 37 regions. The remaining groups included 22 regions each. In the "red zone" were those regions whose exports are not diversified and are represented by fuel, ferrous and non-ferrous metals. Secondly, the 44 "sensitive" regions were given an additional criterion—the share of trading partners with "strict" environmental policies, and we obtained three groups. We observe that 20 Russian regions are in the most vulnerable position—they supply environmentally "unsafe" products to countries that actively implement environmental measures. Hence, we conclude that for 38 Russian regions the environmental agenda may be a challenge and an export-limiting factor.

The map of Russia is shown in the borders as of September 2022.

Source: compiled by the author on the basis of Customs Statistics of Federal Districts of the Russian Federation (URL: https://customs.gov.ru/structure/regionalstructure/regional, accessed December 2023).

Secondly, in 2021, Russia was the third largest exporter of fossil fuels, with a market share of 8.3%. Over the past two decades, developed countries have constituted the largest proportion of the geographic structure of Russia's energy exports. The high dependence on Russian energy imports has been a significant concern for numerous governments (see Figure 5 on p. 52). The current policy makers' intentions to shift away from Russian imports are driven by a number of factors, including the pursuit of zero emissions, extreme economic conditions such as shocks in oil and gas markets or the impact of the global pandemic, and geopolitical considerations that have become increasingly prominent in 2022 [Perdana et al. (2022), Arndt (2023), Crowley-Vigneau et al. (2023), Chepeliev et al. (2024), Shang et al. (2024)]. The advancement of alternative energy sources is regarded as an effective strategy for curbing reliance on imports of Russian energy carriers. In light of these considerations, the global energy transition process presents a number of risks for regions that have developed a specialization in the production of fossil fuels [Sokhanvar and Sohag 2022].

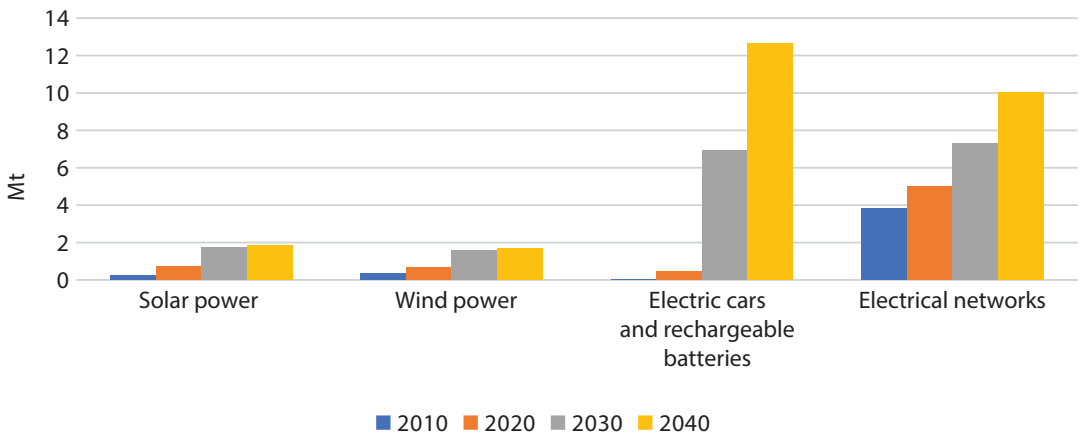
Figure 5. Dependence of trading partner countries on Russian traditional energy imports in 1991-2021, %



Source: compiled by the author based on International Energy Agency (IEA) (URL: https://www.iea.org/reports/national-reliance-on-russian-fossil-fuel-imports/which-countries-are-most-reliant-on-russian-energy, accessed December 2023).

Third, while energy exporters are at risk, the global energy transition opens up new growth opportunities for mineral producers in Russian regions. Mineral resources such as cobalt, nickel, lithium, iridium, palladium, platinum, zinc, copper and uranium in Russian regions are in demand in the context of alternative energy capacity production in trading partner countries (see Figure 6 on p. 53). Thus, given Russia's resource potential, a number of regions can make a significant contribution to the global energy transition trends and increase their exports [Cherepovitsyn and Solovyova 2022; Chupina 2022; Cherepovitsyn et al. 2023].

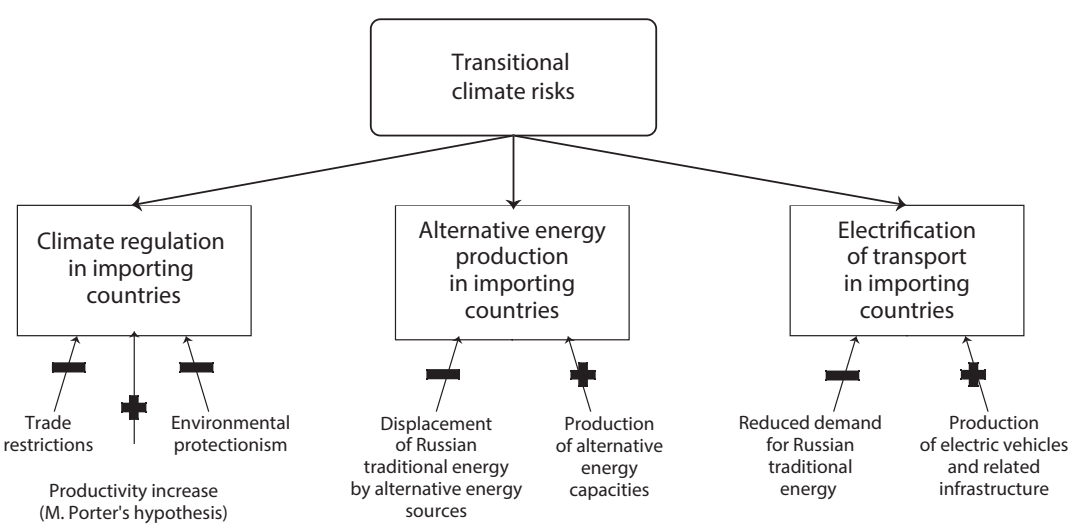
Figure 6. Dynamics of demand for mineral raw materials for the production of clean energy technologies in 2010-2040



Source: compiled by the author according to IEA (URL: https://www.iea.org/reports/the-role-of-critical-minerals-in-clean-energy-transitions/mineral-requirements-for-clean-energy-transitions, accessed December 2023).

The determinants of transitional climate risks for exports of Russian regions can be summarized as follows—see Figure 7 (p. 53).

Figure 7. Determinants of transitional climate risks for Russian exporters

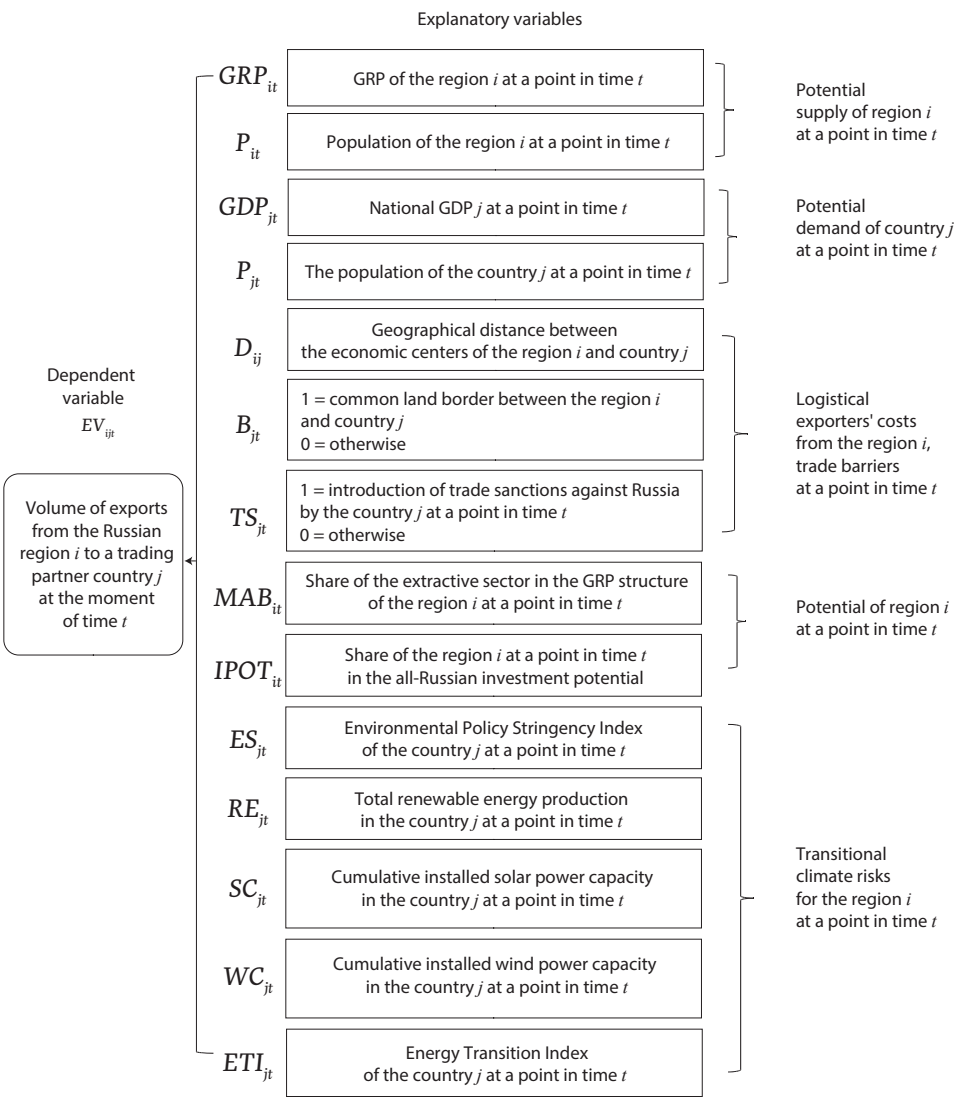


Source: compiled by the author.

3. Research methodology

The paper answers the research question about the impact of transitional climate risks on the exports of Russian regions using econometric modeling tools. The theoretical basis of the study is the gravity model of international trade. For the purposes of the study, the traditional gravity equation is modified as follows—see Figure 8 (p. 54).

Figure 8. Empirical model



Note: $i = 1, ..., 84$ (Russian exporting regions), $j = 1, ..., 204$ (foreign trading partner countries), $t = 2013, ..., 2021$ (period of analysis). Data sources for dependent and explanatory variables: EV_{ijt} (Federal Customs Service: Regional Customs Departments, https://customs.gov.ru/structure/regional), GRP_{it}, P_{it},

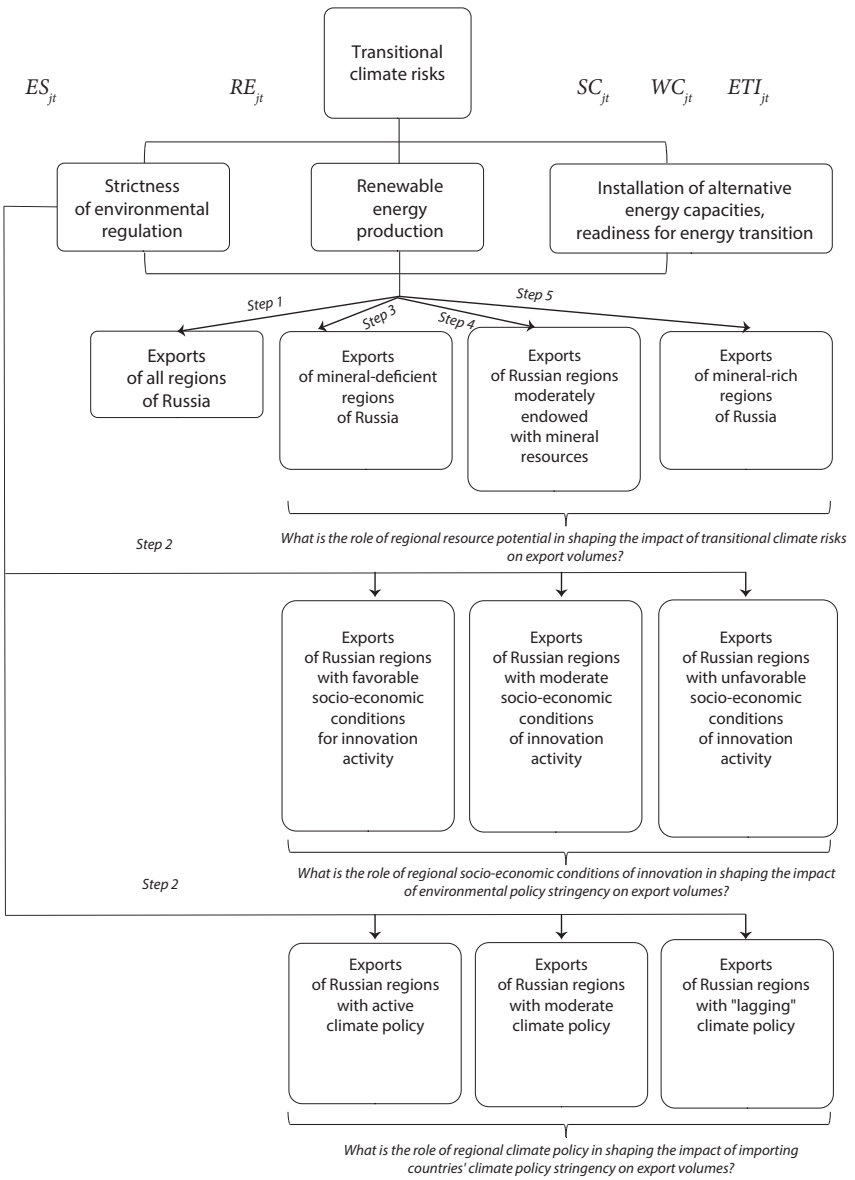
MAB_{it} (Rosstat, https://rosstat.gov.ru/folder/210/document/13204/), P_{jt} (WDI, https://data.worldbank.org/indicator/SP.POP.TOTL?y), D_{ij}, B_{ij} (author's calculations based on Google Maps), TS_{jt} (Syropoulos et al. 2023), $IPOT_{jt}$ (RAEX, https://raex-rr.com/regions/investment_appeal/investment_potential_of_regions/2020/), ES_{jt} (OECDstat, https://stats.oecd.org/Index.aspx?DataSetCode=EPS), RE_{jt} (Energy Institute Statistical Review of World Energy, https://ourworldindata.org/grapher/modern-renewable-prod), SC_{jt} (IRENA, https://ourworldindata.org/grapher/installed-solar-pv-capacity?tab=map), WC_{jt} (IRENA, https://ourworldindata.org/grapher/cumulative-installed-wind-energy-capacity-gigawatts), ETI_{jt} (WEF, https://www.weforum.org/publications/fostering-effective-energy-transition-2023/country-deep-dives-a57a63d0d5/).

Source: compiled by the author.

The export flows from each region of Russia (84) to each trading partner country (204) over the period 2013-2021 are considered as a pairwise dependent variable of the empirical model. The total number of observations is approximately 155,000. The explanatory variables are represented by five blocks, designed to capture the impact of potential supply from the region and demand in the host markets, transportation costs, trade barriers, and transitional climate risks on export volumes. In turn, transitional climate risks are represented by three key components, which are as follows: The stringency of environmental policies of importing countries (ES_{jt}), alternative energy production in host economies, installed alternative energy capacity (SC_{jt}, WC_{jt}), and the Energy Transition Index (ETI_{jt}) in trading partner countries are the explanatory variables. The study posits that an increase in the index of environmental policy stringency indicates a greater likelihood of the government implementing trade barriers to limit the competitiveness of countries without active climate policies. The production volumes of alternative energy in importing countries may be indicative of a potential reduction in demand for conventional Russian energy. In conclusion, the global energy transition process is contingent upon the utilization of mineral products to facilitate the production of alternative energy capacity and electric vehicles. Consequently, the potential demand of importing countries for mineral products from Russian regions is represented by the accumulated alternative energy capacity and the Energy Transition Index.

The study posits that the impact of transitional climate risks varies across Russian regions, contingent on their respective socio-economic characteristics and the idiosyncrasies of their climate policy. For this reason, the analysis is conducted in two principal axes. The initial approach entails evaluating the influence of each transient climate risk factor on the exports of Russian regions, with the analysis stratified by the degree of mineral endowment. The second direction of the analysis entails an assessment of the impact of the stringency of environmental regulation (one of the components of the global energy transition) on the export performance of Russian regions. At this juncture, the role of regional socio-economic conditions of innovation and climate policy in shaping the impact of climate regulation of host markets on the export performance of Russian regions is under investigation (see Figure 9 on p. 56).

Figure 9. Research methodology



Note: division of regions depending on mineral resources endowment is made by means of cluster analysis (k-means method) on the basis of Rosstat data (https://rosstat.gov.ru/folder/210/document/13204/) on the share of extractive sector in the GRP structure of the region; division of regions depending on socio-economic conditions of innovation activity is made by means of cluster analysis (k-means method) on the basis of Higher School of Economics data (https://www.hse.ru/primarydata/rir) on the index of socio-economic conditions of innovation activity; the division of regions according to the degree of climate policy development is based on data on the index of Russian regions' openness to the Green Deal (https://esg-library.mgimo.ru/publications/reyting-otkrytosti-regionov-rossii-k-zelyenomu-kursu/).

Source: compiled by the author.

The estimation of a gravity model is a challenging undertaking. The gravity model is subject to a number of econometric issues, including the presence of zero trade flows, heteroscedasticity, endogeneity, and the influence of unobserved factors [Yotov et al. 2016]. The Poisson pseudo maximum likelihood (PPML) method is an effective solution to the aforementioned issues. The method permits the incorporation of exporter and importer fixed effects, in addition to pairwise effects, into the model. This enables the control of the influence of unobserved factors. The approach employs the Poisson maximum likelihood function to estimate the gravity equation directly from its multiplicative form. Furthermore, this approach accounts for heteroscedasticity in the data, as demonstrated by Correia et al. (2019).

4. Results of empirical analysis and discussion

This study investigates the relationship between transitional climate risks and the value of exports of Russian regions using a gravity model of international trade, estimated by the PPML method. The results for the total subsample of Russian regions are presented in Table 1 on p. 57. The primary factors influencing the growth of exports from Russian regions are: The gross regional product (GRP) of the region in question, the gross domestic product (GDP) of the trading partner, the existence of a common land border between the exporting and importing regions, the availability of natural resources, and the level of investment potential are the primary factors influencing export performance. The costs associated with transportation and the implementation of trade restrictions have been identified as factors that exert a detrimental influence on the export performance of Russian regions.

A negative correlation is observed between the climate regulation of trading partner countries and the export performance of Russian regions. This dependence can be attributed to the following factors: carbon regulation acts as a trade barrier; the requirements of importing countries increase the costs of Russian exporters, which negatively affects competitiveness; Russian companies respond inefficiently to these requirements.

Table 1 also demonstrates that the influence of alternative energy generation in importing countries on the exports of Russian regions is similarly adverse, indicating the displacement of Russian energy by alternative energy sources. A similar conclusion is reached by a study conducted by Sokhanvar and Sohag (2022).

Table 1. Results of modeling the impact of transitional climate risks on export volumes of all Russian regions

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
$lGRP_{it}$	0.802*** (0.088)	0.677*** (0.069)	0.672*** (0.069)	0.680*** (0.071)	0.674*** (0.072)
$lGDP_{jt}$	0.848*** (0.035)	0.804*** (0.027)	0.758*** (0.020)	0.755*** (0.021)	0.772*** (0.021)
lP_{it}	0.008 (0.070)	0.069 (0.061)	0.050 (0.062)	0.063 (0.062)	0.049 (0.064)

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
lP_{jt}	-0.138* (0.017)	-0.045* (0.014)	-0.066* (0.014)	-0.046* (0.014)	-0.059* (0.013)
lD_{ij}	-1.536*** (0.074)	-1.583*** (0.042)	-1.559*** (0.041)	-1.555*** (0.046)	-1.509*** (0.046)
$l(1+B_{ij})$	0.862*** (0.221)	0.676*** (0.129)	0.752*** (0.129)	0.661*** (0.132)	0.713*** (0.143)
$lMAB_{it}$	0.315*** (0.123)	0.268*** (0.016)	0.263*** (0.016)	0.270*** (0.016)	0.271*** (0.017)
$lIPOT_{it}$	0.362** (0.135)	0.491*** (0.094)	0.508*** (0.095)	0.490*** (0.090)	0.505*** (0.099)
$l(1+TS_{jt})$	-0.951*** (0.123)	-0.666*** (0.089)	-0.731*** (0.088)	-0.757*** (0.088)	-0.608*** (0.099)
lES_{jt}	-0.341** (0.099)				
lRE_{jt}		-0.140*** (0.010)			
lSC_{jt}			0.030* (0.010)		
lWC_{jt}				-0.010* (0.006)	
$lETI_{jt}$					-0.189 (0.164)
Pseudo R^2	0.580	0.652	0.673	0.640	0.510

Note: *** - significance at 1% level, ** - significance at 5% level, * - significance at 10% level. Models 1-5 show the impact of transitional climate risks on the export volumes of Russian regions. Since transitional climate risks are considered in different aspects, 5 different models were formulated. Model 1 reflects the impact of environmental regulation stringency. Model 2 is designed to assess the role of renewable energy production in trading partner countries. Models 3, 4, 5 analyze how readiness for energy transition in importing countries affects exports.

Source: calculated by the author.

Table 1 illustrates a negative correlation between the climate regulation of trading partner countries and the export earnings of all Russian regions. However, based on the findings of the literature review, the study posits that the stringency of climate policy may also contribute to the export growth of some Russian regions.

The empirical analysis permits the conclusion that the stimulating effect is observed in the case of regions with favorable conditions for innovation activity and active climate policy (see Table 2 on p. 59). When the innovation potential is considered separately, a positive effect is observed for regions such as the Republic of Tatarstan, Moscow, St. Petersburg, Sverdlovsk Oblast and Tomsk Oblast. Conversely, a negative effect is observed in Altai Krai, Bryansk Oblast, Zabaykalsky Krai, Kurgan Oblast, and other regions. With regard to the role of climate policy, a positive effect is observed in the case of Sakhalin Oblast, Sverdlovsk Oblast, Tomsk Oblast, Ulyanovsk Oblast, Khanty-Mansi Autonomous Okrug, and Yamalo-Nenets Autonomous Okrug. The negative effect is observed in the

case of Amur Oblast, Voronezh Oblast, Lipetsk Oblast, and others. Firstly, the developed innovation environment of the region allows companies to respond effectively to regulations and requirements. In point of fact, companies in such regions are presented with considerable opportunities to implement environmental innovations, technologies, and qualitative changes in products. Moreover, due to the higher labor productivity observed in these regions, firms are able to internalize environmental costs in an efficient manner. Our findings corroborate those of Costantini and Mazzanti (2012). Secondly, the implementation of climate regulation in importing countries has a negligible impact on regions that have their own environmental initiatives in place, as the products manufactured by firms in these regions already comply with the majority of environmental requirements. Furthermore, the implementation of active regional climate policies can facilitate export diversification and the development of new markets. This result lends support to the findings of Wang et al. (2022).

Table 2. Modeling results of the impact of environmental regulation strictness on export volumes of Russian regions: the role of socio-economic conditions of innovation activity and regional climate policy

Variables	The role of socio-economic conditions for innovation			The role of regional environmental policy		
	Russian regions with favorable socio-economic conditions for innovation activity	Russian regions with moderate socio-economic conditions for innovation activity	Russian regions with unfavorable socio-economic conditions for innovation activity	Russian regions with active climate policy	Russian regions with moderate climate policy	Russian regions with "lagging" climate policy
$lGRP_{it}$	1.143*** (0.307)	1.396*** (0.101)	3.222*** (0.190)	3.222*** (0.190)	0.725*** (0.154)	0.842*** (0.210)
$lGDP_{jt}$	1.066*** (0.077)	1.112*** (0.080)	0.959*** (0.258)	0.959*** (0.258)	0.914*** (0.075)	0.657*** (0.066)
lP_{it}	0.121 (0.207)	-0.882*** (0.118)	-1.108*** (0.186)	-1,108*** (0.186)	-0.536*** (0.128)	-0.168 (0.145)
lP_{jt}	0.057 (0.058)	0.166*** (0.058)	-0.021 (0.122)	-0.021 (0.122)	0.115 (0.075)	-0.002 (0.045)
lD_{ij}	-1.467*** (0.173)	-1.881*** (0.077)	-0.793*** (0.187)	-0.793*** (0.187)	-1.129*** (0.103)	-1.560*** (0.130)
$l(1+B_{ij})$	0.956*** (0.211)	0.649*** (0.178)	0.910*** (0.248)	0.910*** (0.248)	0.198 (0.081)	0.671*** (0.123)
$lMAB_{it}$	0.209*** (0.060)	0.287*** (0.030)	0.404*** (0.067)	0.404*** (0.067)	0.224*** (0.042)	0.221*** (0.031)
$lIPOT_{it}$	0.347** (0.026)	0.486*** (0.123)	-1.058 (0.629)	-1.058 (0.629)	0.961*** (0.143)	0.315 (0.207)
$l(1+TS_{jt})$	-0.604* (0.281)	-0.757*** (0.242)	-1.934* (0.789)	-1.934* (0.789)	-0.623* (0.302)	-1.056 (0.245)
lES_{jt}	0.307*** (0.120)	-1.004*** (0.194)	-0.321 (0.371)	-0.321 (0.371)	0.028* (0.016)	-0.634*** (0.190)
$Pseudo\,R^2$	0.640	0.581	0.529	0.529	0.612	0.590

Note: *** - significance at 1% level, ** - significance at 5% level, * - significance at 10% level.

Source: calculated by the author.

The results presented in Table 3 (p. 61) permit the formulation of a conclusion regarding the role of mineral resource endowment in Russian regions in shaping the impact of transitional climate risks on export volumes. The results indicate that the impact of installed solar and wind power capacity and the Energy Transition Index of the importing country have a positive impact on exports of regions that are moderately endowed and rich in mineral resources. These regions include Magadan, Orenburg, Sakhalin Oblasts, Komi Republic, Murmansk, Kursk, Sverdlovsk Oblasts, Perm Krai, Republic of Karelia, and others. The study finds that the global energy transition presents these regions with a greater number of opportunities than risks. This conclusion is consistent with the findings of a recent study by Islam et al. (2022).

Conclusion

Russian companies that are contemplating the expansion of their operations into international markets are confronted with a number of constraints, including elevated production costs, technological backwardness, and a discrepancy between the quality of their goods and the demands of the international market. In the context of the global climate agenda, Russian exporting companies are exposed to a novel category of economic risks, namely transitional climate risks.

From the perspective of the Russian economy and its exports, the global energy transition represents a significant vulnerability. This is due to the considerable contribution of the energy sector to GDP and the elevated carbon footprint associated with exports. Conversely, existing literature suggests that exports from countries with substantial mineral resources may increase during the energy transition. This is due to the fact that the production of alternative energy technologies requires the active use of mineral raw materials. Furthermore, the expansion of Russian regional exports can be attributed to another factor: the intensification of climate regulations, which are an integral aspect of transitional climate risks, compels companies to integrate green technologies into their routine operations, thereby enhancing their competitiveness.

The empirical results of the study demonstrate that, first, there is a negative relationship between the strictness of environmental regulation of trading partners and export volumes for the Russian economy. However, a stimulating effect is observed in the case of regions with a favorable innovation environment and active climate policy. Secondly, the process of global energy transition and the widespread use of alternative energy sources in importing countries serve to reduce dependence on Russian energy imports, which in turn undermines the economic stability of Russian regions that have developed a specialization in energy exports. Conversely, Russian regions with rich mineral resources, which are the primary suppliers of critical minerals essential for the production of alternative energy sources and electric vehicles, stand to gain the most from the energy transition process.

In light of these findings, recommendations can be formulated for the mitigation of risks and the exploitation of opportunities for different groups of regions in the context of the global energy transition (see Figure 10 on p. 62).

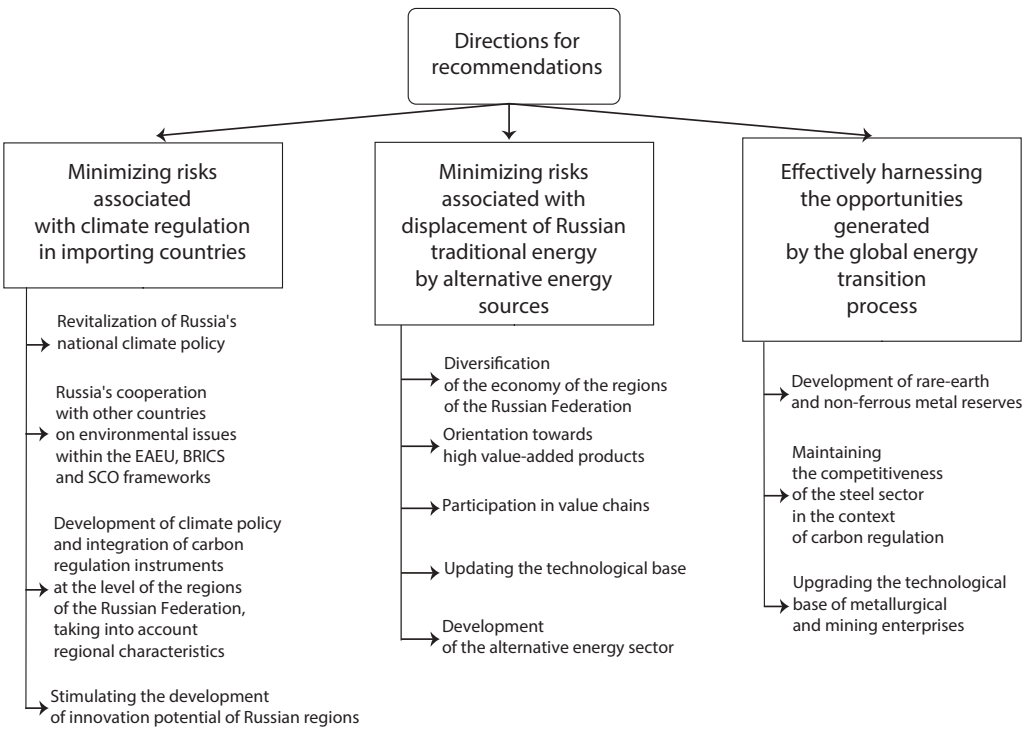
Table 3. Results of modeling the impact of transitional climate risks on export volumes of Russian regions: the role of resource potential

Variables	Mineral-deficient regions of Russia					Russian regions moderately endowed with mineral resources					Mineral-rich regions of Russia				
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 1	Model 2	Model 3	Model 4	Model 5	Model 1	Model 2	Model 3	Model 4	Model 5
$lGRP_{it}$	1.761*** (0.143)	1.420*** (0.095)	1.562*** (0.099)	1.479*** (0.099)	1.464*** (0.102)	0.700*** (0.099)	0.639*** (0.108)	0.701*** (0.112)	0.636*** (0.104)	0.526*** (0.119)	1.350*** (0.328)	1.345*** (0.291)	1.455*** (0.276)	1.352*** (0.293)	1.361*** (0.294)
$lGDP_{jt}$	0.901*** (0.038)	0.674*** (0.026)	0.729*** (0.021)	0.707*** (0.020)	0.703*** (0.021)	0.666*** (0.036)	0.721*** (0.031)	0.669*** (0.025)	0.647*** (0.023)	0.696*** (0.023)	0.928*** (0.067)	1.220*** (0.059)	0.919*** (0.059)	0.986*** (0.046)	0.979*** (0.045)
lP_{it}	-0.804*** (0.141)	-0.550*** (0.093)	-0.606*** (0.093)	-0.600*** (0.096)	-0.602*** (0.100)	0.428* (0.254)	1.098*** (0.219)	1.129*** (0.215)	1.165*** (0.222)	1.053*** (0.224)	0.647*** (0.125)	0.571*** (0.109)	0.545*** (0.111)	0.568*** (0.108)	0.593*** (0.111)
lP_{jt}	-0.120*** (0.019)	0.016 (0.014)	-0.023 (0.016)	0.033* (0.017)	-0.016 (0.013)	-0.094*** (0.019)	-0.036* (0.017)	-0.066*** (0.018)	-0.045* (0.018)	-0.043* (0.015)	-0.204*** (0.030)	-0.193*** (0.030)	-0.235*** (0.028)	-0.194*** (0.027)	-0.153*** (0.030)
lD_{ij}	-1.380*** (0.055)	-1.416*** (0.032)	-1.437*** (0.032)	-1.464*** (0.033)	-1.353*** (0.035)	-1.373*** (0.110)	-1.616*** (0.059)	-1.545*** (0.065)	-1.479*** (0.066)	-1.542*** (0.067)	-2.733*** (0.151)	-2.732*** (0.093)	-2.576*** (0.108)	-2.599*** (0.110)	-2.611*** (0.105)
$l(1+B_{ij})$	1.025*** (0.204)	1.099*** (0.127)	1.129*** (0.127)	1.035*** (0.124)	1.021*** (0.131)	1.378*** (0.289)	0.695*** (0.211)	0.786*** (0.213)	0.822*** (0.210)	0.808*** (0.232)	0.798*** (0.199)	0.604*** (0.243)	0.806*** (0.311)	0.760*** (0.102)	0.812*** (0.230)
$lMAB_{it}$	0.230*** (0.030)	0.202*** (0.020)	0.193*** (0.020)	0.199*** (0.021)	0.219*** (0.022)	1.189*** (0.193)	1.208*** (0.160)	1.225*** (0.159)	1.185*** (0.162)	1.112*** (0.160)	5.739*** (0.526)	4.942*** (0.420)	5.001*** (0.443)	5.147*** (0.449)	5.135*** (0.448)
$lIPOT_{it}$	0.030 (0.146)	0.161 (0.100)	0.031 (0.107)	0.134 (0.104)	0.162 (0.108)	1.323*** (0.321)	1.138*** (0.256)	1.264*** (0.265)	1.172*** (0.265)	1.141*** (0.269)	1.315*** (0.468)	1.596*** (0.424)	1.719*** (0.407)	1.407*** (0.430)	1.414*** (0.434)
$l(1+TS_{jt})$	-1.149*** (0.132)	-1.016*** (0.093)	-1.023*** (0.091)	-1.067*** (0.089)	-0.811*** (0.099)	-0.477*** (0.145)	-0.204*** (0.059)	-0.460*** (0.107)	-0.490*** (0.108)	-0.412*** (0.099)	-0.934*** (0.261)	-0.595*** (0.232)	-0.688*** (0.220)	-0.705*** (0.230)	-0.984*** (0.263)
lES_{jt}	-0.582*** (0.108)					-0.261* (0.101)					-0.427 (0.277)				
lRE_{jt}		-0.018 (0.012)					-0.017 (0.016)					-0.143*** (0.027)			
lSC_{jt}			-0.040* (0.011)					0.061*** (0.014)					0.145*** (0.044)		
lWC_{jt}				-0.058*** (0.008)					0.028*** (0.009)					0.155*** (0.016)	
$lETI_{jt}$					-0.883*** (0.179)					0.077 (0.259)					1.809*** (0.527)
$PseudoR^2$	0.520	0.580	0.610	0.590	0.550	0.520	0.610	0.630	0.599	0.584	0.50	0.645	0.589	0.572	0.525

Note: *** - significance at 1% level, ** - significance at 5% level, * - significance at 10% level.

Source: calculated by the author.

Figure 10. Directions of the research recommendations on minimizing risks and effective use of opportunities for exporters of Russian regions in the context of the global energy transition



The conclusions presented in this study are based on an analysis of trade flows for the period between 2013 and 2021. Therefore, the analysis of the impact of transitional climate risks on the export performance of Russian regions does not consider the period of notable intensification of geopolitical risks, which resulted in alterations to the structure and reorientation of exports. This is due to the unavailability of data on the export volumes of each Russian region to each trading partner country after January 2022. Notwithstanding the aforementioned limitations, the proliferation of carbon regulation, coupled with the advancements in the field of alternative energy and electric vehicles across an expanding number of countries, reinforce the continued relevance of the primary conclusions and recommendations presented in Figure 10, particularly in the context of the events that unfolded in 2022.

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WTO: Accumulated Problems and Prospects after MC-13

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Abstract

Building on the occasion of the regular WTO Ministerial Conference (MC-13) held in early 2024, the author reviews the initial success of this institution and then analyzes the accumulated problems of the organization and its weakening in recent years. An effective solution to these problems involves reforming the WTO. However, this is hindered by numerous disagreements among the organization's members and, above all, by the significant difference in approaches to reform between the two main actors in the global economy and trade, the United States and China. So far, the reform has progressed in small steps, which are more of a technical nature. Despite the apparent weakening of the WTO in recent years and the accumulated problems, none of its members have ever spoken in favor of terminating or limiting its activities. In a worst-case scenario in the global economy, significant damage to the WTO cannot be ruled out. Subsequently, it would be much more difficult to revive the organization than to maintain the existing one.

Introduction

In late February and early March of 2024, the 13th Ministerial Conference of the World Trade Organization (MC-13), which is typically convened biennially, was held in Abu Dhabi. The WTO is one of the largest institutions of global governance, and

its membership continues to expand, reaching 166 countries following the MC-13. Concurrently, the WTO has been the subject of repeated critical commentary in recent years.

Nevertheless, virtually all international institutions, commencing with the United Nations (UN), are the subject of criticism in the present era. The inadequacy and inefficacy of its mechanisms are now being critiqued by both ordinary diplomats and world-renowned personalities. The UN in the form in which it has functioned since its foundation "no longer corresponds to the new realities," Pope Francis wrote not so long ago in connection with the conflict in Ukraine.[1] There is a great deal of discussion surrounding proposals and demands for reform of the UN, particularly with regard to the Security Council. At the same time, there is no serious proposal to close or dissolve the UN on the grounds of its ineffectiveness. This is a reasonable position to take. However, in the case of other esteemed international organizations, such as the WTO, a similar balanced approach is not observed.

The World Trade Organization (WTO) is often referred to as "the UN for world trade." It is also noteworthy that, in terms of the number of members (166 since 2024), the WTO is comparable to the UN. Furthermore, if we consider the number of founding states, it is evident that the UN will be on the losing side, with 51 states against more than 100 at the creation of the WTO. In early March of this year, the esteemed Bloomberg agency, in a commentary on the underwhelming outcomes of the MC-13, deemed it appropriate to disseminate a report bearing the headline "The Death of the WTO Now Looks Inevitable." Additionally, the subtitle of the message was noteworthy: "Few global institutions have been so beneficial—and so comprehensively neglected."[2] It is challenging to refute this assertion. This leads to the question of why this occurred.

In the proposed article, the author aims to demonstrate that, despite the challenges encountered, the WTO should be preserved, although it will be challenging to implement the inevitable reforms to the organization.

How the WTO became a victim of its own success

At the turn of the twentieth and twenty-first centuries, the notion was put forth that the GATT/WTO system had, over time, become "a victim of its own success." The following is a summary of the factors that contributed to this success. In the 1920s, the world was struck by the Great Depression, the first global economic crisis of the 20th century. The realization of its lessons by the advanced countries by the early 1940s resulted in the formulation of the principles of non-discrimination. This represented a profound shift in the international economic order, marking a departure from the historical practice of pursuing one's own prosperity at the expense of others. It became evident

[1] Mares, C., 2022. Pope Francis: We are witnessing the 'impotence' of the UN in the Ukraine war. *Catholic News Agency*. April 6. Available at: https://www.catholicnewsagency.com/news/250898/pope-francis-we-are-witnessing-the-impotence-of-the-un-in-the-ukraine-war

[2] The Death of the WTO Now Looks Inevitable. *Bloomberg*. 2024. March 8. Available at: https://www.bloomberg.com/opinion/articles/2024-03-08/world-trade-organization-s-death-is-a-momentous-error?srnd=opinion

that the economic interdependence between states in the twentieth century had reached a point where it was no longer feasible for individual countries to address economic crises in isolation. By the end of World War II in 1944, the Bretton Woods Conference, guided by the aforementioned principles of non-discrimination, set forth the objective of establishing international institutions that would safeguard the global community against the advent of economic crises with the potential to precipitate another war. Two institutions, the International Monetary Fund (IMF) and the International Bank for Reconstruction and Development (IBRD),[3] were established and commenced operations after 1945. The third, originally designated the International Trade Organization (ITO), was a more complex entity. First, a portion of the Charter of ITO (Trade Policy) was transformed into the General Agreement on Tariffs and Trade (GATT-1947), which was of a temporary nature. After nearly half a century, following eight rounds of intricate trade negotiations within the framework of GATT, it became possible to establish a comprehensive international institution: the World Trade Organization.

The decision-making process was based on consensus and the "single undertaken" principle, which ensured the reliability of the legal framework and the effectiveness of the dispute settlement mechanism. This distinction imbues the WTO with a singular character, as no other universal institution in the world has (or has yet to develop) such a mechanism. Since 1995, the WTO has recorded over 600 cases of trade disputes. Notably, the United States has been a prominent participant in these disputes, frequently raising objections to the WTO. The importance of the WTO's dispute settlement mechanism is widely acknowledged, including by those who are opposed to globalization. It is this mechanism that ensures the realization of the task initially conceived at Bretton Woods: the assurance of security in international trade and economic relations.

Thus, the organization's success can be attributed to its adherence to established rules and the efficacy of its dispute settlement mechanisms, which have contributed to its enhanced international prestige and rapid growth in membership.

The establishment of the WTO occurred concurrently with the "golden age" of globalization, which spanned the 1990s. Following the fall of the Berlin Wall, the barriers to direct and mutually beneficial collaboration between erstwhile ideological adversaries vanished. In his conceptualization of these epochal changes that occurred in the world on a philosophical level, Francis Fukuyama proposed the concept of "the End of History." It is regrettable that the initial years of the 21st century have witnessed a shift in perspective regarding the uninterrupted, mutually advantageous international collaboration that characterized the globalization of the 1990s and the concept of a "win-win game."

The success of the WTO, established by the end of the twentieth century, has not spared it from problems. Among the most acute are the following:

- crisis of the decision-making system in the WTO with a significantly increased number of members of the organization;
- as a consequence of the previous one—a serious slowdown in the WTO's function of generating new rules needed by changing trade;

[3] IBRD — International Bank for Reconstruction and Development, hereinafter the World Bank.

- Protectionism, especially its new forms, as well as economic sanctions inconsistent with the spirit and letter of the WTO have become the most serious challenge to the WTO since the beginning of the 21st century. The coming to power of D. Trump in the United States in 2017 was marked by an unforeseen surge of protectionism and a tendency to depart from the WTO rules for national security reasons [Portansky, The Imperative 2019].

Problems that remain unresolved

Crisis of the decision-making system in the WTO with a significantly increased number of members of the organization. The WTO has inherited from the GATT the system of decision-making through the consensus mechanism, which is currently the most sensitive problem facing the WTO.

In the context of consensus, member countries are able to assert their sovereign equality. This is not always the case in the context of voting, as the economic and political weight of a given state may influence the outcome. Nevertheless, the consensus mechanism allows each member state to prevent a decision from being made. The consensus mechanism functioned effectively during the GATT era, when the number of negotiators was limited to a few dozens. Among them, developed states held a dominant position, pursuing similar goals. The situation is markedly different when the number of participants exceeds 150, with at least two-thirds of them being developing states, often casting a protest vote. In such circumstances, the process of consensus-building has become a challenging and arduous one.

In 2003, at the regular Ministerial Conference in Cancun (Mexico), the issue reached a critical point. Due to the inability to reach consensus on pivotal agenda items, the conference concluded unsuccessfully. As Robert Zoellick, the then US trade negotiator, observed, the split in Cancun was not between rich and poor countries, but between those who are capable of real negotiations *(can-do countries)* and those who simply do not want to negotiate *(won't-do countries)*. In other words, in recent years and decades, consensus has effectively transformed into an unrestricted veto right within the WTO. This enables any participant to obstruct a decision, despite the fact that a substantial number of member countries are in favor of it.

However, consensus remains a unique way to ensure the legitimacy of WTO decisions, especially in the dispute settlement procedure. As a result, there is a certain "institutional deadlock." The way out of this impasse is obviously to be found through the institutional reform of the WTO.

The problem of a serious slowdown in the WTO's function of generating new rules for trade should be seen as a direct consequence of the crisis in the organization's decision-making system.

For the majority of the second half of the twentieth century, the GATT was well suited to the task of regulating trade, performing three basic functions: balanced mutual liberalization of markets; negotiated rulemaking; and diplomatic settlement of trade disputes. The fundamental structure of international trade can be described in a relatively straightforward manner: "Produce goods here, sell them abroad." With the

advent of the 21st century, the nature of trade underwent a significant transformation. The movement of goods and services across borders, while still a prominent feature, gave way to a new phenomenon: the relocation of entire industries. Consequently, in addition to the movement of goods, there are also flows of investments, ideas, know-how, and labor across national borders. Furthermore, the advent of these new areas has highlighted the necessity for the establishment of trade rules that did not previously exist.

The WTO was established with the objective of setting up new rules in 1995. However, these expectations of it have not been fully fulfilled. In nearly three decades of the WTO's existence, member countries have only succeeded in concluding a single comprehensive multilateral agreement: Trade Facilitation Agreement.[4] The absence of contemporary regulations is evident in a number of domains, including the governance of trade in global value chains (GVCs), the utilization of green energy, international investment, monetary policy, and, more recently, the regulation of digital markets and artificial intelligence.[5]

In order for these new rules to emerge within the WTO, it is necessary to prioritize the relevant issues on the Doha agenda and facilitate a change in the current structure. However, this is not a straightforward process, as it is impeded by a considerable number of member countries (predominantly developing countries) who are adamant that all items on the original approved agenda must be fulfilled before new issues can be addressed. Consequently, the absence of timely rule generation undermines the efficacy of the WTO, as it renders it less effective.

A new phase of rising protectionism after Trump came to power in the United States and the tendency to depart from WTO rules on national security grounds. The protectionist policy of the Trump administration has deviated significantly from the principles of trade policy pursued by all previous administrations, beginning with that of Franklin Roosevelt. These principles have historically included consistent liberalization of markets, respect for international trade rules, and the establishment of multilateral regulatory institutions, most notably GATT/WTO [The Economist 2017].

A series of statements by representatives of the Trump administration indicated Washington's willingness to disregard WTO rules if they impede the realization of the country's national interests. Additionally, Washington's highly subjective interpretation of the GATT/WTO provision on the threat to national security, which resulted in an increase in import duties on steel and aluminum in 2018, prompted a sharp negative reaction from the United States' closest trading partners [Portansky, D. Trump, 2019].

The United States' trade conflict with China, which was driven by Washington's objective of impeding China's economic ascendance, has underscored the question of whether the WTO is equipped to address the emerging challenges in global trade. The initial indication that a favorable response was unlikely emerged with the early resignation of the previous WTO head, Brazilian Roberto Azevêdo, in the spring of 2020, citing personal circumstances [DG Azevêdo 2020]. For experts, the rationale behind

[4] The Trade Facilitation Agreement (TFA) was signed at the 9th WTO Ministerial Conference in Bali, Indonesia in December 2013.

[5] In November 2022, the EU Digital Markets Act entered into force, and in March 2024, the European Parliament adopted the Artificial Intelligence Act.

this unprecedented decision was evident: the seasoned and esteemed diplomat, having discerned that the WTO's existing instruments were inadequate to halt the trade conflict between the United States and China, opted to depart discreetly, avoiding any further compromise to his reputation. Azevêdo was correct in his assessment that the WTO lacked the requisite authority to halt the trade conflict. This could be considered the moment when the WTO's relative weakness became apparent.

The US–China trade war provides perhaps the most compelling illustration of the dramatically increased influence of geopolitics on trade in the 21st century. Further evidence of this phenomenon can be observed in the consequences of technological decoupling between the US and Chinese economies; tensions between Washington and Beijing over Taiwan; and the negative impact of new industrial policies of major countries on trade. For example, the EU has expressed significant discontent with the US Inflation Reduction Act of August 2022, which has had a detrimental effect on the EU economy.

In the contemporary era, the most prominent economic actors are pursuing policies that directly contravene the established norms of the World Trade Organization (WTO). Such instances are not uncommon. Notable examples include the United States' restrictions on semiconductor supplies, China's restrictions on the export of rare earth metals, and the practice of "friendshoring," which involves limiting the trade of resources with specific countries. The aforementioned example is arguably the most striking. Treasury Secretary Janet Yellen has repeatedly stated her desire to follow the principle of "friendshoring,"[6] that is, to trade with countries that share common values with the United States. Such actions, however, would constitute a direct violation of the fundamental principle of international trade, namely the mutual granting of Most-Favored Nation (MFN) treatment, as enshrined in the WTO's founding principles.

A recent development has been the emergence of a concerning trend in the perceptions of leading countries regarding the practice of imposing trade barriers. In late March and early April of 2024, the Office of the US Trade Representative (USTR) published a report on "Foreign Trade Barriers" [Office of the United States Trade Representative Ambassador Katherine C. Tai 2024]. As indicated in the report, the USTR has adopted a revised methodology for identifying trade barriers. The report acknowledges that all countries, including the United States, possess the sovereign right to pursue an independent trade policy that is guided by national interests. This thesis is clearly indicative of the recent trade policy approach adopted by the Trump administration, which has been characterized by a flagrant disregard for WTO norms. The USTR report serves to confirm the tendency for countries to freely interpret GATT/WTO national security provisions [Smeets 2014]. Such an approach could result in the uncontrolled proliferation of trade barriers imposed under the pretext of substantial national security interests, which would undoubtedly give rise to a significant new problem. In the absence of prompt action by the WTO, the international trading system is at risk of being subjected to further disruptive influences.

[6] Yellen calls out China's trade practices during South Korea visit. 2022. July 18. Available at: https://www.business-standard.com/article/international/yellen-calls-out-china-s-trade-practices-during-south-korea-visit-122071801525_1.html

The question thus arises as to whether there is a way out of this situation. There is a solution, but it will require a lengthy process of reforming the WTO. It is widely acknowledged that this is a necessary step. However, the initiation of reform is currently precluded by the absence of a fundamental prerequisite: the convergence of the United States' and China's positions on the substance of the proposed reforms.

Why reforming the WTO is harder today than it was yesterday

The need to reform the WTO was discussed shortly after the organization began functioning at the turn of the twentieth century. All WTO participants are interested in WTO reform, and the issue has been on the agenda of all recent WTO Ministerial Conferences in one way or another.

The stalemate in the Doha Round negotiations, the inability to resolve the US–China trade dispute through the WTO's existing instruments, and the new areas of trade that have emerged over the three decades of the WTO's legal framework in the form of the Uruguay Round agreements all call for new rules to be agreed at the multilateral level. But different countries have different economic priorities and approaches to solving these problems, and finding compromises in WTO negotiations tends to be a lengthy process. At the same time, the later one starts to reform the WTO, the more time-consuming it will be, as the organization's legal framework grows and becomes more complex over time.

In the second decade of the 21st century, it has become clear that the state of the global economy and trade is largely determined by two players—the United States and China. Accordingly, it is possible to raise the question of the practical start of WTO reform only in the event of a significant convergence of approaches to the issue of these two parties. So far, no such convergence has been observed.

The US has repeatedly expressed its dissatisfaction with the existing rules and their application in areas such as competition policy and intellectual property rights, which Washington believes are being violated with respect to US business in China. The US is particularly concerned about the position in the WTO of a large group of countries that once joined the organization with developing country status and continue to consider themselves as such, even though many of them have made significant progress in a number of economic sectors and have even surpassed some developed countries. At the same time, a number of developing countries have opaque trade policies. As a result, these WTO members enjoy de facto privileges that are unjustified from Washington's point of view, blocking progress in the development of new WTO rules and further liberalization. And the main US claims among this group of countries are directed precisely at China. The Chinese economy, as representatives of the US administration have repeatedly emphasized, has huge advantages over the US economy because of the privileges it has acquired earlier [Meltzer 2023].

By insisting on its demands, the US side is actually blocking from the very beginning any progress in the consultations on WTO reform, which have barely begun, and making their fulfillment a condition. This is undoubtedly contrary to the very spirit and traditions of multilateral negotiations within the GATT/WTO framework that have developed over many decades, not to mention the fact that it once again calls into question

the long-term leadership of the United States in these negotiations. At the same time, the US position has some merit. In this regard, the example of the suspension of the Appellate Body (AB) in the WTO dispute settlement system from the end of 2019 is characteristic. As Vladimir Ilyichev, Deputy Head of the Ministry of Economic Development of the Russian Federation, commented on the results of MC-13, it cannot be said that the US criticism of the Appellate Body is completely unfounded. Some of the American arguments are valid: at the Appellate Body stage, the conclusions of arbitration panels were easily refuted, and sometimes interpretations of WTO rules were made that were far from the original meaning of the rules. And this stage itself has often been used by the losing party simply as an opportunity to prolong the proceedings, while leaving in place the measures found to be inconsistent with WTO rules during the course of the dispute. However, the tactic chosen by the US to "suspend" the appointment of arbitrators in the AB, thus freezing its work, made all other participants of the organization hostage to its ambitions [WTO Documents Online 2024].

Thus, the essence of Washington's approach to WTO reform is to eliminate the unjustified, outdated privileges of a group of developing countries, which today effectively paralyze trade negotiations and the multilateral trading system as a whole. This approach is understandable, but only partially justified. At the same time, Washington is trying to maintain its image as a staunch supporter of WTO reform.

Regarding China's position on WTO reform, in late November 2018. China's Ministry of Commerce published a document explaining its position. It emphasizes three main principles: safeguarding the fundamental values of multilateral trade, protecting the interests of developing member countries, and respecting the practice of decision-making through a consensus mechanism [Zhu 2019]. Particular attention is paid to the second principle. Trying to remain the main defender of the interests of developing countries in the WTO, China emphasizes the need to preserve its privileges, in particular the SDT regime[7] in the WTO, which directly contradicts the main demand of the United States, supported by the European Union.

Despite the impressive size of its economy, China remains a developing country, Chinese representatives insist. The country has yet to lift millions of its citizens out of poverty.

In response to Washington's repeated accusations that China does not meet the criteria of a market economy and that its market is closed, Beijing, on the one hand, recognizes the importance of further deep reforms and expanding openness in the economy, but on the other hand, rejects the US recommendations on "three zero trade," meaning zero tariffs, zero market barriers and zero subsidies, qualifying them as completely unfair to China as a developing country [Ghosal Singh 2019].

At the same time, China, not wanting to remain in the position of an apologist, makes a number of claims against the United States. For example, according to the Chinese side, the slogan of the US administration under Trump "America First" undermines the basic principles of the WTO—MFN and National Treatment. Similarly, the Chinese

[7] SDT—Special and Differential Treatment, which was established for developing countries when the WTO was created, allowing them to reduce the level of their obligations (for example, on import duties) upon joining the WTO.

side criticizes Washington's well-known abuses with national security exemptions from trade rules and unilateral measures to protect its market, which is essentially outright protectionism. All of this is incompatible with WTO rules and undermines the established rules-based system in trade, according to the Chinese government [Zhong Nan, Ren Xiaojin 2019].

According to the above-mentioned government document, the PRC attaches the utmost importance to preserving the principle of consensus in WTO decision-making, which is in principle consistent with its position on preserving the privileges of developing countries. This approach undoubtedly provides Beijing with support from the latter. On the contrary, the approach of the developed countries to the WTO reform, especially the European Union, is to overcome the consensus mechanism or to transform it into a form of voting. As many studies have shown, the WTO will not be able to function effectively in the future without transforming the consensus mechanism [Elsig, Cottier 2011].

While expressing support for WTO reform, the Chinese side has so far confined itself to rather general statements emphasizing the importance of the inviolability of the WTO's basic principles and rules. It seems unlikely that Beijing will be willing to respond unconditionally to Washington's demands to abolish existing privileges for developing countries that are WTO members. On the contrary, China is more likely to emphasize the need to fight against protectionism that threatens free trade.

It is also important to note that there are different views among Chinese scholars on China's participation in WTO reform. For example, according to Pan Zhongying, director of the Institute of Maritime Development at the Ocean University of China and professor emeritus at the Macau University of Science and Technology, China should not insist on developing country status and privileges in the WTO because it is not in the country's interest to remain in the position of India and other developing countries. Instead, it should turn to positive and constructive coordination of WTO reform efforts with the United States, the EU and Brazil, which would undoubtedly promote China's greater participation in global governance as a whole [Ghosal Singh 2019].

Analyzing the approaches of the US and China to the WTO reform, one cannot but mention the initiative of the European Union, which can be considered as reconciliatory in the context of the existing contradictions between the US and China.

A list of concrete proposals (the Concept Paper) for WTO reform was put forward by the European Union in late summer and early fall 2018 [European Commission 2018]. This position was supported by Canada and a number of other states that formed the so-called Ottawa Group. The proposed concept outlines three key areas of reform:

- Aligning WTO rules with today's global economy;
- Strengthening the role of the WTO in monitoring trade;
- Overcoming the looming impasse in the WTO dispute settlement system.

As noted above, the search for compromise in WTO negotiations is not an easy task and usually takes a long time. This directly affects the organization's "reform" agenda. However, some progress has been made. In the two years since the last MC-12, serious progress has been made in reforming the so-called day-to-day work of the WTO. This involves, for example, making it easier for members of the organization to access information on newly adopted regulatory measures affecting trade. New digital tools are

being introduced and user-friendly electronic databases are being created. Of course, all this is rather technical and does not address the fundamental problems of reform. Nevertheless, small steps are being taken toward the goal.

A modest but important outcome of MC-13

At the MC-13, held in Abu Dhabi at the beginning of the year, no new agreements were signed, and this was not unexpected given the known weakening of the WTO in recent years. This weakening is due to a number of factors, including the accumulation of problems, existing disagreements between members of the organization, and current geopolitical risks. In light of these circumstances, the mere adoption of the final Ministerial Declaration (which was not achieved at the MC-11 in 2017) and the positive decisions on select agenda items should be regarded as an acceptable outcome.

Consequently, the MC-13 adopted a decision acknowledging the advancements made toward the establishment of a comprehensive and efficacious dispute resolution system, accessible to all members by 2024. The Ministers directed their Permanent Delegations in Geneva to expedite deliberations on this matter.

The subject of electronic commerce has been a significant item on the WTO agenda for several decades. The negotiations on the pertinent agreement are conducted in a plurilateral format, which implies that not all WTO members are involved. The drafting process has been relatively slow in recent years, given the novelty of this area for the WTO. Concurrently, numerous jurisdictions (the United States, the European Union, and China, for example) have already established national regulatory norms in this domain. However, these norms frequently contradict one another at the conceptual level. Toward the end of 2023 and the beginning of 2024, the pace of negotiations accelerated considerably, with a potential for completion by the end of this year.

Russia, like numerous other members of the organization, has put forth the proposition of either establishing a moratorium on customs duties on electronic transfers as a permanent measure or, at the very least, extending it, as has been the case at several previous ministerial conferences in succession. Nevertheless, a number of significant developing countries, including India, have thus far impeded the progression of such resolutions. The Indian representatives have advanced the argument that the termination of the moratorium would create opportunities for developing countries to increase their fiscal revenues, which could then be utilized for industrialization purposes. However, a significant challenge lies in the fact that there is no consensus among member countries regarding the precise definition of "electronic transmissions," which is the actual subject of the duties in question. Consequently, there is a concern that such duties could be employed as an instrument of unfair competition. As a consequence of the deliberations at MC-13, it was resolved that the moratorium on customs duties on electronic transmissions should be extended once again until the next conference. As V. Ilyichev elucidated, the aforementioned moratorium is currently the sole "special" WTO agreement pertaining to the domain of electronic commerce.

Another significant item on the agenda is the formulation of an accord on investment facilitation, the drafting of which commenced at MC-11 in Buenos Aires. The document

to be elaborated should serve to supplement the WTO legal package in the form of a plurilateral agreement. As articulated by the Russian delegation, the objective is to facilitate access for Russian investors to the markets of developing countries by reducing the burden of unnecessary administrative barriers. Concurrently, Russia's involvement in this agreement will contribute to enhancing the confidence of investors from allied countries in the Russian market. Nevertheless, some of Russia's BRICS partners (India and South Africa) remain circumspect about the prospect of an agreement. The work on the investment facilitation agreement will continue in Geneva.

The anticipated advancement on fisheries subsidies for the implementation of the associated agreement and the agreement on agriculture was not attained. Negotiations on these and other matters will likewise continue in Geneva.

As anticipated, the MC-13 endorsed the accession of two new members to the WTO, namely Comoros and East Timor. Among the post-Soviet republics, Azerbaijan, Belarus, Turkmenistan, and Uzbekistan are currently engaged in the accession process to the WTO.

Conclusion

In conclusion, it should be emphasized that despite the criticism of the WTO in recent years and its apparent weakening, no representative of a member state has ever advocated the termination or restriction of the organization's activities. When such statements, including those of a scandalous nature, about the impending "death of the WTO" are made by individual politicians, it is important to understand the context in which they are made. Rather than focusing on the organization's activities, it is more useful to examine the specifics of the current political situation in that country. For example, in the United States, Trump's statements against the WTO during his first mandate, which were used again in 2024, can be understood in the context of the nuances of the pre-election presidential race.

It is, of course, not impossible that the WTO could suffer significant damage in the worst-case scenario. The potential for such an outcome is heightened by the possibility of global trade fragmentation and the likelihood of Trump assuming power in 2025. He has already articulated positions that could have a detrimental impact on the system of international trade rules [Stein 2024]. Such an outcome will inevitably result in significant losses for states and the global economy. Should the WTO suffer, the question of its revitalization will inevitably arise. Nevertheless, it will be considerably more challenging to achieve this than to maintain the status quo of the existing organization.

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Digital Trans-Boundary Initiatives of the ASEAN Economic Community as a Tool for the Development of Singapore's Economy

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Abstract

This article seeks to clarify the potential for digital collaboration between the Republic of Singapore and its partners in the Association of Southeast Asian Nations (ASEAN) within the framework of the ASEAN Economic Community (AEC) as a means of stimulating economic growth in Singapore. The paper traces the features of economic modernization of the Republic of Singapore and assesses the efficiency of its approach to digital transformation of its economy. The article reveals Singapore's approach to the integration initiatives undertaken by ASEAN, with a special focus on AEC. It also identifies the possibilities of providing effective digital support for multilateral trans-boundary economic projects within the ASEAN framework. The latter is analyzed through the prism of infrastructure development and digital competencies in ASEAN countries as well as the specifics of their regulation of cross-border digital flows and the development of data centers. Special attention is paid to the role of global value chains (GVCs) in Southeast Asia (SEA) as a key success factor behind ASEAN

cross-border digital projects. The authors argue that negative integration, a cornerstone of ASEAN economic regionalism initiatives, undermines the digital transformation of the ongoing projects. This ultimately constrains Singapore's capacity to leverage the cooperative frameworks and mechanisms established with its AEC partners to diversify and strengthen the foundations of its domestic economic growth. The study's relevance is premised upon two factors: the timeliness of its focus on the digital cooperation between ASEAN countries ahead of the second completion of the ASEAN Economic Community establishment, scheduled for 2025, and the limitations of the modernization strategy implemented by the Republic of Singapore amidst its sixtieth anniversary of independence. The scientific and practical significance of the study stems from its focus, as the possibilities of "resetting" the Singaporean version of new industrialism in synergy with the policy of the Republic of Singapore towards the ASEAN Economic Community, as well as the implementation of multilateral cross-border digital projects by the Association, have not yet been an area of research by Russian and foreign scholars.

Introduction

The Republic of Singapore is one of the four so-called "Asian Tigers"—economies that have moved "from the Third World to the First World" with the help of a development model based on export promotion with an optimal combination of state support and market mechanisms. However, since the early 2000s, the growth rate of the Singaporean economy has slowed down, necessitating a search for alternative instruments of economic development that are not contingent on exports.

The Singaporean leadership identifies the digital transformation of the economy and society as a key instrument for economic development. Participation in integration initiatives, including digital ones, undertaken under the auspices of the Association of Southeast Asian Nations is a significant component and simultaneously a direction of Singapore's policy [The Ministry of Trade and Industry 2023; Singapore Declaration 2024].

Nevertheless, the realities of integration in Southeast Asia indicate that ASEAN lacks effective instruments to digitalize large cross-border initiatives and enhance their impact. Moreover, Singapore demonstrates a greater degree of digital maturity than the majority of its ASEAN partners. It would be unwise, therefore, to exaggerate the impact of the ASEAN Economic Community and its digital initiatives on the Republic of Singapore's ability to acquire additional development tools.

The objective of this article is to assess Singapore's capacity to leverage ASEAN multilateral initiatives and their digital components as a means to enhance the competitiveness of its economy, particularly in light of the country's ongoing economic modernization.

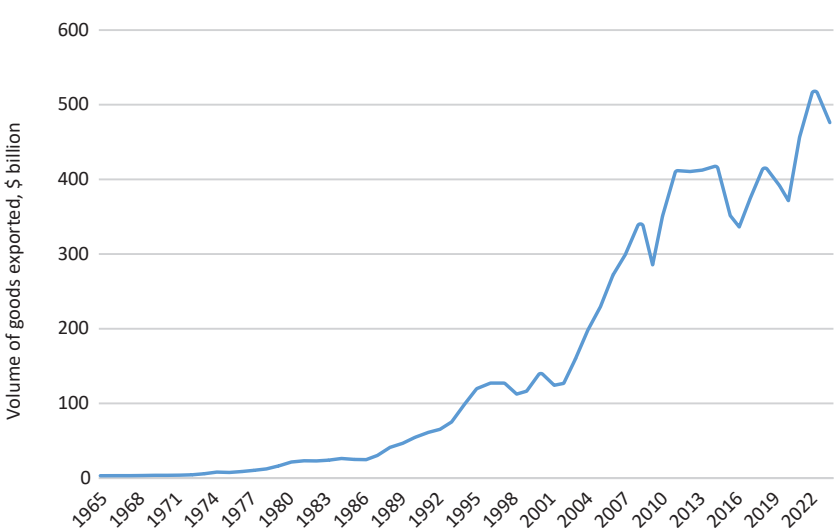
The research methodology is based on statistical and comparative analysis. It aims at identifying key trends in Singapore's economic development and to assess the interim results of its public policies, in particular, support for digital tools and practices.

The paper starts with a qualitative and statistical analysis of the distinctive features of the Republic of Singapore's economic development, with a particular emphasis on its digital component. Then, the authors clarify the role of the ASEAN Economic Community in Singapore's external economic policy, particularly in terms of its potential for leveraging ASEAN integration mechanisms as a driver of economic growth. The third section focuses on the potential for the unification of digital cooperation in Southeast Asia, which is a crucial factor in the successful implementation of ASEAN multilateral projects and a stimulus for the development of the Singaporean economy. The final section summarizes the foregoing analysis.

Economic development of the Republic of Singapore and its digital dimension

Following its independence in 1965, Singapore started a process of economic modernization. Due to its geographical features and inherent limitations, including a relatively small population (in 1965, the city-state had a population of 1.9 million), Singapore opted for a strategy of fostering the growth of export-oriented and technologically-advanced industries. One of Singapore's key advantages, both at the time and in the present period, is its geographical location, which facilitated the development of logistics and re-exports, as well as shipbuilding. Additionally, a deficit-free budget, a stable exchange rate for the Singapore dollar, and a high mandatory reserve ratio for commercial banks were crucial factors.

Figure 1. Singapore's merchandise exports in 1965–2023, $ billion

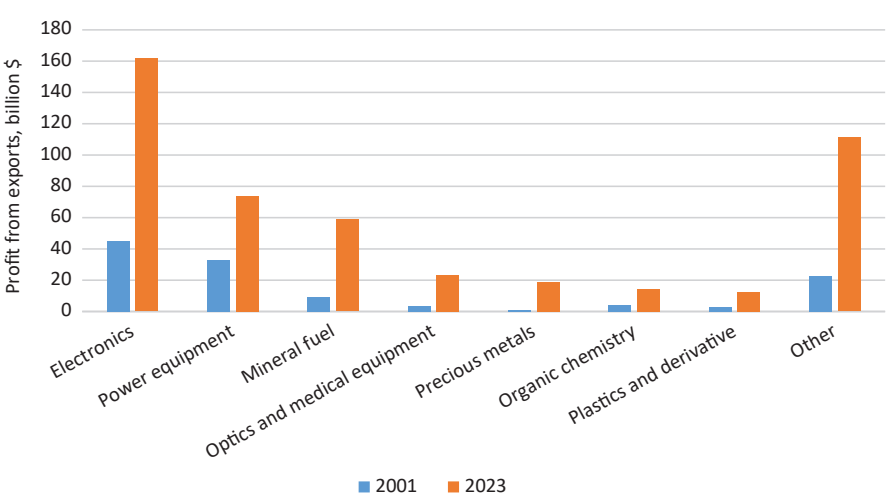


Source: UNCTAD.

In such circumstances, the Singaporean government opted for the advancement of large state-owned enterprises and the establishment of supportive financial structures. In addition to the favorable geographical location and cheap labor, the Singaporean government sought to attract foreign investors by reducing taxes and ensuring the transparency of legislation. Consequently, in 1968 Texas Instruments [National Library Board] commenced semiconductor production on the island, and in 1969 another American company, National Semiconductor [NTU Singapore], followed suit. This policy of attracting foreign manufacturers, reinforced by parallel programs of infrastructure construction, ease of doing business, and person-power training, yielded positive results: between 1976 and 1999, Singapore's merchandise exports grew from $6.6 billion[1] to $114.7 billion, a 17.4-fold increase (see Figure 1 on p. 81), with an average annual growth rate of 14.4%. From 2001 to 2023, there was a fourfold increase in merchandise exports, with an average annual growth rate of 7.1%.

The attraction of foreign manufacturers for the needs of Singapore's industry, as well as the service sector, primarily banking and insurance, enabled the city-state to facilitate the development of linked industries and, most crucially, human capital, thereby enhancing the quality of the workforce. In Northeast Asia, Hong Kong, Taiwan and the Republic of Korea implemented similar modernization strategies. During the 1970s and 1980s, the non-communist countries of Southeast Asia, which, along with Singapore, joined ASEAN, also began to attract foreign investors with the objective of developing production on their territory, relying on the availability of cheap labor resources. These factors incentivized Singapore to increase its effort and, in the 1970s, the country began to implement an export-oriented economic model. The latter focused on the production and supply of high-value-added products to the global market, including electronics, energy equipment, petroleum products, chemical products, and a number of other items (see Figure 2 on p. 82).

Figure 2. Export revenue of Singapore's main commodity groups in 2001 and 2023, $ billion.

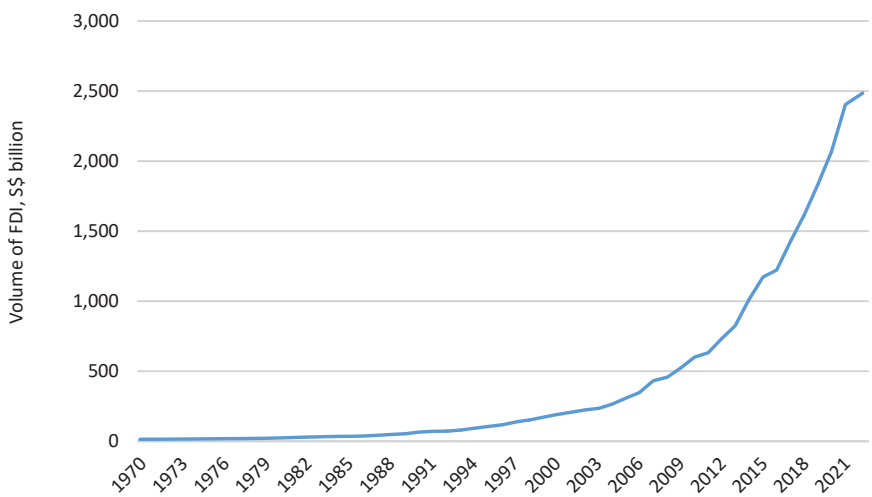


Source: Trademap.

[1] US dollars, unless noted otherwise.

The industrialization of Singapore has been a notable success, reflecting the country's transformation into the most economically developed nation in Southeast Asia. The dynamics of attracting foreign direct investment (FDI) into the economy of the Republic of Singapore provides compelling evidence to support this assessment. From 1979 to 2000, foreign investment in Singapore's equity capital increased 20.7 times, with an average annual growth rate of 16%. In the subsequent period (from 2000 to 2022), the volume of investment grew 13.9 times, with an average annual growth rate of 13% (see Figure 3 on p. 83). Concurrently, the majority of investment was allocated to holding structures, computer, electronics and optics industries, and retail trade [Department of Statistics Singapore 2024a].

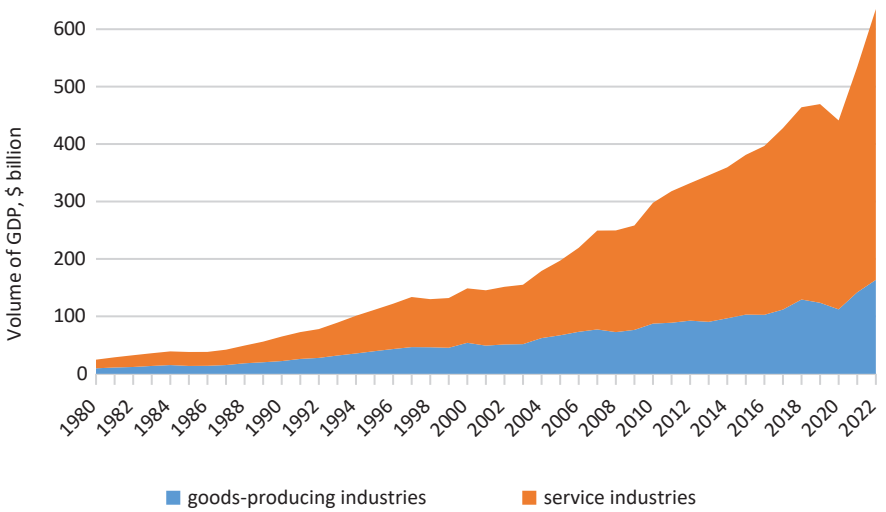
Figure 3. Year-end cumulative FDI in Singapore from 1970 to 2022, S$ billion.



Source: Department of Statistics Singapore, 2024b.

A significant factor contributing to Singapore's economic prosperity has been the stability of its financial system. This has been a key focus for the country's leadership, who have demonstrated a commitment to enhancing this stability through various measures. Consequently, due to the prudent management of accumulated reserves and the adept deployment of financial resources, the country not only demonstrated resilience encountering the Asian financial and economic crisis of 1997-1998 and the global financial crisis of 2008 [Singapore Government, SG101 2024], but also witnessed a notable expansion in accumulated foreign direct investment (FDI). Without competing with other East Asian economies, the Republic of Singapore is able to attract an increasing volume of financial flows, technological and managerial know-how, thereby enhancing its status as a regional industrial, financial, and logistic hub. The efficacy of this strategy is demonstrated in Figure 4 on p. 84. Since 2004, there has been a notable expansion in the service sector and its contribution to GDP, while the industrial sector has continued to demonstrate growth. This is indicative of the efficacy of Singapore's policy of prioritizing the development of its financial and banking sectors.

Figure 4. Growth and composition of Singapore's GDP at current prices in 1980-2022, $ billion



Source: Department of Statistics of Singapore, 2024c.

Nevertheless, a series of economic challenges have been emerging in the Republic of Singapore over an extended period. A persistent source of vulnerability has been and continues to be lack of agricultural production [International Trade Administration 2024b] and natural resources, including fresh water [International Water Association 2024]. It is also noteworthy that the country is highly dependent on imports and that exports play a disproportionately large role in its economic growth. Additionally, Singapore is facing growing competition from other regional transportation and logistics hubs, primarily located in Thailand and Malaysia. These hubs are developing their capabilities based on China's Belt and Road Initiative, which is a significant challenge for Singapore.

The aforementioned factors impede the further economic development of the Republic of Singapore, compelling its leadership to identify alternative sources of growth. There are compelling reasons for this assessment. The proportion of GDP contributed by the service sector has increased markedly since 2003 (Figure 4). From 2000 to 2023, the average annual growth rate of total GDP (in 2015 prices) was 4.8%, while from 1976 to 1999, GDP grew at an average annual rate of 7.6% [Singapore Department of Statistics 2024d]. Importantly, the growth rate was affected by major economic crises, namely those of 1997, 2000, and 2008-2009. However, their impact was insignificant, with the exception of a 2.2% contraction in 1998. The contraction in 2001 was 1.1%, while the growth in 2008 was 1.9%. In 2009, the annualized growth rate was 0.1% [Singapore Department of Statistics 2024d]. With regard to GDP dynamics, the impact of these crises was discernible in only three of the 24 years under consideration (2000-2023).

This factor leads to the conclusion that the decline in GDP growth rates, while they were generally positive, was due to other factors. For example, a decline in industrial

output in the manufacturing sector [S&P 2023] and competition from developing Asian countries may have contributed to this decline. This period also saw the development of human capital and high-value-added industries, as well as an inflow of foreign investment [Max Alston, Ivailo Arsov, and others 2018]. Similarly, the decline in growth rates was evidenced by the indicator of value added per employee, both for the economy as a whole and for the majority of industries in Singapore. From 1984 (the earliest available data point) to 1999, the average annual growth rate was 4.1%. However, between 2000 and 2023, it declined to 1.9%. This demonstrates a decrease in the output efficiency of the economy (Singapore Department of Statistics 2024 data). In this context, digital services and technologies have emerged as a significant competitive advantage, contributing to the positive growth trajectory of Singapore's GDP. In 2023, the ICT sector ranked among the top three sectors with the highest growth rates [Ministry of Trade and Industry 2024].

Singapore occupies the fifth position in the Global Innovation Index, which was achieved in 2018 [Analytical Center under the Government of Russia 2018]. This index considers not only economic factors but also social aspects, the extent of infrastructure development, and the evolution of markets. It encompasses the majority of macroeconomic indicators, thereby facilitating a comprehensive evaluation of the country.

In considering digital tools as new sources of economic growth, the leadership of the Republic of Singapore has identified two key points. The first point to note is that the emergence and development of these sources are not so much related to internal factors, namely Singapore's own policies, as to external factors. Secondly, Singapore must enhance its capacity to leverage these factors by developing digital tools.

From an external perspective, the establishment and expansion of digital cooperation between Singapore and its partners will assist in addressing a number of significant challenges the city-state is facing. The advancement of digital technologies in the agro-industrial sector (commonly referred to as "AgriTech") has the potential to mitigate the severity of the food crisis in Southeast Asia, thereby enhancing Singapore's resilience to disruptions in the supply of essential resources such as fresh water and food. As previously mentioned, Singapore lacks its own agricultural capabilities, making it particularly vulnerable to external factors influencing the availability of these resources. The reformatting of global value chains in the region along with deepening Sino-American tensions over technology (ranging from "China + 1" to "China + many") with effective digital support will make these chains more resilient, thereby enabling Singapore to at least partially hedge risks. The participation of Singaporean companies, including MSMEs, in cross-border digital projects will enable these firms to perform tasks requiring a high level of skill without incurring significant costs. The latter are rising rapidly. In September 2023 and March 2024, the Government of the Republic of Singapore increased the salary threshold requirements for hiring foreign talent from S$4,500 to S$5,000 and from S$5,000 to S$5,600, respectively [HKTDC Research 2024].

Most importantly, the digital transformation of society will enable the Republic of Singapore to fully benefit from China's Belt and Road Initiative (BRI). Singapore

represents the nexus of the Silk Road Economic Belt (where the China-Indochina Economic Corridor culminates, connected by the Kunming-Singapore railway) and the 21st-century Maritime Silk Road. As the BRI encompasses not only transportation but also industrial collaboration, the activation of which is underway in varying degrees across the countries of Southeast Asia, particularly Indochina, it will undoubtedly place significant workload on Singapore's port infrastructure, generating substantial revenue. In the development of the Digital Silk Road, China places a significant emphasis on the provision of digital support for BRI-related projects.

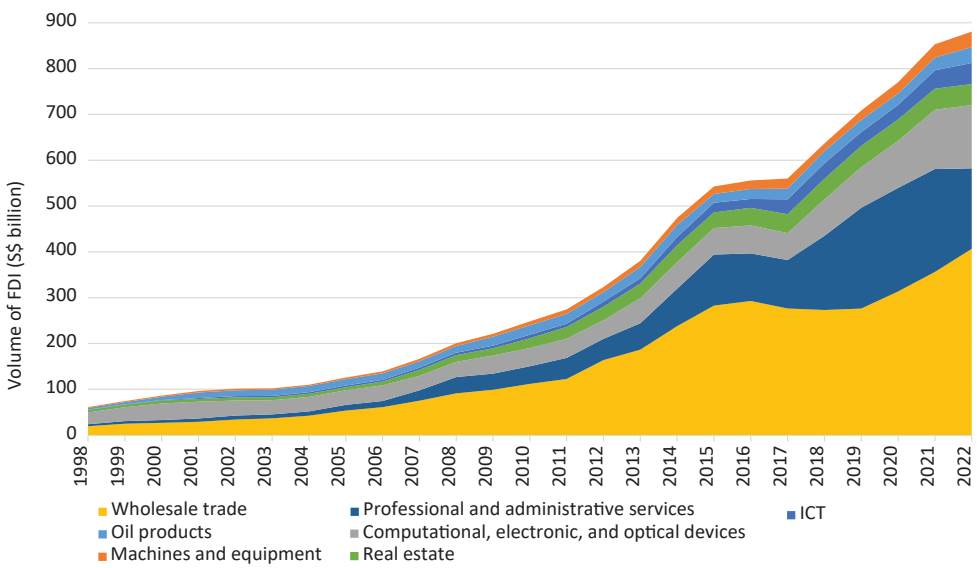
In light of these considerations, the Republic of Singapore aims to use digital tools to stimulate its developmental processes. Notably, the country has established a robust record of accomplishment in this field since the 1980s. The rationale behind this decision was a necessity to address multiple challenges, mostly relating to the competition for foreign investment with neighboring countries. These states are, on average, dozens of times larger than Singapore in terms of population, and offer increased opportunities for the development of labor-intensive industries. Without attempting to completely review most significant programs and initiatives, we will focus on the key on-going program: The Smart Nation, launched in 2014. As a result of its implementation, the Republic of Singapore has become one of the global "centers of excellence" in the field of digital transformation.

Firstly, the country was among the first in the world to provide internet access to nine out of ten households, with an internet penetration rate of 96% in 2022 [World Bank 2024]. Secondly, Singapore has developed an effective economic management structure, primarily through government-affiliated companies developing digital programs both domestically and internationally. Third, the digital transformation of the economy and society has achieved a substantial and, more importantly, an expanding footing. The share of the gross domestic product (GDP) attributed to the information and communication technology (ICT) sector in Singapore increased from 3.1% in 2000 to 6.1% in 2022, according to data from the Department of Statistics of Singapore (2024d). The economic impact of Singapore's digital transformation, including the ICT sector itself and digital support for the rest of the economy, was estimated at S$106 billion in the Singapore Digital Economy Report (2023). The implementation of programs, notably the Singapore Digital Government Blueprint in 2018, has facilitated the digital transformation of the public sector, trade, finance, industry and logistics of the Republic of Singapore. This has enabled the economy to achieve an average annual growth in the volume of value added from digital support of 12.9% from 2017 to 2022 [Singapore Digital Economy Report 2023].

The success of the Republic of Singapore in digital transformation is further evidenced by many additional examples. In 2022, the technology adoption rate among micro, small, and medium-sized enterprises reached 94.3%, defined as the use of at least one digital service by a company [Department of Statistics of Singapore 2024d]. The active adoption of digital services is facilitated by the construction of data centers (DC). In 2023, Singapore had 100 DCs, which accounted for 7% of the city's total electricity consumption. Additionally, there were approximately 2,000 cloud service providers and 22 network infrastructure clusters [ASEANBriefing 2023]. Commercially attractive

solutions in the energy sector, including tools for smart demand monitoring, demand optimization, and household efficiency improvement are if special note. The digital twin of Singapore's power grid serves as an illustrative example of these solutions. Consequently, the implementation of digital solutions across all sectors of the city's economy, encompassing public services, the private sector, and transnational corporations, has become widespread. The Smart Nation program has emerged as a pivotal driver of investment inflows into the Singaporean economy, as illustrated in Figure 5 on p. 87.

Figure 5. FDI dynamics in the top seven[2] industries in Singapore by FDI volume, S$ billion

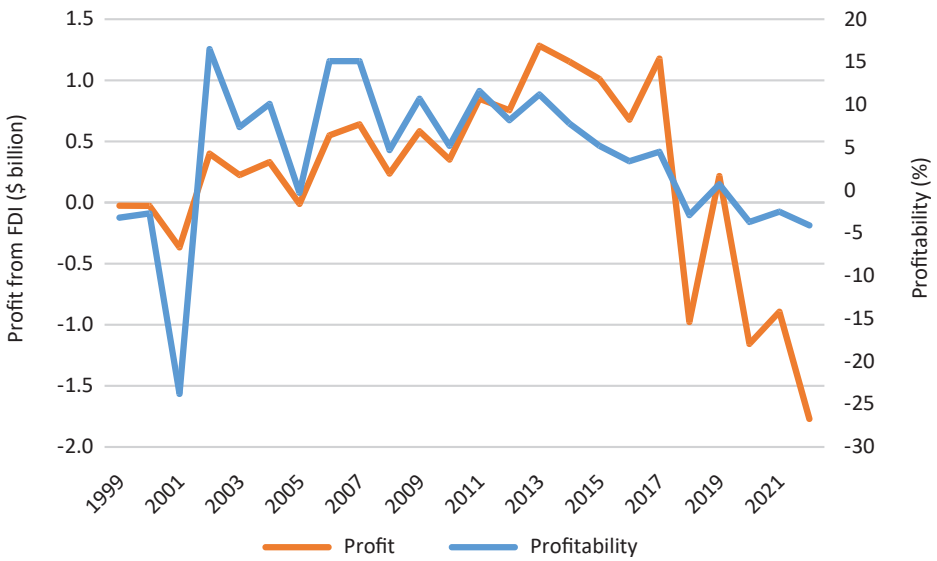


Source: Department of Statistics of Singapore, 2024e.

Nevertheless, the Republic of Singapore encounters a natural limit to the efficiency of digital transformation instruments. This is due to the negative dynamics of profitability and income derived from foreign direct investment (FDI) in the information and communication technology (ICT) sector, as illustrated in Figure 6 on p. 88. The fact that the introduction of digital technologies into Singapore's economy is largely conducted by state-linked companies has the effect of reducing the inflow of investment. To illustrate, 55% of Singtel's shares, one of the largest companies in the Republic, whose 5G network covered 95% of Singapore in 2022 [International Trade Administration 2024a], are owned by Temasek Holdings, which, in turn, is owned by the Singapore government [Temasek Review 2023]. Furthermore, a narrow market in comparison to neighboring countries acts as a natural barrier to the growth of return on investment.

[2] Excluding holding companies.

Figure 6. Yield and income from FDI in Singapore's ICT sector, % and $ billion



Source: Department of Statistics Singapore, 2024fg.

The aforementioned factors lead to several assessments. The digital transformation of the economy of the Republic of Singapore is progressing at a rapid pace, encompassing not only information and communication technology but also traditional sectors of the economy. Nevertheless, a number of distinctive features of Singapore, primarily the lack of opportunities to amplify economic impacts due to its narrow domestic market (which, for purposes of clarification, denotes the volume of demand, in this case from prospective Internet users), serve as intrinsic constraints to digital transformation. This prompts Singapore's leadership and corporate sector to seek growth opportunities beyond the country's borders.

One such area is cooperation with countries in Southeast Asia within the framework of the ASEAN Economic Community. This is aimed at establishing a unified space for industrial and commercial activities in the region, and more recently, facilitating the expansion of cross-border cooperation in the digital space. This is particularly attractive to the Republic of Singapore, given both the high level of its inclusion in the processes of digital transformation and the transition of the global economy to a new technological paradigm.

The ASEAN Economic Community in the policy of the Republic of Singapore

Cooperation with ASEAN partners has historically been a primary focus of the Republic of Singapore. The decision to establish the ASEAN Free Trade Area and the rescheduling of the ASEAN Community establishment from 2020 to 2015 were both made during Singapore's ASEAN Chairmanship. In 2002, Singapore proposed the establishment of the

ASEAN Economic Community [Grzywacz 2021]. It is recognized that the principal factor contributing to the success of the ASEAN Economic Community is the establishment of a unified production and commercial space in Southeast Asia. In light of this, the Republic of Singapore is committed to supporting initiatives that contribute to narrowing intra-ASEAN development gaps. Notably, the ASEAN Integration Initiative, which commenced efforts to harmonize infrastructural development across Southeast Asia, was adopted in 2000, when Singapore acted as ASEAN Chair [ASEAN Secretariat].

Singapore has consistently been a step ahead of its ASEAN partners in undertaking joint multilateral initiatives. A case in point is Singapore's participation in the establishment of the China-ASEAN Free Trade Area (CAFTA), which was signed in 2002 and entered into force in 2010. In addition, the Republic of Singapore concluded a bilateral free trade agreement with China in 2008 [Ministry of Commerce 2024]. Furthermore, Singapore's emphasis on moving from the ASEAN consensus principle in economic decision-making is indicative.[3] Such a shift could potentially facilitate the implementation of agreements. In general, the Republic of Singapore finds it advantageous to accelerate ASEAN economic integration processes by means of joint development of large-scale cross-border projects.

Nevertheless, the Republic of Singapore has to consider the economic realities of Southeast Asia. First and foremost, there are no GVCs established by enterprises of Southeast Asian countries that produce a multiplier effect on ASEAN multilateral projects (except those in the garment and footwear production sector). In the 1960s and 1980s, enterprises in non-communist Southeast Asian countries primarily engaged in trans-boundary activities within Japanese global value chains. Subsequently, the Association began to develop its own multilateral initiatives based on negative integration tools. The promotion of intra-industry and inter-firm cooperation through negative integration alone is insufficient for making a high-tech ASEAN product (like, for instance, an automobile, a smartphone, or another) or an ASEAN-wide tourist destination through the establishment of interconnected tourism clusters and their supporting infrastructure (Southeast Asia has been and remains an attractive destination for international tourism).

The absence of cross-border GVCs is behind the insufficient development of international transport and logistics cooperation in Southeast Asia and the varying degrees of readiness of the regional countries. With regard to the development of transport infrastructure, Southeast Asia remains a fragmented space. The implementation of major trans-boundary projects, including the ASEAN Highway Network, the establishment of a single market for sea and air transportation, and other transport and logistics initiatives, have been and continue to be hindered by the reluctance of ASEAN countries to transfer the issues of transport-related policy to the supranational level [Glazatova, Avetisyan, Aleshin 2023].

Secondly, the ASEAN Business Advisory Council (ASEAN BAC) has not responded to initial expectations. The objective of this dialogue platform is to establish incentives

[3] See also: Wong, J., Tan, K.S., Mu, Y., Tong, S., Lim, T.S., 2009. Study on Singapore's Experience of Regional Economic Cooperation. *Research Collection School of Economics,* No 6. Available at: https://ink.library.smu.edu.sg/cgi/viewcontent.cgi?article=2177&context=soe_research

for the corporate sector of Southeast Asian countries, including micro, small, and medium-sized enterprises, to facilitate cross-border commercial exchanges. However, the instruments of negative integration, on which the Association premises its multilateral projects, do not pressupose the establishment of long-term inter-firm cooperation. Consequently, regular meetings, sessions, seminars, and other forms of establishing and developing professional contacts in the format of the ASEAN BAC have been held on a regular basis. However, this has not resulted in a notable increase in the scale and quality of business relations. Similarly, Singapore's government-business dialogue platforms have not fulfilled their potential to facilitate the entry of ASEAN enterprises into each other's markets.

Thirdly, the Association did not find it expedient to establish its own international commercial arbitration and mediation body, based on the experience of the Singapore International Arbitration Centre (SIAC), a global "center of excellence". International commercial arbitration offers several advantages to the corporate sector, including confidentiality, a possibility to select arbitrators independently, the finality of decisions, and their binding character. A distinctive feature of SIAC is a transition from commercial arbitration to commercial mediation. This approach entails the reconciliation of the parties involved in the dispute resolution process, should they opt for such a course of action. As the Republic of Singapore hosts the headquarters of many large companies, including those from Asia-Pacific countries, Singapore and SIAC are attractive due to their well-deserved and nearly ideal business reputation. As the AEC is a large-scale and long-term project, the establishment of an ASEAN international commercial arbitration center would be in the best interests of the Association.

China's Belt and Road Initiative and the US-centric Indo-Pacific Economic Framework Agreement (IPEF) exert considerable and, most importantly, growing influence on the AEC establishment and the Republic of Singapore's related plans. With regard to ASEAN, it is evident that the BRI brings a significant degree of politicization into ASEAN economic agenda, whereas the IPEF undermines ASEAN's capacity to act as a unified entity. Specifically, by providing assistance to Southeast Asian countries in the construction of expensive and long-term infrastructure projects, Beijing compels the Association and its member states to address regional security challenges, primarily the South China Sea issue, in a way that is advantageous to China.[4] With regard to the IPEF, as seven of the Association's ten countries are IPEF members, ASEAN plans are affected negatively, since it impedes the investment in and commercial attractiveness of Southeast Asia.

Projecting this onto Singapore's interests, several points are noteworthy. As ethnic Chinese account for 76.2% of Singapore's population [Singapore Academy of Corporate Management 2024], and the country is the unofficial capital of the Chinese business community in and beyond Southeast Asia, the Republic of Singapore actively participates in the BRI implementation. Simultaneously, Singapore is a member of the IPEF, which represents the economic aspect of the IPR project. The architects of this project initially did not deny its anti-Chinese character, as evidenced by Boroch, Voda, and colleagues (2020). This adds a significant degree of politicization to regional economic cooperation,

[4] For more details, see: Kanaev, E.A., Liu Xintao, 2022. Asia-Pacific Security Systems: Dynamics and Factors of Development. *Southeast Asia: Actual Problems of Development*, Vol. 2, No 2 (55). P. 11-25.

which is not conducive to Singapore's interests, given its dependence on the global economic development.

Another complicating factor is that, as yet, ASEAN countries have not created their own GVCs and tools for their upgrade. As a result, ASEAN enterprises are dependent on the ongoing models and practices. To substantiate, the COVID-19 pandemic altered priorities from a focus on speed and punctuality of deliveries (*just-in-time*, implies flexibility in inventory management, ideally minimizing inventory stores) to a focus on their stability and security (*just-in-case*, emphasizes the creation of additional, often excessive inventory stores). A substantial proportion of the logistics infrastructure is beyond Southeast Asia. Consequently, ASEAN enterprises have to adhere to the regulations established by external actors, namely those operating beyond the ASEAN area. Furthermore, they are at a disadvantage in terms of developing their own production and technological links and carrying out joint projects. These include the establishment of joint reserve facilities and emergency funds, production alliances, guarantee mechanisms of GVC transparency, etc. Additionally, a joint ESG agenda and numerous other initiatives are cases in point. These developments have a detrimental impact on Singapore's interests, as the country has considerable experience in these areas.

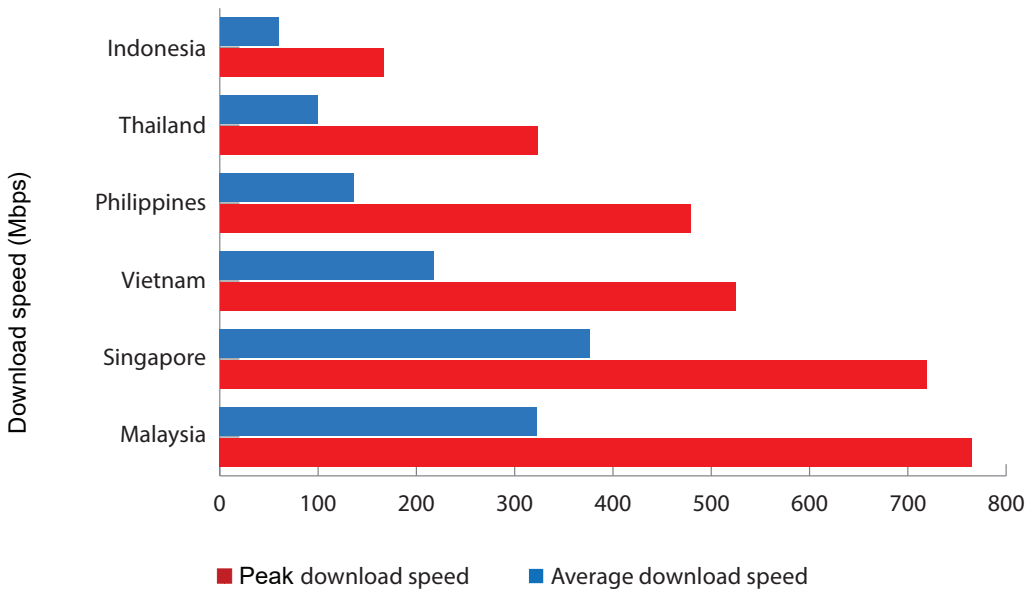
In general, ASEAN lacks a unified industrial policy that would facilitate making Southeast Asia a unified manufacturing and commercial area with a multiplier effect for its member states and a positive impact on the Republic of Singapore. The more so since Singapore can assume a pivotal role in the development, branding and promotion of an ASEAN-made product or service in the global market. Therefore, it is reasonable to question whether the instruments of the ASEAN Economic Community will give the development of the Republic of Singapore a powerful impetus.

Obstacles to the Implementation of ASEAN Digital Projects

Is it plausible that the constraints of ASEAN integration, as previously discussed, could be even partially offset by digital tools, thereby enabling Singapore to expand its resources through involvement in ASEAN's multilateral digital initiatives? There have been many such initiatives, commencing with the ASEAN Framework Agreement on Digitalization in 2000. Nevertheless, practical considerations suggest that the successful implementation of such initiatives is unlikely. This is due to a number of factors, including intra-ASEAN gaps in infrastructure development and digital competencies, as well as difficulties in establishing a unified legal framework in Southeast Asia.

Concerning infrastructure development, it is essential to acknowledge the persisting disparities in internet access across the Southeast Asian (SEA) countries. The most recent data from the ASEAN Statistical Yearbook [ASEAN 2023a] indicate that in 2022, the proportion of the population in the Southeast Asian countries with access to internet services ranged from 98.2% in Brunei to 44% in Myanmar. However, in the latter case, the issue is not infrastructural but political. A more illustrative example is the state of the 5G internet (data for some ASEAN countries are not available) (see Figure 7 on p. 92).

Figure 7. Average and peak 5G download speed in ASEAN countries in 2023, Mbps



Source: Statista, OpenSignal.

A considerable gap between Singapore and its ASEAN counterparts (with the exception of Malaysia) in these indicators impedes the effective advancement of cross-border digital initiatives across Southeast Asia. This includes the integration of public service systems, the implementation of sectoral educational projects, programs designed to develop micro, small, and medium-sized enterprises, etc.

Similarly, gaps in digital competencies necessary for the effective development of economic regionalism are notable among ASEAN states. A case in point is the challenge of countering cyber threats. In 2020, 21.30% of global phishing attacks went to ASEAN financial institutions, a figure that surpasses the corresponding statistics of major technology companies, including Facebook (which has been banned in Russia), Apple, Amazon, and WhatsApp.[5]

Realizing how serious the threat is, ASEAN states have yet to adopt a unified approach to address it. This is largely due to discrepancies in the level of their respective competencies (for more detail, please refer to Figure 8 on p. 93).

Another pressing issue pertaining to the implementation of ASEAN multilateral digital projects is the regulation of cross-border commercial activities in the digital space.

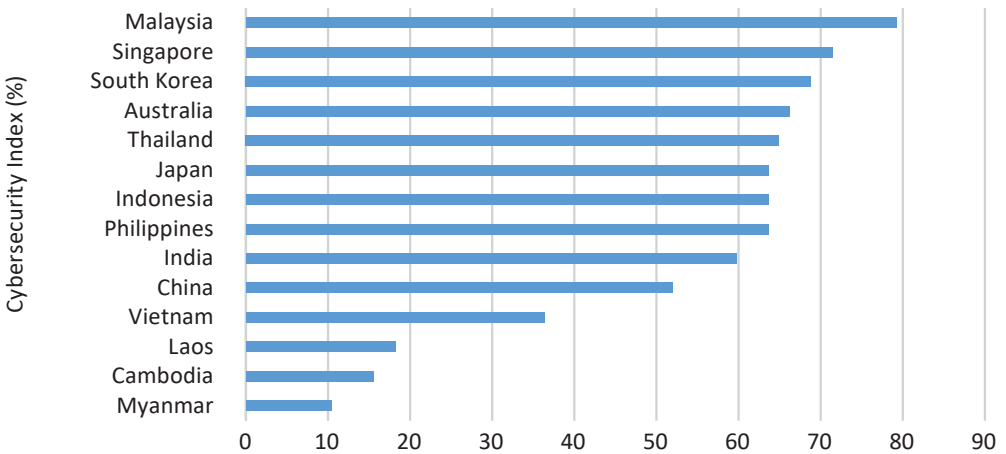
The situation in Southeast Asia is a function of the global dimension of the problem. The norms of international law that govern doing business in the Internet space lag behind practical realities.[6] Consequently, challenges in providing digital support for

[5] See Figure 9. Brands Most Targeted by Phishing Attacks. ASEAN Cyberthreat Assessment 2021. Interpol. [n.p.] P. 16. Available at: https://www.interpol.int/content/download/16106/file/ASEAN%20Cyberthreat%20Assessment%202021%20-%20final.pdf

[6] See, for example: Rozhkova, M.A., 2020. Is digital law a branch of law and should we expect the emergence of the Digital Code? *Khozyaistvo i pravo (Economic and Law),* No 4. P. 3-13 (in Russian).

economic regionalism initiatives in various regions, including Southeast Asia, remain significant. This is exemplified by data localization and the establishment of data centers in ASEAN countries.

Figure 8. SEA countries in the National Cybersecurity Index compared to some extra-regional ASEAN partners in 2023, %



Source: Statista.

The approaches of these states to cross-border data transfers differ considerably. Indonesia and Vietnam, which adopt a restrictive approach, and Singapore, which prefers a more liberal stance, are at opposite ends of the spectrum.

The government of the *Republic of Indonesia* asserts that any data with relevance to national security and government operations must be stored on servers located within the country. This also applies to public service providers that include both public and private entities operating in the financial, insurance, industrial, and social sectors.[7]

The *Socialist Republic of Vietnam* (SRV) uses a comparable approach to data localization. In April 2023, a data protection law (Decree No. 13/2023/ND-CP) was enacted, requiring that all digital service providers (e-commerce, online payments, social networks, and messengers) should store information about the SRV citizens exclusively on local servers or to establish offices in the country. The legislation stipulates specific requirements for cross-border data transfers, including the creation of an Overseas Data Transfer Impact Assessment file and notification of relevant government agencies [Sangfor 2023].

The stance of the *Republic of Singapore* is markedly different. The implementation of data localization policies is contrary to the interests of Singapore, as it hinders the formation of the scale factor and the subsequent capitalization of cross-border digital projects. With a population of 5.637 million in 2022 [ASEAN 2023b], Singapore is

[7] See also: Panday, J., Malcolm, J., 2018. The Political Economy of Data Localization. *PACO*, Issue 11(2), P. 511–527. P. 515. Available at: http://siba-ese.unisalento.it/index.php/paco/article/viewFile/19553/16635

interested in establishing and expanding cross-border data exchanges. In accordance with the Personal Data Protection Act (PDPA), which came into force in 2021, cross-border data sharing is subject to so-called "data adequacy requirements." These requirements stipulate that data sharing standards must be no lower than those currently in force in the Republic of Singapore. However, this is subject to the consent of the individual whose data are transferred. Moreover, the Singaporean government views the APEC Cross-Border Privacy Rules as a model for data transfer [Bhunia 2018].

Other ASEAN countries have not yet adopted legislation that specifically regulates data localization. Nevertheless, an analysis of their strategies for ensuring national security and promoting foreign economic activity reveals that these states are inclined to have information, including both government and commercial data, stored on national servers.

The development of data localization across Southeast Asia is inextricably linked with data centers. The interest stems from the increasing digital transformation of economic and commercial practices and the cooperation with China in the implementation of the Digital Silk Road. The advent of the COVID-19 pandemic provided a substantial impetus to the DC development.

There are numerous examples of close attention that ASEAN countries pay to DC development. In Malaysia, the responsibility for overseeing this process is shared by several agencies whose activities are aimed at making the country more attractive to global digital companies, including Amazon Web Services (AWS), Microsoft, GDS, Equinix, Yondr, and several others [Singh & Naharu 2023]. *Thailand* and *Indonesia* have set forth ambitious plans for the development of their data centers. The former anticipates becoming a digital corridor between India and China in collaboration with major global players in the ICT sector [Onag 2021]. The latter stakes on its population and aims to control 40% of the regional data center market by 2025 [Vietnam Plus 2021]. Additionally, the *Philippines* is engaged in the development of data centers, with these facilities integrated into the infrastructure component of its national vision plans [Business World 2023].

Of particular interest is the case of *Vietnam*, which is striving to enhance its digital and international competitiveness while simultaneously strengthening its cybersecurity (through data localization laws) and pursuing a green development agenda. While the achievements of *Laos, Cambodia, Myanmar*, and *Brunei* have thus far been limited, their endeavors to incorporate the development and maintenance of data centers into subregional collaboration initiatives (as evidenced by the establishment of a data center in Nay Pyi Taw in September 2022 as part of the implementation of the Lancang-Mekong project [Xinhua 2022]), including in cooperation with intra-regional companies, businesses, are noteworthy.

It is evident that the *Republic of Singapore* has made significant advancements in the development of its data centers. Singapore has adapted to this direction by leveraging previously created and well-functioning non-digital resources, including political stability, ease of doing business, tax incentives, and numerous FTZs that serve as platforms for testing various cutting-edge digital cooperation practices. Consequently, Singapore, which has fewer data centers than some other ASEAN countries, is engaged in the process of creating DCs and optimizing their functionality (it is not appropriate

to make comparisons between Singapore and Indonesia for multiple reasons). Data centers are a significant factor behind Singapore's competitiveness as a global business hub, incentivizing multinationals to establish their headquarters. These factors increase the interest of both Singaporean and foreign businesses in investing in Singapore's data centers, despite the limiting factors of the country's small size, high cost of electricity, etc.

The collective impact of the aforementioned digital gaps among ASEAN member states hinders their enterprises from developing effective cross-border GVCs with digital support. The latter entails data transfers based on the integration of IT systems across various links of GVCs (which may be located in different countries), their expeditious diagnostics and prevention, the utilization of digital twins of physical objects engaged in the industrial cycle, and numerous other areas. It is also noteworthy that new and innovative areas of digital transformation have emerged, like, for instance, digital customer experience design. The lack of such support hinders the creation of a digitally supported ASEAN product or service under the "Made in ASEAN" brand, particularly in a mid-term and long-term perspective.

In general, ASEAN's multilateral initiatives in the digital space have yet to be finalized, which is unlikely in decades to come. In light of the aforementioned considerations, it is evident that the Republic of Singapore's aspiration to leverage the digital instruments of ASEAN integration in order to enhance its domestic economic growth is not aligned with the on-going practical realities.

Conclusion

By exploring how the Republic of Singapore implements its own development strategy, it is possible to single out the defining characteristics, potential avenues for growth, and inherent constraints of the Singaporean version of contemporary new industrialism. This approach is a transition from import substitution to an export-oriented catch-up development model that is closely intertwined with the contemporary economic integration and bolstered by digital technologies. While acknowledging the undeniable success of the Republic of Singapore in developing its economy and digital capabilities, it is imperative to recognize the necessity for new tools to provide a fresh impetus for further growth.

It is unlikely that these tools can be developed around Singapore's involvement in ASEAN digital multilateral projects. The negative integration as the basis of ASEAN policy hinders the creation of a unified digital space, which is a crucial element for unifying conditions and opportunities for manufacturing and commercial activities. Even at the sectoral level, implementing this is challenging. Moreover, it seems unlikely that significant advances in digital support for the full range of economic relations among Southeast Asian countries can be anticipated as an independent ASEAN policy objective.

This factor not only undermines the Republic of Singapore's plans to utilize the mechanisms of ASEAN cooperation, including digital initiatives, as a tool to stimulate economic growth, but also nullifies them. As Singapore already has a higher level of digital maturity than its ASEAN partners, it is dependent on their willingness to enhance their digital competitiveness. It is therefore reasonable to expect that the leadership of

the Republic of Singapore will be compelled to reorient its priorities with respect to both the ASEAN Economic Community and ASEAN multilateral digital initiatives.

No less importantly, the Republic of Singapore's reliance on optimal forms and methods of participation in the international division of labor based on dirigisme and Asian values may not be fully relevant to new international conditions. Present realities indicate that Singapore's approach to new industrialism will increasingly prioritize shaping external milieu over carrying out internal transformation. These include the establishment of a novel system of production locations in Southeast Asia against the backdrop of deepening infrastructural imbalances among the regional countries, the production of "Made in ASEAN" goods and services and their integrated digital support, and other areas. The success of these developments, limited by the capacity of Singapore's partners in ASEAN to implement necessary changes, will be a pivotal factor in the country's economic modernization in a near-term perspective.

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1%80%D0%B0%D1%86.%D0%BF%D1%80%D0%BE%D1%86 % D0%B5%D1%81%D1%81%D0%BE%D0%B2_%D0%95%D0%90%D0%AD%D0%A1_%D0%B2_%D1%81%D1%84%D0%B5%D1%80%D0%B5_%D1%82%D0%BE%D1%80%D0%B3%D0%BE%D0%B2%D0%BB%D0%B8_2023-%D0%B4%D0%BE%D0%BA%D0%BB%D0%B0%D0%B4-2.pdf (in Russian).

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Digital Tomorrow: How ASEAN Is Catalyzing Major Growth in the Digital Economy

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Abstract

The emergence of digitalization presents an unparalleled opportunity for transformation in our era. Crucial sectors fundamental to human advancement, such as healthcare, education, energy, and agriculture, increasingly rely on global connectivity and data exchange. However, the infrastructure supporting these connections must meet the criteria of accessibility, affordability, and security to ensure seamless utilization.

The internet, continuously evolving with innovations like artificial intelligence (AI), presents unprecedented prospects for many. Yet disparities persist, particularly in developing nations where access to daily internet use and proficiency in digital technologies lag behind their developed counterparts. Without equitable access and the requisite skills, billions of people, especially in the Global Majority countries, risk marginalization from modern technological advancements.

As of 2023, approximately one-third of the global population—roughly 3 billion individuals—remained without internet access.[1] Addressing this digital divide demands heightened global collaboration to expedite technology adoption and extend connectivity benefits to all.

Navigating digitalization necessitates a delicate equilibrium between risk mitigation and opportunity maximization. As individuals and businesses embrace digital transformation, establishing protective measures to instill user confidence becomes paramount. Foundational policies encompassing data privacy regulations, cybersecurity protocols, and robust institutional frameworks are imperative to cultivate resilient, interconnected digital ecosystems. Advanced systems should not only verify identities but also facilitate secure, expedient transactions while promoting responsible data sharing.

Asia, among the most dynamic and rapidly evolving regions, epitomizes the expansive progress within the global digital economy. This article's main focus is on the remarkable advancements observed within the Southeast Asia region, collectively constituting a focal point of burgeoning digitalization.

Introduction to ASEAN and its role in the global majority

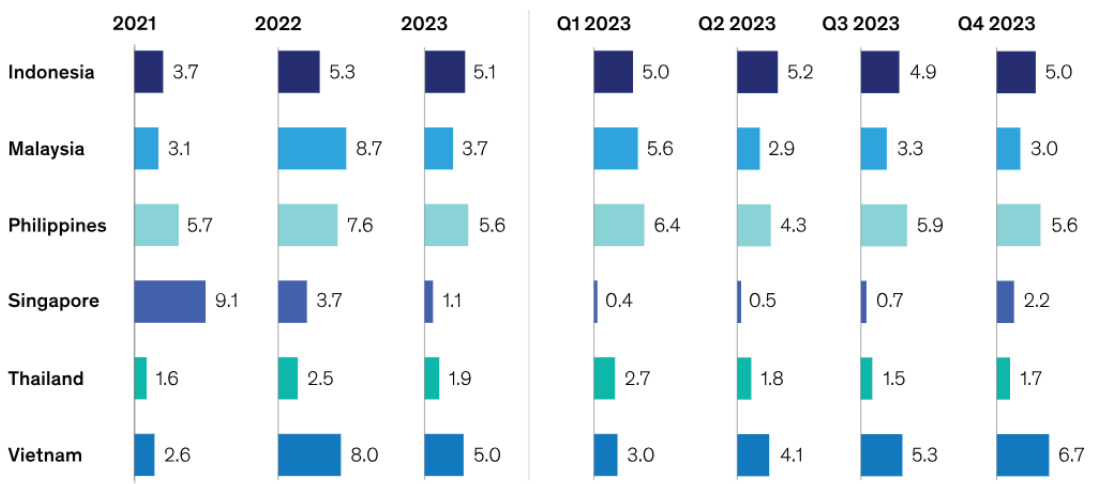
The Association of Southeast Asian Nations (ASEAN) stands out as a successful model of regional integration, fostering economic growth, stability, and regional diplomacy among its ten member states. Established in 1967, ASEAN initially focused on economic cooperation and conflict resolution. However, it has evolved into a multifaceted organization tackling security, sociocultural issues, and regional diplomacy. Principles like non-interference, respect for sovereignty, and consensus-based decisionmaking have been instrumental in maintaining stability and boosting ASEAN's standing on the global stage.

This emphasis on regional integration has been a key driver of ASEAN's progress. By collectively addressing economic, security, and social issues, member states have achieved significant economic growth—with a GDP of $3.3 trillion in 2021, ranking ASEAN as the fifth-largest global economy. This economic strength positions ASEAN as a major force in global trade and investment.

[1] The World Economic Forum, 2023. These are the places in the world where internet access is still an issue – and why. [online] Available at: https://www.weforum.org/agenda/2023/09/broadband-no-luxury-basic-necessity/ (accessed 10 April 2024).

The global shift towards a multipolar world presents exciting opportunities for ASEAN. As a prominent member of the emerging global south, ASEAN exemplifies successful development strategies for other developing regions. Its integrated approach serves as a valuable model for South-South cooperation, highlighting the importance of regional collaboration in addressing shared challenges and promoting inclusive global governance.

Figure 1. Real GDP growth rate vs previous period, %



Source: Countries' national statistics offices; Oxford Economics [McKinsey 2024].

This evolving global landscape underscores the importance of ASEAN's integration and as a model of regional and global cooperation. Indeed, in recent times, the global geopolitical and economic landscape has witnessed a notable transition towards multipolarity. This reflects the rising influence of countries from the global majority, encompassing regions typically characterized by lower income levels, developing economies, and diverse cultural backgrounds, which are situated primarily in Africa, Latin America, Asia, and parts of the Middle East. In recent years, however, many of these countries have experienced significant economic growth and development, propelled by factors such as natural resource wealth, industrialization, technological advancements, and strategic geopolitical positioning. ASEAN, as one of the most progressive regional associations, serves as a great example for many.

Furthermore, the rise of these countries has brought attention to issues such as South-South cooperation, development assistance, and the need for more inclusive global governance structures that reflect the diversity of the world's population and address the unique challenges faced by countries in these regions. Therefore, the shift towards multipolarity underscores the evolving dynamics of the international community, signaling a more diverse and complex global landscape where traditional power structures are being reshaped by emerging forces from previously marginalized regions.

The United Nations is also appreciating and endorsing ASEAN as a vital player within the global majority. The United Nations expresses deep gratitude for ASEAN's robust partnership and unwavering dedication to multilateralism and regional collaboration. ASEAN's pivotal role in promoting human rights, fundamental freedoms, and inclusive political engagement are integral components in the construction of genuine, resilient, and harmonious societies. Additionally, ASEAN's contributions are vital in fostering a robust global economy on a worldwide scale. The United Nations reaffirms its steadfast commitment to stand as a dependable partner alongside ASEAN in navigating the challenges that lie ahead [United Nations].

This article delves deeper into this model, specifically examining how ASEAN's integrated approach shapes its participation in the digital economy. We will explore ASEAN's historical engagement with digitalization, the opportunities and challenges it faces, its unique contributions, and its future trajectory. Through this analysis, we will gain a comprehensive understanding of ASEAN's critical role in driving regional and global digital development.

1. Evolution of ASEAN's digital agenda over the years

For over a quarter-century, ASEAN has been actively engaged in digital transformation efforts, commencing in 1997 with the adoption of the ASEAN Vision 2020. This visionary document is aimed at fostering an integrated ASEAN community and has kickstarted initiatives focused on information and communication technology advancement across the region [ASEAN 1997]. Subsequently, in 2000, ASEAN leaders signed the e-ASEAN Framework Agreement, marking a significant step forward into the "digital realm" [ASEAN]. Since then, dozens of other initiatives have been launched to drive digitalization within ASEAN.

Since the beginning of the 21st century, Southeast Asia, and ASEAN in particular, has been witnessing a rapid uptake of digital technologies, buoyed by tech-savvy younger generations and a population of almost 700 million, in which 61% of the region's inhabitants, which amounts to about 383 million people, are under the age of 35. The ASEAN region saw a remarkable surge in internet users, adding 100 million within just four years from 2015, and another 100 million since 2019, culminating in a total of 460 million internet users by 2022 [The Asean 2022].

Ever since the internet boom, messaging apps, social networks, ridesharing, mobile app-based delivery services, internet banking, and many other "digital products" have over time become an integral part of life for most people across Southeast Asia. The prevalence of online shopping has been solidified by the availability and usage of digital devices. This was the case particularly in light of the COVID-19 pandemic, leading to a significant shift in the retail landscape away from traditional brick-and-mortar stores. In 2022, when the pandemic was still causing concerns to some industries, the gross merchandise value of Southeast Asia's digital economy reached nearly $200 billion [Bain & Company 2022].

Over the past two decades, ASEAN has established around 70 agreements, master plans, frameworks, action plans, and related declarations, which shows how seriously

this topic has been covered in the region. It transcends mere policy alignment among ASEAN Member States (AMS) to foster trade and investment in ICT products and digital services, akin to the multifaceted economic integration within ASEAN, which extends beyond the liberalization and facilitation of goods, services, and investment. Such a digital integration encompasses several key components, including the advancement of ICT infrastructure, encouragement of digital innovation, collaboration on cybersecurity, the establishment of supportive institutions for ASEAN Member States, enhancement of digital education, and development of digital workforce skills. Importantly, it involves transactions both between nations and within domestic settings, such as initiatives aimed at expanding broadband access to rural areas lacking adequate connectivity.

However, it is essential to highlight the significant variances prevailing among ASEAN members in terms of their preparedness for the digital economy. For instance, in the Network Readiness Index 2023, Singapore claimed the 2nd position out of 131 countries globally, while Malaysia ranked 40th, Indonesia 59th, and the Philippines 69th. In stark contrast, Cambodia and Lao PDR secured considerably lower rankings at 108th and 109th, respectively. This diversity underscores the notion that ASEAN's progress in digitalization is not uniform across its member states.

Nevertheless, even among those trailing behind, efforts to fortify their digital economies are palpable. Take Laos, for example, which is taking substantial strides towards embracing a digital future. The country has made telecommunications infrastructure accessible to over 98% of its population. Furthermore, approximately one million Laotians have embraced mobile banking services, evidencing a growing digital finance ecosystem. Moreover, within the capital, digital startups are emerging with confidence, signaling a burgeoning entrepreneurial landscape in the digital sphere [The World Bank 2022].

Cambodia has also undertaken serious steps, thanks to which they were able to achieve a rapid development path towards digital transformation. The nation has achieved one of the world's swiftest rates of digital adoption. In 2023, the number of mobile and internet usage exceeded Cambodia's population of 16 million, while active social media users accounted for 65% of the total population [UNESCO 2023]. That said, outperforming countries are now shifting focus to increase their digital presence, which will strengthen ASEAN's position in the global digital economy.

2. Key milestones and Initiatives in ASEAN's digital journey

The journey of ASEAN into the digital realm has been marked by pivotal milestones and strategic initiatives, shaping its trajectory towards a digitally integrated community.

The first significant milestone emerged with the inception of the e-ASEAN Framework Agreement in 2000. This landmark agreement outlined key objectives, including the promotion of cooperation to bolster the ICT sector's development and competitiveness, bridging the digital divide within and among member states, and fostering collaboration between the public and private sectors to realize the vision of e-ASEAN and facilitate trade liberalization in ICT products, services, and investments.

Subsequently, the signing of the ASEAN Economic Community Blueprint in 2007 marked another crucial milestone. Aligned with the overarching goal of achieving enhanced economic dynamism, sustained prosperity, inclusive growth, and integrated development, this blueprint integrated digital-related endeavors into the broader framework of economic integration [ASEAN 2012a].

The following milestone arrived with the unveiling of the ICT Masterplan 2015, highlighting notable advancements in ICT across ASEAN. Noteworthy achievements included the expansion of ICT service exports, reduced costs associated with internet access and mobile subscriptions, and significant strides in areas such as ICT-driven employment growth, digitization of government services, and heightened cybersecurity awareness [ASEAN 2015].

The year 2015 also brought the AEC (ASEAN Economic Community) Blueprint, representing a comprehensive strategic plan aimed at achieving economic integration among ASEAN member states. The Blueprint outlines a roadmap for transforming ASEAN into a single market and production base, fostering economic growth and development across the region. The blueprint is structured around four key pillars, namely single market and production base, competitive economic region, equitable economic development, and integration into the global economy [The ASEAN Secretariat 2008].

In 2016, the establishment of the ASEAN Coordinating Committee on Electronic Commerce underscored ASEAN's commitment to digital integration. This committee, formed by the Senior Economic Officials Meeting, plays a pivotal role in fostering convergence between the ICT and e-commerce sectors and driving digital integration initiatives within the association.

Another milestone, the Digital Integration Framework Action Plan (DIFAP), consolidates efforts outlined in various strategic blueprints, including the AEC Blueprint 2025 and ASEAN ICT Masterplan 2020. As the most comprehensive framework document within ASEAN, DIFAP spans a wide array of areas, marking a significant achievement in digital policy consolidation [Economic Research Institute for ASEAN and East Asia 2023].

The rapid digital transformation accelerated by the COVID-19 pandemic has further underscored the importance of digitalization within ASEAN's economic integration framework. This acknowledgment has propelled ASEAN towards a strategic pivot in digital policy priorities, positioning digital initiatives at the forefront of its agenda.

Looking ahead, the Digital Economic Framework Agreement (DEFA) and the Post-2025 Agenda are anticipated to serve as forthcoming milestones, charting the course for ASEAN's digital future. These initiatives collectively reflect ASEAN's commitment to fostering the expansion of its digital economy and realizing its vision of a digitally integrated community.

3. Opportunities ASEAN presents in the new digital economy

ASEAN stands at the forefront of the world's fastest-growing digital market, marked by a daily influx of over 100,000 new users. The COVID-19 pandemic catalyzed a profound shift towards digital transformation, welcoming an additional 60 million digital consumers

into the fold. This surge has propelled ASEAN's internet users to over 460 million in 2022 and continues to expand.

Table 1. Total internet users in Southeast Asia, million

2019	2020	2021	2022
360	400	440	460

Source: Google, Temasek, and Bain & Co [The Asean Magazine 2022].

Beyond traditional digital products, five interconnected technology trends—the Internet of Things (IoT), big data, artificial intelligence (AI), blockchain, and fintech—are poised to reshape ASEAN economies, influencing production, industrial structure, and trade patterns [Asia-Nikei 2021]. Advancements in IoT, including cloud computing, machine-to-machine communication, and sensor technology, are poised to revolutionize various sectors within ASEAN. Projections suggest that by 2030, approximately 25 billion interconnected "smart" devices will drive efficiency across manufacturing, logistics, and supply chains, reducing waste and enhancing productivity, all of which will find use within ASEAN.

Big data, powered by sophisticated analytics, enables businesses, governments, and individuals to harness vast datasets for real-time decisionmaking and product refinement. Understanding data allows businesses, governments, and individuals to monitor and enhance their operations and make real-time decisions informed by insights. It also enables entities to refine their products and services to better meet customer needs. When combined with AI, big data is reshaping industries like finance, enhancing algorithmic trading and market insights, while paving the way for quantum computing and telecommunication advancements.

3.1. Deep dive into the technologies of the region

AI represents a transformative force, exemplified by the emergence of generative AI such as ChatGPT [Innoma 2023]. Leveraging data analysis and machine learning, AI drives autonomous decisionmaking and adaptive robotics, enabling them to function across diverse working environments and learn independently. Moreover, AI startups have garnered more than $2.5 billion [Innoma 2023]. in Southeast Asian countries, highlighting the burgeoning interest in artificial intelligence within the region.

Artificial intelligence, 5G, blockchain, and Web 3.0 are driving development in the region's technology sector. AI, in particular, is gaining traction, with 149 companies [The New York Times 2023] actively exploring its capabilities. These companies utilize a range of AI technologies, including machine learning, deep learning, natural language processing (NLP), computer vision, predictive analytics, neural networks, decision trees, and clustering.

The significant investments in AI companies underscore the crucial role of artificial intelligence in driving innovation. This surge in investments reflects the growing

popularity of data-driven strategies, automation, and intelligent solutions, aimed at revolutionizing industry norms and improving work efficiency.

Meanwhile, blockchain, often associated with cryptocurrencies, represents a revolutionary technology. It serves as a decentralized database, functioning as an open, shared, and trusted public ledger resistant to tampering and accessible to all. By enabling the transfer of value within computer networks, blockchain's underlying protocols instill trust in transactions without the need for a central authority. While initially linked primarily to cryptocurrencies, blockchain has demonstrated the potential to transcend its origins. Its applications span various sectors, including financial transactions, record-keeping, verification systems, and smart contracts. For instance, blockchain could revolutionize cross-border remittances, substantially reducing transaction costs. Furthermore, it holds promise in enhancing the transparency and accessibility of land registration and asset ownership proof, while fortifying the integrity of government records and services, such as tax collection.

Another opportunity that ASEAN presents in the new digital economy is in the realm of financial technology (fintech), which is experiencing explosive growth in the region. This is fueled by a young, tech-savvy population comfortable with digital transactions and a booming digital economy. Mobile wallets and QR code payments are king, and with better internet access, seamless cross-border payments are on the horizon. Fintech is also making a big impact on financial inclusion by providing faster loan approvals and integrating financing options into everyday online activities. The insurance industry is being revamped by InsurTech, offering innovative products like microinsurance that cater to the underbanked. But that's not all. Fintech is also looking to attract top talent, seamlessly integrate financial services into daily life, and strike a balance between cutting-edge development and profitability.

Indeed, the technologies discussed above are poised to yield substantial impacts on productivity, economic growth, skills development, income distribution, wellbeing, and environmental sustainability across ASEAN member states. Numerous studies underscore the productivity advantages associated with the "next production revolution," also known as Industry 4.0. This revolution entails the integration of digital technologies into industrial production, fostering innovation, efficiency, and occasionally, the creation of novel goods and services [Rayhan 2023].

However, how can this technology translate into success and profitability for the people in ASEAN? What makes this region worthy of global attention, and what opportunities await exploration within its borders?

3.2. A youthful and tech-savvy population

The COVID-19 pandemic has posed a formidable test of resilience and adaptability, particularly for the younger generation. Despite the challenges it brought forth, individuals in Southeast Asia have exhibited remarkable success in navigating contemporary realities and challenges. By embracing digital connectivity, ASEAN's youth have demonstrated increased innovation, skillfulness, and readiness to seize opportunities in the post-pandemic era [The World Economic Forum 2020].

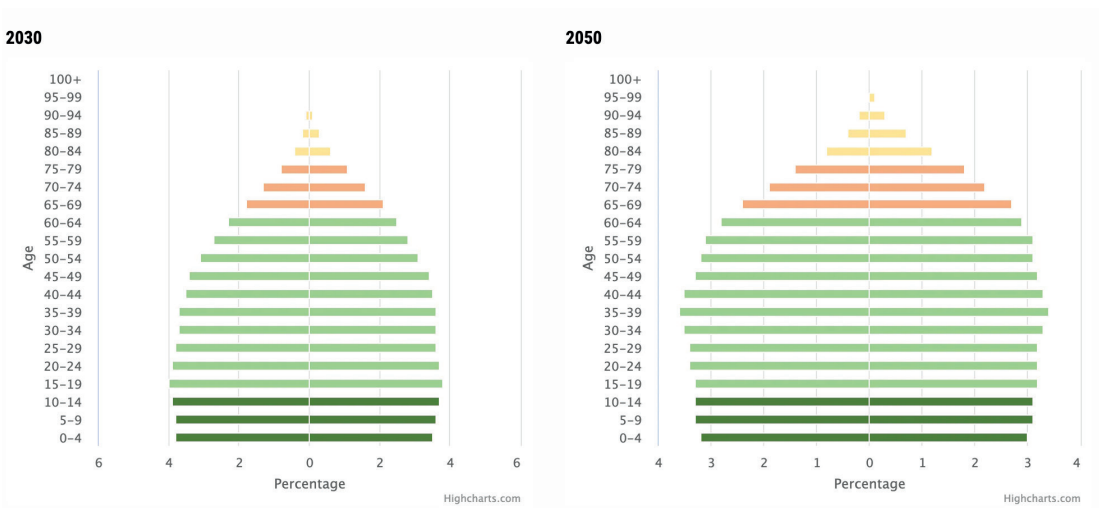
Consequently, ASEAN member states are witnessing a surge in digital transformation, fostering a generation adept at technology, poised to drive sustainable growth in the digital economy. A survey conducted among over 68,000 individuals aged 16-35 across six ASEAN countries revealed compelling insights. Nearly nine out of ten young people reported heightened usage of at least one digital tool during the pandemic, with almost half (42%) adopting at least one new digital tool [The World Economic Forum 2020]. Moreover, young people in the region showcased increased engagement in various digital activities, including online shopping, digital education, food delivery services, e-banking, e-wallets, online gaming (GameFi, Play-To-Earn), and metaverse exploration.

This digital shift was not confined to consumers alone; sellers also embraced the digital sphere. The survey indicated that one-third of entrepreneurs observed increased usage of e-commerce platforms, with a quarter of them venturing into them for the first time in response to the pandemic.

3.3. A thriving digital economy

Foreign direct investors are increasingly recognizing technology and innovation as pivotal drivers for investment in ASEAN, closely followed by the allure of emerging consumer markets and reduced production costs. With a population exceeding 660 million, the region is projected to contribute $1 trillion to the digital economy by 2030. This surge in foreign direct investment is predominantly fueled by the vast potential of digital commerce. Against the backdrop of an innovative business landscape, approximately 70% of the new economic value created in ASEAN over the next decade is anticipated to emanate from digitally empowered platforms [Bloomberg].

Figure 2. 2030-2050: Age distribution in Southeast Asian countries



Source: [Economic and Social Commission for Asia and the Pacific].

For instance, the revenue generated from the Internet of Things (IoT) in ASEAN is forecasted to surpass $60 billion by 2024. Moreover, the region has witnessed the establishment of over 600 crypto and blockchain startups, attracting over $737 million in funding to date [Korea Blockchain Week 2023]. With Singapore leading as the region's most advanced economy and ascending to fifth place in the Global Innovation Index, investors are increasingly drawn to the burgeoning opportunities within ASEAN's digital landscape.

Digital payments in the region are experiencing a significant upsurge, exceeding $800 billion in 2022. To remain competitive, e-commerce businesses must ensure seamless integration between cash and digital payments in real time to optimize their operations. Addressing these challenges, online merchants are increasingly adopting innovative plug-and-play financial solutions for tasks such as cash flow reconciliation and payment cycle management [Bloomberg Sponsored (by Standard Chartered) 2023].

These processes are facilitated by a plethora of innovative financial services solutions. Amidst the proliferation of digital ecosystems and evolving regulatory frameworks, a new wave of bank-fintech partnerships is leveraging application programming interfaces (APIs) to enable real-time interactions. User-friendly and accessible applications are of paramount importance, especially in a region where approximately 70% of the adult population remains unbanked or underbanked [Temenos 2023]. Thus, the ongoing development of open digital banking solutions represents a significant stride towards greater financial inclusion for Southeast Asians.

Table 2. World's most unbanked countries

	Morocco	Vietnam	Egypt	Philippines	Mexico	Nigeria	Peru	Columbia	Indonesia	Argentina
Population, million	36.9	97.3	102.3	109.6	128.9	206.1	33.0	50.9	273.5	45.2
Unbanked population, %	71	69	67	66	63	60	57	54	51	51
Cash transactions, %	41	26	55	37	21	24	22	15	13	18
Card transactions, %	27	35	27	22	44	27	62	55	34	45
% of ATM per 100,000 adults	28.6	25.9	20.1	29.0	61.5	16.9	126.7	41.3	53.3	60.9
Internet penetration, %	62	66	45	60	66	70	49	62	55	76

Source: World's Most Unbanked Countries, fintechnews.sg [Mercuryo].

3.4. Regional collaboration

ASEAN's commitment to regional integration through initiatives like the ASEAN Digital Master Plan 2025 (ADM) lays the groundwork for harmonized policies, infrastructure development, and joint efforts in cybersecurity and digital skills development. This

collaborative approach can maximize the region's collective impact in the digital space. Released in January 2021 following the inaugural Digital Ministers' Meeting, the document reaffirms the urgency of accelerating digitization efforts outlined in previous plans. However, ADM 2025 introduces a significantly broader focus on the adoption of digital services and the development of supporting infrastructure [ASEAN 2021]. Achieving this outcome requires proactive policy adjustments, coupled with essential infrastructure development, support mechanisms, and seamless integration [Quah, Chen 2021].

3.5. An innovation ecosystem

ASEAN is cultivating a dynamic startup and innovation ecosystem, drawing investments and catalyzing the development of novel digital solutions tailored to local needs. This initiative not only creates employment opportunities but also fosters regional economic growth. ASEAN is proactively nurturing an appealing ecosystem encompassing innovators, developers, traders, clients, and consumers alike. In the wake of the transformative impact of COVID-19, there is a global quest for innovation-driven hubs that empower entrepreneurs and businesses to explore new opportunities through innovative processes, products, and services.

Therefore, there is a pressing need for a supportive entrepreneurial ecosystem that encompasses access to critical markets, funding, networks, and skilled human resources, emphasizing in particular the importance of new knowledge and education. To foster the growth of innovation-driven entrepreneurial ventures, it is imperative to map out geographical and sectoral distributions. This is where ASEAN plays a pivotal role, offering burgeoning markets, a pool of skilled human resources, and inclusive frameworks, such as the framework for promoting the growth of digital startups in ASEAN. The primary objective of this framework is "to develop an enabling ecosystem framework for digital startups in ASEAN... and to facilitate the creation of best-practice-based policies by relevant ministries in the AMS to nurture and foster startup ecosystems, particularly in promoting the growth of digital startups in their respective countries" [ASEAN 2023]. As more startups scale, the entrepreneurial ecosystem in Southeast Asia matures, paving the way for subsequent generations of startups and innovations, serving as an exemplar for others on the global scale.

Additionally, it is paramount to consider the strategic location and stature ASEAN has cultivated over the past decades. Firstly, its geographical position, often referred to as the "crossroads of the world" [Alberts 2013], holds significance in connecting major markets like China and India, thereby sustaining the potential for regional and global trade flow. Furthermore, ASEAN is actively embracing leapfrog development strategies, bypassing traditional stages of development by adopting innovative solutions not only in e-commerce and entertainment, but also in critical sectors such as healthcare, education, and financial inclusion. These solutions hold the promise of addressing challenges in these spheres and empowering marginalized communities, bridging the development gap within and between member states.

4. Challenges

Digital transformation has emerged as one of the most impactful innovations shaping modern life over the past decade. Despite a slight slowdown in 2022, technology startups in Southeast Asia secured over $8 billion in funding from 2020 onwards, with ASEAN boasting over 30 unicorns in 2021—startups valued at $1 billion or more—indicative of the region's increasing internet user base and improved internet accessibility [Yan Ing, Markus 2023]. However, amidst this digital transformation journey, the region still grapples with various challenges.

Foremost among these challenges is the digital divide, characterized by significant disparities in internet speed, usage, and technology production across different segments of society. Additionally, cybersecurity threats loom large as a concern, posing risks to individuals, businesses, and governments alike. The issue of digital literacy remains a pervasive challenge, with many lacking the necessary skills to navigate the digital landscape effectively.

Furthermore, a notable skills gap exists in the workforce, hindering the adoption and utilization of digital technologies to their full potential. Data governance issues, regulatory fragmentation, and ethical concerns further compound the complexities of digital transformation in the ASEAN region. Addressing these multifaceted challenges will be crucial in ensuring that the benefits of digitalization are equitably distributed and harnessed to drive inclusive growth and development across ASEAN.

4.1. The digital divide

One of the foremost challenges in digital transformation lies in the uneven distribution of modern technologies, stemming from limited access and opportunities. Countries vary significantly in their readiness for the new digital era, characterized by three key indicators: internet speed, internet usage, and technology production.

For instance, Cambodia and Myanmar exhibit internet speeds of 44 Megabits per second (Mbps) and 20 Mbps, respectively, markedly lower than Singapore's leading speed of over 270 Mbps, underscoring the pronounced disparities in this domain.

Another critical divide lies in internet usage. In 2020, while high-income countries boasted nearly 90% internet penetration, middle-income countries saw around 45%, and low-income countries recorded less than 21%. Brunei Darussalam led with the highest proportion of internet users (95.0% of the population), followed by Singapore (92.0%) and Malaysia (89.6%). In contrast, Myanmar (35.1%) and the Lao People's Democratic Republic (33.8%) reported the lowest percentages of internet users.

Infrastructure disparity:

Singapore and Malaysia stand out as regional leaders in digital infrastructure. Singapore boasts near-universal internet penetration and advanced fiber optic networks, while Malaysia prioritizes expanding mobile broadband coverage, particularly in rural areas [Infocomm Media Development Authority]. In contrast, members like Laos and Myanmar

face challenges with limited internet access, particularly in remote regions. The Asian Development Bank (ADB) highlights the need for infrastructure development to bridge the digital divide within ASEAN [Asian Development Bank 2017].

Digital literacy gap:

The digital skills gap is another key differentiator. Singapore and Thailand have established education systems that prioritize digital literacy and STEM programs, preparing their workforce for the digital economy. However, other members struggle with limited access to quality education, particularly in rural areas. This results in a workforce less equipped to participate fully in the digital revolution [Bangkok Post 2022].

Uneven e-commerce:

The adoption of e-commerce platforms also varies widely. Singapore, with its well-developed digital infrastructure and high internet penetration, is a leader in e-commerce adoption [Singapore Business Federation]. Conversely, some members are in earlier stages, with a larger portion of the population relying on traditional brick-and-mortar businesses. Disparities exist in digital payment infrastructure and logistics networks, impacting e-commerce growth across the region [Bloomberg].

Government policy and digitalization:

Government initiatives play a crucial role in shaping digitalization efforts. Some ASEAN members, like Singapore, have established clear policies and regulations to promote digitalization and attract tech investments [Smartnation]. These policies often focus on infrastructure development, talent development, and fostering innovation. Other members are at earlier stages of crafting a supportive regulatory environment for the digital economy.

Digital government services:

Singapore is again a frontrunner in offering digital government services. Citizens and businesses can access a wide range of services online, streamlining processes and improving efficiency [Singapore Government Agency Website]. Other members are at varying stages of implementing similar initiatives, with some facing challenges in digital government service adoption due to factors like limited infrastructure or lower levels of digital literacy among the population.

4.2. Cybersecurity threats

In the contemporary digital landscape, cyber threats have evolved from occasional concerns to daily challenges for many businesses. From sophisticated phishing schemes to ransomware attacks and espionage, organizations confront a myriad of cyber risks

that continually evolve in complexity. Exploiting even the smallest vulnerabilities, these threats underscore the critical need for advanced cybersecurity measures to safeguard assets and customer data, including the recruitment of cybersecurity professionals.

Fortunately, ASEAN governments have adopted a proactive stance in bolstering cybersecurity measures. Through the establishment and implementation of robust regulatory frameworks, they are committed to enhancing the region's cyber resilience. Initiatives like the ASEAN Cybersecurity Cooperation Strategy exemplify a steadfast dedication to raising cybersecurity awareness and capabilities across member states [ASEAN 2022].

4.3. Data governance across the region

The imperative to balance data privacy concerns with the imperative for data-driven innovation underscores the necessity of developing clear and harmonized data governance frameworks across the ASEAN region. Despite ASEAN's emphasis on digital integration, progress on data regulation has been slow. Existing frameworks and plans for data governance primarily consist of broad principles. For instance, the ASEAN Framework on Personal Data Protection outlines principles for safeguarding personal data [ASEAN 2012c], while the ASEAN Framework on Digital Data Governance offers general guiding principles, albeit non-binding [ASEAN 2012b].

Data regulatory frameworks vary among ASEAN member states, reflecting differences in preferences and harmonization efforts. Some countries have enacted comprehensive legislation on data flow restrictions, while others prioritize data protection laws. For example, Indonesia and Vietnam have implemented data localization laws. In free trade agreements (FTAs), ASEAN member states' adoption of data rules remains inconsistent. Singapore stands out for its numerous FTAs containing data-related provisions, whereas others have made limited commitments [Lee 2023].

However, many FTAs across ASEAN include stringent provisions that allow exceptions for data protection, particularly concerning national security. The divergent data regulatory frameworks in Southeast Asia impede ASEAN's objective of nurturing a unified digital economy and expose the region to challenges in global data governance, highlighting the need for substantial enhancements.

4.4. Regulatory fragmentation

Fragmented regulatory frameworks pose a significant obstacle to the efficient operation of the ASEAN digital economy. Enhanced coherence in regulations would empower regional firms to expand beyond local markets and tap into the burgeoning consumer base, thereby driving revenue growth. Currently, many companies operating within ASEAN face constraints imposed by incomplete digital regulations at the national level, compounded by varying rules enforced by global trading partners. Divergent cross-border data regulations require firms engaged in cross-border electronic activities, such as e-commerce, to navigate disparate regulatory landscapes. This not only escalates the costs associated with regulatory compliance but may also impede their participation in

the digital economy and access to ASEAN markets. Research indicates that restrictions on cross-border data transfers in countries like Indonesia or Vietnam could potentially reduce their gross domestic product (GDP) by 0.5 percent and 1.7 percent, respectively. The primary barrier to digital trade, as confirmed by most surveyed companies, is the limitations on information flows [Cory 2020].

To foster a cohesive regulatory framework for the regional digital economy, ASEAN and its trading partners must prioritize transparency in the design and implementation of digital regulations. The ASEAN Trade Repository should be expanded to encompass areas impacting digital business operations, such as data governance and content moderation, and should integrate with the national trade repositories of key trading partners.

ASEAN requires a systematic approach, akin to the Framework on Digital Data Governance and ASEAN Agreement on E-Commerce, with a focus on facilitating secure cross-border data flows and supporting priority sectors to stimulate growth in the regional digital economy. Accelerating the implementation of the ASEAN Digital Economy Framework Agreement (DEFA) and ASEAN-Plus DEFA will bolster the openness, security, interoperability, and competitiveness of digital economies in the region [Sithanonxay 2023].

The emerging regional digital economy holds immense potential to modernize ASEAN through the adoption of digital technology, fostering private sector-led growth. To realize these aspirations, there must be increased transparency in digital regulations, a more cohesive regulatory framework in Southeast Asia, and strategic collaboration with major trade partners worldwide.

4.5. Digital literacy and skills gap

Closing the digital literacy and skills gap across diverse demographics is paramount for ensuring inclusive participation in the digital economy and harnessing the benefits of digital transformation. Surveys indicate that while most young individuals recognize the importance of digital literacy for their future, many feel they lack sufficient digital skills [Marwaan 2024]. Certain demographic groups, such as rural residents, ethnic minorities, and older individuals tend to exhibit lower levels of digital literacy compared to younger cohorts.

Individuals who lack these skills perceive digital literacy as crucial for developing transferable skills and facilitating enhanced learning. While activities like online information searching are common, fewer individuals engage in more advanced tasks such as creating digital content or problem-solving. There exists a notable disparity in digital literacy education among ASEAN countries, with Myanmar and Lao PDR reporting fewer students learning digital skills in schools. Even in other countries, a significant portion of young people lack a formal digital education, with the quality of instruction often perceived as moderate.

Limited access to technical resources and infrastructure, coupled with inadequate training in schools, pose significant barriers to improving digital literacy. To address these challenges, young individuals advocate for increased practice time, enhanced access to technology, qualified teachers, and heightened awareness among stakeholders.

4.6. Ethical concerns

The widespread adoption of digital platforms has brought forth ethical concerns surrounding data privacy, online content moderation, and the potential exacerbation of social and economic inequalities. Governments across ASEAN are closely monitoring digital developments and have initiated strategies and frameworks to tackle these pressing issues. Moreover, ASEAN is collectively preparing a regional guide to address ethical challenges, among other pertinent matters. Collaborative efforts involving governments, industry stakeholders, academia, and civil society are imperative to maximize the benefits of the digital economy while effectively and sustainably mitigating associated risks [Lee Kok Thong 2024]. ASEAN members should persist in developing robust frameworks that not only address these ethical concerns but also foster innovation in the digital sphere.

5. What's next?

Despite the initial challenges posed by the global COVID-19 pandemic and ongoing geopolitical tensions, sectors harnessing digitalization have demonstrated resilience and sustained growth, with promising prospects for the years ahead. In Southeast Asia, digitalization has experienced rapid acceleration, driven by the influx of new internet users and heightened activity in e-commerce, fintech, the crypto sphere, AI, and other domains. Looking forward, the future of the digital economy in the region appears highly promising, presenting substantial opportunities for new investors seeking to diversify their portfolios and explore dynamic markets poised for sustained positive development across various sectors.

As previously mentioned, the digital economy of ASEAN member countries is projected to surpass a total value of $1 trillion by 2030. This growth trajectory is fueled by the robust internet penetration rate in ASEAN, currently standing at 75%, resulting in a total digital consumer population of 350 million users [YCP Solidiance 2021].

ASEAN is anticipated to witness a significant surge of 62% in e-commerce gross merchandise value, potentially reaching $234 billion by 2025, surpassing previous estimates of $172 billion. Such rapid expansion within the industry presents promising opportunities for all stakeholders involved, drawing increasing interest from investors eyeing opportunities in the region, where ASEAN holds a leading position.

For instance, e-commerce platforms, regardless of their current market standing, are projected to require a continual influx of new vendors to sustain their growth trajectory, thereby presenting significant opportunities for new entrants and SMEs as suppliers. Furthermore, businesses in related sectors such as logistics stand to benefit from the success of e-commerce, with rising demand for services like same-day and long-distance deliveries [YCP Solidiance 2021].

Despite the challenges, the ASEAN region remains one of the most attractive investment destinations globally. Governments within the association are actively focusing on developing areas that are currently underdeveloped, as evidenced by initiatives like the ASEAN Master Plan on Rural Development 2022 to 2026. Here,

governments have articulated their commitment to leveraging new digital technologies and innovation to foster rural development, further bolstering the region's digital transformation journey [ASEAN 2021].

The bottom line

The digital economy presents a transformative pathway for regional growth, unlocking a wealth of opportunities for ASEAN member states. With its increasingly high internet penetration rates, ASEAN demonstrates a strong foundation for digital progress, potentially serving as a model for other developing regions within the Global Majority. However, the full potential of digitalization remains unrealized, with significant gaps in business adoption and monetization despite success stories in the private sector. Recognizing this potential, ASEAN countries are actively formulating national and regional digital economy plans.

For ASEAN to fully embrace the digital revolution, fostering a collaborative and integrated approach is crucial. Governments across the region must continue to work together to create a secure and attractive environment for the digital economy. This includes prioritizing five key areas: payment infrastructure, digital skills development, harmonized policies and regulations, efficient logistics networks, and robust data governance frameworks. Collaborative efforts are needed to address regulatory gaps, particularly in areas like consumer protection and data privacy. Additionally, harmonizing regulations across member states will be essential for promoting cross-border data flows and fostering regional innovation.

While government intervention is necessary to set the stage, it is equally important to empower the private sector as a driver of innovation and investment. Streamlining national and regional digital economy plans and ensuring strong public-private partnerships are critical for successful implementation. This collaborative approach can ensure the private sector has the necessary support and a clear regulatory framework to flourish.

The digital economy has the potential to promote inclusivity within ASEAN by increasing access to information and economic opportunities for a wider demographic. Falling mobile broadband costs are crucial in bridging the digital divide, allowing individuals and entrepreneurs to participate in the global digital marketplace. Fintech advancements are further democratizing financial services, while AI is streamlining tasks and boosting productivity across various sectors. However, it is crucial to acknowledge the existing digital divide within and between ASEAN countries. Unequal access to affordable internet, especially in rural and remote areas, poses a significant barrier to inclusion. Efforts to bridge this gap are essential for ensuring equitable participation in the digital revolution.

Foreign investment remains a vital source of capital for ASEAN's digital transformation. Governments across the region are actively creating attractive investment environments, offering incentives to entice foreign investors. It is important to note that investment opportunities extend beyond the digital sphere, with significant needs in sectors like logistics, retail, and manufacturing, creating a diversified landscape for investment ventures.

By leveraging its successful model of regional integration, ASEAN is well-positioned to become a leader in the digital age. Through collaborative efforts, targeted investments, and a focus on inclusivity, ASEAN can harness the immense potential of the digital economy, propelling the region towards a prosperous and interconnected future.

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Overview of the Roundtable "Prospects for the Development of the World Economy in the Context of Global Economic Fragmentation"

On April 25, 2024, the School of World Economy of the HSE University held a roundtable discussion on "Prospects for the Development of the World Economy in the Context of Global Economic Fragmentation." The participants discussed the main trends in the development of the world economy at the current stage, considered the factors of ongoing fragmentation, assessed the prospects and problems of economic growth in the world as a whole and in individual countries and regions, and identified a number of key challenges facing Russia in this context.

* * *

The roundtable was inaugurated by **Igor Makarov**, head of the School of World Economy, who underscored the consensus among experts that the global economy is entering a new phase, which can be defined as fragmentation, or the division of the world economy into a number of distinct blocs. The precise delineation of these blocks is not yet clear, but it is evident that one comprises Russia, China, and a number of allied countries, while the other includes Western countries. The phenomenon of fragmentation is evidenced by a reduction in international trade and foreign direct investment (FDI) between the blocs, while growth within the blocs occurs, without the prospect of improvement.

The objective of the roundtable was to deliberate on the prospective trajectory of the global economy within the emerging context, to see if the fragmentation exists and has long-term sustainability, and, if substantiated, to delineate the potential ramifications for Russia and the global economy at large. A significant issue for the experts to address was the manner in which countries' foreign economic strategies evolve when security considerations assume precedence over economic efficiency factors. This raises the question of how this shift should be reflected in Russia's foreign economic strategy.

The first speaker was **Alexey Kuznetsov**, a corresponding member of the Russian Academy of Sciences and the director of the Institute of Scientific Information for Social Sciences of the Russian Academy of Sciences. He presented a report on the negative impact of the attempt to exclude Russia from the world economy on the prospects of global economic development. He began by noting that it is erroneous to consider Russia as a country with no significant weight in the global economy. The events of 2022–2023 demonstrated otherwise. In 2023, Russia was ranked 11th in the world in terms of gross domestic product (GDP) and 5th in terms of GDP at PPP. In this regard,

the expert proceeded to elaborate on three aspects of the global economy: (1) the BRICS enlargement and its importance for global regulation, (2) foreign direct investment, and (3) the restructuring of Russia's foreign trade.

The GDP of the ten countries comprising the BRICS group, calculated in market prices, has already surpassed that of the United States and is currently 1.6 times lower than the combined GDP of the G7 countries. Nevertheless, of the BRICS countries, only Russia is currently engaged in active discourse concerning potential modifications to global regulatory instruments. The other countries in the association, despite their common interest in this issue, are reluctant to assume risks, which raises the question of what tools and concrete actions can be taken by Russia. Furthermore, the rapporteur noted that the fragmentation observed today represents an intensification of regionalization processes that commenced during the Coronacrisis and will persist. Additionally, he posited that these processes afford Russia the opportunity to construct novel instruments of involvement in the global economy, citing the International North-South Transportation Corridor as an example.

With regard to foreign direct investment, the expert highlighted that, contrary to expectations, Russia's exclusion from international capital flows has had a significant impact on global processes, including a notable deterioration in the investment climate in the United States and the European Union. There has been a notable decline in the inflow of FDI into Western countries. As a result, Chinese, Arab, and other investors are divesting, creating new opportunities for Russia in the global arena.

In conclusion, the speaker reviewed the evolving geography of Russia's foreign trade, noting that not all prominent non-Western countries have strengthened economic ties with Russia. However, the first three—China, India, and Turkey—are of interest. Russia's foreign trade is not solely concentrated on China. Russia is a significant trading partner for all three countries. As a result of its membership in BRICS and the successful navigation of the initial two years of sanctions, Russia has a promising outlook for continued development. It is now imperative to capitalize on these opportunities.

In his report, associate professor of the School of World Economy **Alexander Zaytsev** undertook a review of trends illustrating the fragmentation of the world economy. The speaker initially observed that the last two to three years have witnessed an uptick in fragmentation, although this phenomenon has been in the making for some time, with the advent of sanctions against Russia in 2014 and the emergence of trade confrontations and technological competitions between the United States and China. The influence of these factors has grown significantly since 2023. There has been an increase in the number of sanctions and trade restrictions imposed, as well as a notable rise in pressure on and heightened scrutiny of FDI. As a result, there has been a political regionalization of trade and FDI and financial fragmentation.

The speaker highlighted that the fragmentation of international trade is occurring concurrently with a decline in trade turnover, particularly in goods, and expressed skepticism about the IMF's projected trade recovery in the coming years. In 2022–2023 substantial structural shifts in global trade happened. Accordingly, the UNCTAD has indicated that the proportion of trading partners within geopolitically proximate blocs increased by about 6% during the 2023 period relative to the period up to February 2022.

Conversely, the proportion of trading partners within geopolitically disparate blocs decreased by 5-6% during the same period. The expert provided examples of increased trade connectivity, citing the growth of China's share in Russia's trade turnover by 7 p.p. and Brazil's by 3 p.p. The most significant decline in trade connectivity was observed between Russia and the EU, as well as between China and the United States.

In the financial sphere, the phenomenon of fragmentation is evidenced by the declining share of the dollar and the euro in the world's gold and foreign exchange reserves. Consequently, the proportion of the dollar has diminished from approximately 70% in 2000 to approximately 58% in the second quarter of 2023. Conversely, the role of alternative methods of settlement has increased, with the share of the yuan in international settlements approximately doubling over the past two to three years.

In conclusion, Zaytsev posited that the global economy is currently undergoing a period of restructuring and long-term decoupling in critical technologies and goods. However, once this process has reached its conclusion, the trend of deglobalization may potentially reverse for less sensitive goods, such as consumer electronics. Those hub countries that occupy a neutral position between the West and Russia / China—Turkey, the UAE, and to a lesser extent Vietnam—will benefit as a result of these processes. Nevertheless, developing countries as a whole will suffer as a result of the return of production to developed countries, the reduction of trade, investment, employment, and inflation associated with these processes. Russia would be well advised to pursue active engagement with countries that serve as global hubs, to invest in countries with which it enjoys a positive relationship, and to reinforce its financial infrastructure.

Andrey Gnidchenko, a senior researcher at the Institute of Economic Forecasting of the Russian Academy of Sciences, presented a report on "Shifting Trade Ties of the United States and China with Their Partner Countries: Changes over the Five Years of Turbulence." The expert presented a view of world trade from the perspective of the two largest economies in the world, the United States and China, as they pass through three stages: (1) the hot phase of the trade war from July 2018 to January 2020; (2) the beginning of the COVID-19 pandemic and active post-COVID trade growth; (3) since February 2022, when the special military operation changed the positioning of Russia in the system of world trade, as well as the relationship between China and the United States.

During the initial stage, the United States' trade balance remained largely unaltered. In formal terms, the objective of the US economy to reduce reliance on imports from China was met. However, the overall trade deficit remained unchanged due to an increase in imports from other countries, particularly from the ASEAN countries. Europe derived some benefit from its ability to align with the revised US import framework. The speaker devoted particular attention to the phenomenon of the reexport of Chinese products to the United States, which primarily occurred through the ASEAN countries, particularly Vietnam.

In the second stage, during the global pandemic, world trade experienced a slight decline. However, it subsequently demonstrated robust growth, both in imports from numerous countries, including the United States, and in exports from China. In 2019, China's share of global merchandise exports was 14 %. During the second stage, during the post-COVID economic recovery, China was able to secure additional market positions,

leading to an increase in its global export share to 16% in 2021. The speaker observed that it is premature to suggest that China is losing its position in the global market, particularly in the context of trade in goods. With regard to the United States, imports from China have increased in the context of post-COVID recovery to a level approaching that of the pre-trade war period. Concurrently, imports from other regions—namely, North America, Europe, and ASEAN—have increased significantly to meet the additional domestic demand.

The third stage was distinguished by rapid geopolitical and structural changes on the global scale. Imports from China to the United States experienced a notable decline, yet the overall US trade deficit reached a historic high due to an increase in imports from other regions. Gnidchenko highlighted the distinctive circumstances of Europe, where the US trade deficit diminished due to the expansion of US exports to the region. With the commencement of the special military operation, there was a reversal in Chinese exports to Europe, resulting in a reduction in China's trade deficit with Europe. It should be noted that China maintained a high level of trade engagement with India throughout the second stage, and this engagement has not diminished in the third stage. Consequently, India persists in its active engagement with both China and the United States.

The speaker devoted a section of the presentation to an analysis of the role of the countries comprising the Chip 4 alliance. In addition to the United States, this group includes US-friendly Japan, South Korea, and Taiwan, which are major suppliers of semiconductors. During the second stage, imports from these countries to the United States increased significantly, a trend that continued during the third stage. Furthermore, when examining these countries from China's perspective, it is evident that during the second stage, China imported their products at a considerable rate. However, during the third stage, there was a notable reduction in imports from Japan, South Korea, and Taiwan. In other words, there has been a reorientation of the alliance countries' focus from the Chinese market to the American market.

In conclusion, the speaker presented a series of conclusions and identified the key drivers of world trade in the coming years. These include:

(1) China, despite experiencing a slowdown and facing uncertain prospects, will remain a primary player in global trade.

(2) The ASEAN countries are an important player in global trade due to their unique position and growing cooperation with both the United States and China.

(3) The ongoing integration of North America, the reindustrialization of the region, and the relocation of high-tech industries to the area will continue to be a significant driving force.

(4) Following a period of restructuring, Russia may emerge as an active player on the global stage, assuming a prominent role in the emerging processes.

(5) India, as a sizable economy in terms of population, also possesses the requisite conditions to assume an active role, albeit in a coalition with other countries, such as those in ASEAN.

Following the three presentations, the roundtable participants engaged in a more in-depth discussion of several key issues. These included the BRICS countries' interest in changes to the global economic regulatory system and the necessary actions Russia

might take in this regard; the continuing deglobalization debate in the context of the growing share of services in GDP and the expansion of digital platforms; the existence of fragmentation in certain critical global economic sectors; the feasibility of using GDP to assess the economic potential of Russia and the existence of alternative indicators for getting a more objective assessment.

At the conclusion of the discussion, **Leonid Grigoryev**, academic supervisor of the School of World Economy, presented his perspective on the ongoing processes, commencing his remarks by underscoring the challenges and prospects for the functioning of the BRICS countries. In consideration of the global economy, he drew attention to the fact that, on the one hand, the transition to a new regime of slower economic growth is being realized, primarily in China and Europe. It is evident that structural problems and the necessity for increased financial investment in technological development and the implementation of the green agenda are present. Conversely, however, the United States is exerting greater control over global financial flows, a trend that is likely to intensify. In this regard, the expert identifies a challenge in the implementation of catching-up and "overtaking" development strategies by developing countries. In the near future, the world may be confronted with a multitude of intricate processes, including a proliferation of conflicts in the trade and economic sphere and a fierce competition for financial control.

The final report on "Adaptation to the Fragmentation of the World Economy: Russia's Tasks in the Foreign Economic Track" was delivered by **Alexander Knobel**, head of the International Laboratory of International Trade Studies of the Russian Presidential Academy of National Economy and Public Administration. At the outset of his presentation, the expert highlighted the relatively modest projections for global economic growth, which are anticipated to reach 2.5% to 3% annually. It is anticipated that global trade will experience a modest increase, with the expansion of trade in services playing a pivotal role in this growth. The CIS region (primarily due to Russia) is in a distinctive position, with exports anticipated to expand while imports are projected to contract, diverging from the trends observed in other global regions.

The primary focus of the report was a comprehensive analysis of the global context in which Russia operates, emphasizing that it is not solely determined by sanctions pressure. It is important to consider the rise of protectionism in the context of the pursuit of multilateral liberalization, the emergence of new regulatory frameworks for trade negotiations, and the presence of contradictions between key countries. Additionally, the reconfiguration of global value chains and networks of cooperation warrant attention. These developments give rise to the need for Russia to reorient trade flows, to ensure technological development in light of ongoing changes, and to reconfigure transportation and logistics. The speaker also addressed the topic of the stability of hard currency payments for Russian exports, emphasizing the favorable resolution of this issue in recent quarters. Additionally, the speaker discussed the topic of critical imports that are crucial for the advancement of specific economic sectors. The speaker posited that should the Russian economy continue to develop in its current trajectory, the macroeconomic situation will remain stable, with a positive current account and trade balance, and Russia will have no problems in its interaction with the outside world. From the standpoint of

technological advancement, it is imperative to either identify a substitute for certain critical supplies from unfriendly or even neutral countries or transition to supplies from the domestic market.

The roundtable concluded with a discussion among the participants regarding the most significant issues that will shape the future of the global economy. These included the potential for economic growth to decelerate and the continued regionalization, as well as the interests and instruments of countries with respect to the development of intrabloc trade. Additionally, the discussion addressed the implications of violations of the fundamental principles of international trade.

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