



**ВЕСТНИК РОССИЙСКОГО УНИВЕРСИТЕТА ДРУЖБЫ НАРОДОВ.
СЕРИЯ: ЭКОНОМИКА**

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ЭКОНОМИКА РАЗВИТЫХ И РАЗВИВАЮЩИХСЯ СТРАН

ECONOMIES OF DEVELOPED
AND DEVELOPING COUNTRIES

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**Центральная Азия
в системе внешнеэкономических связей России:
тенденции и перспективы (2020–2024 гг.)**А.А. Миграян^{1,2} , А.И. Литвинов²  ¹Национальный исследовательский институт мировой экономики и международных отношений им. Е.М. Примакова Российской академии наук, Москва, Российская Федерация²Российский университет дружбы народов, Москва, Российская Федерация landronik@yandex.ru

Аннотация. Санкционные меры, введенные западными странами против России в 2022 г., стали катализатором масштабной перестройки торговых потоков в Евразийском регионе. Эти ограничения не изолировали российскую экономику, но спровоцировали значительную трансформацию системы международных экономических связей. В новых условиях Центральная Азия приобрела особую стратегическую значимость, превратившись в ключевого партнера России и важный транзитный узел для товарообмена. Проведен комплексный анализ структурных изменений в торгово-экономических отношениях России со странами Центральной Азии (Казахстаном, Узбекистаном, Кыргызстаном, Таджикистаном и Туркменистаном) в период с 2020 по 2024 г. Цель исследования заключается в оценке влияния санкций на переориентацию торговых потоков России в сторону Центральной Азии после 2022 г. Применен сравнительный анализ данных таможенной статистики и международных организаций (ИТС Trade Map, Всемирный банк) для отслеживания динамики объемов и структуры торговли до и после введения санкций. Особое внимание уделяется анализу новых товарных ниш, механизмам параллельного импорта и перспективам дальнейшей экономической интеграции в рамках Евразийского экономического союза (ЕАЭС). Основная гипотеза предполагает, что рост товарооборота России со странами Центральной Азии носил дифференцированный характер и определялся специфическими для каждой страны региона факторами. Результаты исследования

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подтвердили данную гипотезу, выявляя ключевые драйверы: переориентацию логистических цепочек и импортозамещение. Сделан вывод о том, что, на фоне сохраняющихся санкционных рисков и инфраструктурных ограничений Центральная Азия укрепила свою роль стратегически значимого экономического партнера России, а двусторонние отношения продолжают развиваться и укрепляться.

Ключевые слова: Россия, Центральная Азия, антироссийские санкции, структурные изменения торговли, внешнеторговый оборот, российско-центральноазиатское сотрудничество, параллельный импорт, транспортная логистика, Евразийский экономический союз, ЕАЭС, товарные потоки, Казахстан, Узбекистан, Кыргызстан, Таджикистан, Туркменистан

Вклад авторов. Авторы внесли равнозначный вклад в разработку структуры и содержания, проведение исследования и подготовку текста статьи.

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Central Asia in Russia's foreign economic relations: trends and prospects (2020–2024)

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Abstract. The sanctions imposed on Russia by Western countries in 2022 acted as a catalyst for a large-scale restructuring of trade flows across the Eurasian region. While aimed at isolating the Russian economy, these restrictions ultimately failed to achieve their goal but instead provoked a significant transformation of the system of international economic relations. In this new environment, Central Asia has acquired strategic importance, evolving into a key partner for Russia and a vital transit hub for trade exchange. This study provides a comprehensive analysis of the structural changes in Russia's trade and economic relations with the Central Asian countries (Kazakhstan, Uzbekistan, Kyrgyzstan, Tajikistan, and Turkmenistan) between 2020 and 2024. The study aims to assess the impact of sanctions on the reorientation of Russia's trade flows towards Central Asia following 2022. It employs a comparative analysis of customs statistics and data from international organizations (ITC Trade Map, World Bank) to track dynamics in trade volume and structure before and after the imposition of sanctions. Particular attention is paid to the analysis of new commodity niches, mechanisms of parallel imports, and the prospects for further economic integration within the Eurasian Economic Union (EAEU). The central hypothesis posits that the growth in Russia's trade turnover with Central Asian countries was differential in nature and determined by specific factors unique to each country in the region. The findings confirm this hypothesis, identifying key drivers such as logistics

rerouting and import substitution. The study concludes that, despite persistent sanctions risks and infrastructure limitations, Central Asia has solidified its role as a strategically important economic partner for Russia, with relations continuing an upward trajectory.

Keywords: Russia, Central Asia, anti-Russian sanctions, structural changes in trade, foreign trade turnover, Russia-Central Asia cooperation, parallel import, transport logistics, Eurasian Economic Union, EAEU, commodity flows, Kazakhstan, Uzbekistan, Kyrgyzstan, Tajikistan, Turkmenistan

Authors' contribution. The authors have made an equal contribution to the development of the structure and content, conducting research and preparing the text of the article.

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Введение

Центральноазиатский регион, обладающий значительным экономическим потенциалом и выгодным географическим положением, продемонстрировал удивительную адаптивность в условиях санкционного давления. Страны региона — Казахстан, Узбекистан, Кыргызстан, Таджикистан и Туркменистан — выработали прагматичные модели взаимодействия с Россией, что нашло отражение в динамике товарооборота, структуре взаимных поставок и развитии совместных инвестиционных проектов. Особенно показателен пример Казахстана и Узбекистана, которые, несмотря на внешнеполитическое давление, значительно нарастили объемы торговли с РФ.

Актуальность исследования обосновывается необходимостью комплексного анализа структурных изменений в торгово-экономических отношениях России со странами Центральной Азии (ЦА). Санкции, введенные после 2022 г., стали одним из наиболее значимых экономических шоков современности, радикально изменив логистические маршруты и товарные потоки. Ограничения на доступ к западным рынкам и технологиям вынудили Россию в сжатые сроки переориентировать внешнеэкономические связи, что привело к формированию новых цепочек добавленной стоимости в евразийском пространстве.

Цель исследования — оценка влияния санкций на переориентацию торговых потоков между Россией и ЦА после 2022 г. Особое внимание уделяется анализу новых товарных ниш, механизмам замещающего импорта и перспективам дальнейшей экономической интеграции. Исследование этих процессов имеет не только теоретическое, но и важное практическое значение, позволяя оценить эффективность адаптации экономик региона к новым геоэкономическим реалиям и спрогнозировать долгосрочные тенденции развития евразийского экономического пространства.

Основной гипотезой исследования является предположение о том, что рост товарооборота России со странами ЦА в 2020–2024 гг. носил дифференцированный характер и определялся специфическими факторами для каждой из стран региона.

Материалы и методы

Материалами для исследования стали:

- 1) официальная статистика: данные о внешнеторговом обороте, его структуре и динамике были получены из баз данных Международного торгового центра (ITC Trade Map) за период 2019–2024 гг., Федеральной таможенной службы Российской Федерации, Межгосударственного статистического комитета СНГ, а также национальных статистических служб и центральных банков стран ЦА;
- 2) аналитические отчеты международных организаций: использованы доклады и прогнозы Всемирного банка (World Bank) и Международного валютного фонда (МВФ), содержащие оценку макроэкономических последствий санкций для региона;
- 3) научные публикации: проанализированы работы российских и зарубежных ученых, посвященные проблемам экономической интеграции, адаптации к санкциям и развития евразийского экономического пространства;
- 4) нормативно-правовые акты и институциональные документы: рассмотрены механизмы и соглашения в рамках Евразийского экономического союза (ЕАЭС), регулирующие вопросы торговли, таможенного администрирования и параллельного импорта.

Методологическую основу исследования составил комплекс методов, основанных на анализе данных из широкого круга источников:

- 1) сравнительный анализ: проведено сопоставление динамики и структуры товарооборота России со странами ЦА в досанкционный (2019–2021 гг.), переходный (2022 г.) и постсанкционный (2023–2024 гг.) периоды. Также выполнен сравнительный анализ с другими ключевыми торговыми партнерами России (ЕС, Китай, Турция, Индия, ОАЭ, США);
- 2) статистический анализ: для обработки массивов количественных данных применялись методы дескриптивной статистики, анализ темпов прироста, расчет долей и выявление корреляционных зависимостей;
- 3) качественный контент-анализ: использован для систематизации и интерпретации материалов научных публикаций и аналитических отчетов с целью выявления ключевых тенденций и факторов, определяющих трансформацию торговых потоков;
- 4) гипотетико-дедуктивный метод: на основе анализа теоретических подходов и эмпирических данных была сформулирована гипотеза о дифференцированном характере влияния санкций на торговлю России с каждой из стран ЦА, которая в дальнейшем была верифицирована в ходе исследования.

Комплексное применение перечисленных методов и материалов позволило обеспечить репрезентативность выборки, достоверность полученных результатов и обоснованность выводов.

Результаты

Адаптация экономик стран к санкциям: теоретические подходы и региональная специфика

Санкционное давление начиная с 2022 г. стало беспрецедентным вызовом для экономик России и стран ЦА, потребовавшим быстрой трансформации сложившихся торгово-экономических связей. В научной литературе этот процесс анализируется через призму нескольких взаимосвязанных концепций.

1. Теория экономической устойчивости и замещающих рынков

Исследования И.В. Андроновой, А.Х. Абашидзе и А.Ю. Пак (Андропова, Абашидзе, 2024; Пак, Андропова, 2023), В.И. Гришина, Р.И. Хасбулатова, А.Н. Спартака (Гришин, Хасбулатов, Спартак, 2024; Спартак, 2022; Спартак, 2023), А.В. Точина, Т.М. Алиева, А.Э. Безрукова (Точин, Алиев, Безруков, 2023), А.В. Точина, Н.С. Пыжикова, В.Н. Живалова (Точин, Пыжиков, Живалов, 2025), Д.И. Ушкалова (Ушкалова, 2024), В.Ю. Черновой и А.Г. Пылина (Чернова, Пылин, 2023), А.А. Мигранян, И.С. Кришталь (Мигранян, Кришталь, 2024а, 2024б) подчеркивают, что санкции, направленные на ограничение доступа России к западным технологиям и рынкам, спровоцировали эффект «импровизированной глобализации» — переориентацию потоков на альтернативные направления. ЦА, благодаря географической близости, инфраструктурной связанности с РФ и гибкости регуляторных режимов, стала естественной платформой замещения прямых поставок санкционных товаров для РФ. При этом, как отмечает В.В. Антропов (Антропов, 2025), ключевую роль сыграла способность стран региона адаптировать таможенное и валютное регулирование под новые условия, что позволило Казахстану и Кыргызстану увеличить транзитные потоки в 2–3 раза к 2024 г.

2. Институциональная адаптация в рамках ЕАЭС

Работа А.Д. Гронского, Е.П. Ионовой, М.И. Кривогуза и др. (Гронский и др., 2024) акцентирует внимание на том, что санкции ускорили институциональные изменения в евразийской интеграции. Например, механизмы ЕАЭС по снижению торговых барьеров позволили странам ЦА быстрее замещать импорт из ЕС российской продукцией, особенно в агросекторе и фармацевтике. Однако, как показывает статистика¹, этот процесс носил асимметричный характер: если Казахстан и Кыргызстан активно использовали режим параллельного импорта, то Туркменистан и Таджикистан сохраняли зависимость от традиционных поставщиков из Китая. Это обусловлено экономическим потенциалом, степенью инфраструктурной и финансовой связанности отдельных республик региона с РФ, уровнем развития предпринимательских свобод и развитостью рыночных институтов на внутренних рынках этих стран.

3. Социально-экономические последствия для стран ЦА

Анализ официальной статистики Евразийской экономической комиссии (ЕЭК) и национальных банков стран региона (2022–2024 гг.) подтверждает тезис о двойственном характере последствий санкционного кризиса для социально-

¹ База данных международной торговой базы Trade Map. URL: <https://www.trademap.org/Index.aspx> (дата обращения: 16.05.2025).

экономического развития ЦА. Отмечаются положительные и отрицательные эффекты влияния санкций на экономику стран региона:

Положительные эффекты:

- рост ВВП;
- увеличение занятости в логистическом секторе;
- рост бюджетных доходов от транзитных операций;

Отрицательные тенденции:

- инфляционное давление;
- усиление сырьевой зависимости в торговле с Россией;
- рост госдолга.

Как показывает статистика МВФ (2023)², эти процессы имеют выраженную региональную специфику:

- в Казахстане преобладают эффекты, полученные от переориентации энергопотоков;
- в Кыргызстане и Таджикистане доминирует фактор денежных переводов;
- в Узбекистане и Туркменистане ключевым драйвером стали совместные промышленные проекты.

Ключевыми каналами воздействия стали:

- 1) переориентация российского экспорта с европейских на центральноазиатские рынки;
- 2) смещение транзитных потоков товаров и услуг через территорию стран региона;
- 3) увеличение денежных переводов трудовых мигрантов;
- 4) релокация в регион иностранных и российских компаний, ранее работавших в РФ.

Анализ Всемирного банка³ выявил рост товарооборота, обусловленный переориентацией российского экспорта на рынки ЦА, который стал драйвером инфляции в регионе (рис. 1). Это объясняется тремя ключевыми факторами:

1) ***переносом импортных цен*** — удорожание логистики (включая «санкционные премии» в 20–30 % к стоимости товаров) и рост транспортных издержек (на 40–60 % для транзитных операций)⁴;

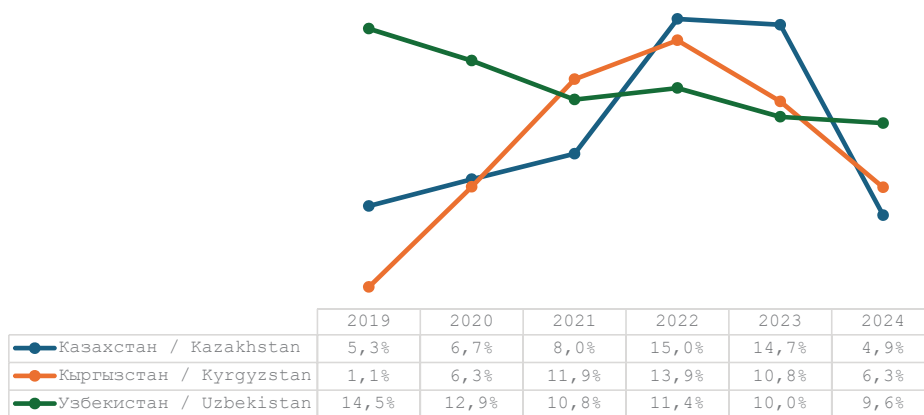
2) ***дисбалансом спроса*** — завышенная платежеспособность релокантов спровоцировала скачок цен на жилье и услуги;

3) ***эффектом денежных переводов*** — приток рублевых средств из России усилил инфляционное давление без соответствующего увеличения товарного предложения.

² International Monetary Fund. World Economic Outlook — 2023. URL: <https://www.cef.imf.org/content/dam/CEF-IMF/CEF-IMF-NewSite/4-Publications/2-RegionalPublications/English/WEО%20-%20April%202023%20-%20English%20version.pdf> (дата обращения: 16.05.2025).

³ World Bank. Global economic prospects: January 2023. URL: <https://www.worldbank.org/en/publication/global-economic-prospects> (дата обращения: 16.05.2025).

⁴ Винокуров Е., Амангельды С., Ахунбаев А., Забоев А., Кузнецов А., Малахов А. Евразийский транспортный каркас. Доклад 24/6. Алматы: Евразийский банк развития, 2024. <https://eabr.org/upload/iblock/6ce/Evraziyskiy-transportnyy-karkas.pdf> (дата обращения 16.05.2025).



Примечание. График отражает данные из БД World Bank. Статистика представлена не в полном объеме: по Кыргызстану источник данных за 2024 г. — БД Национального банка Кыргызской Республики.

Note. The chart reflects data from the World Bank database. The statistics are incomplete: for Kyrgyzstan, the 2024 data source is the National Bank of the Kyrgyz Republic database.

Рис. 1. Инфляция (годовой процент изменения потребительских цен) в 2019–2024 гг.

Источник: составлено А.А. Мигранян, А.И. Литвиновым по данным Word Bank⁵ и Национального банка Кыргызской Республики⁶.

Figure 1. Inflation (annual percentage change in consumer prices), 2019–2024

Source: compiled by A.A. Migranyan, A.I. Litvinov based on data from the World Bank⁵ and the National Bank of the Kyrgyz Republic⁶.

При этом внутренние источники роста остаются ограниченными: корреляция между наращиванием госдолга и динамикой инвестиций в основной капитал свидетельствует о структурной зависимости от внешних ресурсов. Это подчеркивает уязвимость модели, где торговый рост не трансформируется в устойчивое развитие.

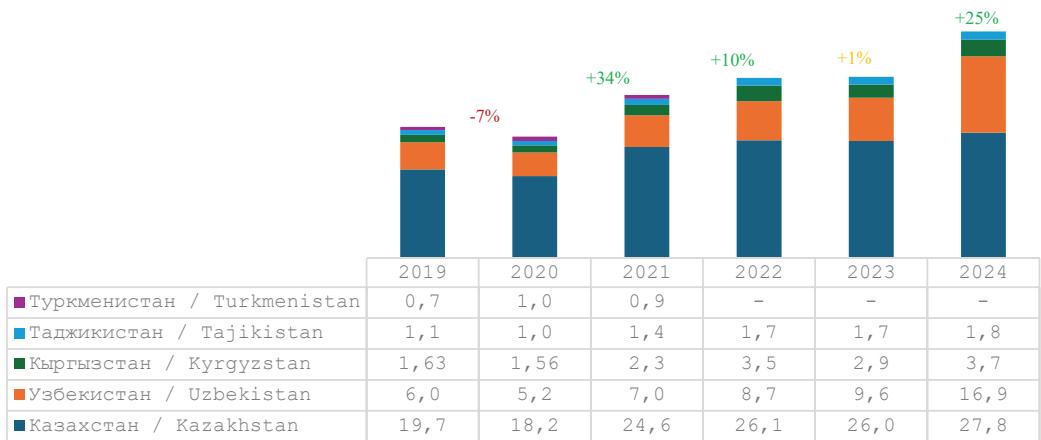
Динамика торговых объемов России со странами ЦА: сравнительный анализ до и после 2022 г.

Для оценки влияния санкций на торговые потоки между Россией и странами Центральной Азии (Казахстаном, Узбекистаном, Кыргызстаном, Таджикистаном и Туркменистаном) проведен сравнительный анализ данных таможенной статистики за период 2019–2024 гг. (рис. 2).

Анализ перестройки торговых потоков между Россией и ЦА важен для понимания новых механизмов экономической интеграции в условиях глобальной нестабильности. Санкции ускорили процессы кооперации в рамках ЕАЭС, стимулировали развитие параллельного импорта и выявили скрытый потенциал регионального сотрудничества в промышленности, энергетике и логистике.

⁵ База данных. World Bank. URL: <https://data.worldbank.org> (дата обращения: 16.05.2025).

⁶ Отчет о денежно-кредитной политике Национального банка Кыргызской Республики. IV квартал 2024 г. URL: <https://nbkr.kg/DOC/17032025/0000000000064042.pdf> (дата обращения 16.05.2025).



Примечание. График отражает данные международной торговой базы Trade Map. По Туркменистану отсутствуют данные после 2021 г. По Кыргызстану и Таджикистану данные за 2024 г. дополнены национальной статистикой стран.

Note. The chart reflects data from the International Trade Centre Trade Map database. The statistics are incomplete: for Turkmenistan, data after 2021 are missing; for Kyrgyzstan and Tajikistan 2024 data are supplemented with national statistics.

Рис. 2. Динамика товарооборота России со странами ЦА, млрд долл., 2019–2024 гг.

Источник: составлено А.А. Мигранян, А.И. Литвиновым по данным International Trade Centre Trade Map⁷; Агентство по статистике при президенте республики Таджикистан. URL: <https://www.stat.tj/ru/>; Национальный комитет статистики Кыргызской Республики. URL: <https://stat.gov.kg/ru/> (дата обращения: 16.05.2025).

Figure 2. Dynamics of Russia's trade turnover with Central Asian countries, billion USD, 2019–2024

Source: compiled by A.A. Migranyan, A.I. Litvinov based on data from the International Trade Centre Trade Map⁷; Agency for Statistics under the President of the Republic of Tajikistan. URL: <https://www.stat.tj/ru/>; National Statistical Committee of the Kyrgyz Republic. URL: <https://stat.gov.kg/ru/> (accessed: 16.05.2025).

Для анализа влияния санкционного давления на товарооборот между странами ЦА и России использованы данные за 2019 г. как базовый год для сравнения. Приведенные данные (см. рис. 2) свидетельствуют, что санкционный режим 2022 г. стал переломным моментом в торговых отношениях России с ЦА.

Падение товарооборота в 2020 г. обусловлено пандемией коронавируса. Совокупное падение товарооборота составило –7 % — с 29,1 в 2019 г. до 26,0 млрд долл. в 2020 г. (абсолютное снижение на 2,1 млрд долл.). Основные причины — временный разрыв глобальных цепочек поставок, ограничения на передвижения, снижение потребительского спроса, перебои с поставками сказались на объемах производимой продукции.

Наибольшее падение товарооборота с Россией в период пандемии продемонстрировал Казахстан — 1,5 млрд долларов (–7 %) из-за снижения поставок нефтепродуктов, падения спроса на металлы и прекращение авиасообщения.

⁷ База данных международной торговой базы Trade Map. URL: <https://www.trademap.org/Index.aspx> (дата обращения: 16.05.2025).

В Узбекистане самое большое падение товарооборота — на 13 % (–0,8 млрд долл.), что было обусловлено прекращением поставок текстильной продукции, сокращением торговой миграции и остановки совместных инфраструктурных проектов с Россией.

Падение товарооборота отмечено в Таджикистане — на 0,08 млрд долл. (–9,1 %), в большей степени это произошло из-за сокращения денежных переводов и остановки ряда строительных проектов в стране при участии российских подрядчиков.

Наименьшее падение товарооборота с Россией в пандемию показал Кыргызстан — на 0,07 млрд долл. (–4,6 %), благодаря увеличению поставок медицинских товаров из России и созданию специального торгового коридора для реэкспорта китайских товаров в то время, когда границы многих стран были закрыты.

Единственная страна в ЦА, где вырос товарооборот с Россией, это Туркменистан — +40 % (на 0,3 млрд долл.), за счет увеличения поставок медицинского оборудования и фармацевтической продукции из России, а также роста металлургической продукции.

В 2021 г. отмечен самый большой прирост — на 9,2 млрд долл. (+34 %) в товарообороте между странами ЦА и Россией из-за отложенного спроса и возобновления приостановленных за период пандемии проектов. Совокупный товарооборот за 2021 г. составил 36,2 млрд долл. Восстановление и прирост товарооборота к 2019 г. отмечается во всех странах Центральной Азии: Казахстан — +25,2 %; Узбекистан — +16,5 %; Кыргызстан — +39,9 %; Таджикистан — +28,4 %; Туркменистан — +24,6 %.

Товарооборот во всех странах превысил доковидные показатели, пандемия ускорила трансформацию торговых связей в регионе и сделала возможным построение новых логистических цепочек через Центральную Азию благодаря цифровизации таможенных процедур и модернизация транспортных коридоров, развитию ИТ и банковского сектора. В результате стало возможным безболезненная переориентация транзита большей части санкционных товаров из ЕС в 2022–2024 гг. через территории Центральноазиатских стран.

После введения санкций в 2022 г. товарооборот России со странами ЦА претерпел качественную трансформацию, демонстрируя устойчивый рост на фоне переориентации экономических связей, увеличился с 2019 по 2024 г. на 73 % (+21,1 млрд долл. — с 29,1 до 50,2 млрд долл.), при этом особенно выделился Узбекистан, чей товарооборот с Россией вырос на 180 % (+10,8 млрд долл. — с 6 до 16,9 млрд долл.) благодаря активизации промышленной кооперации и реэкспортных операций. Казахстан сохранил лидерство с ростом на 41 % (+8,1 млрд долл. — с 19,6 до 27,7 млрд долл.), хотя его доля в региональном товарообороте сократилась с 67 до 62 %. Ключевыми драйверами стали: переориентация логистических цепочек через Центральную Азию (особенно для европейских товаров), рост параллельного импорта (через Кыргызстан поставки увеличились в 3 раза в 2022 г.), а также углубление

производственной кооперации в машиностроении, химической промышленности и агросекторе. Слабый прирост товарооборота в 2023 г. по сравнению с 2022 г. всего в 1 % (+0,25 млрд долларов) обусловлен сложностями с введением вторичных санкций против третьих компаний в феврале 2023 г. (10-й пакет санкций), установка «потолка цен» в размере 60 долл. за баррель на российскую нефть и нефтепродукты в декабре 2022 г. При этом с 2023 г. наблюдается структурная перестройка — сокращение реэкспортных операций при одновременном росте поставок товаров местного производства, что свидетельствует о переходе к более устойчивой модели сотрудничества⁸.

Период 2022–2024 гг. ознаменовался фундаментальной перестройкой торгово-экономических отношений России со странами ЦА, сформировав качественно новую модель взаимодействия.

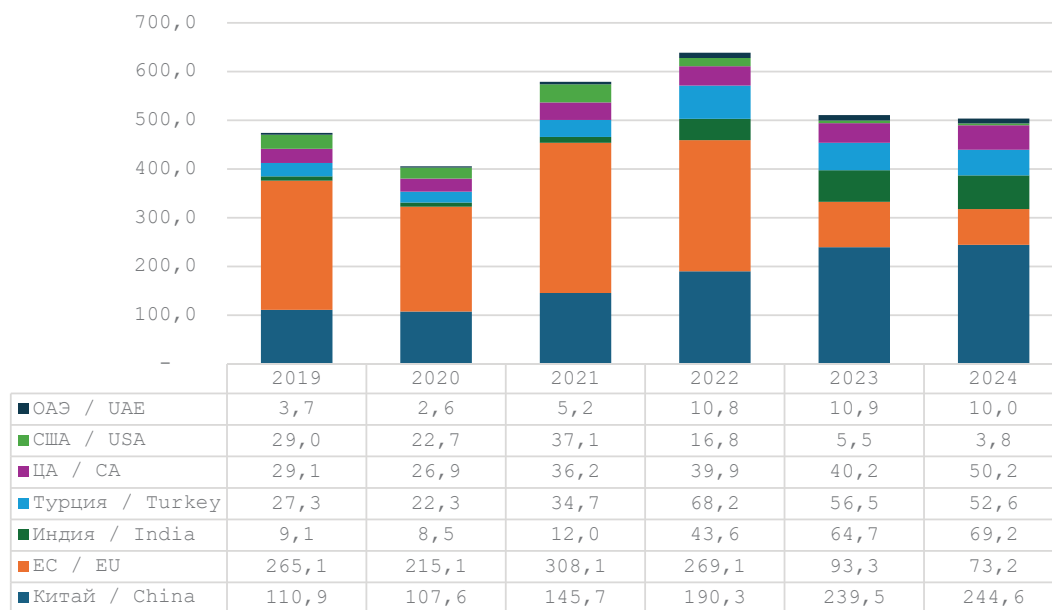
В странах ЦА эффекты антироссийских санкций проявились в виде роста экономической активности, обусловленного перераспределением торговых потоков и увеличением денежных переводов из России. Казахстан, несмотря на сравнительно низкий рост ВВП (2,8 %) в 2022 г., увеличил экспорт на 39,9 % в том же году за счет замещения российских энергоносителей на европейских рынках. Однако инфляция в стране достигла 17,2 % в 2022 г., что отразилось на снижении покупательной способности населения. Киргизия и Таджикистан продемонстрировали более высокие темпы роста ВВП (7 и 6,2 % соответственно), чему способствовал приток капитала от релокантов и рост транспортных услуг. В Киргизии объем денежных переводов из России составил 2,5 млрд долл., что стимулировало внутренний спрос, но привело к инфляции в 12,1 % (Мигранян, 2023).

Узбекистан, несмотря на меньшую вовлеченность в новые логистические схемы, добился роста ВВП на 5,8 %, в основном за счет увеличения розничной торговли и сферы услуг. Однако инфляция оставалась высокой (9,4 %), что указывает на сохраняющиеся экономические риски. Общим трендом для региона стало усиление зависимости от российского рынка, особенно в сфере трудовой миграции и денежных переводов, что делает эти страны уязвимыми к дальнейшим изменениям в экономике России. В то же время страны ЦА активно интегрируются в новые торговые коридоры, что открывает для них возможности для долгосрочного роста, но требует решения инфраструктурных и институциональных задач.

Структурные изменения в товарообороте

Анализ данных (рис. 3) выявил кардинальную трансформацию внешне-торговых связей России за последние шесть лет. Наиболее значительные изменения произошли после 2022 г., когда традиционные торговые потоки переориентировались на новые направления.

⁸ World Bank. Global economic prospects: January 2023. URL: <https://www.worldbank.org/en/publication/global-economic-prospects> (дата обращения: 16.05.2025).



Примечание. График отражает данные международной торговой базы Trade Map. Статистика представлена не в полном объеме: по Туркменистану отсутствуют данные после 2021 г. Данные по ОАЭ дополнены данными национальной статистики стран.

Note. The chart reflects data from the International Trade Centre Trade Map database. The statistics are incomplete: for Turkmenistan, data after 2021 are missing. Data for the UAE are supplemented with national statistics.

Рис. 3. Динамика товарооборота России с ключевыми партнерами в 2019–2024 гг., млрд долл.

Источник: составлено А.А. Мигранян, А.И. Литвиновым по данным International Trade Centre Trade Map, 2024⁹; Бюро экономического анализа США. URL: www.bea.gov; Министерство торговли и промышленности Индии. URL: <https://www.commerce.gov.in/>; Статистический институт Турции. URL: <https://www.tuik.gov.tr/Home/Index> (дата обращения: 16.05.2025).

Figure 3. Dynamics of Russia's trade turnover with key partners (2019–2024), billion USD

Source: compiled by A.A. Migranyan, A.I. Litvinov based on data from the International Trade Centre Trade Map, 2024⁹; Bureau of economic analysis. USA. URL: www.bea.gov; Ministry of Commerce and Industry of India. URL: <https://www.commerce.gov.in/>; Turkish Statistical Institute (TurkStat). URL: <https://www.tuik.gov.tr/Home/Index> (accessed: 16.05.2025).

Особенно показательно сравнение динамики с разными группами стран (см. рис. 3, рис. 4):

- **страны ЦА** демонстрируют устойчивый рост товарооборота: как уже отмечено выше, совокупный товарооборот вырос с 2019 по 2024 г. на +73 %; среднегодовой темп роста (GAGR): 11,5 %. Примечательно, что в отличие от других направлений, спад в пандемийном 2020 г. был минимальным (–7,6 %), а после 2021 г. наблюдается стабильный ежегодный прирост. В 2022–2024 гг. товарооборот с ЦА вырос на 12 %, что свидетельствует о возрастающей роли региона как стратегического экономического партнера;

⁹ База данных международной торговой базы Trade Map. URL: <https://www.trademap.org/Index.aspx> (дата обращения: 16.05.2025).

• резкое сократился товарооборот с традиционными партнерами с 2021 по 2024 г.:

ЕС: катастрофическое падение (–76 %);

США: сокращение (– 90 %).

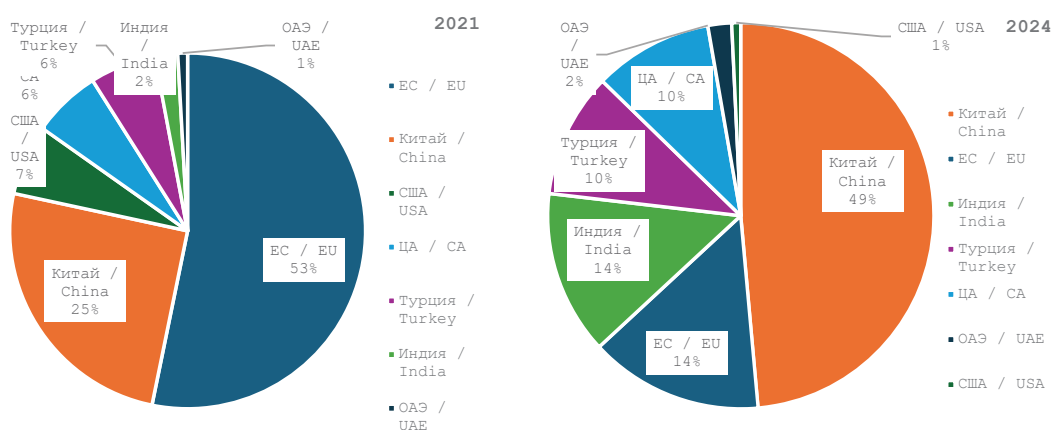
• формирование новых экономических осей с 2021 г. по 2024 г.:

Китай: рост (+68 %);

Индия: взрывной рост (+475 %);

Турция: увеличение (+51 %);

ОАЭ: рост (+94 %).



Примечание. График отражает данные международной торговой базы Trade Map. Статистика представлена не в полном объеме: по Кыргызстану, Таджикистану и ОАЭ отсутствуют данные за 2024 г. Данные по данным странам дополнены данными национальной статистики стран.

Note. The chart reflects data from the International Trade Centre Trade Map database. The statistics are incomplete: for Kyrgyzstan, Tajikistan, and the UAE, 2024 data are missing. Data for these countries are supplemented with national statistics.

Рис. 4. Структура товарооборота России с ключевыми партнерами: процентное соотношение за 2021 и 2024 г.

Источник: составлено А.А. Мигранян, А.И. Литвиновым по данным International Trade Centre Trade Map, 2024¹⁰; Агентство по статистике при президенте республики Таджикистан. URL: <https://www.stat.tj/ru/>; Национальный комитет статистики Кыргызской Республики. URL: <https://stat.gov.kg/ru/>; Статистический центр Совета сотрудничества арабских стран Персидского залива. URL: <https://gccstat.org/en/country-profile/ae> (дата обращения: 16.05.2025).

Figure 4. Structure of Russia's trade turnover with key partners: percentage distribution for 2021 and 2024

Source: compiled by A.A. Migranyan, A.I. Litvinov based on data from the International Trade Centre Trade Map, 2024¹⁰; Agency for Statistics under the President of the Republic of Tajikistan. URL: <https://www.stat.tj/ru/>; National Statistical Committee of the Kyrgyz Republic. URL: <https://stat.gov.kg/ru/>; The Statistical Centre for the Cooperation Council for the Arab Countries of the Gulf. URL: <https://gccstat.org/en/country-profile/ae> (accessed: 16.05.2025).

Сравнительный анализ выявил три этапа трансформации внешнеторговых связей России. В досанкционный период (2019–2021 гг.) наблюдалось доминирование европейского направления (50–55 % товарооборота) при стабильном росте сотрудничества с азиатскими партнерами, тогда как доля

¹⁰ База данных международной торговой базы Trade Map. URL: <https://www.trademap.org/Index.aspx> (дата обращения: 16.05.2025).

ЦА оставалась умеренной (7–9 %). Переходный 2022 г. ознаменовался резким сокращением западных направлений, ускоренным ростом обмена с альтернативными партнерами и увеличением доли ЦА до 10 %. В период постсанкционной стабилизации (2023–2024 гг.) сформировалась новая конфигурация, где ЦА закрепились как четвертое (если не учитывать ЕС) по значимости направление среди анализируемых стран, а доля ЕС сократилась до исторического минимума 73,2 млрд долл. в 2024 г.

Сложившиеся тренды экономического взаимодействия России с внешними игроками обуславливают прогноз:

- 1) углубления сотрудничества с ЦА в промышленной кооперации, транспортной логистике и энергетике;
- 2) стабилизации товарооборота с Китаем;
- 3) постепенной нормализации торговли с Турцией и Индией;
- 4) сохранения минимальных объемов взаимодействия с западными странами в среднесрочной перспективе.

Полученные результаты приводят к выводу: санкционные ограничения не только привели к фундаментальной перестройке системы внешнеэкономических связей России, в которой страны ЦА приобретают принципиально новое стратегическое значение, но и сформировали новые тренды региональной фрагментации, в которой России остается ядром экономического притяжения стран постсоветской Евразии.

Обсуждение

Санкционное давление 2022 г. выступило не столько фактором изоляции, сколько катализатором глубокой структурной перестройки внешнеэкономических связей России, в рамках которой страны ЦА перешли из категории периферийных партнеров в статус стратегически значимых. Ключевым выводом является подтверждение гипотезы о глубоко дифференцированном характере этой адаптации: Казахстан и Кыргызстан стали критически важными логистическими хабами и центрами реэкспорта; Узбекистан нарастил обороты за счет углубления производственной кооперации; тогда как экономики Таджикистана и, отчасти, Кыргызстана получили значительный стимул через канал денежных переводов и рост потребления. Однако выявленные положительные эффекты — рост ВВП, бюджетных доходов и занятости — носят двойственный характер. Они сопровождаются нарастанием инфляционного давления, усилением сырьевой зависимости и ростом госдолга, что указывает на уязвимость новой модели роста, пока еще слабо трансформирующейся в устойчивое развитие. Таким образом, текущий тренд на углубление интеграции, хотя и выглядит устойчивым в среднесрочной перспективе, требует от стран ЦА проведения сбалансированной политики, направленной на смягчение макроэкономических рисков и диверсификацию сотрудничества за счет расширения производственной кооперации и реализации совместных инфраструктурных проектов.

Заключение

Анализ динамики товарооборота России за 2019–2024 гг. продемонстрировал экономическую адаптацию за счет фундаментальной перестройки всей системы внешнеэкономических связей страны. Кардинальные изменения особенно проявились после 2022 г., когда традиционная ориентация на европейские рынки (сокращение товарооборота с ЕС с 306,1 млрд долл. в 2021 до 73,2 млрд долл. в 2024 г. (–76 %)) сменилась активным развитием сотрудничества с альтернативными партнерами. В этом контексте страны ЦА превратились в один из ключевых векторов экономической политики России, продемонстрировав устойчивый рост товарооборота на 73 % за рассматриваемый период (с 29,1 до 50,2 млрд долл.).

Особое значение имеет качественная трансформация характера экономического взаимодействия. При этом в отличие от «бума» в отношениях с Индией (+660 %) или ОАЭ (+195 %), рост товарооборота с ЦА отличается большей устойчивостью и сбалансированностью, сочетая как торговые, так и производственные формы кооперации. ЦА перестала быть периферийным направлением, превратившись в стратегически важного партнера России. Этот тренд, по всей видимости, сохранится в среднесрочной перспективе, учитывая географическую близость, и растущую взаимодополняемость экономик региона.

Выдвигаемая гипотеза позволила не только объяснить наблюдаемую динамику, но и прогнозировать дальнейшее развитие интеграционных процессов в регионе с учетом специфики каждой страны:

- для Казахстана ключевым драйвером стало замещение европейских энергопоставок и переориентация логистических цепочек, что подтверждается ростом экспорта нефтепродуктов на 39 % в 2022 г. (по данным ЕЭК);
- для Кыргызстана основным фактором выступило включение в систему параллельного импорта, что привело к трехкратному увеличению реэкспорта электроники и оборудования через киргизско-китайский коридор;
- для Узбекистана решающую роль сыграло участие в импортозамещающих проектах, особенно в автомобилестроении (рост поставок комплектующих для российских автозаводов на 210 % в 2023 г.);
- для Таджикистана значимым фактором стал рост трудовой миграции и связанный с ним приток денежных переводов, который стимулировал спрос на российские товары (прирост розничного товарооборота на 28 % в 2022–2023 гг.);
- для Туркменистана основными драйверами сотрудничества выступили совместные проекты в газовой отрасли и увеличение поставок российского оборудования для ТЭК (рост на 65 % в 2023 г.).

Результаты проведенного анализа подтверждают первоначальную гипотезу о дифференцированном характере влияния санкций на торгово-экономическое взаимодействие России со странами ЦА, что нашло отражение в выявленных закономерностях изменения товарных потоков и структурных сдвигах в региональной торговле.

Несмотря на сохраняющиеся санкционные риски и необходимость решения инфраструктурных ограничений, ЦА подтвердила свою роль стратегически важного экономического партнера России, отношения с которым продолжают развиваться по восходящей траектории.

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Сведения об авторах / Bio notes

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BRICS as a center of interfacing civilizations

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Abstract. The study analyzes the role of BRICS in shaping the multipolar architecture of international relations. The focus is on the economic and geopolitical functions of the alliance, in particular its role as a platform for bringing civilizations together and mitigating global contradictions. The increasing tension in the system of international relations and the widespread escalation of conflicts compel us to talk about instruments, institutions and associations that have a direct or indirect opportunity to influence the stabilization and settlement of global contradictions. The proactive socio-economic and political inclusive expansion of the BRICS, which is spreading across the spectrum of civilizations, can already form alternative centers of regional power today, gradually bringing the opposing powers closer together. The purpose of the study is to identify the influence of civilizational factors on the geopolitical situation and to determine the role of BRICS in shaping the new world order through integration socio-economic processes. Analytical methods were used to study the theoretical foundations, methods of systematization and content analysis for processing publications and data. Comparative analysis was also used to identify the features of BRICS in relation to Western alliances, deduction and induction to create a holistic model of the alliance's influence on world politics. It is determined that BRICS plays an important role in promoting the processes of de-dollarization, providing financial resources through the New Development Bank and strengthening the positions of the participating countries in the international system. It has been established that the alliance actively promotes the rapprochement of civilizations through transparent and tolerant partnership. The analysis showed that the architecture of BRICS cooperation attracts the interest of non-Western countries due to a fair and equitable approach, which leads to an increase in the number of those wishing to join the alliance. The intensification of forums, the creation of coordinating institutions and the strengthening of economic ties make BRICS an important element of international politics. The analysis of geopolitical processes demonstrates that the expansion of BRICS occurs mainly in the zones of civilizational faults identified by S. Huntington, while the alliance includes representatives of 6 of the



8 major civilizations (Orthodox, Sini, Hindu, Latin American, Islamic and African). It has been established that, unlike Western associations with pronounced US leadership, BRICS has a polycentric decision-making model that requires consensus among all participants, which creates institutional prerequisites for mitigating inter-civilizational contradictions. It has been revealed that the New Development Bank, which approved loans worth \$32.3 billion without political conditions by the end of 2023, is forming an alternative model of international financing that promotes economic convergence of states of different civilizations. Of particular importance is the strategy of “inclusive expansion” of the BRICS, in which countries in potential or actual confrontation (India — Pakistan, Iran — Saudi Arabia, Egypt — Ethiopia) are accepted into the alliance, which creates a platform for dialogue and economic cooperation that reduces the potential for conflict along the lines of civilizational fault.

Keywords: international relations, multipolar world, tellurocracy, talassocracy, economic architecture

Authors' contribution. Grinivetskiy I.I. — conceptualization (lead); methodology (lead); formal analysis (lead); investigation (lead); writing — original draft preparation (lead); writing, review & editing (lead); visualization (lead); supervision (lead); project administration (lead); funding acquisition (lead); Storozhyk R.P. — writing, review & editing (supporting); data curation (lead); validation (lead).

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БРИКС как центр сопряжения цивилизаций

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Аннотация. Исследование посвящено анализу роли БРИКС в формировании многополярной архитектуры международных отношений. Основное внимание уделено экономическим и геополитическим функциям альянса, в частности его роли как платформы для сопряжения цивилизаций и смягчения глобальных противоречий. Возрастающая напряженность в системе международных отношений и повсеместная эскалация конфликтов вынуждает говорить об инструментах, институтах и объединениях, которые имеют прямую или косвенную возможность влиять на стабилизацию и урегулирование глобальных противоречий. Проактивная социально-экономическая и политическая инклюзивная экспансия БРИКС, которая распространяется в контур разлома цивилизаций, уже сегодня может формировать альтернативные центры региональной

силы, постепенно сближающие противоборствующие державы. Целью исследования является выявление влияния цивилизационных факторов на геополитическую ситуацию и определение роли БРИКС в формировании нового мирового порядка через интеграционные социально-экономические процессы. Применены аналитические методы для изучения теоретических основ, методы систематизации и контент-анализ для обработки публикаций и данных. Использованы также сравнительный анализ для выявления особенностей БРИКС относительно западных альянсов, дедукция и индукция для создания целостной модели влияния альянса на мировую политику. Определено, что БРИКС играет важную роль в продвижении процессов деолларизации, предоставлении финансовых ресурсов через Новый банк развития и укреплении позиций стран-участников в международной системе. Установлено, что альянс активно способствует сближению цивилизаций благодаря транспарентному и толерантному партнерству. Анализ показал, что архитектура сотрудничества БРИКС вызывает интерес у стран не-Запада благодаря справедливому и равноправному подходу, что приводит к росту числа желающих присоединиться к альянсу. Активизация форумов, создание координирующих институтов и укрепление экономических связей делают БРИКС важным элементом международной политики. Анализ геополитических процессов демонстрирует, что расширение БРИКС происходит преимущественно в зонах цивилизационных разломов, идентифицированных С. Хантингтоном, при этом альянс включает представителей 6 из 8 основных цивилизаций (Православной, Синской, Индуистской, Латиноамериканской, Исламской и Африканской). Установлено, что в отличие от западных объединений с выраженным лидерством США, в БРИКС функционирует полицентричная модель принятия решений, требующая достижения консенсуса между всеми участниками, что создает институциональные предпосылки для смягчения межцивилизационных противоречий. Выявлено, что Новый банк развития, одоббивший к концу 2023 г. кредиты на 32,3 млрд долл. без политических условий, формирует альтернативную модель международного финансирования, способствующую экономической конвергенции государств различных цивилизаций. Особую значимость приобретает стратегия «инклюзивной экспансии» БРИКС, при которой в альянс принимаются страны, находящиеся в потенциальной или актуальной конфронтации (Индия — Пакистан, Иран — Саудовская Аравия, Египет — Эфиопия), что создает платформу для диалога и экономического сотрудничества, снижающего конфликтный потенциал на линиях цивилизационного разлома.

Ключевые слова: международные отношения, многополярный мир, теллуократия, таласократия, экономическая архитектура

Вклад авторов. Гринивецкий И.И. — концептуализация (ведущая); курирование данных (ведущая); формальный анализ (ведущая); исследование (ведущая); методология (ведущая); администрирование проекта (ведущая); визуализация (ведущая); подготовка первоначального варианта текста (ведущая); редактирование (ведущая); Сторожук Р.П. — концептуализация (вспомогательная); руководство (ведущая); валидация (ведущая); редактирование рукописи (вспомогательная).

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Introduction

The Deluge, generated by the hegemony of thalassocracies (marine civilizations), radically destabilized and destroyed the system of international relations. For many centuries, despite the geo-political cycles (for example, Kondratiev — Wallerstein), the civilizations of the sea have surpassed the civilizations of the land in their influence. Russia, as the core of the Heartland, the mainstay of Eurasia and the main historical and geographical representative of the body of bureaucracies, has been pursuing a policy of continental Eurasian strengthening since the end of the nineteenth century, striving to build a strong “axis” with other land civilizations. The policy of putting Russia in the “Anaconda ring” (the policy of political and economic deterrence), pursued by the West throughout modern history, has in every way hindered the tellurocratic integration process. At the beginning of the 21st century, the West’s desire to preserve unipolar dominance caused concern among a significant part of the world community, which prompted the Indian-Chinese elites to accept Russia’s proposal and begin active cooperation within the framework of the RIC. The initiatives of the RIC’s expansion across the Eurasian continent seemed effective at first, but today they have been fully implemented and exceeded all forecasts and expectations. BRICS has transformed into a transcontinental powerful economic association. The “Brick Alliance” became a system-like alliance, which mainly contributed to the formation of a multipolar world order, where regional centers of power became the main actors in international processes. Moreover, the civilizational sign (community of ethnicity, religion, language and culture) becomes the determining factor of relations between states. In the context of escalating conflicts around the world (Russia — Ukraine, Israel — Iran, Israel — Lebanon, India — Pakistan, China — Taiwan, Venezuela — Guyana, etc.), it is especially relevant to talk about the role of BRICS as a representative of several civilizations, expanding in the field of cultural and religious rift in order to mitigate the contradictions between the great Powers, despite the political and economic risks.

Literature review

BRICS research is formed at the intersection of political economics, international finance, and civilizational analysis and covers both institutional aspects and the empirical dynamics of the member economies. At the level of international institutions, attention to BRICS is linked to two cross-cutting themes: the representation and reform of the global architecture (including IMF quotas), as well as the formation of alternative financing channels for development. The IMF’s document on the 16th quota revision fixes the imbalance between the economic weight and voting rights of the BRICS countries, which gives additional legitimacy to the reform agenda. The annual report of the New Development

Bank (NDB) indicates the practical institutionalization of the BRICS alternative financial infrastructure. The analysis of international centers, in particular the Carnegie Endowment review, highlights the combination of geo-economic and political institutional incentives that encourage countries in the Global South to consider BRICS as a platform for diversifying foreign economic relations and reducing political vulnerability. In the Russian academic and expert agenda, the role of BRICS in the transformation of the world order is systematized, including in works comparing the scenarios of the “sum of terms” and the system of the forming nature of the association.

The theoretical and methodological basis of the research is formed by classical geopolitical concepts, in particular, the theory of confrontation between the maritime and continental powers (Gorshcharik, 2016), as well as fundamental works reflecting on the transformation of the world order after the end of the Cold War. Of key importance are the works of F. Fukuyama (Fukuyama, 1992) on the “end of history” and S. Huntington (Huntington, 1993, 1996) on the “clash of civilizations”, the latter of which serves as a conceptual framework for analyzing BRICS as a multicivilization association. The historical context of attempts to create continental blocks is revealed in the works of E.V. Tarle (Tarle, 1958), K. Haushofer (Haushofer, 2001), V.A. Dergachev (Dergachev, 2011) and V.E. Molodyakov (Molodyakov, 2004).

Modern BRICS research covers a wide range of issues. The historical stages and the political role of unification in the formation of a multipolar world are analyzed in the works of V. Belov (Belov, 2024), A.G. Senokosov (Senokosov, 2012) and O. Shtuenkel (Stuenkel, 2020). The issues of institutionalization, security and network interaction are considered by A. Abdenur (Abdenur, 2017), D.A. Panova (Panova, 2024) and D. Kuznetsov (Kuznetsov, 2020).

The BRICS economic agenda, including the role of the New Development Bank and the prospects for de-dollarization, is the subject of study by P.N. Batista Jr. (Batista Jr, 2023), V. Daldegan and V. de Borba (Daldegan, de Borba, 2023), A.D. Kostarev (Kostarev, 2020), as well as S.R. Esenbayeva and A.V. Kuznetsov (Esenbaeva, Kuznetsov, 2024).

The civilizational dimension of unification, its “soft power” and spiritual and moral values are explored in the works of V.M. Kapitsyn (Kapitsyn, 2015), A.A. Konkin and I.V. Romanova (Konkin, Romanova, 2021), A.P. Markov (Markov, 2024) and A.N. Mikhaylenko (Mikhaylenko, 2024).

The challenges and opportunities associated with the recent expansion of the alliance are reflected in the works of F.D. Yiblet (Yiblet, 2024) and in the Clingendael Policy Report (Bunskoek & Verburg, 2025), which emphasises the grouping’s pragmatic foundation in “shared utility” rather than shared values. The empirical basis for this analysis comprises official BRICS declarations, summit communiqués, and data from international organisations such as the New Development Bank, the IMF, and the World Bank.

Despite the recognition of the multicivilizational nature of BRICS, the literature has not sufficiently investigated the mechanism by which this civilizational

pluralism is transformed into a tool for mitigating global contradictions. **This study aims** to fill this gap by analyzing BRICS as a center of purposeful integration of civilizations.

Materials and methods

The information base of the research was the works of various foreign and domestic thinkers, such as the works of S. Huntington (Huntington 1993, 1996), H. Mackinder (Mackinder, 1904), E. Tarle (Tarle, 1958), O. Spengler (Spengler, 1993), A. Toynbee (Toynbee, 2022), F. Fukuyama (Fukuyama, 1992) et al., as well as analytical documents, reports of international organizations and materials from the IMF, the United Nations, the World Bank, the ILO, the Central Bank of the Russian Federation, the Take-Profit exchange portal, the statistical portals the GlobalEconomy, ZhujiWorld, Worldometer, Statista and TradingEconomics, corporate The Knoema database, a joint statistical publication of the BRICS countries, allows a quantitative analysis of current socio-economic indicators of the BRICS member states. Special attention is paid to the BRICS Economic Partnership Strategy until 2025, which defines the key areas of cooperation and the goals of the alliance. The object of the analysis was the geopolitical processes in which the BRICS countries participate, including their interaction and influence on the course of these processes and the formation of the world order. The following methods were used in the study: analytical methods to evaluate the theoretical foundations and concepts related to the BRICS and geopolitical changes, systematization methods to organize and classify the data and information obtained, content analysis to study publications and official documents related to the activities of the BRICS and international relations, comparison methods to identify differences and similarities in the approaches of BRICS and Western alliances, deduction and induction to build a holistic model of understanding the role of BRICS in the context of global and regional changes, generalization methods for drawing conclusions based on the collected data and analysis.

Results and discussion

Theoretical and historical background of the formation of BRICS

The historical confrontation between the civilizations of land (tellurocracies) and sea (thalassocracies) is the cornerstone of geopolitics and geo-economics. After the era of the domination of continental empires, the rise of maritime powers began in the 15th century, which reached its peak in the 19th and 20th centuries. Attempts to create continental blocs (for example, the idea of S.Y. Witte on the union of Russia, France and Germany (Tarle, 1958) or the geopolitical project “Berlin — Moscow — Tokyo” by K. Haushofer (Haushofer, 2001; Gorshcharik, 2016; Molodyakov, 2004) were aimed at restoring the balance of power but were unsuccessful.

The Versailles-Washington system of international relations, which developed after World War II, was structured under the auspices of the ideological struggle between capitalism and communism, the civilizations of land and sea, West and East, the World Island and the Heartland. This confrontation actually projects onto modern history the principle of “duality of civilizations”, which was described by H. In 1904, in the work “The geographical axis of history” by Mackinder (Mackinder, 1904).

The end of the Cold War and the collapse of the Soviet Union led to the establishment of a unipolar world order led by the United States (Belov, 2024). This moment was understood by F. Fukuyama as the final victory of the Western Model and the “end of history” (Fukuyama, 1992). In contrast to this concept, S. Huntington put forward the theory of “clash of civilizations”, according to which future global conflicts will be determined by cultural, religious and historical differences (Huntington, 1993, 1996). He argued that the world is moving towards a multipolar and multicivilization system, where the key actors will not be individual states, but integration blocs.

The Russian leadership of the 90s, despite its pro-Western views, was already aware that hoping only for partnership with the United States for such a potentially powerful country was fundamentally the wrong policy. In this regard, first in 1994, the Chairman of the Russian State Duma, I.P. Rybkin, and then in 1998, the Head of the Russian Foreign Ministry, E.M. Primakov, proposed the creation of a “strategic triangle” of the RIC (Russia — India — China). but Indian-Chinese disagreements hinder the process. The events in Kosovo (1999) significantly changed the situation, after which E.M. Primakov completed his famous “Atlantic U-turn”. The Primakov Loop, firstly, showed the whole world that Russia’s policy must be reckoned with, and secondly, it made it clear to non-Western countries that it is necessary to maintain global stability and observe the fundamental principles of international law, rather than defending only their interests, extracting short-term political and economic benefits (Grinivetskiy, 2024b). It benefits from being a tool for implementing the strategic beliefs of the West. The United States’ desire to become a total hegemon on the global stage has crossed the boundaries allowed by the world community and alarmed the global majority. The events in Afghanistan (2001) and Iraq (2003) forced the Indian-Chinese partners to seriously consider integration (Grinivetsky, 2024a). In 1999–2001, the active discussion of cooperation within the framework of the RIC resumed, where all 3 states had already shown interest (Senokosov, 2012).

Russia, India and China did not stop at strengthening Eurasian continentalism and began integration with Brazil. In 2009, the partnership relations were given official status and the BRIC bloc was formed, and in 2011, after the accession of South Africa, the union was transformed into BRICS. In the following years, BRICS has been actively developing and strengthening its trade and economic ties. During this period, the world order has undergone a profound transformation. The concept of a multipolar and transcontinental world turns out to be real and feasible (Grinivetsky, 2024b). The BRICS Alliance is becoming a leading player

in the global arena. Today, BRICS has 10 member states (Brazil, Russia, India, China, South Africa, Iran, Ethiopia, Egypt, UAE, Indonesia) and more than 20 potential participants.

It is noteworthy that Huntington's works are only increasing their relevance, since it is on the borders of the ethnic, linguistic, and cultural-religious division of civilizations that the escalation of armed conflicts is increasingly evident today: Ukraine — Russia — Western-Orthodox civilizations, Israel — Palestine, Israel — Iran, Israel — Lebanon (and others Middle Eastern countries) — Western-Islamic civilizations, India — Pakistan — Hindu-Islamic civilizations, Venezuela — Guyana — Western-Latin American civilizations, Indo-Chinese — The Hindu-Sin civilization, the Taiwan — China — Western-Sin civilization crisis. As you can see, the pro-Western dictatorship has greatly distorted the balance of power in the international arena. Non-Western civilizations are strengthening and increasingly defending their historical borders. This trend underlies the modern processes of the formation of a multipolar world order (Konkin, 2021; Markov, 2024).

It is worth noting that the role of BRICS in these geopolitical processes is enormous, although not immediately noticeable. To understand the influence of the “brick alliance” on the formation of the world order, one must recall the effectiveness of the pro-Western policy of “soft power” (de facto “smart power”) in the late twentieth and early twenty-first centuries, which consisted in obtaining desired results on the world stage through financing and creating an attractive image of one's own culture and politics. and values. If the West acted exclusively in its own interests, then the distinguishing feature of the “soft power” from the BRICS is its mission — to maintain a transparent and equal dialogue with all actors in the international arena in order to form a license — based world order¹.

Comparative economic analysis, global governance imbalances, and BRICS institutional and civilizational flexibility

The reliability of the BRICS mission, goal-setting, and political and economic orientations is emphasized by the following key factors:

1. While the Western Bloc associations always have a pronounced leader — the United States (Table 1), which actually imposes the rules of the game on the “partners”, acting in order to preserve its hegemony, then the BRICS has at least 6 centers of power representing different civilizations (Russia — Orthodox, China — Chinese, India is Hindu, Brazil is Latin American, the United Arab Emirates, Saudi Arabia, Egypt, Indonesia and Iran are Islamic, Ethiopia and South Africa are African) and are catalysts of socio-economic development in their regions (Table 2). This suggests that for decision-making in BRICS, it is necessary to reach consensus among all members of the alliance, i.e. a true “balance of power” is observed.

¹ Strategy for BRICS Economic Partnership until 2025. Retrieved 1 May 2025 from <https://brics-russia2020.ru/images/114/81/1148133.pdf>

Table 1

Differentiation of the economies of the G7 countries

Countries	Area, 1000 km	Population, million (2024)	Population density, per km ²	GDP, trillion USD (2024)	GDP per capita, USD	GDP (PPP), trillion USD (2024)
United Kingdom	245	67.7	276.3	3.5	51699	4.03
Germany	357	83.3	233.3	4.59	55102	5.69
Italy	301	58.9	195.7	2.33	39559	3.35
Canada	9984	38.8	3.9	2.24	57732	2.47
France	547	64.8	118.5	3.13	48302	3.99
Japan	378	123.3	326.2	4.11	33333	6.72
United States	9623	340	35.3	28.78	84647	28.78
Total (G7)	21435	776.8	132.1	48.68	41153	55.03
World totals	148940	8164	58	109.2	13376	185.737
Percentage of world totals, %	14.4	9.5	227.8	44.6	307.7	29.6

Source: compiled by I.I. Grinivetskiy on the basis of data from the exchange portal “Take-Profit”², the statistical portals “theGlobalEconomy”³, “Worldometer”⁴, “Statista”⁵ and “TradingEconomics”⁶, the corporate database “Knoema”⁷, a joint statistical publication of the BRICS countries⁸.

Based on Table 1, it can be noted that the nominal GDP at current prices of the G7 countries is 43.5% of the global total, GDP by PPP is 29.9%, population is 9.5%, territorial area is 14.4%, and GDP per capita of the G7 is 3 times higher than the global average, which indicates high economic development countries of this association. It should also be noted that the population density in the G7 member States is 2.28 times higher than the global average. The United States is the clear leader among the countries of the union, second only to other members in terms of two indicators — the area of territories (Canada) and population density (all except Canada).

² Economic Statistics and Indicators by Country. Take-profit. Retrieved 30 May 2025 from <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwjGjIfY5vmSAxUTJhAIHRvZEooQFnoECBoQAQ&url=https%3A%2F%2Ftake-profit.org%2Fen%2Fstatistics%2F&usg=AOvVaw2TTw4koCGeVOjg4F67UgMI&opi=89978449>

³ Indicators. TheGlobalEconomy. Retrieved 30 May 2025 from https://www.theglobaleconomy.com/indicators_list.php

⁴ Population. Worldometer. Retrieved 30 May 2025 from <https://www.worldometers.info>

⁵ Global GDP — statistics & facts. Statista. Retrieved 30 May 2025 from <https://www.statista.com/topics/7747/gross-domestic-product-gdp-worldwide/?srsltid=AfmBOooi19wLHWNyW62XhqSuITyOwzZFWKNOBGOGw4T3Ql6Az5d2Weh>

⁶ Countries. TradingEconomics. Retrieved 30 May 2025 from <https://tradingeconomics.com/countries>

⁷ World Data Atlas. Knoema. Retrieved 30 May 2025 from <https://knoema.ru/atlas>

⁸ BRICS Joint Statistical Publication. Retrieved 30 May 2025 from https://brics.ibge.gov.br/downloads/BRICS_Joint_Statistical_Publication_2024.pdf

Table 2

Differentiation of the economies of the BRICS countries

Countries	Area, 1000 km ²	Population, million (2024)	Population density, per km ²	GDP, trillion USD (2024)	GDP per capita, USD	GDP (PPP), trillion USD (2024)
Brazil	8512	216.4	25.4	2.33	10767	4.27
Russia	17275	147.4	8.5	2.06	13976	5.5
India	3288	1429	434.6	3.94	2757	14.6
China	9600	1426	148.5	18.53	12994	35.29
South Africa	1221	60.6	49.6	0.373	6155	1.02
Egypt	1001	113	112.9	0.348	3080	1.9
Iran	1648	89.2	54.1	0.464	5202	1.85
UAE	83	9.52	114.7	0.527	55357	0.95
Ethiopia	1127	127	112.7	0.163	1283	0.43
Indonesia	1905	282.5	148.3	1.49	5274	4.72
BRICS	39896	3279.4	133.3	27.233	9330	60.68
Total (BRICS+)	45660	3900.6	120.9	30.225	11684.6	70.53
BRICS+/BRICS, %	114.4	118.9	90.7	111.0	125.2	116.2
World totals	148940	8164	58	109.2	13376	185.737
Percentage of world totals, %	30.7	47.8	208.5	27.7	87.4	38.0

Source: compiled by I.I. Grinivetskiy on the basis of data from the exchange portal “Take-Profit”⁹, the statistical portals “theGlobalEconomy”¹⁰, “Worldometer”¹¹, “Statista”¹² and “TradingEconomics”¹³, the corporate database “Knoema”¹⁴, a joint statistical publication of the BRICS countries¹⁵.

The total territory of the BRICS+ countries increased by 15.2% and reached 45.7 million km², which is 31% of the world’s land area. The population has grown to 3.9 billion people (44.7% of the global figure), and the population density

⁹ Economic Statistics and Indicators by Country. Take-profit. Retrieved 30 May 2025 from <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKewjGjIfY5vmSAxUTJhAIHRvZEooQFnoECBoQAQ&url=https%3A%2F%2Ftake-profit.org%2Fen%2Fstatistics%2F&usg=AOvVaw2TTw4koCGeVOjg4F67UgMI&opi=89978449>

¹⁰ Indicators. TheGlobalEconomy. Retrieved 30 May 2025 from https://www.theglobaleconomy.com/indicators_list.php

¹¹ Population. Worldometer. Retrieved 30 May 2025 from <https://www.worldometers.info>

¹² Global GDP — statistics & facts. Statista. Retrieved 30 May 2025 from <https://www.statista.com/topics/7747/gross-domestic-product-gdp-worldwide/?srsltid=AfmBOooi19wLHWNyW62XhqSuITyOwzZFWKNOBVGOGw4T3Ql6Az5d2Weh>

¹³ Countries. TradingEconomics. Retrieved 30 May 2025 from <https://tradingeconomics.com/countries>

¹⁴ World Data Atlas. Knoema. Retrieved 30 May 2025 from <https://knoema.ru/atlas>

¹⁵ BRICS Joint Statistical Publication. Retrieved 30 May 2025 from https://brics.ibge.gov.br/downloads/BRICS_Joint_Statistical_Publication_2024.pdf

(121 people km²) is almost twice the global average. The economic indicators of the union are also showing significant growth. The nominal GDP of the BRICS+ countries amounted to \$30.2 trillion (28.6% of global GDP), of which \$27.2 trillion accounted for the original countries of the bloc. After the new members joined, GDP per capita increased by 51.8% and reached \$11.7 thousand, remaining below the global average (\$13.4 thousand). However, the UAE (\$55.4 thousand) and Russia (\$14 thousand) show higher values. China (\$18.5 trillion), India (\$3.9 trillion) and Russia (\$2.1 trillion) remain the leaders in total GDP. However, the lower GDP per capita in most BRICS countries (\$11.7 thousand on average for BRICS+ versus \$41.1 thousand in the G7) indicates that the economic weight of the alliance is based on scale rather than technological leadership and high labor productivity. This determines both the long-term growth potential and the current vulnerability associated with the need for structural reforms and technological modernization (Grinivetskiy, 2024b).

It is worth saying that BRICS makes a significant contribution to the global economy. The role of the association in international economic processes is mainly related to the production of strategically important resources, low- and medium-complexity manufacturing products, as well as providing multinational companies with affordable labor. Within the framework of the current system, the BRICS countries face systemic imbalances, which are reflected in unfair compensation for their contribution to the development of the real sector of the global economy. This is a serious reason for reforming the established rules in the global financial environment. This implies a fair revision of IMF quotas in favor of fast-growing developing countries, increased trade in national currencies, and the creation of their own supranational regulatory institutions. In 2025 (16 revision), the total quota of the BRICS countries is 17.53% (China — 6.4%, India — 2.75%, Russia — 2.71%, Brazil — 2.32%, Iran — 0.75%, Indonesia — 0.98%, South Africa — 0.64%, UAE — 0.49%, Egypt — 0.43%, Ethiopia — 0.06%), and the G7 — 43.42% (USA — 17.43%, Japan — 6.47%, Germany — 5.59%, Great Britain — 4.23%, France — 4.23%, Italy — 3.16%, Canada — 2.31%). Even though the GDP in terms of PPP of the BRICS countries is already 28.2% higher than the corresponding indicator for the G7, the share of the BRICS countries in the IMF remains unfair in relation to their contribution to global economic development.

2. The BRICS association has an informal status, therefore, there are no formal mechanisms of coercion and pressure on the members of the union. Unlike Western institutions (such as NATO or the EU), which are dominated by strict contractual obligations, BRICS relies on the principles of voluntariness and consensus. This allows the participating countries to maintain their sovereignty in decision-making and avoid pressure from large economies. For example, within the framework of the BRICS Forum on Global Security in 2024, the need to respect national peculiarities and unobtrusive development models was emphasized, which corresponds to the concept of “soft power” of the alliance. This configuration has favorable macro and microeconomic consequences for the participating countries. First, the consensus procedure slows down decision-making and increases the danger of a “minimum common denominator”, which may limit the depth and speed of integration in complex issues (finance, standards, capital market). Secondly, the lack of strict enforcement is offset by the increased enforceability

of commitments made: the low costs of inconsistency at the decision-making stage are replaced by a higher likelihood of bringing agreements to implementation, since they reflect a real “zone of intersection” of national interests. Thirdly, soft coordination encourages institutional experimentation and “piloting” in the formats of coalitions of stakeholders — from local currency lending and settlements to testing digital payment solutions — with the subsequent scaling up of successful practices. In this sense, the New Development Bank acts as an important mechanism for “positive coercion” through economic incentives: project covenants and financial conditions form a disciplining framework without political conditionality, which reduces the risks of non-fulfillment and ensures that integration initiatives are linked to measurable economic results. To minimize the costs of the consensus model, BRICS is consistently increasing its coordination tools without losing its sovereignty. The role of the rotating chairmanship as an “agenda setter” is being strengthened, procedures for mutual reviews and comparable indicators (“scoreboards”) are being developed in sectoral tracks, compatibility of disclosure, compliance and payment reporting standards is increasing, network “epistemic communications” are being formed in business and academic tracks, which reduces information asymmetries and transaction costs. As a result, the BRICS informality rationally correlates the speed and depth of integration with the political and economic heterogeneity of the participants: it reduces entry costs and risks of political confrontation, increases the stability of execution and creates space for step-by-step institutional rapprochement through economic incentives and integration mechanisms, rather than through strict legal coercion.

3. While the Western IBRD (International Bank for Reconstruction and Development), the World Bank, and the IMF de facto lend and provide assistance to countries in order to form leverage over these geopolitical actors (i.e., they accompany financing with political demands), the New Development Bank, firstly, seeks to develop settlements in national currencies, and secondly, is really interested in the socio-economic progress of emerging centers of economic power by providing them with cheap loans, financing infrastructure projects and not burdening them with political obligations (Daldegan, de Borba, 2023; Kostarev, 2020; Panova, 2024). The New Development Bank, established in 2014, actively promotes a model of project financing without political conditionalities, which contrasts with the practice of the IMF and the World Bank. By the end of 2023, the NDB has approved loans worth \$32.3 billion for 90 projects, including renewable energy, transport and urbanization, demonstrating its focus on the socio-economic progress of developing countries (for example, a \$1 billion loan from South Africa to finance water supply and sanitation infrastructure). In addition, the NBR is actively developing settlements in national currencies: in 2024, the share of such transactions in the bank’s portfolio exceeded 40%, reducing dependence on the dollar and the euro. According to the Clingendael Institute’s analysis, BRICS membership offers emerging and developing countries several strategic advantages rooted in what the report terms “shared utility” rather than shared values. Key among these is the provision of “a seat at the table” — enabling participating states to articulate their preferences within a multilateral forum. The grouping also provides tangible alternatives to Western-led financial

architecture: through the New Development Bank (NDB) and the Contingent Reserve Arrangement (CRA), members gain access to infrastructure financing and emergency liquidity support, which is particularly valuable for nations facing sanctions, currency instability, or debt distress. Furthermore, BRICS facilitates efforts to reduce perceived overreliance on Western-led institutions and the US dollar, while allowing countries to explore alternative approaches to multilateralism and development that may better align with their specific contexts. For many developing economies, the BRICS thus represents a pragmatic platform for enhancing strategic autonomy, diversifying economic partnerships, and accessing development finance with fewer political conditionalities — all within an increasingly multipolar global order¹⁶.

4. Under the risk of less stable and sustainable development, BRICS is actively expanding and accepting new members into its ranks, who may be in confrontation with existing participants (Stuenkel, 2020). On the one hand, this poses a threat to the socio-economic (Table 3) and political security of the association, but on the other, BRICS is blurring the contour of the clash of civilizations, seeking to include them in a common transcontinental integration process that will bring them closer (Markov, 2024; Mikhailenko, 2024). Let's consider the options for civilizational coupling of potential and current BRICS members: Pakistan-India — Islamic-Hindu; Algeria-Morocco-Syria-Saudi Arabia-Egypt-UAE-Kuwait-Iran and Nigeria-Ethiopia-South Africa-Uganda-Chad-South Sudan-Eritrea-Equatorial Guinea-Senegal-Zimbabwe — Islamic-African; Venezuela-Brazil-Argentina-Cuba-Honduras-Nicaragua-Bolivia — rapprochement of Latin American civilizations; Russia-Belarus and Kazakhstan-Turkey — Orthodox-Islamic; Thailand-Bangladesh, and India — Buddhist-Islamic-Hindu; China-India — Sin-Hindu; Russia-China — Orthodox-Chinese.

As we can see from Table 3, the expansion of the BRICS, in addition to increasing the nominal economic and demographic scale, has significant risks of the disintegrative impact of unstable economic systems on transcontinental convergence within the framework of the association. Serious inflation rates in Iran (36%), Egypt (29.8%) and Ethiopia (29%) hinder not only the full-fledged and stable economic development of these states, but also increase the volatility of their national currencies, which, in the context of the prioritization of trade in national currencies within the framework of the BRICS, significantly weakens the efficiency of export-import activities of these countries. This forces us to resort to using other reserve currencies and neglect de-dollarization initiatives, which so far have not had the proper real effect (Batista Jr., 2023; Esenbaeva, Kuznetsov, 2024). It should also be borne in mind that Ethiopia, although it is one of the strongest economies in Central Africa, but a small number of its international reserves indicates the impossibility of regulating financial stability by the Ethiopian Central Bank. Egypt and South Africa face the same problem. And combined with the huge external debt (relative to GDP) Brazil (38%), Ethiopia (21.5%), the United Arab Emirates (31%), India (18.7%), Egypt (34.3%)

¹⁶ Bunschoek, R., & Verburg, S. The BRICS and the Emerging Order of Multipolarity. Retrieved 30 Jun 2025 from https://www.clingendael.org/sites/default/files/2025-05/BRICS_Emerging_Order_Multipolarity.pdf

and the unstable military and political situation in Russia, Iran, Ethiopia, Brazil and Egypt pose a great threat to the realization of that socio-economic potential the “brick” alliance, which is discussed from summit to summit.

Table 3

Key macroeconomic indicators of the BRICS countries

Countries	CPI, % (Jan 2023)	CPI, % (Jan 2024)	CPI (% of previous year)	Inflation rate, % (Jan 2024)	Unemployment rate, % (Jan 2024)	External debt, million USD (2022)	International reserves, million USD (2022)
Brazil	6508	6802	104.5	4.51	7.6	728181	343500
Russia	234	251	107.3	7.4	2.9	327000	585448
India	177	186	105.1	5.1	6.8	635324	567298
China	104	103	99.0	–1	5.2	2452800	3306839
South Africa	107	113	105.6	5.3	32	156096	60553
Egypt	149	193	129.5	29.8	6.9	164728	32143
Iran	161	226	140.4	36	7.6	6282	122000
UAE	106.5	106.2	99.7	0.44	3	158000	138433
Ethiopia	333	423	127.0	29	4	28000	3046*
Indonesia	102	105	102.9	2.9	4.82	425	137000

*Data on Ethiopia's international reserves for 2020.

Source: Compiled by I.I. Grinivetskiy on the basis of data from the Central Bank of the Russian Federation¹⁷, the exchange portal “Take-Profit”¹⁸, the statistical portals “theGlobalEconomy”¹⁹, “Worldometer”²⁰, “Statista”²¹ and “TradingEconomics”²², the corporate database “Knoema”²³, a joint statistical publication of the BRICS countries²⁴.

¹⁷ Key indicators. The Central Bank of the Russian Federation. Retrieved 30 May 2025 from <https://www.cbr.ru/key-indicators/>

¹⁸ Economic Statistics and Indicators by Country. Take-profit. Retrieved 30 May 2025 from <https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKewjGjIfY5vmSAxUTJhAIHRvZEooQFnoECBoQAQ&url=https%3A%2F%2Ftake-profit.org%2Fen%2Fstatistics%2F&usq=AOvVaw2TTw4koCGeVOjg4F67UgMI&opi=89978449>

¹⁹ Indicators. TheGlobalEconomy. Retrieved 30 May 2025 from https://www.theglobaleconomy.com/indicators_list.php

²⁰ Population. Worldometer. Retrieved 30 May 2025 from <https://www.worldometers.info>

²¹ Global GDP — statistics & facts. Statista. Retrieved 30 May 2025 from <https://www.statista.com/topics/7747/gross-domestic-product-gdp-worldwide/?srsltid=AfmBOooi19wLHWNyW62XhqSuITyOwzZFWKNOBVGOGw4T3Ql6Az5d2Weh>

²² Countries. TradingEconomics. Retrieved 30 May 2025 from <https://tradingeconomics.com/countries>

²³ World Data Atlas. Knoema. Retrieved 30 May 2025 from <https://knoema.ru/atlas>

²⁴ BRICS Joint Statistical Publication. Retrieved 30 May 2025 from https://brics.ibge.gov.br/downloads/BRICS_Joint_Statistical_Publication_2024.pdf

5. The Non-Western world and the BRICS members are concerned about the crises of the financial architecture of the world and are actively discussing the creation of a new currency and developing a single independent and apolitical (unlike SWIFT) payment system (BRICS Pay, BRICS Bridge), considering the interests of all participants in this de-dollarization process. The BRICS states are making serious plans to restructure the global economic system on a fair basis: there are talks about creating a common economic space, simplifying financial transactions, a new investment platform to support national economies and countries of the global South and East, and a depository system (accounting for securities in the BRICS countries — BRICS Clear), a grain exchange (protecting markets from attacks by speculators and artificial scarcity) and an exchange for trading precious metals and diamonds (creating a fair competitive mechanism based on exchange principles). Methodologically, it is important to distinguish between financial message transmission systems (the level of standardized communication between banks, as exemplified by SWIFT and its analogues) and proprietary settlement/clearing (transfer of liquidity, finalizing obligations, and risk management): the BRICS focus is shifted towards practical steps for local currency settlements and the creation of channels with reduced political vulnerability (Batista Jr., 2023; Esenbaeva, Kuznetsov, 2024; Bunskoek, Verburg, 2025). Cross-border settlements based on central bank digital currencies (CBDCs — Central Bank Digital Currency) and multi-CBDC platforms are being tested as a technological area; the experience of the mBridge project with the participation of the UAE and China is indicative, demonstrating the potential to reduce costs and shorten payment processing time, subject to legal compatibility and mature cybersecurity standards. However, scaling mCBDC solutions will require synchronization of regulation, data protection regimes, and operational risk management procedures. These initiatives are designed to reduce the cost of access to capital, create alternative price benchmarks and increase the sustainability of critical supply chains; at the current stage, we are talking about roadmaps and pilots, sustainable liquidity requires the participation of large international traders, coordination of regulatory regimes and building a reliable clearing and management infrastructure. In the short term, it is appropriate to expand the NBR's LCY (Local Currency) instruments and related hedging products in national currencies, develop a network of central banks' bilateral swap lines along priority trade corridors, modernize communication standards, and launch bilateral netting schemes for obligations with agreements on mutual recognition of KYC/AML (Know Your Customer / Anti-Money Laundering) procedures. In the medium term, the key milestones are the launch of limited multilateral netting clearing (with settlements in LCY or through neutral "anchor" currencies of the BRICS countries, the initial interoperability of individual CBDC platforms for settlements on critical commodity chains, pilots of the depository and clearing infrastructure for cross-border securities transactions and commodity auctions with settlements in national currencies and a transparent pricing methodology. In the long term, it is possible to scale multilateral clearing, transition from pilot recruitment to stable markets with deep liquidity, and, if economically feasible, introduce a synthetic unit of account based on a basket of currencies and/or commodities as an accounting unit that is not

identical to a “supranational currency” and does not require immediate monetary centralization. At the same time, the main projects and initiatives belong to Russian experts and scientists.

6. The BRICS countries act as regional leaders, representing the interests of various regions such as the CIS, Southeast Asia, South Asia, Latin America and Africa. These states have significant influence on events in their regions and, with the help of BRICS, actively pursue relevant policies in the international arena (Kuznetsov, 2020). This is reflected in the institutional connection with regional associations (AU (African Union) / AfCFTA (African Continental Free Trade Area) through South Africa and Egypt, MERCOSUR (Mercado Común del Sur / Southern Common Market) through Brazil, EAEU (Eurasian Economic Union) / CIS (Commonwealth of Independent States) and SCO (Shanghai Cooperation Organisation) through Russia, SAARC (South Asian Association for Regional Cooperation) / BIMSTEC (Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation) and the SAGAR (Security And Growth for All in the Region) initiative through India / ASEAN (Association of Southeast Asian Nations) and BRI (Belt and Road Initiative) (“Belt and Road”) / AIIB (Asian Infrastructure Investment Bank) through China, GCC (Gulf Cooperation Council) and OPEC+ (Organization of the Petroleum Exporting Countries plus other major non-OPEC oil-producing countries) through Saudi Arabia and the United Arab Emirates, IGAD (Intergovernmental Authority on Development) / AU (African Union) through Ethiopia.); implementation of cross-border infrastructure corridors (for example, the INSTC (International North–South Transport Corridor) of the Russian Federation–Iran–India, energy coordination in OPEC+, port logistics hubs of Egypt and the United Arab Emirates); using development tools (NBR, local currency financing), which reduces transaction costs and currency risks for regional partners.

7. The multicivilizational composition of the BRICS acts not only as a symbolic, but also as an institutional resource of the alliance: the accumulated experience of the coexistence of various cultural and historical traditions is transformed into a set of compatibility norms (respect for sovereignty, non-interference, consideration of national specifics, equality), which is formalized in the BRICS Economic Partnership Strategy until 2025 and supported by mechanisms of regular “socialization” of elites in specialized tracks — business, academic and expert. Such a regulatory framework has a direct economic dimension. It reduces the transaction costs of interstate cooperation (search for a counterparty, standard approval, enforcement), generates trust capital and, as a result, reduces the risk of contract “capture” and regulatory uncertainty in cross-border projects. The repeatability of contacts within the BRICS Business Cooperation Council, the Business Forum, the Council of Analytical Centers (BTTC), and the Academic Forum creates “epistemic communities” that develop agreed expectations and procedures, from compliance and data exchange to approaches to resolving contentious issues, which expands the possibilities of long-term contracting and joint investments. A polycentric, consensus-based management model focused on institutional pluralism reduces the likelihood of imposing single «universal» prescriptions and thereby reduces the

risk of politically motivated gaps in cooperation; economically, this translates into a lower premium for country risk in projects involving participants from several BRICS jurisdictions, greater stability of supply chains, and better predictability of the regulatory environment for businesses. In comparison with approaches that strictly link financing and trade to political conditions, BRICS' emphasis on sovereign equality, transparency, inclusivity, and mutual benefit creates a more acceptable incentive structure for partners and reduces the likelihood of a “political shock” to economic transactions, which is especially important for countries with unstable institutions (Mikhailenko, 2024). In the long term, intercivilizational cooperation creates an additional “portfolio” effect due to the diversification of macrocycles and supply/demand shocks between the regions represented in the BRICS. This reduces the correlation of risks and improves the parameters of the distribution of returns in joint projects, increasing their banking and market financiability. An additional channel is the development of a “soft infrastructure” — comparability of statistics, harmonization of disclosure standards, KYC/AML procedures, and data protection — that increases transparency and reduces monitoring costs for financial institutions. The combination of these mechanisms allows us to interpret the BRICS value and regulatory framework as an economic asset: it ensures the accumulation of social capital between different civilizational communities, which is converted into an increase in the likelihood of successful implementation of cross-border projects and into a reduction in the cost of capital by reducing institutional uncertainty. Thus, the BRICS intercivilizational dimension, being fixed in strategic documents and reproduced through regular interaction formats, performs the function of reducing coordination costs and political and regulatory risks, which is an important condition for increasing trade, investment and joint innovation in a diverse and coordinated institutional environment. This approach distinguishes the “brick alliance” from Western paternalistic associations with a colonial past (Kapitsyn, 2015).

In addition to the factors listed above, in the medium and long term, it is the BRICS countries that will become the pacemaker of the global economy. This is due to the fact that the alliance represents vast territories saturated with an abundance of strategically important resources and cheap labor, with fully unrealized human capital and untapped production facilities. If the BRICS can transform from a “trader” of raw materials and low-value-added products to a developed geo-economic association, the countries of which will create comfortable and competitive working conditions, a proper technological base, high-quality structural (minimizing sectoral distortions, especially towards the raw materials sector) and regional policy (reducing the polarization and differentiation of regional development) contributing to an even and sustainable national prosperity, this will create a springboard for the formation of truly effective supranational institutions. The combination of these components will make it possible to launch a global “multiplier effect” that will become the engine of intercivilizational socio-economic development. According to Y. Lissovolik: “In order to enhance the multiplicative effects, the BRICS+ integration integration platform should be based on alliances capable of scaling and establishing links

with other regional blocs (i.e., on regional alliances capable of ‘globalization’))” (Lissovolik, 2023).

It is necessary to take into account the fact that the BRICS countries are still in trade and economic dependence on Western countries. Mutual trade between the members of the brick alliance accounts for only 6% of their total trade, despite the fact that total exports account for 20.7% of the global total. In such circumstances, the “bricks” of the union clearly need to strengthen export-import cohesion in order to have proper trade and economic sovereignty when making political decisions and implementing announced initiatives.

Conclusion

In the context of the representation of the world majority by non-Western countries, the architecture of building BRICS international policy, which corresponds to the provisions stated in the Strategy 2025, is objectively attractive for non-Westerners. More and more countries want to join the BRICS, and demand for loans from the NBR and de-dollarization processes is growing. Tolerant, transparent and equal partnership attracts civilizations, which softens their relationship, behind the scenes, but systematically preventing the escalation of large-scale international conflicts. The active holding of summits and forums with an annual increase in participants, the creation of institutions that coordinate their activities with other international organizations and real assistance in the development of emerging centers of economic power strengthens the BRICS positions on the global stage and contributes to the formation of a polycentric world order. At the same time, it is necessary to take into account the fact that the association has a lot of work to do to form and declare a clear mechanism for implementing the declared extensive guidelines, strengthen geopolitical and geo-economic rapprochement in the context of turbulence in the system of international relations, and implement its own projects (payment system, unit of account/currency, depository system, an investment platform, an exchange for ensuring fair trade in strategically important resources) in global economic processes, innovative intensification of national economic systems in order to offset the outflow of capital and labor to unfriendly jurisdictions, reform existing supranational institutions in order to develop fair monetary, financial and trade standards that will ensure global inclusive and sustainable development rather than being tools for maintaining Western hegemonism.

In economic terms, BRICS represents a new center of global growth, which is confirmed by quantitative indicators: the combined share of the expanded association in global GDP at purchasing power parity has reached 38%, which is significantly higher than the equivalent figure for the G7 countries (29.6%). However, the influence of the Bretton Woods institutions is not equivalent to the BRICS’ real contribution to the global economy. The BRICS’ total quota in the IMF remains at 17.53%. This institutional imbalance serves as a fundamental incentive for building an alternative financial architecture. Nevertheless, the internal integration potential of the BRICS is limited by objective factors: a low level of mutual trade, not exceeding 6% of the

total trade turnover of the participating countries, and significant macroeconomic heterogeneity, aggravated after the last expansion due to countries with high inflation and debt burden.

At the same time, the consensus procedure inevitably limits the speed of decision-making on complex issues (finance, standards, capital markets), which requires compensatory implementation mechanisms — the role of the NBR as the anchor institution of project finance in LCY, a wide network of bilateral swap lines for key trading pairs, and the launch of pilot multilateral clearing with netting and the gradual interoperability of individual CBDC platforms in critical commodity chains. The concepts of payment interoperability (BRICS Pay/Bridge), custody and clearing infrastructure (conditionally BRICS Clear) and commodity areas with settlements in LCY seem economically feasible when linked to real flows, neutral jurisdiction and compliance with international standards ISO 20022 and FATF; in the long term, it is possible to introduce synthetic a unit of account based on a basket of currencies/commodities as an accounting benchmark without immediate monetary centralization.

BRICS is already comparable to the G7 in terms of real economic scale (GDP by PPP) and has significant demographic and resource potential, but its conversion into sustainable financial and economic autonomy requires deepening internal trade and production cooperation, accelerated development of payment and clearing institutions and mechanisms for smoothing macroeconomic heterogeneity. The most feasible trajectory seems to be the consistent integration of the “three contours”: increasing the share of mutual trade and production cooperation in sectors with high multiplier and import-substituting potential; scaling local currency instruments (central bank swap lines, multilateral netting, LCY hedging, NBR guarantee windows) and interfacing a payment infrastructure with real commodity and investment flows; institutional coordination through comparable indicators and mutual reviews in sectoral tracks to reduce information asymmetries and transaction costs. If these conditions are met, we can expect an increase in the share of settlements in national currencies, a reduction in the cost of capital, an increase in the stability of supply chains and, as a result, a strengthening of the BRICS role as one of the centers of the emerging polycentric world order.

Thus, BRICS is not just an economic association, but also an important political actor contributing to the creation of a more equitable and balanced international system. BRICS forms “geopolitical communication corridors” that promote “energy and civilizational exchange”. In this context, his role in mitigating conflicts and maintaining world order will continue to grow, making him an indispensable figure on the global chess board of the 21st century.

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Determinants of household final consumption expenditures in Asia: identifying regional features

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Abstract. Amid slowing global economic growth and declining external demand, several traditionally export-led Asian markets try to diversify their economic growth sources and expand household consumption expenditures. The largest Asian markets possess significant but not fully realized consumer potential, which is largely shaped by regional characteristics — particularly the considerable difference in household consumption expenditures' dependency on the dynamics of their key determinants. The study aims to quantitatively assess this dependency for a group of the 10 largest consumer markets in Asia — China, India, Japan, South Korea, Indonesia, Malaysia, the Philippines, Singapore, Thailand, and Vietnam — and compare them with global trends in order to evaluate the region's potential to become a global consumption center and, consequently, to turn Asian consumption into a driver of both regional and global growth. The methodological basis of the study is a fixed-effects regression model calculated for current and permanent income specifications. It was found that the income elasticity of consumption in Asia is significantly lower compared to the global trend. A key barrier preventing private consumption from becoming a driver of regional growth remains the traditional high household saving rate and a households' preference for long-term stability over short-term income growth. As a result, despite rapid income growth and the middle class expansion, these factors are likely to contribute to sustained consumer demand growth only in the medium term — over a horizon of five years or more. Inflation, on the other hand, has an opposite effect on private consumption dynamics: when prices rise, households are more inclined to direct short-term income gains toward additional consumption. The inertial export orientation in several Asian economies remains an obstacle to the shift toward consumption-led growth. However, the rapid development of financial systems is a stimulating factor. An important factor influencing the dynamics of private consumption is the gender structure of the population. In all societies, women are drivers of consumer demand, but this effect is significantly stronger in Asia.

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Детерминанты потребления домохозяйств в Азии: выявление региональных особенностей

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Аннотация. В условиях замедления темпов глобального экономического роста и снижения внешнего спроса ряд традиционно экспортоориентированных азиатских рынков начинает двигаться по пути диверсификации источников экономического роста и расширения потребительского спроса домохозяйств. Крупнейшие азиатские рынки обладают значительным, но не в полной мере реализованным потребительским потенциалом, что обусловлено особенностями региона: существенными различиями в зависимости потребительских расходов домохозяйств от динамики ключевых детерминант. Цель исследования — измерить эту зависимость количественно для группы 10 крупнейших потребительских рынков Азии: Китая, Индии, Японии, Республики Корея, Индонезии, Малайзии, Филиппин, Сингапура, Таиланда, Вьетнама, сравнив с общемировыми трендами, чтобы оценить потенциал превращения региона в центр глобального и, как следствие, азиатского потребления, в драйвер регионального и глобального роста. Методологическую основу исследования составила регрессионная модель с фиксированными эффектами, рассчитанная для моделей текущего и постоянного дохода. Установлено, что по сравнению с общемировым трендом эластичность азиатского потребления по уровню дохода значительно ниже. Ключевым барьером превращения частного потребления в драйвер регионального роста остаются традиционная высокая склонность домохозяйств к сбережениям и предпочтение долгосрочной стабильности краткосрочному росту доходов. В результате, несмотря на стремительный рост доходов и расширение среднего класса, трансформироваться в устойчивый рост потребительского спроса эти факторы способны лишь в среднесрочной перспективе 5 лет и более. Противоположное влияние на динамику частного потребления оказывает инфляция: при росте цен домохозяйства в большей степени готовы краткосрочный скачок доходов направить на дополнительное потребление. Трансформации в направлении роста, движимого внутренним потреблением, препятствует инерционная экспортоориентированность ряда азиатских экономик. При этом стимулирующим фактором в среднесрочной перспективе становится стремительное развитие финансовых систем. Важным фактором изменения динамики частного

потребления является гендерный состав населения. Женщины выступают драйвером потребительского спроса во всех обществах, однако в Азии этот фактор проявляется значительно сильнее.

Ключевые слова: частное потребление, экономический рост, доходы, финансовое развитие, средний класс, регрессионный анализ

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Introduction

Exceptionally rapid growth of consumption in Asian countries has been one of the most significant development trends in recent years (Kondratyev, 2020). Strong consumption, driven by rising incomes, stable inflation, and sustained remittance flows, underpins growth in Indonesia, Malaysia, Thailand, and the Philippines (Potapov, 2020). Actually, countries that are more successful in expanding their consumer potential (such as the Philippines, India, Indonesia, and, to some extent, China) exhibit relatively higher growth rates.

The increase in household consumption is largely attributed to the rapidly expanding middle class, which forms the basis for effective demand. Rising incomes are accompanied by significant improvements in quality of life (Lee, Hong, 2012), and household expenditures are shifting from meeting basic needs to acquiring a more diversified basket of higher-quality and more technologically advanced goods and services (Hubacek, Guan, Barua, 2007). At the same time, the development of financial markets and digital technologies is making Asian markets more integrated, while the expansion of e-commerce, mobile platforms, and digital payment systems is stimulating consumer demand. The region's medium- and long-term consumer potential is also shaped by the so-called low-base effect, a traditionally high household savings rate (Arapova, 2017; Kholopov, 2022), and relatively low-income elasticity of consumption (Arapova, 2017).

Despite the region's enormous consumer potential, it remains significantly underperformed. While accounting for 47% of the world's population, households in the ten selected Asian countries — China, Japan, India, Republic of Korea, Indonesia, Malaysia, the Philippines, Singapore, Thailand, Vietnam — accounted for only 17.4% of global private consumption in 2007. By 2023, this figure had increased to 24.2%, but it's still much lower compared to the consumption in developed economies. In the EU and the US, which represent less than 9% of the world's population, households account for over 44% of global consumption.

In the context of declining external demand, the Asian region's ability to boost consumption — and thereby maintain its role as a driver of global growth — depends on two factors:

- 1) the dynamics of key determinants influencing the growth of household consumption expenditure, and
- 2) the elasticity of consumer demand with respect to these determinants, considering the socio-economic and civilizational characteristics of Asian countries.

The objective of this study is to quantify these elasticities for a group of the ten largest consumer markets in Asia and to compare the findings with global trends. This comparison aims to assess the region's potential to emerge as a center of global consumption and, consequently, to conclude on the contribution of Asian consumption to regional and global economic growth.

A substantial body of literature has examined disparities in consumption elasticity with respect to income across different country groups. It has been demonstrated that income elasticity of consumption is higher in both low-income and high-income countries, compared to middle-income countries (Diacona, Maha, 2015). However, with equal income growth, consumption increases more rapidly in developing countries than in developed ones (Mayer, 2013). After a certain income threshold is reached, the marginal sensitivity of consumption to additional income tends to decline (Zhao, Huang, Nie, 2022). Similar patterns may be also seen in Asia, although consumer behavior in the region is shaped by a much broader set of socio-economic factors.

Despite growing academic interest in the Asian region, its shifting growth models, the exhaustion of export-led growth potential following the Global Financial Crisis, there remains a significant gap in comprehensive research on the determinants of household consumption and their elasticity. Most studies either focus on individual countries or are limited to the consumption of specific goods (e.g., food, fuel, electricity), and do not examine the regional characteristics of determinant impacts in comparison with global trends (Arapova, 2018; Rathnayaka, Selvanathan, Selvanathan, 2022; Guo, N'Diaye, 2010). This study aims to address this academic gap, comparing the elasticity of Asian consumption with global averages across key determinants.

Methodological Approach and Data

A regression model based on a panel dataset, tested using three approaches — ordinary least squares (OLS), fixed effects, and random effects models — seems to be the most appropriate method for achieving the stated research objectives. Within this study, a unified model of the determinants of private household consumption is tested for two samples of countries: (1) a broad set of countries representing different regions, and (2) a group of ten Asian countries, which constitute the focus of this research.

The overall dataset comprises 4,719 observations (for a group of 143 countries over the period from 1991 to 2023), including 330 observations for the ten Asian countries over the same period.

The selection of model indicators bas on key consumption theories and empirical research (Table 1).

Table 1

Factors of the Regression Model and Their Theoretical Justification

Indicator Name	Model Variable	Supporting Theories / Empirical Studies	Expected Effect
Household final consumption expenditure per capita (constant 2015 US dollars) ¹	<i>HFCE</i>	—	—
GDP per capita (constant 2015 US dollars) ¹	<i>GDP</i>	Absolute Income Hypothesis (Keynes, 1936)	Positive
Average GDP per capita over the previous 5 years (constant 2015 US dollars) ¹	<i>GDP5</i>	Permanent Income Hypothesis (Friedman, 1957); Empirical research by Campbell and Mankiw (Campbell, Mankiw, 1991)	Positive
Urban population (% of total population) ¹	<i>Urban</i>	Empirical studies by Rosenthal and Strange (Rosenthal, Strange, 2004)	Positive
Population aged 15–64 (% of total population) ¹	<i>Pop15_64</i>	Life-Cycle Hypothesis (Modigliani, 1966; Modigliani, Ando, 1957)	Positive
Female population (% of total population) ¹	<i>Female</i>	Empirical research by Morrison and Morrison (Morrison, Morrison, 2007); Malghan and Swaminathan (Malghan, Swaminathan, 2021)	Mixed
Inflation, consumer prices (%) ¹	<i>Inflation</i>	(Leland, 1968); (Doepke, Schneider, 2006); (Lieb, Schuffels, 2022); (Weber, Hoang, D'Acunto, 2015)	Mixed
Services, value added (% of GDP) ¹	<i>Services</i>	Empirical research by Francois and Hoekman (Francois, Hoekman, 2010)	Positive
Trade (% of GDP) ¹	<i>Trade</i>	Empirical research by Francois and Hoekman (Francois, Hoekman, 2010); Porto (Porto, 2006)	Mixed
Financial Development Index ²	<i>FDI</i>	Empirical research by Bernanke and Gertler (Bernanke, Gertler, 1995); Bacchetta and Gerlach (Bacchetta, Gerlach, 1997)	Positive

Source: compiled by E.Y. Arapova from ¹World Development Indicators (WDI), World Bank. <https://databank.worldbank.org/source/world-development-indicators> (accessed October 10, 2025) and ²Financial Development Index, International Monetary Fund <https://db.nomics.world/IMF/FDI> (accessed October 10, 2025).

Based on the results of multicollinearity testing of the regressors, and due to the expected high correlation between current and permanent income levels, it was decided to test two separate model specifications, each incorporating the standard set of other influencing variables.

$$\begin{aligned}
 \ln HFCE_{it} = & \beta_0 + \beta_1 \ln GDP_{it-1} + \beta_2 \ln Urban_{it} + \beta_3 \ln Pop15_64_{it} + \\
 & + \beta_4 \ln Female_{it} + \beta_5 \ln(1 + Inflation_{it-1}) + \beta_6 \ln Services_{it} + \\
 & + \beta_7 \ln Trade_{it} + \beta_8 \ln(1 + FDI_{it}) + u_{it};
 \end{aligned}
 \tag{1}$$

$$\begin{aligned} \ln HFCE_{it} = & \beta_0 + \beta_1 \ln GDP5_{it-1} + \beta_2 \ln Urban_{it} + \beta_3 \ln Pop15_64_{it} + \\ & + \beta_4 \ln Female_{it} + \beta_5 \ln(1 + Inflation_{it-1}) + \beta_6 \ln Services_{it} + \\ & + \beta_7 \ln Trade_{it} + \beta_8 \ln(1 + FDI_{it}) + u_{it}. \end{aligned} \quad (2)$$

Based on the results of the Wald, Hausman, and Breusch-Pagan tests for both specifications, the fixed effects model was identified as the most appropriate. Heteroskedasticity of the regression residuals was corrected using robust (heteroskedasticity-consistent) standard errors. The identified endogeneity problem, caused by reverse causality concerns the inflation variable (since not only does rising price levels influence household consumption behaviour, but also expanding consumer demand can provoke inflationary trends). This issue was addressed by lagging the inflation variable.

Results and Discussion

The econometric calculations demonstrate a high predictive power of the regression model: the model including the current income parameter explains 94.9% of the observations for the group of 143 countries and 98.9% for the Asian countries, while the model with permanent income explains 94.7 and 98.9% of the values, respectively (Table 2). Coefficients for most key factors in the regression model confirmed their statistical significance and the direction of influence consistent with established household consumption behaviour theories.

The conducted calculations revealed a number of specific features of private household consumption in Asian countries compared to global trends.

First, the population of the ten studied Asian countries reacts significantly less to changes in income levels compared to the global trend. While a 1% increase in current income globally leads to a 0.79% increase in per capita private consumption, for the group of 10 Asian countries this figure is only 0.66%. For permanent income, the figures are 0.69% for Asia versus 0.77% for the entire sample of countries. Notably, Asian consumption is relatively more responsive to growth in permanent income compared to current income. Asian consumers behave more cautiously and tend to plan consumption with consideration for long-term income expectations rather than one-time increases. Accordingly, assuming economic stability improves, the expansion of consumer demand will be more intensive, while the comparatively lower elasticity with respect to current income may restrain consumption surges in response to short-term income growth. With rising incomes, there is not only an expansion but also a diversification of the consumer basket. Dietary patterns change due to overall income growth and the expansion of the middle class. Consumers' preferences shift toward higher-quality and luxury goods, and demand for innovative, creative products and content is increasing. Table 2.

Table 2

**Determinants of Household Consumption Expenditure
at Global and Regional Levels**

Model and Dataset	Current Income (143 countries)	Current Income (10 Asian countries)	Permanent Income (143 countries)	Permanent Income (10 Asian countries)
Number of obs	4.719	330	4.719	340
Number of groups	33	33	33	34
R-sq: Obs per group:	within=0.9489	within=0.9888	within=0.9466	within=0.9888
	between=0.9804	between=0.9954	between=0.9782	between=0.9947
	overall=0.9494	overall=0.9893	overall=0.9473	overall=0.9892
LnGDP1/ LnGDP5	0.79139*** (0.01479)	0.659822*** (0.019064)	0.774181*** (0.015713)	0.685671*** (0.018165)
LnPop_Urban	0.080463** (0.033682)	0.559581*** (0.02873)	0.0831** (0.036952)	0.492938*** (0.027538)
LnPop15_64	0.209556*** (0.054691)	–0.10319 (0.105888)	0.36124*** (0.045819)	0.012949 (0.093242)
LnFemale	0.498245*** (0.079468)	4.06008*** (0.304756)	0.604555*** (0.091463)	3.575258*** (0.303996)
Ln(1+Inflation1)	–0.08885*** (0.02528)	0.554257*** (0.149592)	–0.15281*** (0.026375)	0.454025** (0.184613)
LnServices	0.407885*** (0.03003)	0.699735*** (0.048902)	0.387534*** (0.025985)	0.623928*** (0.046175)
LnTrade	–0.08978*** (0.0044)	–0.01465* (0.008443)	–0.07914*** (0.00493)	–0.01942** (0.007982)
Ln(1+FDI)	0.325003*** (0.063999)	0.172378** (0.085993)	0.409566*** (0.070377)	0.084912 (0.089281)
_cons	–3.15209*** (0.370323)	–18.0605*** (1.564384)	–4.01476*** (0.371642)	–16.207*** (1.564668)

Note. *, **, *** denote significance levels of 10%, 5%, and 1%, respectively.

Source: E.Y. Arapova's calculations based on data from sources listed in Table 1.

Second, urbanization is a significant stimulating factor for consumption in Asian countries: amid its general significance, the coefficients for the group of Asian countries were 5 to 6 times higher than for the overall sample. The concentration of market participants in cities facilitates their interaction, benefiting both themselves and the local community as a whole, and causes shifts in the sectoral structure of the economy. A 1% increase in the share of the urban population in Asia leads to a 0.49 to 0.56% expansion in private household consumption. This means that urbanization can, in the medium and even long term, be one of the key drivers for achieving a consumption-driven growth model. In the Asian region, this is not merely an increase in the urban population share but a profound structural shift associated

with the transition towards strong industrial and service economy. Urban growth, coupled with accelerated digitalization of urban infrastructure, ensures improvements in the quality and availability of a diversified range of goods and services, shaping new consumer habits. Considering current urban population growth rates, the stimulating effect on household consumption dynamics will be most evident in the short- and medium-term in China, Malaysia, Indonesia, and Thailand, and in the more deferred perspective — in India and Vietnam. Urbanization and technological development are driving the growing demand for smart technologies, eco-friendly products (shaping the trend toward sustainable consumption), and digital services.

Third, price growth has the opposite effect on the dynamics of private consumption. While for the entire sample of 143 countries the inflation factor was significant but negative, for the dataset of 10 Asian countries a direct significant positive impact of inflation on household consumption was confirmed (both in the current and permanent income models). Price increases stimulate current consumption, whereas inflation expectations restrain deferred consumption. Experts explain this direct influence of price growth on consumption dynamics by the intertemporal effect, where, in anticipation of high inflation, current prices are perceived as lower than future ones, which stimulates current demand (Lieb, Schuffels, 2022). Expectations of rising prices may especially encourage spending on durable goods (Burke, Ozdagli, 2021). Price increases generate additional inflation expectations among Asian consumers, prompting them to make purchases “before further price increases”. Given the relatively lower financial security in some developing Asian countries and limited access to insurance and credit resources, inflation is perceived as a threat to real incomes, stimulating current expenditures. Moreover, this tendency becomes stronger when current income rises: with increasing prices, households are more willing to allocate a short-term income spike to additional consumption.

Fourth, the negative effect of external trade openness was confirmed in all specifications of the regression model. For the Asian countries, this inverse relationship is primarily explained by the high export orientation of the largest economies in the sample (China, Malaysia, South Korea, etc.), since export orientation can stimulate economic growth at a certain stage but also increases savings rates, thereby restraining the expansion of private consumption (Athukorala, Suanin, 2025). Economies with inertial export orientation are more focused on capital accumulation to maintain competitiveness in external markets.

Fifth, the development of the services sector plays an important role in stimulating consumption. In all specifications, this factor was positive and confirmed its direct influence in both the short and long term.

Sixth, a key distinctive feature of consumer behaviour in this sample of 10 Asian countries is the significance of the financial development index only in the current income model. For the entire sample of countries, the financial factor ranks third in importance for stimulating private household consumption, contributing to its expansion by 0.32% and 0.41% in the current and permanent income models, respectively. However, this result should not be misleading. The set of the studied Asian sample includes regional economies that differ significantly in the level of financial

development. This group can effectively be divided into three clusters: (1) Japan, South Korea, Malaysia, Singapore, and Thailand, for which the Financial Development Index ranges from 0.704 to 0.888; (2) China and India, with values of 0.634 and 0.534 respectively; and (3) the group of the least financially developed countries — Indonesia (0.364), the Philippines (0.379), and Vietnam (0.382), where the financial sector has not yet reached a level of maturity, capable of exerting a stimulating effect on private consumption. This imbalance explains the insignificance of the Financial Development Index in the permanent income model.

Excluding these three countries, the coefficient's significance is confirmed in both specifications, and its value is substantially higher than in the model for the 143 countries worldwide (Table 3).

Table 3

Determinants of private household consumption in the current income model for 7 Asian countries (excluding Indonesia, the Philippines, and Vietnam)

Model and Dataset	Current Income Model	Permanent Income Model
Number of obs	231	231
Number of groups	33	33
	<i>within</i> =0.9924	<i>within</i> =0.9931
<i>R</i> -sq: Obs per group:	<i>between</i> =0.9898	<i>between</i> =0.9882
	<i>overall</i> =0.9861	<i>overall</i> =0.9866
LnGDP1/ LnGDP5	0.563013*** (0.028628)	0.594105*** (0.02755)
LnPop_Urban	0.440848*** (0.073252)	0.39753*** (0.07382)
LnPop15_64	0.385403*** (0.119702)	0.470917*** (0.106241)
LnFemale	−0.35663 (0.569368)	−0.54969 (0.540104)
Ln(1+Inflation1)	0.911274* (0.536054)	1.007598* (0.526601)
LnServices	1.170928*** (0.091516)	1.042475*** (0.099021)
LnTrade	−0.07449*** (0.012318)	−0.07782*** (0.010891)
Ln(1+FDI)	2.278968*** (0.180255)	2.138756*** (0.174699)
_cons	−4.20076* (2.262344)	−3.28092 (2.206956)

Note. *, **, *** denote significance levels of 10, 5, and 1%, respectively.

Source: E.Y. Arapova's calculations.

Gender composition has a notable influence on the nature of private consumption. In all societies, women act as drivers of consumer demand; however, this factor manifests significantly stronger in Asia. The coefficient values for the sample of ten Asian countries in both models (current and permanent income) were 6 to 10 times higher. This trend is especially pronounced in the relatively less developed countries of the sample — Indonesia, Vietnam, and the Philippines — since the coefficients in samples including these countries are substantially higher than in the analysis limited to the seven more developed regional states, where this factor proved insignificant.

Conclusion

The largest Asian economies possess substantial but not fully performed consumer potential. The future development trends will depend less on the objective market capacity and more on the region's ability to overcome institutional, infrastructural, and especially behavioral constraints, transforming them into drivers of regional demand.

The traditionally high propensity to save among households remains a key barrier, which hinders the outpacing expansion of private consumption even while incomes rise. For consumers, long-term stability is more important than short-term income increases. Another limiting factor is the immaturity of financial infrastructure and the accumulation of financial issues in some countries of the region. Low financial accessibility, underdeveloped insurance, credit, and investment tools not only limit consumption but also strengthen the tendency to save as a way for households to protect themselves from economic instability. At the same time, the development of financial markets and overall institutional improvement of the financial environment can become key drivers for expanding consumer demand.

If we attempt to rank the ten regional economies by their potential for expanding consumer demand in the future based on the dynamics of key determinants and identified elasticities, the following conclusions can be drawn:

- Japan essentially lacks potential for further consumer market development;
- In the short term (until 2030), the consumer market growth resources of Singapore and South Korea may be exhausted;
- China will maintain its role as one of the key regional consumer markets by 2030 (mainly due to its large capacity), despite a negative forecast;
- Malaysia, Thailand, and India will be centers of intensive consumer demand growth in 2025–2035; Indonesia, Vietnam, and the Philippines — in 2030–2040.

Thus, the prospects for consumer demand growth in the region are delayed. Turning consumer demand into a driver of regional development requires simultaneous inflation control, financial infrastructure development, inclusion, and increased trust in financial institutions to reduce uncertainty and support sustainable long-term consumption. Public policy should aim to reduce gender inequality in access to resources and the labor market, support urban agglomerations, and work on reducing behavioral and institutional uncertainty to shift household economic behavior from saving to consumption.

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Indonesia's opportunity in driving an optimistic involvement in the multipolar world: trade evidence from ASEAN and BRICS+

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Abstract. Indonesia has played a significant role in the global shift towards multipolarity. After joining ASEAN in 1967, Indonesia officially joined BRICS+ in early 2025. Indonesia's involvement in these blocs is undoubtedly intended to increase economic growth through international trade. This study examines Indonesia's involvement in establishing bilateral trade cooperation and explores opportunities for future Indonesian trade cooperation with these two blocs. Researchers employed four approaches, including trend visualization, the trade complementarity index (TCI), the trade intensity index (TII), and the autoregressive distributed lag approach. Trend visualization shows that Indonesia had significant trade cooperation with Singapore, Malaysia, the Philippines, China, and India from 2012 to 2023. The TCI calculation reveals that Indonesia has a reasonably high trade compatibility with other ASEAN and BRICS+ countries, with an average TCI value of 0.8. Thus, the TII discloses that several countries have the potential to become new markets for Indonesian trade. The Russian Federation and the Lao PDR are the countries with the most potential for Indonesian trade collaboration. The ARDL model analysis indicates that the values of Indonesia's imports to ASEAN, its exports to BRICS+, and the exchange rate have a significant impact on Indonesia's GDP. This study offers a comprehensive examination of the impact of Indonesia's participation in multipolar organizations on its economic growth, particularly in relation to its membership in the BRICS+ group. Indonesia's economic growth forecast indicates an upward trend, with an average growth rate of 3.4% projected over the next decade. This suggests that Indonesia's involvement in ASEAN and BRICS is expected to have a substantial impact on its economic development. In conclusion, Indonesia's decision to join the BRICS+ is a strategic move aimed at diversifying international trade and reducing its dependence on conventional markets. This study recommends that policymakers develop regulations for bilateral trade cooperation between Indonesia and ASEAN, as well as BRICS+ countries.



Keywords: bilateral trade, intra-trade, geopolitical issues, international organization, unipolar world

Authors' contribution. Rizki S.W. — research concept and design, data collection, data analysis, wrote the paper; Didenko N.I. — research concept, supervision, result correction. All authors approved the initial version of the manuscript.

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Возможности Индонезии в продвижении позитивного участия в многополярном мире: примеры торговли в странах АСЕАН и БРИКС+

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Аннотация. Индонезия сыграла значительную роль в глобальном переходе к многополярности. После вступления в АСЕАН в 1967 г. страна официально присоединилась к БРИКС+ в начале 2025 г. с целью ускорения собственного экономического роста посредством международной торговли. Рассмотрено участие Индонезии в установлении двустороннего торгового сотрудничества и изучены возможности будущего торгового взаимодействия страны с двумя блоками. Используются четыре исследовательских подхода, включая визуализацию тренда, индекс торговой взаимодополняемости, индекс интенсивности торговли и метод авторегрессионного распределенного лага. Визуализация тренда показала, что Индонезия имела значительное торговое сотрудничество с Сингапуром, Малайзией, Филиппинами, Китаем и Индией в период с 2012 по 2023 г. Согласно проведенным расчетам, Индонезия имеет достаточно высокую торговую совместимость (ИТС) с другими странами АСЕАН и БРИКС+ со средним значением 0,8. Таким образом, несколько стран могут стать новыми рынками для индонезийской торговли. Российская Федерация и Лаосская Народно-Демократическая Республика — страны с наибольшим потенциалом для торгового сотрудничества с Индонезией. На основе модели ARDL выявлено, что стоимость импорта Индонезии в страны АСЕАН, экспорта в страны БРИКС+ и обменный курс значительно отражаются на ВВП Индонезии. Предложен комплексный анализ влияния на ее экономический рост Индонезии ее членства в многополярных организациях, особенно в группе БРИКС+. Прогноз экономического роста Индонезии указывает на тенденцию к увеличению, при этом средний темп роста в течение следующих десяти лет составит 3,4 %.

Участие Индонезии в АСЕАН и БРИКС, как ожидается, приведет к ускорению ее экономического развития. Отмечено, что решение присоединиться к БРИКС+ является стратегическим шагом, направленным на диверсификацию международной торговли и снижение зависимости Индонезии от традиционных рынков. Подчеркнута необходимость разработки правил двустороннего торгового сотрудничества между Индонезией и странами АСЕАН, а также БРИКС+.

Ключевые слова: двусторонняя торговля, внутренняя торговля, геополитические вопросы, международная организация, однополярный мир

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Introduction

The emergence of regional powers is a primary cause of the development of multipolar structures. The increasing trend of multipolarity is driven by several factors, including the rise of new powers such as China and Russia, as well as a shift in the dynamic of the power structure from unipolarity to multipolarity (Muzaffar, Yaseen, Rahim, 2017). The Association of Southeast Asian Nations (ASEAN) and Brazil, Russia, India, China, and South Africa (BRICS) bloc, as well as the newcomer BRICS Plus, are international organizations that contribute significantly to the multipolar world, promoting global economic integration. The global landscape of international trade and economic cooperation has undergone a significant transformation, marked by the emergence of new economies and the growth of regional and international organizations over the past few decades. Economic integration with regional entities, such as ASEAN, and global initiatives, like BRICS, has played a significant role in shaping the region's economic landscape. However, ASEAN and BRICS member countries have significant economic disparities, high population dynamics, and challenging investment challenges (Porca-Konjikusic, Hudson Jr., Jain Harshi, 2024).

Indonesia is the country with the largest population and economy in Southeast Asia. Indonesia has committed to continuing its development of international cooperation to diversify strategic partners for export markets. In 1967, Indonesia was one of the founding members of the ASEAN establishment in Bangkok, Thailand. The ASEAN member countries are Indonesia, Malaysia, Singapore, Thailand, the Philippines, Myanmar, Cambodia, Lao PDR, Vietnam,

and Brunei Darussalam. The ASEAN Free Trade Area agreement was a significant commitment by ASEAN to enhancing intra-ASEAN trade. The agreements that eliminated tariff and non-tariff barriers have had a significant impact on intra-ASEAN trade, resulting in a net trade effect from export-import activities (Wong, Liew, Arip, 2017).

The establishment of the ASEAN Economic Community in 2015 was considered a response to the growing phenomenon of global economic integration. The AEC is a forum for ASEAN to carry out regional economic integration before participating at a higher level in global economic integration. Thus, Indonesia has not maximized its potential to become a major player in ASEAN regional economic integration, still lagging behind Singapore and several other ASEAN countries. Indonesia must further maximize its potential in the AEC 2025, which is predicted to be a more dynamic continuation of the AEC 2015. Furthermore, Indonesia is believed to be able to strengthen its position in the AEC 2025 and enhance its economy by developing a more structured and reconstructed identity (Permatasari, 2020).

To expand and strengthen Indonesia's involvement and role in the multipolar economy, the BRICS forum is a potential and significant preference for strategic moves in diversifying trade and investment. This decision also provides broader market opportunities and reduces dependence on conventional markets, including the United States. The BRICS has emerged as a new power balancing the other three economic and political powers: the United States, the European Union, and Japan. The BRICS economies have become more integrated with international trade over time (de Castro, 2013). At the BRICS summit in 2017, the Chinese government announced the promotion of the "BRICS Plus" cooperation approach to establish closer and stronger partnerships with emerging market and developing countries, aiming to enhance potential cooperation in finance, trade, and investment (Arapova, 2019). In the modern world, establishing regional economic relations is considered a key factor in reducing conflicts between countries within the same region. The BRICS fosters strong economic relations among its member countries to reduce the likelihood of conflicts and promote a diplomatic global atmosphere (Shameem, Jayaprasad, 2020). The economic growth of the BRICS is heading in an optimistic direction, serving as a stepping stone for member countries towards achieving positive economic growth.

Indonesia has committed to improving bilateral relations in international trade. To fulfill this commitment, Indonesia officially became a full member of BRICS+ on 1 January 2025. This decision is part of the expansion drive at the BRICS summit 2023 in Johannesburg. Indonesia's official participation in the BRICS international organization is expected to increase strategic opportunities that can strengthen national interests in the economy, politics, and diplomacy. Furthermore, Indonesia's involvement in BRICS has the potential to develop intercontinental market access, reduce dependence on previous trading nations, and enhance infrastructure development through stronger competitive financing support from BRICS (Myajaya, 2025).

Indonesia's BRICS membership is an opportunity to expand economic partnerships, utilize alternative financial mechanisms, and increase its influence in global governance. Indonesia's decision on BRICS affiliation is expected to reflect a potential strategy that aligns with national interests, economic pragmatism, and geopolitical considerations in a rapidly evolving global context (Setiawan, 2025). The BRICS+ members include Brazil, China, Egypt, Ethiopia, India, Indonesia, Iran, the Russian Federation, South Africa, and the United Arab Emirates.

This study aims to enhance and build upon previous research on Indonesia's membership in BRICS. The authors examine Indonesia's opportunities for membership in international organizations from a trade perspective. To examine the opportunities Indonesia has in international trade involvement with ASEAN and BRICS countries, researchers employ several approaches. The approaches display Indonesian trade trends, trade complementarity index, trade intensity index, and the Autoregressive Distributed Lag (ARDL) model. The trend display is to determine how far Indonesia's trade growth is associated with ASEAN and BRICS countries. The trade complementarity index measures the level of similarity in export products between two countries across 10 product sectors. The trade intensity index is calculated to determine which country is the most suitable destination for Indonesian trade cooperation.

The research question of this study is how far Indonesia's involvement is in establishing bilateral trade cooperation in the context of a multipolar world.

The research purpose of this study is to examine opportunities for Indonesian trade cooperation with these two blocs in the future.

This study employs four approaches: trend visualization, the trade complementarity index, the trade intensity index, and the ARDL model, which are expected to provide deeper confidence and understanding. It is considered to be a moderate difference in the discussion of studies on Indonesia's involvement in the multipolar economy. Data visualization is used to provide a clear understanding of the growth of Indonesian trade through the export and import sectors with ASEAN and BRICS member countries. Data visualization can be applied in all fields of research. For example, data visualization is crucial in the business sector and can be used as a key consideration in making decisions closely related to the primary income of industrial companies (Qin et al., 2020).

The trade complementarity index and trade intensity index are employed to measure market compatibility and identify market opportunities between Indonesia and ASEAN, as well as BRICS+ member countries. There are several previous studies on the trade complementarity index, such as the study on the trade complementarity index was used to investigate the complementarity of agricultural trade of the Association of Southeast Asian Nations countries in the global agricultural market over 19 years, providing results implying that ASEAN countries have either weak complementarity or intense competition in agricultural trade in the world market (Hoang, 2018). Furthermore, the study examining the trade intensity index analysis of trade intensity among BRICS member countries indicated that the results of the trade intensity analysis recommend the need for closer cooperation to promote more intra-BRICS trade. Thus, important policies

related to structural transformation are necessary to promote trade relations and strengthen ties between BRICS countries, with a focus on free trade agreements (Maryam, Banday, Mittal, 2018).

Research on international trade cooperation involving the ASEAN and BRICS blocs has been widely conducted. For instance, a study applying gravity models to intra-BRICS trade movements and the potential for building economic cooperation confirmed that intra-BRICS trade relations have a substantial positive impact on economic performance in these countries (Rahman, Fatima, Rahman, 2020). Next, the study examines the structure and characteristics of ASEAN+3 intra-regional trade through the analysis of intra-regional trade shares, the intra-regional trade intensity index, and the introversion index provides indications that, for the sustainability of intra-regional trade development, more comprehensive and higher intra-regional economic integration is needed (Ra, 2015). Moreover, a study evaluating the impact of the ASEAN-China Free Trade Area on Indonesia's trade intensity index shows that Indonesia's trade intensity index with other ACFTA members is lower than that of Malaysia. This indicates the need for a targeted trade policy in Indonesia that aims to increase export volumes in sectors where it has comparative advantages (Wardani et al., 2024). Lastly, the study of trade expansion liberalization between Indonesia and its regional partner countries, which utilized the trade balance index (TBI) to analyze goods based on specialization advantage patterns, revealed that Indonesia profited from primary raw material trade, while losing ground in specific low-cost manufacturing sectors (Purwono et al., 2022).

Mathematical models and statistical methods are prevalent approaches utilized in econometric studies, especially to investigate the relationship between economic growth and trade in a country. Some of them are regression analysis, panel data, and ARDL models. Research examining the factors affecting international trade relations in Indonesia, using cointegration analysis, provided results indicating that export value, import value, exchange rate, and GDP have a significant effect on the balance of trade, accounting for 55.08 percent of the long-term trend over the next 35 years (Laksono, Mohd Saudi, 2020). Furthermore, an autoregressive distributed lag model is employed to examine the short-run and long-run effects of exchange rate volatility on Somalia's trade balance, revealing that GDP and the real effective exchange rate have a positive impact on the trade balance (Nur, Ali, 2025). To complement and examine in more depth previous studies on international trade involving ASEAN and BRICS countries, researchers examined Indonesia's opportunities in international trade involving the two blocs. The ARDL regression model is employed to identify the factors integrated into international trade that influence economic growth. Economic growth in this study is measured by GDP.

The research hypothesis of this study can be represented as follows,

H1: Export, import, and exchange rates have an impact on economic growth.

The alpha value has been chosen to assess the probability of error in determining a decision to reject or support the hypothesis. The hypothesis will be accepted if the p-value is less than the alpha value.

Methodology

Trend visualization in econometrics is commonly used, primarily employing line plots to illustrate how economic variables, such as GDP, change over time. Trends aim to help identify patterns, cycles, and volatility. Trend visualization can also be used as a visual basis for selecting appropriate econometric models and understanding the temporal behavior of time series. Trend visualization is a crucial and widely used tool in economic research (Song, Zhang, Dong, 2016; Wright, 2015). The trade complementarity index (TCI) assesses the extent to which a country’s export profile is correlated with the import profile of another country. The TCI can provide valuable insights into mutual trade prospects, as it illustrates how well a country’s import and export structures align with each other. The index can also be used as a basis for considering the formation of regional trade agreements. An index value of zero indicates that no products or services are exported by the determined country or imported by the partner country. A value of 1 indicates that the shares of both countries’ exports and imports are equal.

$$TCI_{ij} = \left[1 - \frac{\sum_k |m_k^i - x_k^j|}{2} \right],$$

(1)

where m_k^i — product k 's share in the total import of other ASEAN or BRICS countries in the world; x_k^j — product k 's share in Indonesia’s total exports to the world.

The composition of commodity trade is crucial for analyzing international trade. It represents the share of each sector or product category traded between trading partners. This study examined the 10 commodity sectors traded between Indonesia, ASEAN, and BRICS member countries, covering both total exports and imports for the period from 2017 to 2023 (Table 1).

Table 1

List of product shares

Code of Products	Label of products	Code of products	Label of the products
9	Coffee, tea, maté, and spices	30	Pharmaceutical products
12	Oil seeds and oleaginous fruits; miscellaneous grains, seeds, and fruit; industrial or medicinal	40	Rubber and articles thereof
13	Lac, gums, resins, and other vegetable saps and extracts	64	Footwear, gaiters, and the like, parts of such articles
15	Animal, vegetable, or microbial fats and oils and their cleavage products; prepared edible fats	73	Articles of iron or steel
18	Cocoa and cocoa preparations	84	Nuclear reactors, boilers, machinery, and mechanical appliances; parts thereof

Source: compiled by S.W. Rizki, N.I. Didenko.

The TII is a measure used to assess the cost of trade between two countries. Whether the value is greater or less than projected based on its expected position in world trade, this index represents the ratio of a country's exports to its partner to the world's exports to its partner. An index greater than or less than 1 indicates that bilateral trade flows are greater or less than expected. It provides an interpretation of the significance of the partner country in the global trade landscape.

$$TII_{ij} = \frac{X_{ij}}{Y_{jw}} = \frac{E_{ij}/E_{iw}}{E_{wj}/E_{ww}}, \quad (2)$$

where X_{ij} — a partner country j 's share of the determined country i 's total export; Y_{jw} — its share of the world export; E_{ij} — the total bilateral export between the determined country i and partner country j ; E_{iw} — export between the determined country i and the world; E_{wj} — export between countries j and the world; E_{ww} — total world export.

The ARDL model of order q and r , $ARDL(q, r)$ where e_t is a scalar zero-mean error term and X_t is N — dimensional column vector process¹. The coefficients σ_i are scalars while α_i are row vectors. Applying a lag operator L employed by each component represents a vector, $L^n X_t = X_{t-n}$ represent the lag polynomial $\sigma(L)$ and the vector polynomial $\alpha(L)$. A scalar variable Y_t is denoted as an equation

$$Y_t = \sum_{i=1}^q \sigma_i Y_{t-i} + \sum_{i=0}^r \alpha_i X_{t-i} + e_t. \quad (3)$$

An econometric model in which the endogenous variable Y can be presented as a function of its past values, counting the current and lagged values of other exogenous variables X . It is entitled 'a dynamic model'. If we regress Y on its m -lagged values and the current and m -lagged values of the exogenous variable X . Then the dynamic model is expressed as an equation as below²:

$$Y_t = \mu + \sigma_1 Y_{t-1} + \dots + \sigma_m Y_{t-m} + \alpha_0 X_t + \alpha_1 X_{t-1} + \dots + \alpha_m X_{t-m} + e_t. \quad (4)$$

The ARDL model involves several steps, including stationarity tests, correlation and multicollinearity tests, Akaike Information Criterion (AIC) checks, cointegration and autocorrelation tests, stability checks, and residual tests.

¹ Hassler, U., & Wolters, J. (2005). *Autoregressive Distributed Lag Models and Cointegration*.

² Hossain, S. (2024). *Econometric Analysis: An Applied Approach to Business and Economics* (1st edition). Cambridge Scholars Publishing.

Trend of Indonesia's bilateral trade with ASEAN and BRICS countries

A trend visualization represents the movement of international trade between Indonesia and ASEAN and BRICS+ member countries, in terms of export and import volumes. The graphs give readers information on intra-trade between Indonesia and the ASEAN and BRICS+ blocks. The intensity and volume of trade between Indonesia and ASEAN-BRICS member countries from 2012 to 2023 are illustrated in the trend graphs 1–4.

Singapore is Indonesia's largest export destination in the ASEAN region, followed by Malaysia, Thailand, the Philippines, and Vietnam, as shown in Figure 1. The remaining four countries import goods from Indonesia but have not gained a significant amount. In 2022, Indonesia earned an export value of more than \$ 10 billion from Singapore, Malaysia, and the Philippines. Since 2012, Indonesia has had the lowest export value among Brunei Darussalam, Cambodia, Lao PDR, and Myanmar.

Within the ASEAN bloc, Indonesia has made the most significant imports from Singapore since 2012, with a total import value exceeding \$ 20 billion, as shown in Figure 2. Indonesia's imports from other ASEAN countries are less than or around \$ 10 billion. From both Figures 1 and 2, it can be concluded that Indonesia has the most trade cooperation with Singapore.

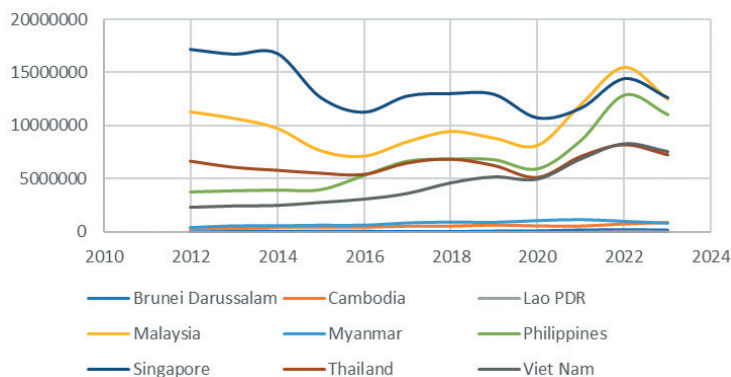


Figure 1. Indonesia's exports to ASEAN countries from 2012 to 2023

Source: compiled by S.W. Rizki, N.I. Didenko.

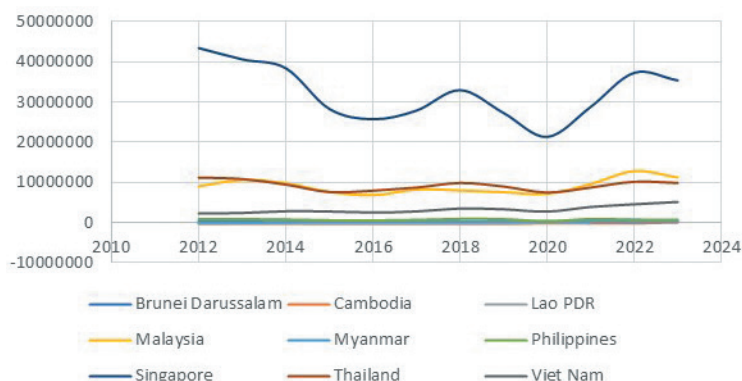


Figure 2. Indonesia's imports from ASEAN countries from 2012 to 2023

Source: compiled by S.W. Rizki, N.I. Didenko.

Indonesia's membership of BRICS+ officially took effect in early 2025; however, it had already initiated trade cooperation with BRICS+ member countries prior to this. The display of export and import cooperation is shown in Figures 3 and 4. Since 2012, China has been Indonesia's largest export destination, and this trend has continued to increase since then. This export trend increased sharply from 2020 to 2022, with the highest total export value of approximately \$ 70 billion in 2022. In 12 years, India has become Indonesia's second-largest export destination, although the total export value has remained relatively stable at around \$10–\$20 billion US dollars. Indonesia's export value to other BRICS+ countries remains insignificant, with a value of under \$ 3 billion.

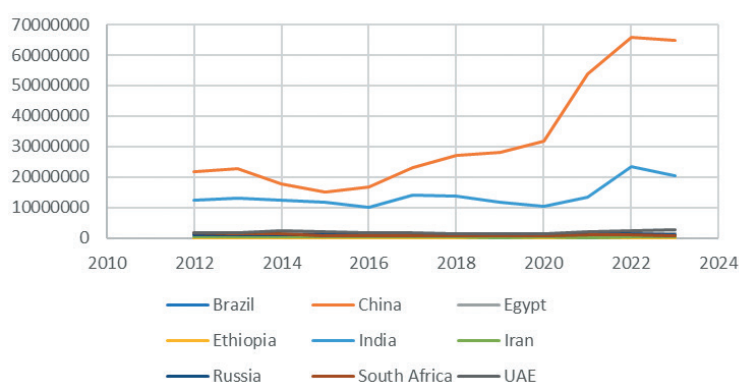


Figure 3. Indonesia's exports to BRICS+ countries from 2012 to 2023

Source: compiled by S.W. Rizki, N.I. Didenko.

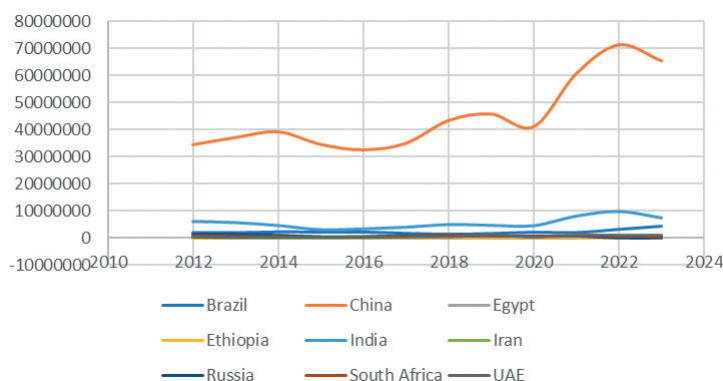


Figure 4. Indonesia's imports from BRICS+ countries from 2012 to 2023

Source: compiled by S.W. Rizki, N.I. Didenko.

In the BRICS+ group, China contributes the greatest number of Indonesia's imports. Between 2012 and 2023, Indonesian imports experienced an upward trend, particularly from 2020 to 2022, with a sharp increase. Other BRICS+ member countries have contributed a small amount to Indonesia's imports.

Based on the graphs, it can be concluded that only several ASEAN and BRICS+ member countries have significant trade cooperation with Indonesia. These are Singapore, Malaysia, the Philippines, China, and India. To strengthen this study

of Indonesia’s trade cooperation, additional approaches were taken to determine the level of optimism regarding opportunities for Indonesia’s trade cooperation with ASEAN and BRICS+ member countries. The next approach is identifying bilateral trade opportunities between Indonesia and those countries using the TCI and TII approaches.

TCI and TII values of Indonesia with ASEAN and BRICS countries

In the trend visualization approach, only five countries have cooperated significantly in trade with Indonesia. The TCI and TII calculations will provide an overview of Indonesia’s bilateral trade opportunities with ASEAN and BRICS+ member countries. Table 2 revealed bilateral trade suitability between Indonesia and ASEAN and BRICS+ countries.

Table 2

TCI and TII values of Indonesia and ASEAN-BRICS countries

ASEAN countries		TII	TCI	BRICS+ countries		TII	TCI
Indonesia	Brunei Darussalam	1.5954	0.8210	Brazil		0.4613	0.8406
	Cambodia	3.5768	0.8226	China		1.4327	0.6185
	Lao PDR	0.1448	0.8209	Egypt		3.3575	0.8323
	Malaysia	3.8587	0.8594	Ethiopia		1.5003	0.8263
	Myanmar	5.6862	0.8249	India		4.2113	0.8886
	Philippines	11.7292	0.8353	Iran		0.2821	0.8351
	Singapore	2.8847	0.8319	Russian Federation		0.2517	0.8518
	Thailand	2.5816	0.8279	South Africa		0.7396	0.8360
	Viet Nam	1.9480	0.8361	Uni Arabic Emirates		0.4443	0.8406

Source: calculated by S.W. Rizki, N.I. Didenko.

TCI values represent the strength of the bilateral connection between Indonesia and countries affiliated with ASEAN and BRICS+. The values indicate a correlation between a country’s exports to the world and imports from partner countries. The more significant the index score, the stronger the opportunity to provide beneficial bilateral trade and further development. We concluded that the order of TCI values from the largest to the smallest in ASEAN is as follows: Indonesia-Malaysia, Indonesia-Vietnam, Indonesia-Philippines, Indonesia-Singapore,

Indonesia-Thailand, Indonesia-Myanmar, Indonesia-Cambodia, Indonesia-Brunei Darussalam, and Indonesia-Lao PDR. In BRICS+, we have Indonesia-India, Indonesia-Russian Federation, Indonesia-Brazil, Indonesia-UAE, Indonesia-South Africa, Indonesia-Iran, Indonesia-Egypt, Indonesia-Ethiopia, and Indonesia-China. The TCI values are around 0.80, excluding Indonesia-China, and are around 0.6. It reveals that almost all ASEAN and BRICS+ countries have a significant level of bilateral trade compatibility with Indonesia. Bilateral trade with these countries will provide significant benefits for both countries involved.

The TII represents the intimacy of the trade relationship between two countries based on actual observations of bilateral trade flows. The lower the TII value, the better the export prospects. Exporters can use the results of the TII calculation as a reference for selecting markets, specifically with a low TII value. The low values indicate a greater potential opportunity for export. Table 2 discloses Indonesia's export opportunities to ASEAN and BRICS countries. The order of opportunities from the largest to the smallest of Indonesia's export destinations in ASEAN countries is Indonesia-Lao PDR, Indonesia-Brunei Darussalam, Indonesia-Vietnam, Indonesia-Thailand, Indonesia-Singapore, Indonesia-Cambodia, Indonesia-Malaysia, Indonesia-Myanmar, and Indonesia-Philippines. In BRICS, the opportunity order is as follows: Indonesia-Russia, Indonesia-Iran, Indonesia-United Arab Emirates, Indonesia-Brazil, Indonesia-South Africa, Indonesia-China, Indonesia-Ethiopia, Indonesia-Egypt, and Indonesia-India.

The ARDL Model (2,2,2,2)

The ARDL model employed GDP as an endogenous variable. Volume of Indonesia's export to ASEAN, volume of Indonesia's import to ASEAN, volume of Indonesia's export to BRICS, volume of Indonesia's import from BRICS, and the exchange rate were chosen as exogenous variables influencing and significantly impacting GDP. The research applied time series data in the period 2005–2023. The data struggled during the COVID-19 era from 2020 to 2022. It would be a unique and challenging expectation in the analysis process.

The endogenous variable in the ARDL model analysis is GDP (\$ million). Exogenous variables include *ExpA* represents Volume of Indonesia's exports to ASEAN (\$ million), *ImpA* represents Volume of Indonesia's imports from ASEAN (\$ million), *ExpB* represents Volume of Indonesia's exports to BRICS+ (\$ million), *ImpB* represents Volume of Indonesia's imports from BRICS+ (\$ million), and *ER*³ represents the Exchange rate (IDR/USD). Several stages are required to run the ARDL model.

Stationarity checking. The ARDL model tolerates data stationarity at level I (0) and first differencing I (1). An augmented Dicky-Fuller test is required to check the stationarity status. In this study, all variables are stationary in first differences (I (1)) and exhibit different types, as shown in Table 3.

³ Foreign Exchanges Rates. Central Bank of Indonesia. Retrieved 4 April 2025, from <https://www.bi.go.id/en/statistik/informasi-kurs/transaksi-bi/default.aspx>

Table 3

Stationery test results using the augmented Dicky-Fuller Test

Var	Stationery at	Type (1): no drift, no trend	Type (2): with drift, no trend	Type (3): with drift, with trend
GDP	I (1)	Yes at lag 0, p-value=0.0233	Yes at lag 0, p-value=0.0243	No
ExpA	I (1)	Yes at lag 0, p-value =0.0100 at lag 1, p-value =0.0100	Yes at lag 0, p-value=0.0158 at lag 1, p-value =0.0100	Yes at lag 0, p-value=0.0747 at lag 1, p-value =0.0100
ImpA	I (1)	Yes at lag 0, p-value =0.0100 at lag 1, p-value =0.0100 at lag 2, p-value =0.0100	Yes at lag 0, p-value =0.0100 at lag 1, p-value =0.0174	Yes at lag 0, p-value =0.0199 at lag 1, p-value =0.0461
ExpB	I (1)	Yes at lag 0, p-value =0.0141 at lag 1, p-value =0.0100	Yes at lag 1, p-value =0.0100	Yes at lag 1, p-value =0.0217
ImpB	I (1)	Yes at lag 0, p-value =0.0100 at lag 1, p-value =0.0100	Yes at lag 0, p-value=0.0100 at lag 1, p-value =0.0100	Yes at lag 0, p-value=0.0398 at lag 1, p-value =0.0100
ER	I (1)	Yes at lag 0, p-value =0.0100 at lag 1, p-value =0.0240	Yes at lag 0, p-value =0.0269	No

Source: calculated by S.W. Rizki, N.I. Didenko.

Correlation and multicollinearity tests. The correlation coefficient indicates the degree to which a linear relationship exists between two variables, as shown in Table 4.

Table 4

Pearson’s correlation coefficients

Coefficients	GDP	ExpA	ImpA	ExpB	ImpB	ER
GDP	1					
ExpA	0.9473	1				
ImpA	0.6777	0.7964	1			
ExpB	0.8950	0.9302	0.5676	1		
ImpB	0.9606	0.9515	0.6134	0.9659	1	
ER	0.8002	0.6450	0.2218	0.7125	0.8209	1

Source: calculated by S.W. Rizki, N.I. Didenko.

The correlation coefficient calculation revealed that most variables have a strong relationship, as indicated by a value greater than 0.75. A strong correlation causes multicollinearity significantly. This condition leads to uncertainties, such as unstable estimates and higher standard errors. Correlation values have been

determined as an initial step in recognizing multicollinearity. The Variance Inflation Factor (VIF) test is conducted to determine the independent variables used in the ARDL model in Table 5.

Table 5

The VIF values of variables in the expected model

	ExpA	ImpA	ExpB	ImpB	ER
GDP	71.67042	10.17597	42.66207	159.89425	16.38089
	46.135444	10.136164	19.714961	X	2.955736
	X	1.639301	3.165799	X	2.256720

Source: calculated by S.W. Rizki, N.I. Didenko.

Akaike information criterion (AIC) checking. The AIC is a measure used to assess model fit and determine the optimal number of lags. The Akaike information criterion value determines the optimal lag and the best model. The lowest value recommends the optimal lag for the best model. This study recommends the ARDL (2,2,2,2) model based on the smallest value of 368.0632, as seen in Table 6.

Table 6

The Akaike information criterion for optimal lag selection

No	GDP	ImpA	ExpB	ER	AIC
1	2	2	2	2	368.0632
2	1	2	2	2	368.4078
3	1	2	2	1	371.7326
4	1	2	1	1	372.8647
5	1	1	1	1	400.3230

Source: calculated by S.W. Rizki, N.I. Didenko.

Cointegration and autocorrelation checking. The ARDL model and bounds tests for cointegration, as recommended by Pesaran et al., were employed using the open-source programming language R and the ARDL package (Natsiopoulou, Tzeremes, 2022). This calculation uses case type 1, with no drift and no trend, based on the stationarity test results in Table 4. The results of the cointegration and autocorrelation tests are presented in Table 7.

Table 7

Pesaran-Shin and the autocorrelation test

Special test	Hypothesis	Test result	Decisions
<i>Bounds F-test</i>	H0: No cointegration exists. H1: Cointegration exists	F = 1.0846 p-value = 0.726	The p-value is greater than 0.05, thus H0 is accepted. It means no cointegration exists in an ARDL model
<i>Bounds t-test</i>	H0: No cointegration in the coefficients on the lagged variables H1: Cointegration exists in the coefficients on the lagged variables	t = -4.2228, Lower-bound I (0) = 2.8650, Upper-bound I (1) = -3.7713 p-value = 0.01627	The p-value is less than 0.05, thus H0 is rejected. It indicates the presence of cointegration in the coefficients on the lagged variables in an ARDL model
<i>Breusch-Godfrey test</i>	H0: No serial correlation in the residuals. H1: Serial correlation exists in the residuals	LM test = 1.0247 df = 1 p-value = 0.3114	The p-value is greater than 0.05, thus H0 is accepted. It means no serial correlation in the residuals in an ARDL model

Source: calculated by S.W. Rizki, N.I. Didenko.

Stability model checking. The cumulative sum (CUSUM) test is a statistical method used to detect small, persistent shifts in a data series. This test involves calculating the cumulative sum of observations or residuals and comparing it to a predetermined threshold or control limit. The ordinary least squares cumulative sum (OLS-CUSUM) test is a statistical tool used to detect structural errors in regression models, indicating potential changes in parameter stability. This test involves accumulating OLS residuals over time and plotting their cumulative sum.

Figure 5 describes that the CUSUM line (actual line) remains within the blue line (confidence limits). It means the model is considered stable at the 95% confidence level. Figure 6 reveals that the OLS-CUSUM line does not cross the predetermined critical boundary (red line), indicating no structural break and leading to the rejection of the null hypothesis of parameter stability. This plot indicates that the ARDL (2,2,2,2) model has good parameter stability. Both figures above indicate that the model in this study exhibits no structural changes in the model or its parameters. Briefly, the ARDL (2,2,2,2) model is stable, indicating that the model remains consistent over the analyzed time period, making it reliable for forecasting

To conduct residual tests for an ARDL model in R, use the ARDL package and its function to extract the residuals test: normality test, heteroskedasticity checking, and autocorrelation checking as follows:

Normality test using Q-Q plots. The Q-Q plot is used to compare the actual residual distribution with the theoretical normal distribution. Figure 7 shows that the data points approach a straight line; thus, the normality assumption is fulfilled, and the ARDL (2,2,2,2) model is valid.

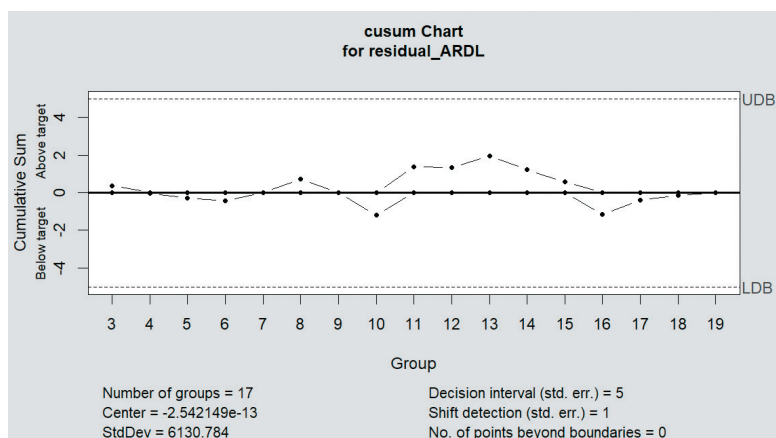


Figure 5. CUSUM plot

Source: compiled by S.W. Rizki, N.I. Didenko.

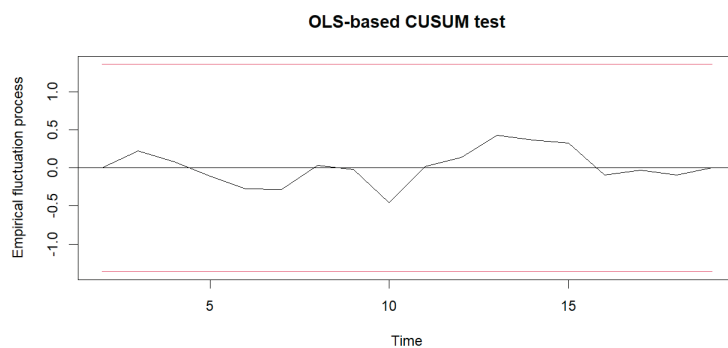


Figure 6. OLS-CUSUM plot

Source: compiled by S.W. Rizki, N.I. Didenko.

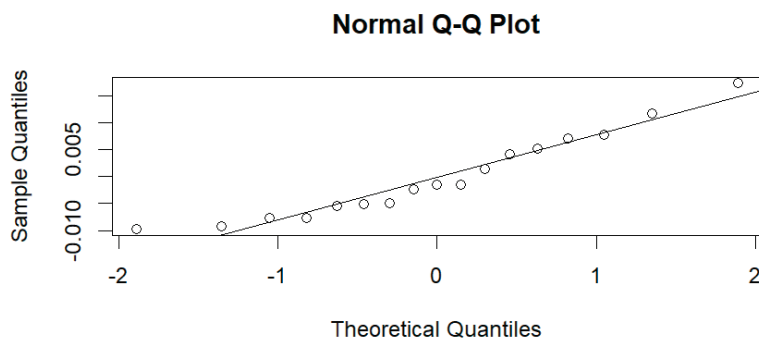


Figure 7. Q-Q plot

Source: compiled by S.W. Rizki, N.I. Didenko.

Heteroskedasticity checking using the Breusch-Pagan test. The test requires a hypothesis as follows

H0: No heteroskedasticity problem

H1: Heteroskedasticity problem exists

H_0 will be rejected if the p-value is less than alpha 0.05. From the analysis test using R Studio software, a p-value of 0.6699 is obtained. It concludes that H_0 is accepted, indicating that there is no heteroskedasticity problem.

Autocorrelation checking. In the Durbin-Watson test, which aims to measure the dependence between residuals sequentially, the DW value is 2.45, which is still considered close to 2. This means that this model can be said to have no autocorrelation. To conduct a deeper examination for autocorrelation testing, we employed Autocorrelation Function (ACF) plots and Partial Autocorrelation Function (PACF) plots (Fig. 8, 9). Both plots can be used to determine the presence of autocorrelation. Testing these two plots uses lag as a comparison. Lag is the difference in the order of a residual from the previous residual.

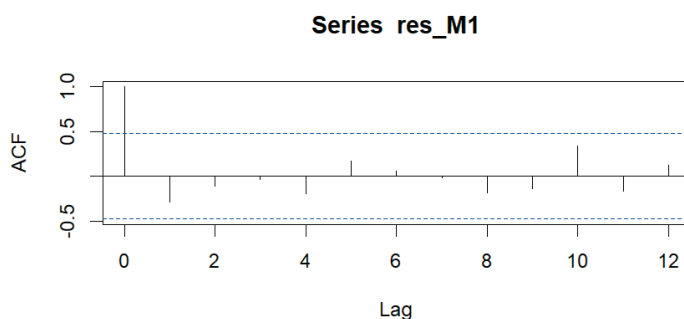


Figure 8. ACF plot

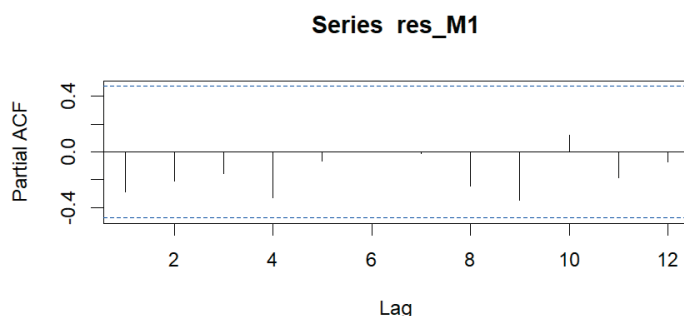


Figure 9. PACF plot

Source: compiled by S.W. Rizki, N.I. Didenko. Source: compiled by S.W. Rizki, N.I. Didenko.

The results of the ACF and PACF plots generated in the residuals of the ARDL (2,2,2,2) model analysis in this study disclose that in both the ACF and PACF plots, no vertical line at a particular lag exceeds the height of the horizontal blue line. According to these two plots, it indicates that there is no autocorrelation in the model. By fulfilling all these residual tests, the ARDL (2,2,2,2) model is considered good and reliable for further prediction or analysis.

Analysis of the ARDL (2,2,2,2) model in Table 8 helps researchers determine whether to reject or fail to reject the hypothesis. The hypothesis will be accepted if the p-value is less than the alpha level. Intercept is significant at alpha 5%, because the p-value is 0.015846. Indonesia's imports from ASEAN at the time t are significant

at the 1% alpha level, as indicated by a p-value of 0.001258. Indonesia's import from ASEAN at the time $t - 1$ are significant at alpha 5%, because the p-value is 0.025779. Indonesia's export to BRICS at the time t . This result is significant at $\alpha = 1\%$, because the p-value is 0.005831. The exchange rate at the time t is significant under alpha 0.1%, because the p-value is 0.000135. The exchange rate at the time $t - 1$. This result is significant at the 5% alpha level, as the p-value is 0.023455.

Table 8

Results of ARDL model analysis

Indicator	Estimate	Std. Error	t-value	Pr (> t)
Intercept	-4.129e+05	1.153e+05	-3.5820	0.015846 *
GDP_{t-1}	1.267e-01	3.368e-01	0.3760	0.722243
GDP_{t-2}	1.713e-01	1.992e-01	0.8600	0.429143
$ImpA_t$	5.102e-03	7.810e-04	6.5320	0.001258 **
$ImpA_{t-1}$	5.170e-03	1.649e-03	3.1360	0.025779 *
$ImpA_{t-2}$	1.642e-03	1.126e-03	1.4580	0.204659
$ExpB_t$	2.950e-03	6.411e-04	4.6020	0.005831 **
$ExpB_{t-1}$	4.958e-04	1.609e-03	0.3080	0.770384
$ExpB_{t-2}$	-1.533e-03	1.269e-03	-1.2080	0.280934
ER_t	-6.248e+01	5.945e+00	-10.509	0.000135 ***
ER_{t-1}	6.503e+01	2.019e+01	3.2200	0.023455 *
ER_{t-2}	4.413e+01	3.084e+01	1.4310	0.211812

Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
 Residual standard error: 10440 on 5 degrees of freedom
 Multiple R-squared: 0.9995, Adjusted R-squared: 0.9984
 F-statistic: 915.9 on 11 and 5 DF, p-value: 1.585e-07

Source: calculated by S.W. Rizki, N.I. Didenko.

The adjusted R-squared value is 0.9984. It reveals that the volume of Indonesia's imports to ASEAN in the current and previous years, the volume of Indonesia's exports to BRICS in the current year, and the exchange rate in the current and previous years give an explanation and impact on the GDP in the current year, accounting for 99.84%. R-squared of 0.9995 indicates that the entire set of exogenous variables at any time has a 99.95% effect on the GDP. The ARDL (2,2,2,2) model is represented in the Equation

$$\begin{aligned}
 GDP_t = & -4.129E05 + 1.267E01GDP_{t-1} + 1.713E01GDP_{t-2} + \\
 & + 5.102E03ImpA_t + 5.170E03ImpA_{t-1} + 1.642E03ImpA_{t-2} + \\
 & + 2.950E03ExpB_t + 4.958E04ExpB_{t-1} - 1.533E03ExpB_{t-2} - \\
 & - 0.6248ER_t + 0.6503ER_{t-1} + 0.4413ER_{t-2} + e_t.
 \end{aligned} \tag{5}$$

The intercept of $-4.129E05$ indicates that the function value for the exogenous variable is 0. This means that the average GDP when GDP at lags, importing from ASEAN, exporting to BRICS+, and the exchange rate are equal to zero is minus \$41.29. A negative GDP indicates the Indonesian economy will experience a contraction or slowdown. This situation will indicate a decrease in the total value of goods and services produced, which can lead to increased unemployment, reduced purchasing power, and negative impacts on various economic sectors.

The coefficient of Indonesia's import volume from ASEAN in the current year of $5.102E03$ indicates that GDP will increase by \$ 5102 if the import from ASEAN is \$ 1 million — an analogous explanation for the coefficient of those variables at lags. Positive import values indicate economic growth through the provision of capital goods, raw materials, and technology, which increases domestic production capacity to meet consumer needs, encourages innovation through competition, and creates jobs through the processing of imported products. Furthermore, imports also help countries obtain products at more competitive prices, optimize profit margins, and increase economic diversification, reducing dependence on a single sector.

The coefficient of Indonesia's export volume to BRICS+ in the current year, $2.950E03$, indicates that GDP will increase by \$ 2950 if the export to BRICS+ is \$1 million. An analogous explanation for the coefficient at time $t - 1$ and $t - 2$. A positive export value has a significant impact on economic growth by increasing state revenue, creating jobs, encouraging increased domestic production, and improving the trade balance. Increased exports can also diversify a country's economy and reduce dependence on a single sector, ultimately building a more solid economic foundation. Indonesia's export volume to the BRICS bloc is expected to increase due to the high economic growth and large market size of BRICS+ members, which will provide greater demand for Indonesian products and new trade opportunities.

The coefficient of exchange rate for the current year, -0.6248 , indicates that GDP will decrease significantly when the exchange rate of IDR 1. However, the exchange rates at $t - 1$ and $t - 2$ also contribute to influencing GDP. If the three coefficients are added together, the result will be positive, indicating that GDP will continue to increase with a 1-unit change in the IDR exchange rate. A stable and competitive exchange rate stimulates economic growth by increasing exports, attracting foreign investment, and creating certainty for economic actors. A stable exchange rate minimizes volatility, which can disrupt trade and investment, and maintains the purchasing power and stability of imported goods prices, thereby creating a conducive economic environment.

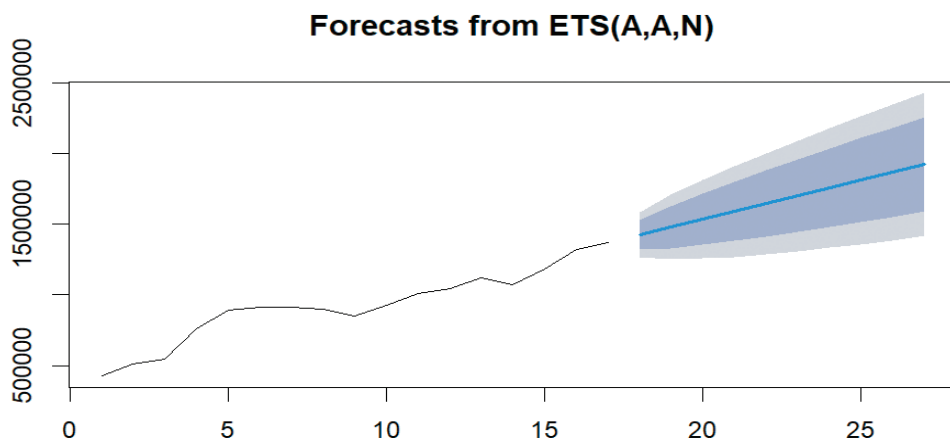
The results of Indonesia's economic growth forecast, which involves international trade with ASEAN and BRICS+ member countries, show an upward trend with an average growth rate of 3.4% until 2033 (Table 9). This confirms that bilateral trade with members of the two blocs has a significant impact amidst global challenges.

Table 9

Forecasting of Indonesia's GDP in the upcoming 10 years

Year	Forecasting, \$ million	Lo 80	Hi 80	Lo 95	Hi 95
2024	1424264	1319399	1529130	1263886	1584643
2025	1479635	1331332	1627937	1252826	1706444
2026	1535005	1353367	1716644	1257213	1812798
2027	1590376	1380629	1800123	1269596	1911156
2028	1645747	1411232	1880261	1287087	2004406
2029	1701117	1444207	1958027	1308207	2094027
2030	1756488	1478980	2033996	1332076	2180900
2031	1811858	1515176	2108541	1358121	2265596
2032	1867229	1552534	2181924	1385944	2348513
2033	1922599	1590866	2254333	1415256	2429943

Source: calculated by S.W. Rizki, N.I. Didenko.

**Figure 10.** Forecast of Indonesia's GDP

Source: compiled by S.W. Rizki, N.I. Didenko.

Based on the graphical illustration of the forecasted upward trend in Indonesia's economic growth in upcoming 10 years (Figure 10). Indonesia's involvement in ASEAN and BRICS+ is projected to have a significant impact on its economic development. Joining BRICS enables Indonesia to diversify its export markets, reduce its reliance on traditional Western markets, gain leverage in global trade, and access alternative financing through institutions.

Discussion

The analysis result of Indonesia's membership in ASEAN and BRICS+ leads to a discussion. This strengthens Indonesia's position in a multipolar world. Indonesia has taken the right step in joining BRICS+, a grouping that includes several key countries, such as China and Russia. A study examining the strategic policies of Russian and Chinese foreign relations in terms of post-hegemony or multipolarity in the global political economy revealed that multipolarity has endured for a long time under the policies and agreements approved by the involved countries to achieve mutual goals within the global political and economic structure (Silvius, 2019). Next, a study showed that BRICS consistently represents the image of multipolarity, showing the revival movement followed by several Southern countries. The BRICS have a distinct conception of world order and continue to compete and interact with one another. On the other hand, the West suffers from the re-nationalization of Europe and the polarization of US politics. This results in the management of global interdependence being realized through ad hoc meetings of various groups for different purposes (Cooper, Flandes, 2013). Furthermore, a study revealed that the rise of emerging economies, including China, India, Brazil, and South Africa, is counterbalancing the hegemony of traditional powers, catalysing a transition from a unipolar to a multipolar world order. The rise of emerging economies represents a strategic shift in redefining the nature of global governance, leading to a multipolar world where shared leadership and multilateralism must be achieved in response to current challenges (Ali, Rassias, 2024).

The analysis result of the trade intensity index discloses that Russia is the BRICS country with the greatest potential for Indonesian trade collaboration. To date, the Indonesian government has strengthened economic cooperation with Russia. Various news sources⁴ Throughout 2025, it was reported that Indonesia was strengthening its cooperation with Russia in various areas, including trade in agricultural and food products (such as Russian wheat to Indonesia and Indonesian agricultural products to Russia), as well as potential cooperation in investment, oil and gas, technology, and nuclear energy. Bilateral economic growth between Indonesia and Russia has shown a positive trend, with trade reaching US\$4.3 billion in 2024 and increasing by 40% between January and April 2025. Efforts to strengthen bilateral relations between Indonesia and Russia continue. In 2018, the two leaders agreed in Moscow to expedite the drafting of a new strategic partnership agreement aimed at intensifying bilateral interactions. The Kremlin views Jakarta as a regional power with the potential to become a dominant regional performer in Southeast Asia (Manurung, Bainus, 2022). Indonesia is considered a key partner of Russia in the Asia Pacific region.

⁴ Information portal about Indonesian economy. Kontan. Retrieved 4 August 2025, from https://www.kontan.co.id/search/?search=Rusia+Indonesia&Button_search=

Conclusion

In the graph visualization display from 2012 to 2023, Indonesia has bilateral trade cooperation with significant export and import volumes with several ASEAN and BRICS+ member countries, namely Singapore, Malaysia, the Philippines, China, and India. Other countries have bilateral trade cooperation with Indonesia, with relatively low trade volumes. The situation can be used as a reference to open up market opportunities for Indonesia in these countries. Further studies on bilateral trade cooperation are conducted through the TCI approach to gain a deeper understanding of market opportunities in the ASEAN and BRICS regions. The calculation of the TCI value between Indonesia and other member countries in ASEAN and BRICS+ provides information on the market compatibility for 10 international trade products. Based on the TCI value, the countries with the largest to smallest opportunities for market compatibility with Indonesia in ASEAN are Malaysia, Vietnam, the Philippines, Singapore, Thailand, Myanmar, Cambodia, Brunei Darussalam, and Laos. The order of the most significant TCI values between Indonesia and its bilateral partner countries in BRICS is as follows: India, the Russian Federation, Brazil, the UAE, South Africa, Iran, Egypt, Ethiopia, and China.

In addition, the order of opportunities based on TII calculations, from the largest to the smallest, of Indonesia's export destinations in ASEAN countries is as follows: Lao PDR, Brunei Darussalam, Vietnam, Thailand, Singapore, Cambodia, Malaysia, Myanmar, and the Philippines. In the BRICS+, the order of opportunities is as follows: Russian Federation, Iran, United Arab Emirates, Brazil, South Africa, China, Ethiopia, Egypt, and India. This study determined the ARDL (2,2,2,2) model as the best model. From the results of the calculation analysis using this model, it was found that the volume of Indonesian imports to ASEAN, the volume of Indonesian exports to BRICS+, and the exchange rate have a strong impact on Indonesian GDP, as indicated by the Adjusted R-squared value of 0.9984. This revealed that those exogenous variables provide an explanation and impact on GDP of 99.84% in the current year.

This study has assessed the impact of Indonesia's involvement in multipolar organizations on its economic growth, particularly its membership in the BRICS+ group. The study reveals that Indonesia has an optimistic opportunity to establish international trade relations with BRICS+ countries. Indonesia needs to strengthen bilateral relations with BRICS countries, especially Russia. Indonesia's decision to join BRICS+ is crucial to diversifying international trade and reducing reliance on traditional markets.

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Development of a new currency settlement mechanism among BRICS countries

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Abstract. This study investigates the feasibility of introducing a supranational settlement instrument — the BRICS Currency Unit (BCU) — designed to reduce exchange-rate volatility, enhance financial sovereignty, and strengthen trade and investment flows among BRICS and BRICS+ members. The research models the real effective exchange rates (REERs) of BRICS countries using data from the Bank for International Settlements. Macroeconomic drivers—including GDP growth, inflation, current-account balances, foreign direct investment inflows, reserves, and the share of intra-BRICS trade—were incorporated into the modeling. Five alternative weighting schemes for the BCU were tested to identify the most stable and diversified composition. The analysis confirmed that REER dynamics across BRICS are shaped by both shared and country-specific macroeconomic factors, complicating the creation of a unified framework. Among tested approaches, GDP-growth-based weighting minimized correlation with domestic shocks and produced the most stable basket. This variant of the BCU demonstrated the strongest diversification properties, effectively mitigating currency risks and enhancing predictability for long-term trade and investment contracts. The findings support the potential of the BCU as a hedging tool and settlement mechanism that can reduce transaction costs, stabilize pricing in energy, agriculture, and manufacturing, and increase competitiveness of BRICS economies. Extending its application to BRICS+ partners would further diversify settlement options, reduce dependency on the US dollar, and reinforce the role of BRICS in the global economy.

Keywords: real exchange rates, BRICS currency policy, cross-border capital investments, international trade

Conflicts of interest. Author declares no conflicts of interests.

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Разработка нового механизма валютных расчетов между странами БРИКС

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Аннотация. Рассмотрена возможность введения наднационального расчетного инструмента — валютной единицы БРИКС (BCU), призванной снизить волатильность обменных курсов, укрепить финансовый суверенитет и стимулировать рост торгово-инвестиционных потоков между странами БРИКС и БРИКС+. Проведено моделирование реальных эффективных валютных курсов (REER) стран БРИКС с использованием данных Банка международных расчетов за период 1999–2025 гг. В анализ включены макроэкономические факторы: рост ВВП, инфляция, сальдо текущего счета, приток прямых иностранных инвестиций, объем международных резервов, а также доля внутригрупповой торговли БРИКС. Были протестированы пять альтернативных схем взвешивания BCU с целью выявления наиболее устойчивой и диверсифицированной конфигурации. Анализ подтвердил, что динамика REER стран БРИКС определяется как общими, так и специфическими для отдельных стран факторами, что усложняет создание единой системы. Среди протестированных подходов наилучшие результаты показала модель взвешивания по темпам роста ВВП, которая минимизировала корреляцию с внутренними шоками и обеспечила наибольшую устойчивость корзины. Данный вариант BCU продемонстрировал высокие диверсификационные свойства, эффективно снижая валютные риски и повышая предсказуемость долгосрочных торговых и инвестиционных контрактов. Полученные результаты подтверждают потенциал BCU в качестве инструмента хеджирования и расчетного механизма, способного сократить транзакционные издержки, стабилизировать цены в энергетике, сельском хозяйстве и промышленности, а также повысить конкурентоспособность экономик БРИКС. Применение с партнерами БРИКС+ позволит дополнительно диверсифицировать расчетные механизмы, снизить зависимость от доллара США и укрепить роль БРИКС в мировой экономике.

Ключевые слова: реальный валютный курс, валютная политика БРИКС, трансграничные потоки капитала, международная торговля

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Introduction

In the current state of the global economy, currency stability is one of key challenges, directly affecting international trade volumes and national economic growth. The high volatility of currencies creates significant risks for businesses, forcing them to expend considerable resources on hedging and risk management

(Brooks, Persaud, 2003). Recent crises have underscored that diversifying currency assets is a crucial defensive strategy, particularly for companies in developing nations (Gupta, Chaudhary, 2023).

The vulnerability of BRICS economies to exchange-rate shocks and their continued exposure to the US dollar remain a central policy concern (Haddad, 2025). These vulnerabilities amplify transaction costs, constrain strategic planning for exporters and importers, and increase exposure to external political and financial pressures. In this context, there is a demonstrable demand for a resilient, multilateral settlement mechanism that attenuates external transmission channels and reduces the practical effectiveness of extraterritorial sanctions on cross-border commerce.

Our central hypothesis is that a supranational settlement unit — the BRICS Currency Unit (BCU) — constructed on the basis of REER-informed weighting rules can materially reduce idiosyncratic currency risk and improve the predictability of cross-border pricing. The study therefore develops and evaluates alternative BCU weighting schemes, assesses their volatility and correlation properties, and proposes an implementation framework for BCU-based settlements as a mechanism to deepen economic cooperation and enhance financial resilience across BRICS.

The BCU's design integrates theoretical approaches to risk reduction and hedging, offering a practical mechanism to mitigate currency uncertainty and stimulate economic integration within BRICS. The findings of this study can complement exchange rate policy of Russia and guide the development of joint projects with BRICS partners in trade, investment, and financial integration.

The objective of this study is to develop a mechanism that strengthens trade and investment flows by enhancing cooperation within BRICS. To achieve this goal, the following tasks were set:

1. To analyze the dependence of the BRICS countries' real exchange rates on macroeconomic parameters from a strategic development perspective.
2. To propose the creation of a currency settlement mechanism (BRICS Currency Unit — BCU) based on findings in #1.
3. To test the hypothesis that the proposed mechanism will reduce currency risks.

Literature review

Research on exchange-rate dynamics and policy responses converges on several interrelated themes: the determinants and transmission of currency volatility in emerging markets; the macroeconomic consequences of exchange-rate movements for prices, trade and investment; and institutional or instrument-level remedies, including regional settlement units (Hussain, Bashir, Rehman, 2024), (Kozlyuk, Chirak, 2013). Empirical studies document that exchange-rate volatility responds to both domestic fundamentals — inflation, GDP growth, reserves, current-account positions-and external shocks, with pronounced heterogeneity across countries (Zerihun, Breitenbach, Njindan Iyke, 2020; Sbeiti et al., 2025; Bosupeng, Naranpanawa, Su, 2024; Liu, Lee, 2022; Goryunov, 2020).

Several works emphasize the pass-through from exchange-rate movements to goods and services prices and the broader macroeconomic impact (Warnes, 2022; Chaudhari, Trivedi, 2022). A related literature quantifies effects on the corporate and financial sectors: exchange-rate uncertainty alters firms' risk profiles, raises hedging and transaction costs, depresses trade and investment, and triggers portfolio rebalancing by institutional investors—thereby creating feedback on currency markets (Kuchin, Elkina, Dranev, 2019; Al Mansoori et al., 2024; Camanho, Hau, Rey, 2022). Policy studies underline the role of coordinated public-sector measures and integrated payment infrastructures to mitigate these risks (Saji, 2019; Zhu, Sardana, 2020).

A growing strand examines synthetic or anchor currencies for regional blocs. Authors propose basket-based or reference units to smooth national shocks, lower transaction costs, and build confidence for multilateral settlement (Nach, Newadi, 2024; Bastanifar, Khan, Koch, 2025; Chiappini, Lahet, 2020).

Empirical and theoretical evidence indicates that active use of a stable settlement unit increases trust and promotes trade and investment (Kazakova, 2015), while regional lessons (e.g., eurozone analyses) illuminate institutional prerequisites and risks (Bai Gao, 2024). Collectively, these contributions motivate the present proposal of a BRICS Currency Unit (BCU) as a practical instrument for reducing volatility and fostering deeper economic integration.

Previous studies demonstrated that real exchange-rate dynamics are determined by a constellation of macroeconomic variables — GDP growth, inflation dynamics, current-account positions, net FDI inflows, net reserves — which jointly reflect countries' structural characteristics and external interdependence. Accordingly, this study supplements standard fundamentals with a specialized trade indicator — the share of intra-BRICS trade in total trade — to capture the intensity of commercial links within the group.

Methodology

In the proposed valuation of the BRICS Currency Unit (BCU), macro-weights such as GDP growth and nominal GDP serve to embed economic size and stability into the unit; inflation and reserves reflect domestic price stability and external shock-absorption capacity; trade-related parameters ensure the unit mirrors the fiscal and external positions of member economies). This design aims to improve balance in currency fluctuations across heterogeneous members (Meher, Mishra, 2024; Goryunov, 2020).

REER series are sourced from the Bank for International Settlements (BIS) using data from January 1999 to July 2025¹. The realized-volatility approach follows T.G. Andersen et al., who demonstrate its effectiveness for quantifying market risk (Andersen et al., 2005). To assess BCU's stabilizing properties, we compute correlation coefficients between BCU variants and key macrovariables identified

¹ 2024 data is based on actual data BIS, IMF, Worldbank. REER 2025 is based on actual BIS data. 6M 2025 is based on official preliminary estimates from IMF and Worldbank.

during BRICS REERs modelling. This combined volatility-correlation framework tests the hypothesis that a weighted BCU can attenuate transmission of local shocks and function as an effective hedging instrument within BRICS.

We model the dynamics of the real effective exchange rates (REER) using a linear specification:

$$Y = B_0 + B_1 \cdot X_1 + B_2 \cdot X_2 + \dots B_n \cdot X_n.$$

Each model will be tested for usefulness for further analysis based on variance explanatory power using F-tests and specification correctness (using Ramsey test), tested for autocorrelation (using Darbin — Watson test), heteroscedasticity (using Breusch — Pagan test). Detailed test results are presented in Appendix 1. Empirically, we analyse realized volatility measures and compute correlation coefficients between BCU variants and these indicators to assess the BCU’s capacity to dampen transmission of idiosyncratic shocks and to serve as an effective hedging instrument within BRICS.

Results

BRICS’s REER modelling

To model the REER of BRICS countries most informative factors (statistically and economically significant), mutually uncorrelated will be used. Detailed model characteristics are provided in Appendix 1. The REER models are adequate according to most statistical criteria and can be confidently used for analysis and for further application in the estimation of the BRICS currency exchange rate mechanism. Model coefficients for interpretation are below (Table 1).

Table 1

BRICS REERs modeling results

Parameter	Russia		India		SA		China		Brazil	
	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value	Coeff	P-value
Intercept	4.96	0.0	4.51	0.0	−0.07	0.2	3.93	0.0	0.62	0.4
Share of trade with BRICS countries in total trade	0.16	0.1	0.07	0.3	−0.05	0.0	−0.12	0.6	−0.64	0.0
Inflation	−0.09	0.1	−0.04	0.0	0.03	0.3	−0.04	0.1	−0.05	0.5
GDP growth rate	−0.06	0.1	0.00	0.8	−0.05	0.0	−0.01	0.7	−0.01	0.4
Current account balance	0.07	0.4	0.00	0.9	0.01	0.6	−0.06	0.0	0.08	0.0
FDI net inflow	0.13	0.0	0.02	0.2	−0.00	1.0	0.04	0.1	0.10	0.3
Reserves	—	—	—	—	—	—	0.07	0.0	0.49	0.0

Source: compiled by E.A. Vasyukov.

The study revealed a heterogeneous impact of macroeconomic factors on the REERs of BRICS countries. Each factor affects the exchange rate differently, reflecting the unique characteristics of national economies. Using the standard criterion for the reliability of statistical results (significance level 5%), modelling of the real exchange rates (REER) revealed the following:

The factor “share of trade with BRICS countries in total trade” is significant only for South Africa and Brazil.

1. The “inflation” factor is significant for India.
2. The “GDP growth rate” factor is significant only for South Africa.
3. The “current account balance” factor is significant for China and Brazil.
4. The “FDI (net inflows)” factor is significant only for Russia.
5. The “reserves” factor is significant for Brazil and China.

6. The analysis of macroeconomic parameters is critical for designing a BRICS settlement mechanism, as it enables accounting for the heterogeneous impact of key factors on each country’s REER. Understanding the dynamics of trade flows, inflation, GDP growth, the current account balance, FDI inflows, and reserve management is necessary to build a resilient and stable financial system. Neglecting these parameters may lead to unpredictable exchange-rate volatility, rendering the settlement mechanism ineffective and risky for its participants. Thus, incorporating country-specific macroeconomic characteristics is a fundamental prerequisite for ensuring the long-term robustness and success of any BRICS integration project in the financial domain.

Development of an approach to the creation of a new settlement mechanism among BRICS countries (BCU)

To reduce exchange rate risk and increase the volumes of trade and investment, it is proposed to develop a BRICS settlement mechanism — the BRICS Currency Unit (BCU) — based on the following equations:

Equation 1: Equal Weighting

$$BCU = 20\% * REER_{Br} + 20\% * REER_{Rus} + 20\% * REER_{Ind} + \\ + 20\% * REER_{Ch} + 20\% * REER_{SA}.$$

Equation 2: Trade-Weighted

$$BCU = X1 * REER_{Br} + X2 * REER_{Rus} + X3 * REER_{Ind} + \\ + X4 * REER_{Ch} + X5 * REER_{SA},$$

where X_i is the share of trade with BRICS countries in total trade.

Equation 3: BRICS-GDP Share-Weighted

$$BCU = X1 * REER_{Br} + X2 * REER_{Rus} + X3 * REER_{Ind} + \\ + X4 * REER_{Ch} + X5 * REER_{SA},$$

where X_i is each country’s share of the total BRICS GDP, in percent.

Equation 4: GDP-Weighted

$$BCU = X1 * REER Br + X2 * REER Rus + X3 * REER Ind + \\ + X4 * REER Ch + X5 * REER SA,$$

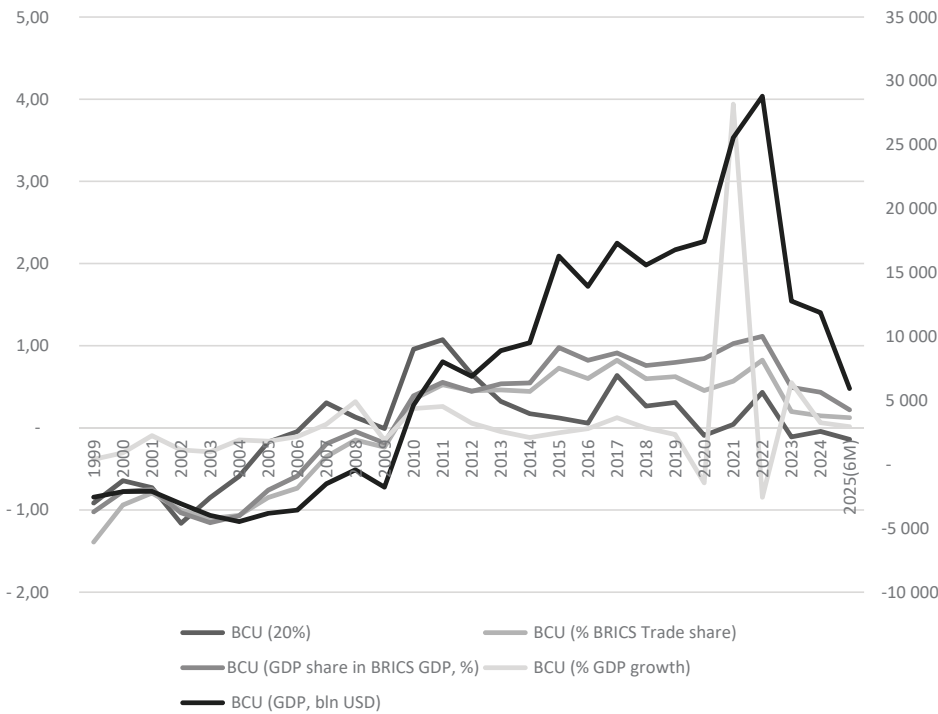
where X_i is the country’s GDP size.

Equation 5: GDP Growth-Weighted

$$BCU = X1 * REER Br + X2 * REER Rus + X3 * REER Ind + \\ + X4 * REER Ch + X5 * REER SA,$$

where X_i is the country’s GDP growth rate.

Figure below presents the currency charts depicting the historical dynamics of the BCU.



Historical dynamics of the BCU²

Source: compiled by E.A. Vasyukov.

Let’s examine the correlation coefficients between the BCU equations and the REERs of the BRICS countries (Table 2).

² Bank for International Settlements. (2025). Effective exchange rates [Data set]. BIS WS_EER 1.0. Retrieved 26 August 2025, from https://data.bis.org/topics/EER/BIS%2CWS_EER%2C1.0/D.N.B.BR

Table 2

Correlation matrix of the BCU equations and the REERs of the BRICS countries

Parameter	1. BCU (20%)	2. BCU (share of trade with BRICS countries in total trade)	3. BCU (share of the total BRICS GDP)	4. BCU (GDP size)	5. BCU (GDP growth rate)
REER. Russia	0.84	0.61	0.52	0.26	0.03
REER. India	0.55	0.67	0.71	0.70	0.26
REER. SA	0.10	−0.47	−0.51	−0.58	−0.10
REER. China	0.42	0.88	0.91	0.94	0.25
REER. Brazil	0.80	0.46	0.37	0.04	−0.05

Source: compiled by E.A. Vasyukov.

Based on the correlation matrix between the BRICS countries' REERs and the BCU equations, it can be concluded that the BCU currency (Equations 1, 2, and 3) demonstrates significant correlation with the REERs of the BRICS countries. In contrast, Equation 4 shows lower level of correlation with ruble and real. Equation 5 exhibits the weakest correlation with the BRICS REERs.

Table 3

Correlation matrix of the BCU equations and key macroparameters of BRICS countries

Parameter	1. BCU (20%)	2. BCU (share of trade with BRICS countries in total trade)	3. BCU (share of the total BRICS GDP)	4. BCU (GDP size)	5. BCU (GDP growth rate)
Brazil. Share of trade with BRICS countries in total trade	0.67	0.88	0.88	0.77	0.28
Brazil. Current account balance	−0.18	−0.33	−0.33	−0.26	−0.04
Brazil. Reserves	0.79	0.95	0.93	0.75	0.25
Russia. FDI net inflow	0.45	0.13	0.07	−0.18	0.29
India. Inflation	0.55	0.28	0.25	0.05	0.02
China. Current account balance	0.07	−0.32	−0.33	−0.47	−0.03
China. Reserves	0.80	0.91	0.89	0.69	0.24
SA. GDP growth rate	−0.11	−0.44	−0.46	−0.41	0.29
SA. Share of trade with BRICS countries in total trade	0.66	0.92	0.90	0.77	0.22

Source: compiled by E.A. Vasyukov.

Based on the table above, it can be noted that Equation 5, on average, exhibits the lowest correlation with most parameters: moderate with reserves, GDP growth rates, FDI inflows, and intra-BRICS trade share, and low with the current account balance and inflation (see Table 3). Thus, Equation 5 demonstrates the most favorable diversification properties and is therefore proposed as the basis for the creation of the BCU currency.

Weighting a basket by GDP growth rates makes the BCU responsive to changing macroeconomic momentum. When a country experiences a negative domestic shock (currency collapse, recession), its growth rate typically falls; a growth-weighted basket therefore automatically reduces exposure to that country's currency at precisely the moment its idiosyncratic volatility rises. Conversely, economies with stable or accelerating growth acquire relatively greater weight, so the basket shifts toward more resilient performers and away from transient sources of shock. This mechanically lowers the basket's comovement with the most volatile national currencies. If member economies are out of phase (anti-cyclical), a growth-weighted basket tends to smooth cycle-driven volatility: outward shifts in weights reflect relative cycle strength and thus dilute synchronous transmission of shocks from one country to the whole index. Conversely, if cycles are highly synchronous, growth weighting will not amplify group-level procyclicality because weights evolve with common trends, preserving the basket's role as a stabilising reference.

From a policy perspective, growth-weighting is easy to communicate (it links the unit to economic performance) and can be updated periodically (quarterly or annually) to reflect structural shifts. It also reduces the need for active reserve intervention because the basket itself shifts away from stressed economies-complementing reserve diversification strategies recommended by central-bank studies listed above.

However, weighting the BCU by GDP growth exposes the basket to the inherent volatility and revision-proneness of growth statistics: procyclical down-weights during recessions and up-weights during booms can amplify short-term instability if weights are updated too frequently. Rapid weight shifts may trigger portfolio rebalancing by market participants, generating capital-flow volatility that undermines the stabilising intent of the basket. To mitigate these effects, implement smoothing and delay rules (e.g., multi-year moving averages, lagged growth indicators), caps/floors on annual weight changes, and transition bands that phase weight adjustments over time. Combining growth with a stabilising anchor (hybrid weights incorporating nominal GDP or reserve buffers) reduces sensitivity to transient growth spikes while preserving the responsiveness advantages of growth weighting. Growth figures are subject to measurement error, late revisions and heterogeneous statistical practices across countries; reliance on such data can produce biased or disputed weights. This risk is addressed by using standardized data sources, applying outlier-robust estimators, and defining an explicit governance protocol for data updates and dispute resolution.

Discussion

The results of the analysis indicate that the dynamics of real exchange rates in BRICS countries are highly sensitive to a wide range of macroeconomic factors, such as trade flows, inflation, GDP growth rates, and capital movements, with each factor exerting a heterogeneous impact.

The proposed settlement mechanism, based on a notional accounting unit (BCU), directly addresses this issue. Its primary objective is to reduce volatility and minimize risks arising from the aforementioned macroeconomic factors. The introduction of the BCU makes it possible to:

- Smooth price fluctuations, rendering them less pronounced than in traditional commodity markets, thereby mitigating the impact of inflationary shocks and instability.
- Lower transaction costs and currency risks, providing a stable foundation for long-term planning — a particularly important feature in contexts where GDP growth rates and investment flows can significantly influence exchange rates.
- Enhance predictability, which strengthens trust among participants and stimulates trade turnover, as economic agents gain access to a reliable instrument independent of the volatility of individual national economies.

Thus, the analysis of macroeconomic parameters substantiates the necessity of creating such a mechanism, while its structure offers practical tools for addressing the challenges identified in the study.

The expansion of BRICS into the BRICS+ format has opened new opportunities for financial and trade integration across a wider set of economies. With the accession of Saudi Arabia, the United Arab Emirates, Egypt, Iran and others, the group represents not only a significant share of global GDP but also a highly diversified structure of economic models. The creation of the BCU can serve as a unifying instrument to stabilize trade, facilitate investment, and enhance institutional cooperation across this heterogeneous landscape.

At the same time, bilateral agreements between members — such as Brazil-China cooperation in agriculture, Russia-India and Russia-China settlements in energy trade, and Egypt's promotion of local-currency trade — demonstrate a clear willingness to diversify away from dollar-denominated transactions. The BCU could operate as the natural extension of these efforts, serving as a synthetic unit that reduces volatility and transaction costs while increasing predictability.

For energy exporters such as Saudi Arabia, the UAE, and Iran, the BCU could provide a stable settlement mechanism for oil and gas exports. Invoicing in BCU would shield revenues from fluctuations in external currencies and create a predictable benchmark for long-term supply contracts. This would be especially valuable in multi-party trade chains where exports are directed to Asia, and payments are reinvested across BRICS+ markets. For Russia, also a major energy supplier, the BCU offers an additional channel to strengthen energy trade integration with partners in Asia and the Middle East, further advancing the strategy of de-dollarization.

In the agricultural domain, Brazil's trade with Africa represents a key example of how the BCU could function in practice. The planned BRICS Grain Exchange would benefit from a common settlement unit, allowing exporters in Brazil to sell to import-dependent countries such as Egypt and Ethiopia without the need to hedge against bilateral currency risks. Payments in BCU through BRICS Pay would simplify transactions, lower costs, and foster food security in the region.

In industrial and technology trade, countries such as India, China, and South Africa could use the BCU to enhance predictability in the supply of machinery, electronics, and services. Egypt and Ethiopia, with currencies subject to significant inflationary pressures, would benefit from the use of a stable unit of account for essential imports. This would improve planning for both public budgets and private enterprises, while simultaneously supporting integration into regional blocs such as the African Continental Free Trade Area (AfCFTA).

In addition BCU can serve multiple practical roles: a denomination for NDB-issued bonds, loans and guarantees, and a benchmark for corporate and sovereign financial reporting and budgetary planning across BRICS members; as a clearing unit it can facilitate multilateral netting of payments and reduce the volume of cross-border FX transactions; as a reserve-management instrument it can be held in diversified reserve tranches or used to denominate central-bank swap lines, thereby complementing existing reserve assets; as a basis for new financial markets it can underlie tradable instruments (BCU bonds, forwards and options), enabling liquidity-building and price discovery; and when implemented on interoperable digital rails (CBDC / blockchain), it can support programmable payments, conditional transfers, and automated settlement in complex value chains-thereby lowering transaction costs, enhancing transparency, and strengthening the operational backbone for deeper economic integration.

Limitations of the BCU approach overall. A BCU-even well designed-cannot eliminate all exchange-rate or macroeconomic risk: it redistributes rather than removes exposure and may underperform as a nominal anchor if underlying macro imbalances persist. Liquidity and depth are critical; without sufficiently liquid markets for BCU-denominated instruments and credible issuers (e.g., NDB-backed facilities), the unit may remain a notional accounting device with limited practical hedging value. Political constraints and asymmetric interests among members may also limit the BCU's representativeness and long-term credibility. Operationalising BCU requires robust payment, clearing and settlement infrastructure, legal harmonization (contract law, bankruptcy, taxation), KYC/AML alignment and coordination of central-bank reserve and liquidity operations. Interoperability with national payment systems and CBDCs, and decisions about issuer/manager (centralised vs. distributed) and collateralisation, pose complex technical and regulatory challenges. These tasks demand sustained multilateral governance, interoperable APIs, and investment in market-making capacity to ensure tradability and viability. Adoption carries transition costs and risk of fragmentation-parallel systems (BCU vs. USD) could bifurcate markets, raise

hedging complexity, and invite speculative attacks if confidence is incomplete. BCU may also create moral-hazard incentives for weaker members if markets expect basket-support or intervention, and could transmit contagion if a major member experiences a prolonged crisis.

Conclusion

Modeling of real exchange rates in BRICS countries confirmed and identified both unique and common factors that determine their values. A conducted study allowed for the identification of the significance of various macroeconomic factors in shaping the dynamics of real exchange rates in BRICS countries, highlighting their heterogeneity and individual characteristics of influence on each national currency. The analysis showed that factors such as the share of trade volume within BRICS, inflation, GDP growth rates, current account balance, foreign direct investment, and foreign exchange reserves have a non-uniform impact depending on the specific economy of a particular country. These findings create a basis for developing effective currency regulation measures and demonstrate the potential for creating a new BRICS currency — the BCU.

This study has demonstrated that the dynamics of real exchange rates in BRICS countries are shaped by a wide set of macroeconomic factors, including intra-BRICS trade, inflation, GDP growth, current account balances, foreign direct investment, and international reserves. The analysis highlights both common patterns and country-specific sensitivities, which complicates the development of a unified monetary framework. These findings provide the basis for designing effective regulatory mechanisms and underscore the potential of a new settlement instrument — the BRICS Currency Unit (BCU).

The BCU's value could be pegged to a basket of BRICS currencies, with the weighting based on different principles, such as each country's economy gdp growth. Special attention was given to minimizing correlation with the volatility of individual national economies. Weighting currencies by gdp growth proved to be the most efficient approach, producing a more stable unit that is less exposed to domestic shocks. Out of the five modeled equations, this method demonstrated the best diversification properties, confirming the suitability of the BCU as a practical hedging tool. By reducing currency risks, BCU-based settlements can encourage higher trade and investment flows, fostering deeper economic integration across BRICS.

BCU has significant strategic implications. It can stabilize long-term contracts in energy, agriculture, and manufacturing by reducing price volatility and transaction costs. For Russia and other members, this provides a means to strengthen financial sovereignty, mitigate exposure to external shocks, and increase competitiveness in global markets. Furthermore, extending the BCU to BRICS+ partners such as Saudi Arabia, the UAE, Argentina, and Egypt would diversify settlement mechanisms, reduce dependency on the US dollar, and reinforce the group's role in shaping a multipolar global financial system.

In sum, the BCU is not only a technical solution to exchange rate volatility but also a strategic instrument for building long-term stability, trust, and resilience in the BRICS economic space.

Future research should quantify these trade-offs through counterfactual simulations and stress tests, back-testing alternative re-weighting rules on historical crises, and modelling market-microstructure effects of phased re-weighting. Empirical studies comparing hedging costs for BCU vs. existing instruments, pilot implementations with limited instruments (trade invoices, NDB bonds), and legal-institutional research on governance architectures and reserve-management protocols would provide practical guidance for policy pilots and gradual rollout.

Appendix 1

BRICS countries REERs models data

Parameter	Russia	India	SA	China	Brazil
R Square	0.62	0.64	0.63	0.82	0.76
Adjusted R Square	0.53	0.56	0.52	0.77	0.69
F	6.75	7.55	5.71	15.29	10.82
Significance F	0.00	0.00	0.00	0.00	0.00
DW	1.42	1.52	0.85	0.88	1.57
DI	1.01	1.01	1.01	1.01	1.01
Du	1.86	1.86	1.86	1.86	1.86
Chi-squared test	8.46	10.15	3.59	8.76	4.56
Chi-squared stat	11.07	11.07	11.07	12.59	9.49
Ramsey test (F)	5.76	0.73	1.34	6.37	2.49
Significance F	0.00	0.65	0.29	0.00	0.05

Source: compiled by E.A. Vasyukov.

Model adequacy analysis:

1. F-test: The F-test indicates that the independent variables explain a significant portion of the variance in the dependent variable (>50%).
2. Durbin — Watson test: The test statistic is between dL and dU values for Russia, India and Brazil, it is not possible to conclusively accept or reject the null hypothesis of no autocorrelation. DW statistic for China and South Africa is below dL and close to 1, which implies positive autocorrelation.
3. Breusch — Pagan test: The calculated Chi-squared statistics do not exceed the critical values. Therefore, the null hypothesis of homoscedasticity is accepted.
4. Ramsey RESET test: The calculated F-statistics exceed the critical values, indicating correct model specification.

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Research article / Научная статья

The role of China and Russia in global governance and cooperation among BRICS and prospects of organization

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Abstract. The establishment of the intergovernmental association that later became known as BRICS — uniting Brazil, Russia, India, and China — took place in June 2006 during the St. Petersburg Economic Forum. Since then, the group has evolved into one of the most influential formats of cooperation among emerging economies, providing a structured yet flexible platform for political dialogue and economic coordination. Annual summits, ministerial consultations, and sectoral working groups have contributed to a gradual institutionalization of the format, even though BRICS remains distinct from traditional economic or military alliances. It lacks a common tariff policy, a free trade area, or supranational governance mechanisms, emphasizing instead the principles of equality, sovereignty, and mutual benefit among its members. This study examines the evolving role of China and Russia as central actors within BRICS and their capacity to influence global governance. The research draws upon a mixed-methods approach, combining qualitative analysis of academic literature and official policy documents with quantitative assessment based on data from the IMF, World Bank, UN Comtrade, and national statistical agencies. The findings demonstrate that China's growing economic dominance within the bloc has generated a form of asymmetrical interdependence, while Russia continues to provide political and strategic balance. At the same time, the shared objective of reducing Western economic hegemony and promoting a multipolar order continues to unite the member states despite internal divergences. The study concludes that BRICS functions as an evolving platform for shaping an alternative model of globalization — one based not on confrontation, but on the diversification of international institutions and the search for more inclusive mechanisms of global governance.



Keywords: emerging economies, sovereignty, world order transformation, strategic partnership, economic cooperation, Global South

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Роль Китая и России в глобальном управлении и сотрудничестве в рамках БРИКС и перспективы организации

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Аннотация. Основание межправительственного альянса, включающего Бразилию, Россию, Индию и Китай, произошло в июне 2006 г. в рамках Петербургского экономического форума. С тех пор государства-члены поддерживают постоянный диалог через серию высокоуровневых встреч, включая министерские консультации в сферах внешней политики и финансов, а также более широкие дипломатические взаимодействия. Начиная с 2009 г. страны БРИКС ежегодно проводят саммиты на высшем уровне. Вместе с тем, объединение не может рассматриваться как классический экономический союз или военно-политический блок, поскольку отсутствуют соглашения о свободной торговле, единая тарифная политика и совместные наднациональные институты управления. БРИКС функционирует прежде всего как платформа для диалога, на которой национальные лидеры стремятся согласовывать позиции по ключевым вопросам экономической политики. Несмотря на взаимодействие, все государства сохраняют полный суверенитет. Кроме того, значительные различия в правовых системах государств-членов часто создают сложности для эффективной реализации коллективных инициатив. Исследована роль Китая и России как центральных участников блока, оценено их влияние на формирование совместной повестки БРИКС и трансформацию глобального порядка в направлении большей многополярности. Особое внимание уделено выявлению структурной асимметрии между двумя странами и оценке рисков, связанных с экономической зависимостью России от Китая. Анализ базируется на сравнительном

обзоре академических исследований, официальных документов и институциональных практик, а также на авторской обработке статистических данных из General Administration of Customs PRC, Центрального банка РФ, China Statistical Yearbook, UN Comtrade, IMF и World Bank. Результаты исследования позволяют выявить основные направления экономической, финансовой и политической кооперации стран БРИКС, определить потенциал укрепления их влияния на мировой арене и сформулировать выводы о перспективах функционирования блока в условиях глобальных изменений.

Ключевые слова: страны с формирующимся рынком, суверенитет, трансформация мирового порядка, стратегическое партнерство, экономическое сотрудничество, Глобальный Юг

Вклад авторов. Мамахатов Т.М. — концепция и дизайн исследования, сбор данных, анализ данных, написание текста статьи; Кулаева Е.К. — концепция и дизайн исследования, сбор данных, анализ данных, написание текста статьи. Все авторы одобрили окончательную версию статьи.

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Introduction

The role of BRICS in global governance has become a central topic in contemporary international relations scholarship. As the bloc brings together the most influential emerging economies, it has positioned itself as both a complement to and a potential challenger of the Western-dominated order. Among the BRICS members, China and Russia occupy a particularly prominent role, not only because of the scale of their economies and geopolitical weight, but also due to their active promotion of alternative mechanisms of international cooperation.

To investigate the role of China and Russia in global governance and their contribution to cooperation within BRICS, this study employs a comparative review of existing academic literature, official documents, and institutional practices. The analysis is structured around two main perspectives present in scholarly debates. The first views BRICS as a coalition of emerging economies — led primarily by China and Russia — aimed at reshaping the existing global order in which the U.S. dollar and Western-centered institutions retain dominance. Within this framework, particular emphasis is placed on the processes of “dedollarization” and the development of a multipolar economic system. Scholars such as Oliver Stuenkel (Stuenkel, 2015) argue that initiatives championed by BRICS, including the use of national currencies in trade settlements and the establishment of the New Development Bank (NDB), represent collective efforts to reduce dependency on the dollar and expand

the economic sovereignty of member states. Chinese researchers, including Li Xing (Xing, 2016), highlight the role of China and Russia as key actors in promoting financial mechanisms designed to provide alternative development financing and to counterbalance the reliance on U.S.-centric monetary structures.

The second perspective approaches these processes more cautiously, suggesting that BRICS initiatives should not be understood primarily as an attempt to undermine U.S. influence or dismantle the dollar's dominance. Instead, they are interpreted as pragmatic steps to enhance the bargaining power of developing countries and to complement, rather than replace, the existing financial and institutional order (Subramanian, 2011). Kevin P. Gallagher (Gallagher, 2016), for instance, considers the NDB to be an addition to the global financial framework rather than a disruptive alternative, while John Kirton (Kirton, 2018) emphasizes BRICS' strategy of constructive dialogue with advanced economies.

This article seeks to investigate the role of China and Russia in global governance and their contribution to cooperation within BRICS. **The aim of the study** is to assess the extent to which these two states, as central actors within the bloc, are able to shape its cooperative agenda and influence the transformation of the global order toward more inclusive and multipolar structures.

Materials and methods

In this research paper, the authors use a mixed methodological approach combining qualitative and quantitative analysis to assess the role of China and Russia in BRICS cooperation and their impact on global governance. The qualitative component is based on the analysis of scientific publications, official documents and reports of research institutes in order to identify the external strategic orientations of Russia and China, determine the priorities of the national political and economic models of the two states and compare them. This allows us to better understand the asymmetry within the BRICS and identify the ways in which China and Russia are shaping the unification agenda.

The quantitative analysis is based on a systematic analysis of data from official sources providing statistics, such as the General Administration of Customs PRC, the Central Bank of the Russian Federation, China Statistical Yearbook, UN Comtrade, IMF and the World Bank. The authors independently processed the data and presented their own analysis in the form of diagrams, graphs and tables to confirm the main theses, which made it possible to identify key trends in bilateral relations between Russia and China within the framework of the BRICS, compare indicators, identify patterns and correlations in trade flows, foreign direct investment, demographic dynamics and the currency structure of settlements. Qualitative analysis was also used to calculate author's indexes reflecting economic interdependence, the share of trade within the BRICS group of countries, the degree of financial integration and the success of the process of reducing the role of the dollar in bilateral trade and international trade in general. These indicators served as a basis for comparing the

role of China and Russia in the framework of unification and assessing the structural consequences of their interaction.

Among other methods, SWOT and risk analysis was also used to assess the internal weaknesses and external vulnerabilities of the BRICS. The financial, geopolitical, legal, and institutional risks associated with differences in the economic models of China and Russia and with the specifics of implementing initiatives such as the Belt and Road Initiative and the Eurasian Economic Union are considered. Combining trend analysis, author's indexes, and scenario assessments allows us to identify the potential and understand the limitations of the BRICS group of countries, as well as explain how the interaction of economic and political forces of China and Russia influences the formation of the trajectory of the entire organization.

The use of various methodological approaches is dictated by the need to identify the extent to which China and Russia are able to shape the agenda within the association and influence the development of global governance institutions in a way that reflects the interests of developing countries.

Results

An analysis of existing research has shown that there are two main points of view in the scientific community on the role of China and Russia within the framework of the BRICS. The former considers the bloc as a tool for changing the world order in order to weaken the dollar and form a multipolar system of international relations. The second point of view interprets the BRICS initiatives as pragmatic steps to strengthen the negotiating position of developing countries and complement existing financial structures. A comparison of these points of view with statistical and factual information has demonstrated that China is currently the core of the BRICS, while Russia is dependent on the decisions of the Chinese political elite. China acts both as the economic leader of the bloc and as a state capable of advancing its own interests through the BRICS platform.

The authors' processing and interpretation of statistical data made it possible to identify key trends in the economic interaction of the BRICS countries over the past decades. Thus, a comparison of trade indicators within the BRICS according to UN Comtrade data showed a steady increase in trade turnover between the members of the association, with China and Russia making the largest contribution to the dynamics. The share of intra-BRICS trade in the total foreign trade turnover of the participating countries has maintained a high level over the past decade, reflecting the formation of stable trade and economic ties. At the same time, a structural asymmetry has been revealed: China acts as the industrial and technological center of the bloc, while Russia concentrates on the supply of energy resources and raw materials.

A comparison of the China Statistical Yearbook data on foreign direct investment showed that within the framework of the EAEU, Chinese investments are mainly directed to Russia, while investments in the rest of the union countries remain minimal. An analysis of the currency structure of Russian foreign trade based on data from the Central Bank of Russia after 2022 helped to discover that after 2022

there was a sharp increase in the use of the yuan in settlements, indicating a gradual strategic transfer of the financial infrastructure of Russian trade from the jurisdiction of the West to the jurisdiction of China, which increases not only Moscow's trade but also financial dependence on Beijing, in which the stability of Russia's financial operations will depend on the decisions of the Chinese government.

The charts based on panel data on GDP, population, and the share of the working-age population demonstrated that economic and demographic power are also factors that further stimulate the growth of asymmetry within the BRICS. The leading role of China and India in these parameters is directly translated into their influence on the formation of trade and investment flows within the bloc, and their large domestic markets stabilize overall economic activity and de facto determine the integration agenda within the BRICS.

An analysis of the Belt and Road Initiative's integration with the EAEU has established that the economic interests of Russia and China complement each other, which is reflected in the formation of new transport and logistics routes, ensuring energy security and stimulating settlements in national currencies. The analysis of correlations between the volumes and dynamics of bilateral trade, investment flows and the structure of currency settlements showed that China determines the economic vector of the BRICS group to the greatest extent. At the same time, Russia retains influence within the group by controlling strategic resources and key transport corridors.

Thus, the study revealed two contours of influence: internal, where China and Russia, through economic, financial and logistical levers, structure cooperation within the bloc, and external, where this structuring strengthens their collective weight in the revision of the foundations of global governance. At the same time, the study showed that for Russia, the main challenge lies not in direct confrontation with other countries of the bloc, but in managing the risks associated with dependence on China's economic strategy. At the same time, China gets the opportunity to balance between global integration and strengthening its leadership within the BRICS, which creates new conditions for building a Russian foreign economic and political strategy.

BRICS accounts for 40% of the global economy, which is more than the G7 countries. Both Russia and China would like to make BRICS a platform for the global South and East. It is possible to unite countries with common interests — open borders for trade, political stability, and the absence of opposition to any blocs. Taken together, the BRICS nations occupy over one-fourth of the planet's total land area and are home to nearly two-fifths of humanity. Their collective economic weight is equally significant: when measured in terms of gross domestic product at purchasing power parity (PPP), the group holds a prominent position within the global system. According to 2022 estimates from the IMF and the World Bank, China emerges as the largest economy worldwide, India follows in third place, Russia in fifth, Brazil in eighth, while South Africa stands in thirty-second position¹. These indicators appear particularly appealing to other states considering accession to the grouping.

¹ World Bank. (2025). *World Bank Open Data*. Retrieved 31 August 2025, from <https://data.worldbank.org/>

Brazil, India, South Africa have positive population growth rates, which means that these countries are also increasing their domestic consumption, so that other countries want to gain access to their markets. A substantial share of the country's population consists of young and working-age individuals, which contributes to higher production capacity and, consequently, fosters growth in GDP (Figure 1).

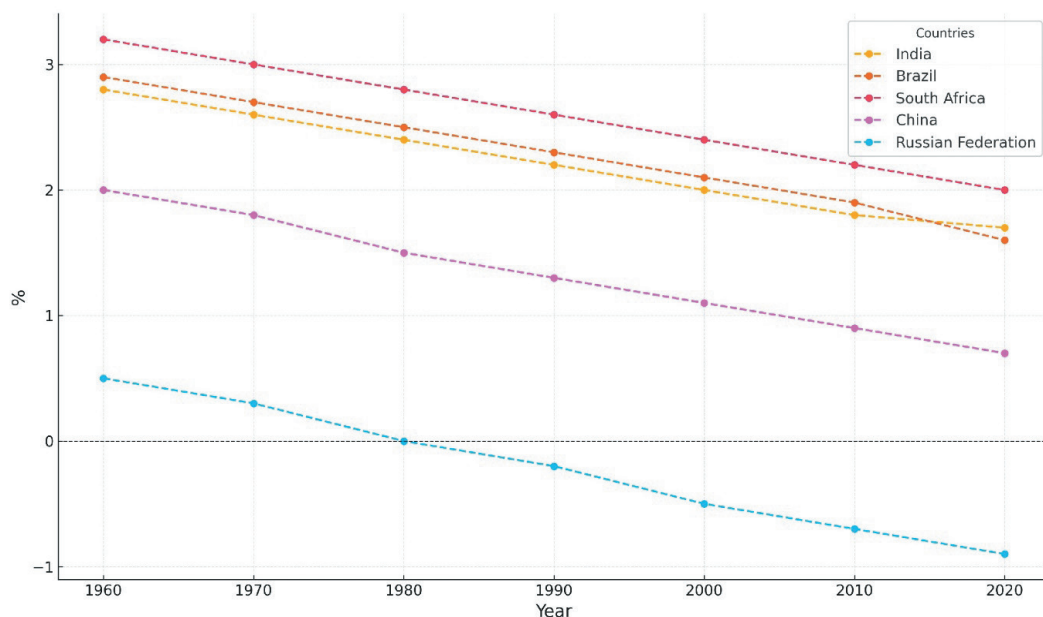


Figure 1. Population growth (annual %) — Brazil, China, India, South Africa, Russian Federation (1961–2020)

Source: World Bank. Retrieved 31 August 2025, from <https://data.worldbank.org/indicator/SP.POP.GROW?end=2020&locations=CN-BR-IN-ZA-RU&page=1>

Enduring poverty across developing economies often translates into weak domestic demand, thereby increasing uncertainties for international investors and reducing the potential for foreign direct investment inflows². The ratio of the dependent population to the working-age population is noteworthy: in countries like Russia and China, it remains relatively low. This eases the economic strain on these nations and reduces budgetary demands for healthcare, education, and pensions (Figure 2).

The influence of the BRICS countries on the global economy and world politics can also be established by such indicators as trends in foreign direct investment inflows and outflows. Foreign direct investment flows to BRICS countries increased by almost 11% between 2000 and 2010. In terms of the BRICS countries share of global FDI inflows, they accounted for almost 18% of total global FDI in 2010. More importantly, their share in global FDI has risen sharply since 2000³.

² United Nations. (2023). Extreme poverty in developing countries inextricably linked to global food insecurity crisis, senior officials tell Second Committee [Press release]. Retrieved 31 August 2025, from <https://press.un.org/en/2023/gaef3590.doc.htm>

³ United Nations Conference on Trade and Development. (2011). *World investment report 2011: Non-equity modes of international production and development* (UNCTAD/WIR/2011). Retrieved 31 August 2025, from https://unctad.org/system/files/official-document/wir2011_en.pdf

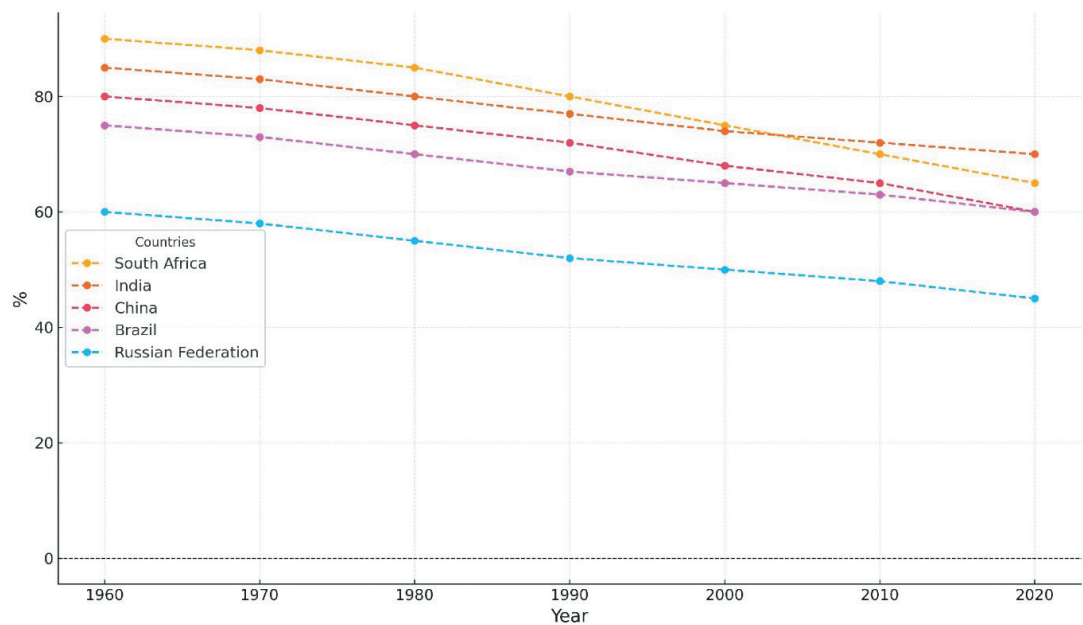


Figure 2. Age dependency ratio (% of working-age population) — Brazil, China, India, South Africa, Russian Federation (1960–2020)

Source: World Bank. Retrieved 31 August 2025, from <https://data.worldbank.org/indicator/SP.POP.DPND?end=2020&start=1960>

According to the IMF, the BRICS countries have made significant progress in economic construction from 1990 to 2019. After the 2008 crisis, the economic situation in the BRICS countries started to improve and we could observe the growth of the economies of South Africa, China and Brazil during this period of time (Table 1).

Table 1

**Economic overview of the BRICS countries:
GDP, share in world GDP and GDP per capita in 1990, 2010 and 2019, USD**

Country	GDP (\$, Bn) 1990	GDP (\$, Bn) 2010	GDP (\$, Bn) 2019	Share of World GDP (%) 1990	Share of World GDP (%) 2010	Share of World GDP (%) 2019	GDP Per Capita (\$) 1990	GDP Per Capita (\$) 2010	GDP Per Capita (\$) 2019
Brazil	502.09	2.085.00	1.839.00	3.7	3.0	2.7	3.464.00	10.861.00	11.089.00
Russia	517.98	1.850.00	1.690.00	3.0	2.7	2.0	3.101.00	13.345.00	11.047.00
India	304.09	1.685.00	2.850.00	3.1	2.5	3.3	322.00	1.345.00	2.101.00
China	112.09	5.878.00	14.340.00	0.9	9.3	16.3	341.00	4.382.00	10.261.00
South Africa	119.00	357.00	351.00	0.6	0.7	0.5	5.436.00	7.158.00	6.417.00

Note. Green color — increase; Red color — decrease.
Source: IMF World Economic Outlook Database. Retrieved 5 October 2025, from <https://www.imf.org/en/Publications/WEO/weo-database/2023/October> (processed by E.K. Kulaeva).

The outlook becomes even more favorable when evaluated on a GDP nominal basis. Currently, China stands as the world's third-largest economy, while India holds the sixth position (measured by nominal GDP in US dollars; Figure 3).

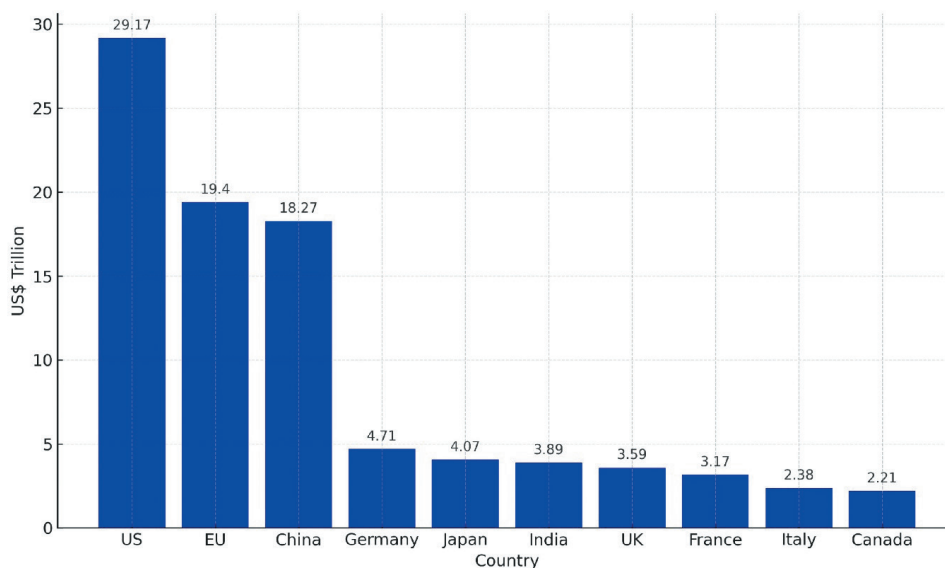


Figure 3. Largest economies in the world by GDP (nominal) in 2024, USD

Source: International Monetary Fund estimates. Retrieved 9 October 2025, from <https://www.imf.org/en/Publications/WEO/weo-database/2024/October> (processed by E.K. Kulaeva).

BRICS economies collectively exert a considerable influence on global resource markets, with their prominence extending across agriculture, industry, and energy. China, for instance, consistently maintains global leadership in grain output, while Russia, India, and Brazil also rank among the top producers. Livestock production follows a similar pattern: in 2021, China dominated worldwide meat supply, with Brazil, Russia, and India occupying additional positions in the upper tier of global rankings. By the following year, China had also secured the foremost role in mineral fertilizer production, whereas India and Russia were positioned in third and fifth place. These outcomes underscore the group's weight in sustaining global commodity flows. Notably, several states aspiring to join BRICS — such as Indonesia, Algeria, Saudi Arabia, and Egypt — already occupy strong positions within the world's top ten producers of strategic goods, suggesting that enlargement would only reinforce the bloc's centrality in international trade and supply chains. The energy sector provides further evidence of this dominance: China stands as the largest generator of electricity worldwide, while India, Russia, and Brazil occupy the third, fourth, and seventh places, respectively (Iqbal, 2022).

As BRICS continues to strengthen its global position, its growing clout is increasingly juxtaposed with that of long-standing Western coalitions. Jim O'Neill, the economist credited with introducing the acronym BRIC, argued in an interview with *African Business* that the grouping has already evolved into a formidable rival to the G7. Economic assessments from 2022 substantiate this claim, revealing that the combined GDP of BRICS economies has exceeded that of the G7. O'Neill stressed

that the association's founding rationale was rooted in the need for a governance model capable of reflecting shifting global power dynamics and delivering more inclusive and adaptive responses to modern challenges — something the G7, in his view, struggles to achieve due to its limited representativeness and its adherence to a system that primarily serves the interests of advanced economies⁴.

The demographic and territorial scale of BRICS provides the grouping with a strategic advantage over the G7. With a combined population exceeding 3.2 billion — over four times larger than the 777 million living in G7 countries — BRICS represents a far broader human resource base and consumer market. Its members also occupy a considerably greater landmass, a factor that amplifies their capacity in resource extraction and agricultural production. This is reflected in wheat output, where BRICS states collectively produce more than double that of the G7. Projections by the International Monetary Fund suggest that these structural strengths will translate into economic momentum: by 2028, BRICS is expected to generate more than one-third of global growth, while the G7's share will contract below 28 percent⁵. Such trends indicate not only a shift in economic weight but also a gradual rebalancing of influence in global governance and food security.

Taken together, these indicators suggest a gradual rebalancing of the global economic order in favor of the Global South, with BRICS emerging as a serious counterweight to established Western structures. At the same time, the trajectory is not without complications. The European Union has not taken part in BRICS, even though its trade and investment ties with several members of the group are extensive. This absence can be explained by both institutional differences and cautious geopolitical positioning. Although the EU figures among the top sources of investment for BRICS states, the relationship is far from balanced. China's rapid rise — and, to a lesser extent, India's growth — has shifted economic influence toward Asia, while the other BRICS countries, whose economies are heavily tied to resource exports, remain exposed to the volatility of global commodity markets (Wouters, Van Kerckhoven, 2018). For the European Union, the consolidation of BRICS cooperation carries a mixed set of implications. It opens potential channels for collaboration, yet simultaneously heightens concerns about growing dependence on external actors in sensitive industries. As BRICS expands its reach and asserts itself as a rival center of global governance, the bloc's rising influence is accompanied by deepening structural asymmetries and mounting external pressures. These factors, in turn, pose risks to the long-term stability of the group.

The BRICS economies display markedly different structural profiles. Brazil and South Africa remain strongly tied to agriculture, whereas Russia continues to rely predominantly on natural resources, particularly its energy sector. India has

⁴ Masie, D. (2023). The future of the BRICS — in conversation with Lord Jim O'Neill. *African Business*. Retrieved 9 October 2025, from <https://african.business/2023/06/resources/the-future-of-the-brics-in-conversation-with-lord-jim-oneill>

⁵ International Monetary Fund. (2023). *World Economic Outlook database* (October 2023 edition) [Data set]. Retrieved 9 October 2025, from <https://www.imf.org/en/Publications/WEO/weo-database/2023/October>

developed a comparative advantage in services, excelling in fields such as information technology, financial activities, business operations, and transportation. China, on the other hand, has firmly established itself as a leading global center for consumer goods manufacturing. Yet, in spite of these distinctions, the member states frequently compete with one another as each seeks to maintain robust economic growth (Luckhurst, 2013).

The development of trade relations within the BRICS association reflects not only the quantitative expansion of mutual exports and imports, but also a qualitative change in the structure of interaction between its members. The data presented in Figures 4–7 make it possible to analyze the key trends in domestic trade over the period 2001–2024 and assess the transformation of the positions of individual countries, primarily China and Russia, in the context of deepening economic cooperation.

The dynamics of the total trade turnover between the BRICS countries (Figure 4) indicates the formation of a stable upward trend, significantly outpacing the growth rate of global trade. This confirms the increasing role of the association as an independent economic center.

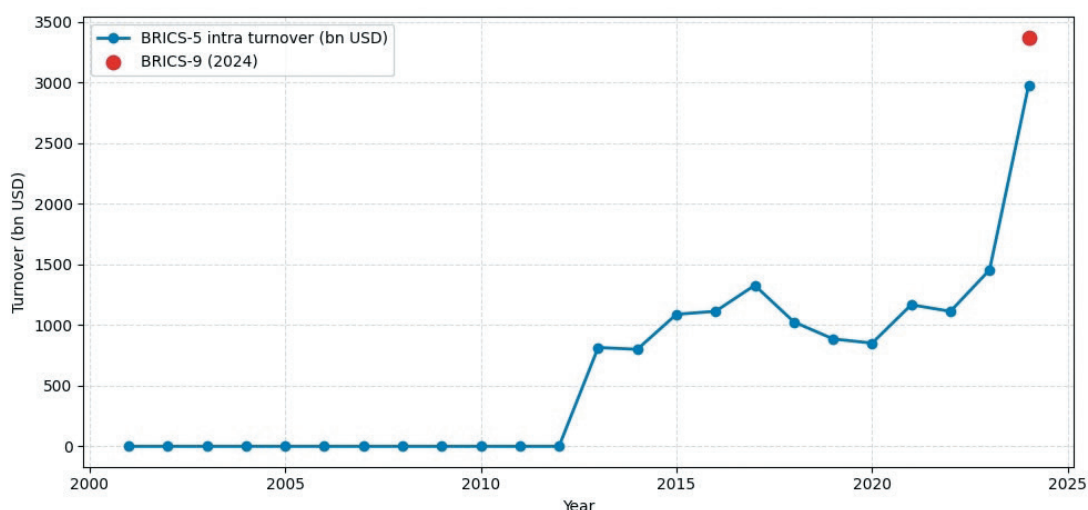


Figure 4. Intra-BRICS merchandise trade turnover (BRICS-5), 2001–2024. Values are exports + imports between BRICS members (current USD). The red marker shows the BRICS-9 aggregate for 2024

Source: UN Comtrade. Retrieved 10 October 2025, from <https://comtradeplus.un.org/TradeFlow> (processed by E.K. Kulaeva).

At the same time, the indicator of the share of trade within the group in the total foreign trade turnover of the BRICS countries (Figure 5) demonstrates a steady high level over the past decade, which indicates the established structure of mutual trade relations within the association. The slight decrease in the indicator in 2024 is not due to the weakening of cooperation, but to the expansion of the BRICS and the inclusion of new participants whose trade relations with the former members are still being formed. Thus, the stability of the indicator reflects the maturity of existing channels of interaction and the potential for their further deepening as new members are institutionally integrated.

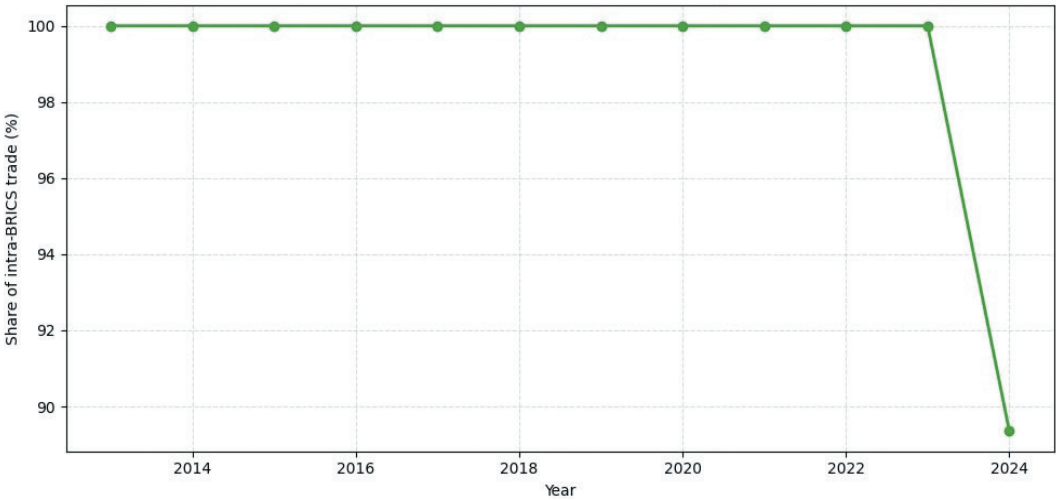


Figure 5. Share of intra-BRICS trade in BRICS members' total trade with the world, 2001–2024 (percent)

Source: UN Comtrade. Retrieved 10 October 2025, from <https://comtradeplus.un.org/TradeFlow> (processed by E.K. Kulaeva).

Of particular interest are the differences in the national political strategies of the BRICS member countries. A comparison of indicators by key years (Figure 6) and the structure of countries' participation in trade flows (Figure 7) demonstrate that China and Russia are the main drivers of BRICS domestic trade growth. At the same time, the roles are complementary, but not identical. China is an industrial and technological center of unification, forming a steady demand for raw materials and supplying industrial products, technologies and equipment. Russia, on the contrary, is a key supplier of energy, food and metals, ensuring the stability of the trade balance within the bloc.

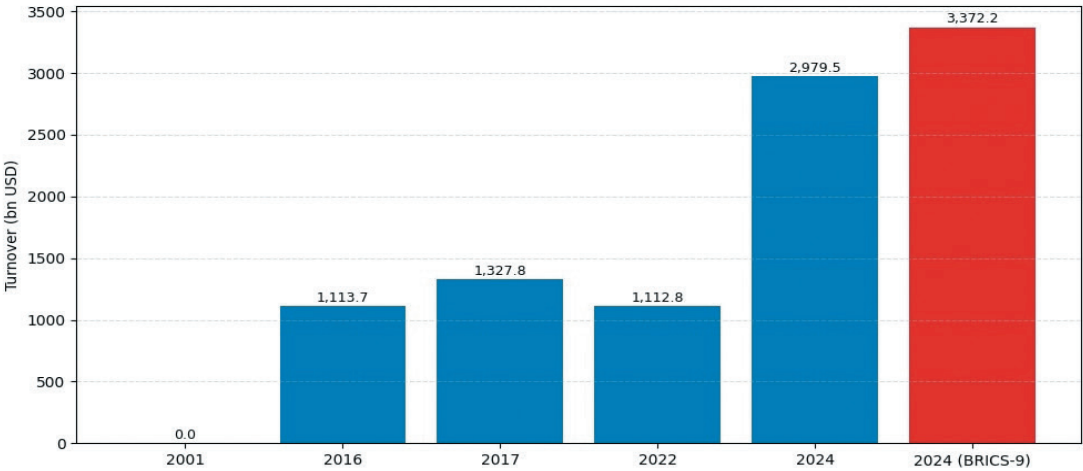


Figure 6. Intra-BRICS turnover in selected key years (2001, 2016, 2017, 2022, 2024); 2024 (BRICS-9) shows value if new members are included. Values in billion USD

Source: UN Comtrade. Retrieved 10 October 2025, from <https://comtradeplus.un.org/TradeFlow> (processed by E.K. Kulaeva).

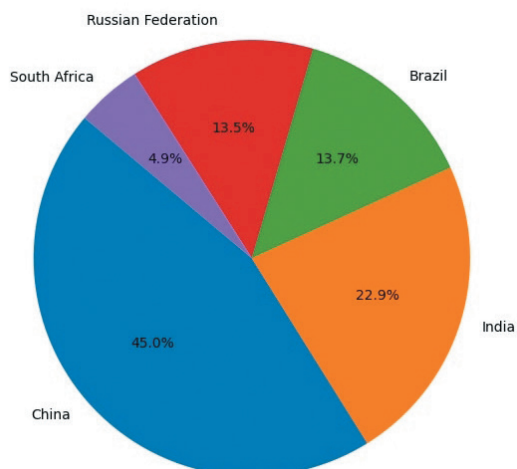


Figure 7. Country-level involvement in BRICS-5 intra trade (2024), measured as sum of reporter + partner appearances in intra-BRICS flows. Values shown as percent shares

Source: UN Comtrade. Retrieved 10 October 2025, from <https://comtradeplus.un.org/TradeFlow> (processed by E.K. Kulaeva).

This complementarity explains the stability of trade relations, but at the same time forms a certain structural asymmetry: the BRICS' economic dependence on China's industrial potential is increasing, while Russia is strengthening its influence through energy instruments. In political and economic terms, this is expressed in a combination of the coincidence of strategic goals — strengthening the role of the Global South and weakening the influence of the dollar in world trade, with differences in approaches to achieve them: China seeks to consolidate its leading position by creating high-value-added goods and forming value chains in its territory, and Russia — through development of alternative payment mechanisms and new logistics routes.

Discussion

Despite certain positive achievements in the economic sphere, the BRICS countries face a number of unresolved problems. For example, the World Bank's Global Business Environment Report notes that the BRICS countries rank comparatively low⁶. In addition, at the level of individual countries within the group, there are serious contradictions and conflicts of interest between states. However, the concept of “inclusive competition” may be more appropriate to describe the relationship between the BRICS countries. The countries are all emerging economies and have opposing positions compared to Western countries on many global issues, especially those of a financial and economic nature. Therefore, using the BRICS platform to enhance coordination within the group and minimize disagreements meets the expectations of the member countries (Fan, He, 2015).

⁶ World Bank. (2012). *Doing business 2012: Doing business in a more transparent world*. Retrieved 10 October 2025, from <https://archive.doingbusiness.org/ru/reports/global-reports/doing-business-2012>

In the financial sphere, cooperation among BRICS has been institutionalized through agreements concluded by their respective development and export-import banks, including the Brazilian Development Bank (BNDES), Russia's VEB.RF, the Export-Import Bank of India, the China Development Bank, and South Africa's Development Bank (DBSA). These arrangements explicitly promote the broader utilization of national currencies in trade and settlement mechanisms, thereby serving as a deliberate strategy to curtail systemic reliance on the US dollar and to reinforce monetary sovereignty within the grouping (Xu, 2012).

According to the theory of liberal institutionalism, state interests, the desire to maximize benefits will always be present when it comes to interstate cooperation. As American political scientist Robert Keohane (Keohane, 2005) notes, cooperation between countries is only possible when governments begin to focus not on relative short-term benefits, but on absolute benefits, which can be achieved through international organizations. However, the level of institutionalization of BRICS countries remains low and the influence of member countries on relations within the group is also limited. The BRICS countries need to establish formal dispute resolution platforms to complement the existing mechanisms of agreements (Shinkaretskaya, 2015).

Given the diversity of the BRICS countries, there are disputes between them. For example, regarding the introduction of a unified payment system or logistics structures. Thus, India takes an extremely careful position in terms of introducing new payment centers (Kondratov, 2021) and a number of countries are afraid of additional tariffs. Trump has already announced the introduction of 10% additional duties on goods from BRICS-supporting countries.

We would like to place special emphasis on the interests of Russia and China within the BRICS group. Currently, China and Russia are jointly developing a number of initiatives, the most important of which are the Belt and Road Initiative of the People's Republic of China⁷, as well as the initiative of the Eurasian Economic Union, in which Russia is directly involved. A more detailed examination of these two initiatives makes it possible to see that the economic interests of Russia and China complement each other: for example, China needs stable supplies of raw materials for its own economic needs, as well as the development of alternative transport routes that help reduce dependence on vulnerable sea routes. At the same time, Russia, for its part, is interested in attracting Chinese investment and technology and needs new markets amid Western sanctions⁸. Both initiatives ultimately help to form complementary economic corridors across Eurasia, where the Northern Sea Route, which connects the Russian Far East with the European part of the country by the shortest route by sea, is a strategically important logistics route. Thus, Chinese companies are actively involved in projects located on the Northern Sea Route, namely in the construction of ports in Arkhangelsk and Zarubino, bridges over the

⁷ Ministry of Foreign Affairs of the Russian Federation. (2021). *O kitayskoy initsiative «Odin poyas, odin put'»* [On the Chinese “One Belt, One Road” initiative]. Retrieved 10 March 2026, from https://www.mid.ru/ru/activity/coordinating_and_advisory_body/head_of_subjects_council/materialy-o-vypolnenii-rekomendacij-zasedanij-sgs/xxxvi-zasedanie-sgs/1767163/

⁸ Zhong, N. (2023). BRICS ties give impetus for growth. *China Daily*. Retrieved 10 March 2026, from <https://en.people.cn/n3/2023/0823/c90000-20061907.html>

Amur and Ussuri rivers, and invest in the modernization of railways and airfields in the Far East (Ren, Ma, Shi, 2015), which leads to an effect that It can be compared with the historical impact of the construction of the Trans-Siberian and Chinese Eastern Railways: the adjacent territories are actively being developed, new markets and jobs are emerging. On the Eurasian mainland, the initiatives of the OBOR and the EAEU complement each other through the development of transport infrastructure on the border of China with Kazakhstan (the Chungkha-Khorgos checkpoint) (Xi, 2014b) and in Belarus (the Great Stone Industrial Park), (Lee, Voskresenskii, 2016), which facilitates the process of establishing logistical links between China and the EAEU countries. In the context of the BRICS association, the use of the Northern Sea Route strengthens the interconnection between the economies of developing countries, reduces transit risks, and also diversifies trade routes and strengthens energy security. From the point of view of geo-economic and political influence, these initiatives stimulate the process of “de-dollarization” and reduce dependence on investments from the West, increasing settlements in national currencies. For example, the transportation of liquefied natural gas from Yamal to China allows not only to increase energy security by reducing dependence on an alternative route through the Strait of Malacca, but also to reduce travel time by almost 40% (Xi, 2014a).

From a legal point of view, the initiatives also deepen cooperation rather than lead to confrontation, as the Chinese authorities respect Russian jurisdiction and do not prevent Russia from maintaining control over the Northern Sea Route through a special reporting and permitting system, as well as maintaining the Russian nuclear icebreaker fleet in the Arctic (Solski, 2020). At the same time, China is building a long-term presence in the Arctic through the Polar Silk Road bilateral initiative, which is paving a route between North America, East Asia and Western Europe, connecting them with each other. The common strategic and legal position of Russia and China is based on the non-recognition of the American “Rules-Based Order” concept, which assigns the main regulatory role to international institutions such as the UN, WTO and others in international relations, which is also often perceived as an attempt to dominate and impose the interests of the United States and the West on other countries without taking into account their opinions⁹. This position creates a stable platform for cooperation without direct confrontation with the countries of the collective West.

From a geo-economic and political point of view, these initiatives also encourage settlements in national currencies and are therefore aimed at “de-dollarization”, or, in other words, reducing dependence on the US dollar, which, according to some researchers, is one of the most important goals of the BRICS group of countries. It is worth noting that Russia and China have signed a number of bilateral agreements. Currency swap agreements¹⁰ and settlements

⁹ Kosachev, K. (2023). Kosachev: “Rules-based order” is an order maintained by the USA. *RG.RU*. Retrieved 10 October 2025, from <https://rg.ru/2023/05/22/kosachev-poriadok-osnovannyj-na-pravilah-eto-poriadok-podderzhivaemyj-ssha.html>

¹⁰ Bank of Russia. (2014). *Bank of Russia concludes a currency swap agreement with the People's Bank of China* [Press release]. Retrieved 11 October 2025, from https://cbr.ru/press/PR/?file=13102014_154408if2014-10-13T15_39_28.htm

and payments¹¹. This will eventually allow the two countries to abandon the use of Western financial instruments and make national economies more resilient to sanctions. In the long term, joint actions by Russia and China to implement these initiatives will increase transit flows between Asia and Europe, strengthen the integration of BRICS and the EAEU, and increase the importance of the Northern Sea Route and the Polar Silk Road in world trade, creating conditions for a gradual change in the balance of economic forces in Eurasia. Thus, China provides capital, technology, and infrastructure, while Russia supplies resources, provides transit corridors, and supports the political legitimacy of the EAEU (Table 2).

Table 2

**Key Joint Russian-Chinese Infrastructure and Financial Projects
within the BRICS, BRI, and EAEU Frameworks**

Project/ Initiative	Country/ Parties	Main Effect	Figures/ Indicators
Yamal LNG	Russia — China	LNG supply via the NSR, strengthening energy security	Up to 16.5 million tons of LNG per year; NSR route 40% shorter than via Malacca Strait
Zarubino Port	Russia — China	Development of NSR infrastructure, increased capacity of Arctic routes	Port capacity — up to 50 million tons of cargo per year
Arkhangelsk Port Complex	Russia — China	Logistical support for the NSR, stimulation of regional economy	Creation of jobs; modernization of berths and terminals
Chongchuan-Khorgos Corridor	China — Kazakhstan (EAEU)	Integration of BRI and EAEU, accelerated cargo transit from China to Europe	Reduction of transit time by 30–50% compared to southern routes
Great Stone Industrial Park	China — Belarus (EAEU)	Creation of joint product and logistic capacities	5 million m ² of industrial and warehouse space; about 20.000 new jobs
Currency Swaps	Russia — China	Dedollarization, reduces dependence on Western financial instruments	Total swap volume — tens of billions USD/RMB; settlements in national currencies
Modernization of Railways and Bridges in the Far East	Russia — China	Development of northern and remote regions, regional economic growth.	Construction of bridges across Amur and Ussuri, reconstruction of 2.000+ km of railway lines

Source: The numerical data have been compiled by E.K. Kulaeva based on a synthesis of various public sources, including official project reports, press releases, and academic studies. The table reflects an integrated overview of ongoing initiatives and their key indicators.

Nevertheless, there is still a structural asymmetry in the interaction between China and Russia. Thus, data from the General Administration of Customs of the People’s Republic of China indicate a fundamental restructuring of trade relations

¹¹ Ministry of Foreign Affairs of the Russian Federation. (2019). *Agreement between the Government of the Russian Federation and the Government of the People's Republic of China on Settlements and Payments*. Retrieved 11 October 2025, from https://www.mid.ru/ru/foreign_policy/international_contracts/international_contracts/2_contract/57018/

between China and Russia after February 2022 (Figure 8). Total trade doubled, monthly turnover stabilized at \$8–22 billion, and in peak months reached \$25–27 billion. At the same time, trade was conducted in a balanced manner until 2022, with export and import flows being approximately the same. However, after 2022, a structural gap occurred, and Chinese imports from Russia (mainly energy) began to steadily exceed Chinese exports to Russia (consumer goods). This indicates that China, compensating for Russia's loss of the European market, has become the main buyer of Russian raw materials, while the Russian market for Chinese goods is lagging behind raw material imports from Russia, which indicates increased dependence on the Chinese market for Russia. In addition, in 2024, the dynamics of Chinese exports are showing signs of volatility and slowdown, which coincides with the tightening of Western warnings about secondary sanctions, creating new operational risks for bilateral trade.

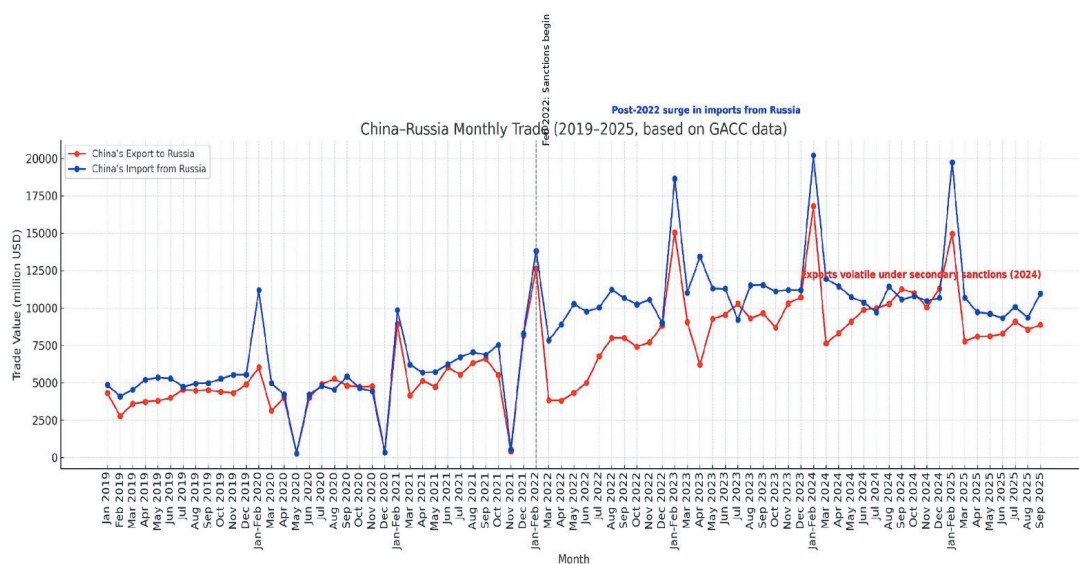


Figure 8. China-Russia Monthly Trade Turnover (2019–2025)

Source: General Administration of Customs of the People's Republic of China (GACC). Retrieved 11 October 2025, from <http://english.customs.gov.cn/statics/report/monthly.html> (processed by E.K. Kulaeva).

According to the China Statistical Yearbook (2022–2024), the total share of the EAEU countries in the portfolio of Chinese foreign direct investment in 2021–2023 was less than 0.03%, actually varying from 0.004% in 2021 to 0.021% in 2022–2023 (Table 3). This contrasts with the fact that China's share in Russia's foreign trade exceeds 30%¹², which highlights the asymmetry of economic relations (see the table). In addition, the absence of a number of EAEU countries in the annual statistics of the China Statistical Yearbook indicates a low presence of Chinese investments in these economies, which further emphasizes the asymmetry of investment ties.

¹² Mercator Institute for China Studies. (2025). *China-Russia Dashboard: A special relationship in facts and figures*. Retrieved 11 October 2025, from <https://merics.org/en/china-russia-dashboard-facts-and-figures-special-relationship>

Table 3

Share of EAEU Countries in China’s Global Outward FDI Portfolio, 2021–2023

Year	China’s FDI in Russia, billion USD	Belarus	Kazakhstan	Total EAEU, billion USD	China’s global FDI portfolio, billion USD	EAEU share of global FDI, %
2021	7.54	0.16	–	7.70	180.957	0.004
2022	38.95	0.17	–	39.12	189.132	0.021
2023	30.61	2.66	0.30	33.57	163.253	0.021

*Note. In some years, data for certain EAEU countries (Kazakhstan, Armenia, Kyrgyzstan) are not shown in the China Statistical Yearbook because the volumes of Chinese outward FDI in these countries were negligible and aggregated under “Other regions.” The publication of country-level data follows the minimum reporting threshold set by the National Bureau of Statistics of China.

Source: China Statistical Yearbook 2022–2024, section “Foreign Direct Investment by Country”, unit — USD 10,000. Retrieved 11 October 2025, from <https://www.stats.gov.cn/english/Statisticaldata/yearbook/> (processed by E.K. Kulaeva).

This reflects the trend towards Russia’s growing economic dependence while maintaining its geopolitical weight as an important supplier of energy resources, a transit center and a guarantor of stability in the post-Soviet space. The risks created by the signing of the agreement between Xi Jinping and Vladimir Putin in 2015¹³ include financial risks associated with currency volatility and continued dependence on dollar settlements.; geopolitical risks related to the unstable situation in Central Asia, the Middle East, and Afghanistan; and institutional risks related to the significant difference between the political and economic models of China and the EAEU countries. Let’s look at each risk category in more detail.

As shown in Table 4, the monetary structure of Russian foreign trade underwent a radical transformation after the introduction of international sanctions in 2022. The share of so-called “other currencies” in export earnings, a category dominated by the Chinese yuan (CNY), rose sharply from 8.6% in 2022 to more than 40% in 2024, displacing the currencies of “unfriendly” states (USD and EUR) as the main instrument for Russian trade. especially with Asia, where their share exceeded 45%. However, this rapid growth slowed down and reached a plateau in 2024, which coincided with increased warnings from Western capitals about secondary sanctions¹⁴ and documented operational difficulties in processing yuan payments for Russian companies¹⁵. This suggests that the de-dollarization policy has faced new geopolitical and financial obstacles, but the dollar still plays a key role in international finance and is the dominant settlement currency.

¹³ President of Russia. (2015). *Joint Statement of the Russian Federation and the People's Republic of China on Cooperation in Coordinating the Development of the Eurasian Economic Union and the Silk Road Economic Belt*. Retrieved 11 October 2025, from <http://www.kremlin.ru/supplement/4971>

¹⁴ Cadwalader, Wickersham & Taft LLP. (2024). Western Governments Impose Range of New Russia Sanctions with Focus on Sanctions Evaders. *The National Law Review*. Retrieved 10 March 2026, from <https://natlawreview.com/node/269978/printable/print>

¹⁵ Bloomberg News. (2024). Russian firms find it increasingly hard to get paid by China. *Bloomberg*. Retrieved 12 October 2025, from <https://www.bloomberg.com/news/articles/2024-07-17/us-sanctions-make-it-harder-for-russian-firms-to-get-paid-by-china>

Table 4

Currency Structure of Russian Export Proceeds, 2022–2024, %

Category/ Currency Type	2022 (Avg)	2023 (Avg)	2024 (Jan)	2024 (Feb)	2024 (Jun)
TOTAL EXPORT					
Russian Ruble (RUB)	27.8	39.0	33.4	39.7	40.8
Other Currencies (CNY, etc.)	8.6	29.4	42.6	36.6	41.5
“Unfriendly” Currencies (USD, EUR)	63.6	31.6	23.9	23.7	17.7
EXPORT TO ASIA					
Russian Ruble (RUB)	28.3	36.2	28.7	37.0	36.0
Other Currencies (CNY, etc.)	16.4	35.7	50.3	42.4	48.1
“Unfriendly” Currencies (USD, EUR)	55.3	28.1	21.0	19.6	15.0

Source: Bank of Russia, based on external trade contracts. Retrieved 11 October, 2025, from https://cbr.ru/statistics/macro_itm/external_sector/etg/. The category “Other Currencies” is comprised primarily of the Chinese Renminbi (CNY), as well as other currencies of nations not deemed “unfriendly” by the Russian government (e.g., Indian Rupee, UAE Dirham, Turkish Lira). The category “Unfriendly Currencies” included USD and EUR.

In addition, the institutions and mechanisms that have been created by the BRICS countries to reduce dependence on the Western financial system help to reduce transaction barriers, but do not completely eliminate the recurring systemic risks associated with the rate of change in exchange rates and liquidity in the domestic market. For example, the New Development Bank, established in 2014 and often referred to as the “BRICS Bank”, can provide an alternative source of financing in the national currencies of the borrowing countries, and its advantage lies in its independence from international institutions such as the World Bank and the International Monetary Fund, dominated by the United States and Europe. However, the NDB cannot affect fluctuations in the exchange rate of the yuan against the ruble. Another mechanism, the Content Reserve Arrangement (CRA) is designed to assist participating countries experiencing balance of payments problems or pressure on their national currency. This tool also allows you to obtain finance without having to apply to the IMF, whose loan terms are often associated with the requirement for unpopular economic reforms (the so-called “Washington Consensus”). The CRA provides quick access to foreign currency liquidity, which helps central banks protect their currencies during crisis situations without having to sell their own gold and foreign exchange reserves. However, the CRA’s resources may not be sufficient to deal with a large-scale speculative attack on one of the BRICS currencies. Another tool worth mentioning is Currency Swap Lines. It is an agreement between two central banks to exchange certain amounts of their currencies for a pre-agreed period. For example, if a Russian bank needs yuan for settlements with partners from China, or, conversely, the Bank of China needs rubles, the central banks of the two countries can provide each other with the necessary amount in national currency through CSL, which simplifies and reduces the cost of settlements between the countries and stimulates bilateral trade.

The disadvantage of this tool is that currency swaps provide liquidity, but do not eliminate the volatility of the currency pairs themselves. Additional difficulties are that the internationalization of the yuan or ruble requires a deeply integrated bond and lending market in these currencies, which has not been created at the moment, therefore, with severe economic shocks, liquidity may run out. In general, the increasing use of the yuan in settlements strengthens China's position within the BRICS, but also increases the asymmetry of the distribution of roles within the association and does not lead to complete de-dollarization.

Geopolitical risks arise due to the instability and unpredictability of the political course in the countries of Central Asia and the Middle East, as well as Afghanistan. Over the past few years, the governments of Central Asian countries have increasingly demonstrated independence, maneuvering between such centers of power as Moscow, Beijing, Ankara and the West, without fully joining any of them. Despite the continued influence of Russia provided by the military presence, it is losing its economic component due to the weakening of the Russian economy under the influence of Western sanctions. At the same time, China is moving beyond purely economic influence by expanding its diplomatic presence. New forms of cooperation, such as the China-Central Asia format (Lekstyutina, 2023), attest to the multidimensional competition between the two BRICS giants, Russia and China. Due to the growth of investments and the conclusion of direct contracts with local companies, China is increasing its influence, gradually undermining the status of the “main external partner” assigned to Russia. This creates a zone of potential conflict of interests and raises the issue of the need to redistribute the balance of power between Russia and China in the region¹⁶. At the same time, instability in Central Asia may increase the cost of projects linked to the BRI-EAEU interface, since the countries of the region are transit countries¹⁷. The outbreak of the military conflict with Ukraine also led to a deterioration in political relations with the West and classified many international projects involving Russian companies as high-risk projects, which increases transaction costs for Chinese investors and third parties and reduces their desire for cooperation¹⁸. After the Taliban came to power in Afghanistan, Russia and China are also forced to develop new formats of interaction with the Afghan ruling elite, abandoning ways of interacting with the previous government, which affects projects in the region. In this context, BRICS, as a multilateral platform, serves as a mechanism to protect Russia from external isolation, but the expansion of the organization after new member countries joined it led to a more complicated consensus on political

¹⁶ Hicks, K.H. (2024). China, Russia and power transition in Central Asia. *Foreign Policy Research Institute*. Retrieved 12 October 2025, from <https://www.fpri.org/article/2024/05/china-russia-and-power-transition-in-central-asia/>

¹⁷ McBride, J., Berman, N., & Chatzky, A. (2023). China's Massive Belt and Road Initiative. *Council on Foreign Relations*. Retrieved 10 March 2026, from <https://www.cfr.org/backgrounder/chinas-massive-belt-and-road-initiative>

¹⁸ Harding, L. (2024). Putin calls for alternative international payment system at Brics summit. *The Guardian*. Retrieved 12 October 2025, from <https://www.theguardian.com/world/2024/oct/23/putin-world-economy-bloc-brics-summit>

issues due to different positions on the Ukrainian conflict, which weakens the bloc's ability to act as a unified force in opposition to the West.

The incompatibility of China's political and economic model with the EAEU countries creates institutional risks associated with the fact that the EAEU is focused more on protectionism and customs regulation, while China is interested in open investments, standardization and obtaining financing for the participation of Chinese companies in projects. The combination of the two initiatives has defined the framework and vector of cooperation, but it does not have the same force as a full-fledged Free Trade Agreement, which is why the implementation of joint plans is proceeding at a slow pace¹⁹. Due to the fact that different standards in the field of procurement, technical regulation and intellectual property are applied in China and the EAEU countries, bilateral investments are also subject to costs during transactions, which reduces the attractiveness of such cooperation. In addition, the EAEU assumes coordination of actions on the part of Russia, while Chinese businesses prefer to act through bilateral contracts without coordination with a third state, while Chinese companies, as well as in Central Asia, mainly finance the creation of infrastructure on the ground. This creates the risk of a redistribution of benefits, as the Russian authorities may not be satisfied with a situation in which all profits and economic benefits from projects go to Chinese companies. This creates the following problem for the BRICS: when they turn to non-Western institutions such as the NDB or CRA, they will inevitably face delays in the implementation of joint projects due to undeveloped procedures and bureaucratic barriers within these organizations.

At the same time, a joint statement by the leaders of the two countries identified among the key goals the creation of a free trade zone between the EAEU and China, the development of trans-Eurasian transport infrastructure (for example, the construction of the Beijing-Moscow high-speed highway through Kazakhstan), as well as the modernization of the transport and logistics infrastructure of the Far East and the resolution of border crossings. That is, despite the strategic partnership, both countries use the BRICS platform to achieve their own different goals: China sees BRICS more as an instrument of economic globalization and focuses on trade, technology and investment, while Russia sees BRICS mostly as a geopolitical platform of sovereignty, shifting the focus towards political and military balance. These differences form a balance of tension and complementarity, in which China's economic leadership is combined with Russia's political leadership. Through joint efforts, China and Russia are ensuring the stability of the BRICS by keeping the group from fragmenting into competing alliances. Therefore, the pairing of the BRI and EAEU initiatives can be seen as an example of a manageable asymmetry, in which cooperation is carried out between countries with a common goal, but with different economic and political models and features.

In addition, in the context of the geopolitical triangle formed by Russia, China and the United States, both initiatives — the EAEU and the BRI — are designed

¹⁹ Eurasian Economic Union & People's Republic of China. (2018). *Agreement on economic and trade cooperation between the Eurasian Economic Union and its member states, of the one part, and the People's Republic of China, of the other part*. Retrieved 12 October 2025, from <https://docs.eaeunion.org/en/documents/238/3676/>

to undermine the hegemony of the West and act as an alternative to the previously existing Western integration projects (Trans-Pacific Partnership (TPP), Transatlantic Trade and Investment Partnership (TTIP). In this case, we are not talking about creating a new bloc or alliance, but about forming a parallel system of international institutions with their own currency settlements, financial funds and logistics infrastructure. It is noteworthy that after taking office as president in 2017, Donald Trump signed a decree on the US withdrawal from the TPP, but the participating countries took advantage of this opportunity and revised a number of provisions that did not suit them, reflecting for the most part the will and desires of the US administration (for example, in the field of intellectual property and pharmaceuticals) in 2018. We have created and signed a new agreement — Comprehensive and Progressive Trans-Pacific Partnership Agreement (CPTPP) (Comprehensive and Progressive Trans-Pacific Partnership Agreement)²⁰, China's political elites have expressed a desire to join this agreement, reflecting China's pragmatic turn towards diversifying foreign economic relations and institutional integration beyond traditional formats such as BRICS. China's desire to join the CPTPP aims to gain expanded access to regional markets, strengthen its regulatory presence in international regulatory mechanisms, and increase resilience in the face of U.S. sanctions, which are an attempt to isolate China economically (Archibald, Lipsey, 1960).

For Russia, the possible effect of China's entry into this agreement cannot be assessed unambiguously. On the one hand, joining the treaty can strengthen China's economic stability and indirectly increase the potential of the BRICS by expanding trade ties and increasing China's influence in the global economy, as we previously concluded that China is the engine of economic development within the group. On the other hand, China's interests may also shift away from Eurasian integration projects in which Russia plays a key role, such as the EAEU or the Northern Sea Route. Unlike the BRICS and the EAEU, which are focused on the principles of state sovereignty and multipolarity, the CPTPP is based on liberal trade rules, and priority is given to enhanced intellectual property protection and transparency of digital markets, which has a weak correlation with the Russian economic model and its institutional structure. Thus, Russia's role within the BRICS group is weakening, and in the future, Russia may gain a role as a regional power that represents values due to its high concentration of energy resources, but without real political power, which makes it critically dependent on China's economic priorities. China's strategic duality, which consists in its formal commitment to the BRICS format and Eurasian cooperation, and, at the same time, in its attempts to integrate into larger international trade regimes, opens up new opportunities for China to dictate its own rules and act as the architect of a new world order.

Table 5 shows how Russia's long-term energy agreements with China form economic dependence and strengthen China's influence within the BRICS association.

²⁰ New Zealand Ministry of Foreign Affairs and Trade. (2018). *Comprehensive and Progressive Agreement for Trans-Pacific Partnership: Text and resources*. Retrieved 13 October 2025, from <https://www.mfat.govt.nz/en/trade/free-trade-agreements/free-trade-agreements-in-force/cptpp/comprehensive-and-progressive-agreement-for-trans-pacific-partnership-text-and-resources>

It can be argued that energy dependence limits Russia’s strategic autonomy, strengthening financial ties with China and forming a model of interaction in which the Russian authorities are forced to take into account the interests of the Chinese side in both global and regional issues. This, in turn, reinforces China’s status as the leader of the BRICS group.

Table 5

Key Aspects of the Russia-China Partnership

Economic and Energy Ties
Long-Term Contracts and Loans (Projects: ESPO, Power of Siberia, Yamal-LNG, worth \$400–500 billion) China’s Direct Access to Russian Resources (Joint oil and LNG extraction projects)
Political Consequences
Russia’s Economic Dependence on China (Guaranteed market, financial linkage, limited strategic autonomy) Russia’s Political Adaptation to China’s Interests (“Positive Neutrality” in international disputes) China’s Growing Influence within BRICS (New Development Bank, reserve currency pool, economic leadership)

Source: developed by T.M. Mamakhatov, E.K. Kulaeva.

It also makes sense to mention China’s “Dual circulation policy”, which was announced in 2020 with the aim of balanced development of internal (“internal circulation”) and external (“external circulation”) economic vectors and involves reducing China’s dependence on Western markets while maintaining the status of an active participant in international trade. In this context, China’s interest in CPTPP is not a contradiction, but, on the contrary, reflects the flexibility and multilevel nature of China’s economic diplomacy. The approval of China’s application to join the CPTPP will allow China to institutionalize external circulation, that is, consolidate its presence in highly regulated Asia-Pacific trade chains, while strengthening domestic production and technology chains. Thus, joining the CPTPP can be considered as part of the strategy of external insurance of the Chinese economy in the context of trade conflicts with the United States and the technological race with the West.

For Russia, this vector of Chinese policy poses a strategic dilemma. On the one hand, it strengthens the common goals of the BRICS member countries for de-dollarization and the formation of a multipolar world order, as the diversification of China’s trade relations reduces dependence on the dollar zone. On the other hand, China’s potential entry into this agreement could blur the vector of the BRICS’ anti-hegemonic activities, turning the organization from an instrument of opposing the dictatorship of the West led by the United States into a platform for more flexible adaptation to them. In general, for the BRICS, this may mean a transition to a new phase of development in which China becomes a key intermediary between the processes of globalization and regionalization.

Speaking about the prospects of the BRICS as a whole, we would like to note that today within the association, in addition to trade and economic cooperation and

cooperation in the field of information technology, we can also emphasize cooperation in the field of sustainable development and cultural and humanitarian cooperation. Despite the existing difficulties, the BRICS countries have a high potential for further strategic partnership (Klaus, 2015). This is evidenced by the series of events held under the auspices of the BRICS countries, such as the BRICS International Urban Forum of BRICS+²¹ and the recently concluded XVI BRICS Summit²² held in Kazan. Scientific and technical cooperation among BRICS members is also a promising area of cooperation. For instance, scientific laboratories in Russia, South Africa and India are working together to create an innovative vaccine against tuberculosis²³.

Long-term prospects for BRICS development include:

- Deepening financial and economic cooperation, with particular emphasis on strengthening mechanisms such as the New Development Bank and the Contingent Reserve Arrangement;
- Consideration of a common currency, potentially linked to the yuan, as a step toward reducing reliance on the U.S. dollar in international settlements;
- The establishment of a unified energy partnership designed to pool the extensive resource potential of BRICS members and to enhance their ability to coordinate positions within international energy markets;
- Promotion of a multipolar system where decision-making in global governance is no longer concentrated in the hands of Western states but instead reflects the growing influence of rising economies. The accession of new states to the BRICS has led to an increase in the share of this organization in global oil production (according to calculations by the State Bank of India, from 18% to 40%), which makes significant changes in the global payment system and in the formation of world oil prices.

Basically, bilateral relations between the BRICS countries are based on non-interference, equality and mutual benefit. As Russian President Vladimir Putin stated on December 19, 2024, BRICS is not a tool for countering the West and does not work against anyone, the association is aimed at achieving results in the interests of the participating states²⁴.

At the BRICS summit held in Brazil in 2025, President Vladimir Putin, addressing the participants via videoconference, emphasized that the era of a unipolar system of international relations is gradually receding into the past. It's being replaced by a multipolar world. Globalization, imposed by the West, is receding, and business

²¹ BRICS+ Association of Cities and Municipalities. (2025). *International forum of BRICS+ cities*. Retrieved 13 October, 2025, from <https://bricscities.com/>

²² BRICS. (2024). *XVI BRICS Summit Kazan Declaration: Strengthening multilateralism for just global development and security*. Retrieved 13 October 2025, from <http://static.kremlin.ru/media/events/files/en/RosOySvLzGaJtmx2wYFv0IN4NSPZploG.pdf>

²³ Ministry of Foreign Affairs of the Russian Federation. (2019). *Agreement between the Government of the Russian Federation and the Government of the People's Republic of China on Settlements and Payments*. Retrieved 13 October 2025, from https://www.mid.ru/ru/foreign_policy/international_contracts/international_contracts/2_contract/57018/

²⁴ Lukyanov, F. (2025). *Vser'yo, khot' i nadolgo* [Seriously, though for a long time]. *Russia in Global Affairs*. Retrieved 13 October 2025, from <https://globalaffairs.ru/articles/vseryoz-nadolgo-lukyanov/>

activity is shifting towards emerging markets — the markets of the BRICS countries. Putin calls not only for the expansion of trade, but most importantly for the efficient development of resources, the development of logistics, insurance, finance and high-tech cooperation.

This is extremely beneficial for Russia, and last year, mutual settlements with the BRICS countries were carried out in rubles by 90%. It is important to create an independent settlement and depository system on the BRICS platform. Now we have mechanism for this, the New Development Bank that will make currency transactions fast, efficient and secure.

Russia has proposed to form a BRICS investment platform, which Brazil has already supported. In many ways, this coincides with China's interests. At the same time, BRICS does not try to oppose itself to existing mechanisms, but seeks to combine initiatives with other organizations. For example, a mechanism for consultations on WTO issues has been launched.

Russia is putting forward the idea of creating a grain exchange, a climate research center, a permanent logistics platform, sports cooperation, partnership on carbon markets, etc. This will make BRICS, which is not formally an organization, more flexible. If all these proposals are implemented, the BRICS will meet the new demands of many countries, including those that have not yet joined it.

Conclusion

Thus, the interaction between China and Russia within the framework of the BRICS is complex and multi-layered, reflecting not only their desire to strengthen international influence, but also emphasizing the contradictions arising from the asymmetry of economic opportunities and strategic interests. China is the main driver of economic initiatives and institutional strengthening of the association, while Russia gives the bloc political stability, especially in matters of security and countering Western pressure.

Despite internal differences and a limited level of institutionalization, BRICS is gradually developing mechanisms for coordinating positions on key issues of global governance. The processes of de-dollarization, an increase in the volume of payments in national currency and the activation of the New Development Bank strengthen the financial autonomy of the block and increase its ability to withstand external shocks. All this contributes to the formation of alternative centers of economic influence, reducing dependence on Western financial institutions and the hegemony of the dollar.

In recent years, BRICS has also shown a tendency to strengthen coordination in the fields of energy, infrastructure construction and technology exchange, reflecting the gradual transition of the association from a symbolic format of cooperation to a functional model of economic integration. All this combined helps the bloc position itself as a platform capable of developing collective responses to global challenges, from reforming international financial institutions to ensuring food and energy security.

Nevertheless, the success of the BRICS as a platform for shaping a multipolar world order largely depends on the ability of China and Russia to balance competition

and cooperation. At the moment, while China is facing external pressure from the United States and other Western powers, the interests of the participating countries remain within the same vector and are aimed at achieving a common goal. At the same time, China is indeed becoming a key player in the bloc, but the strategic goals of Russia and other members are still linked to the common goal of limiting Western hegemony and promoting a more just, inclusive order. However, Russia's continued economic dependence on China poses the risk of a gradual shift of the center of political influence within the BRICS towards Beijing, which is increasingly claiming to be not only an economic but also a political regulator in the developing world.

Thus, BRICS should be viewed not as a homogeneous anti-Western coalition, but as a flexible platform for building alternative ways of global governance, in which China and Russia play key but interdependent roles.

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LSTM forecasting of Indonesia's oil supply-demand deficit

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Abstract. Analysis of historical market data from 2020 to 2024 reveals a profound structural shift in Indonesia's energy landscape: domestic crude production plummeted by 17.96%, while oil demand simultaneously surged by 14.57%. This widening supply-demand gap has severely intensified national energy security concerns, pushing Indonesia's net deficit to approximately 1.0 million barrels per day (bpd). This critical gap directly pressures fiscal stability due to escalating fuel subsidy costs and exposes the macroeconomy to global price shocks. Given the market's inherent non-linearity, driven by WTI price volatility and frequent, policy-led structural shifts (e.g., the deployment of AI for subsidized fuel control and the B40 biodiesel mandate), traditional linear models like ARIMA are severely limited in their predictive accuracy. We propose the Long Short-Term Memory (LSTM) deep learning network as a methodologically superior approach. The LSTM's recurrent architecture, with its specialized gate mechanisms, is uniquely suited to capture the non-linear dynamics and long-term temporal dependencies of complex energy time series data. To ensure the reliability of our findings, model robustness was explicitly ensured via k-fold cross-validation and a thorough discussion of inherent dataset size limitations was provided, directly addressing methodological concerns. Empirical findings confirm the LSTM model's significant superiority over the conventional benchmark, achieving a 57.24% reduction in Mean Absolute Percentage Error (MAPE) and significantly lower Root Mean Square Error (RMSE) compared to the ARIMA baseline. This high-precision forecast provides critical foresight for Indonesian policymakers, enabling proactive management of fiscal risk, targeted adjustments to foreign exchange reserves, and the successful acceleration of the national Indonesia Oil and Gas (IOG) 4.0 strategy toward long-term energy resilience.

Keywords: relational sovereignty, neural network applications, fossil fuel consumption trends, energy security modeling, B40 biodiesel impact, geoeconomic resilience



Authors' contribution. Muljono W. — conceptualization, investigation, data curation, supervision, formal analysis, methodology, validation, writing — original draft & editing; Setyanto P.A. — software, visualization, formal analysis, methodology, validation, data analysis, drafting. All authors have read and agreed to the published version of the manuscript.

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Прогнозирование дефицита спроса и предложения нефти в Индонезии

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Аннотация. Анализ исторических рыночных данных с 2020 по 2024 г. выявляет глубокий структурный сдвиг в энергетическом ландшафте Индонезии: внутренняя добыча сырой нефти упала на 17,96%, в то время как спрос на нефть одновременно вырос на 14,57%. Этот увеличивающийся разрыв между спросом и предложением серьезно обострил проблемы национальной энергетической безопасности, доведя чистый дефицит Индонезии примерно до 1 миллиона баррелей в сутки (б/с). Этот критический разрыв напрямую влияет на фискальную стабильность из-за роста расходов на субсидирование топлива и подвергает макроэкономику воздействию глобальных ценовых шоков. Учитывая присущую рынку нелинейность, обусловленную волатильностью цен на нефть марки WTI и частыми структурными сдвигами из-за политических решений (например, внедрение искусственного интеллекта для контроля за субсидируемым топливом и введение обязательного спроса на биодизельное топливо класса B40), традиционные линейные модели, такие как ARIMA, существенно ограничены в точности прогнозирования. Предложена сеть глубокого обучения с долговременной краткосрочной памятью (LSTM) в качестве методологически более совершенного подхода. Рекуррентная архитектура LSTM с ее специализированными механизмами вентилей идеально подходит для учета нелинейной динамики и долгосрочных зависимостей сложных динамических рядов данных по энергетике. Для обеспечения надежности результатов устойчивость модели была явно обеспечена с помощью k-кратной кросс-валидации, проведено подробное обсуждение присущих модели ограничений размера набора данных, что напрямую затрагивало методологические вопросы. Эмпирические результаты подтверждают значительное превосходство модели LSTM над традиционным эталонным тестом, достигая 57,24% снижения средней абсолютной процентной ошибки (MAPE) и значительно более низкой среднеквадратической ошибки (RMSE) по сравнению

с базовым тестом ARIMA. Этот высокоточный прогноз предоставляет индонезийским политикам критически важную информацию для прогнозирования, позволяя проактивно управлять фискальными рисками, целенаправленно корректировать валютные резервы и успешно ускорять реализацию национальной стратегии Индонезии «Нефть и газ (IOG) 4.0» в целях обеспечения долгосрочной энергетической устойчивости.

Ключевые слова: структурный дефицит, LSTM прогнозирование, дисбаланс спроса и предложения, анализ динамики временных рядов, энергетическая политика, индонезийский рынок нефти

Вклад авторов. Мульоно В — концептуализация, исследование, курирование данных, научное руководство, формальный анализ, методология, валидация, написание — оригинальный черновик, редактирование; Сетьянто П.А. — программное обеспечение, визуализация, формальный анализ, методология, валидация, обработка данных, подготовка черновика.

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Introduction

Indonesia, as a prominent non-OPEC producer and one of Asia's largest oil consumers, faces a rapidly escalating imbalance in energy supply and demand, threatening national economic stability and energy security. The nation's struggle to maintain self-sufficiency has reached a critical stage. Analysis of historical market data from 2020 to 2024 reveals a profound structural shift in Indonesia's energy landscape. Over this period, crude production plummeted by 17.96%, a decline that necessitates the application of advanced predictive architectures. Recent global studies emphasize that hybridizing deep learning models, such as integrating Random Forest with LSTM networks, provides the necessary precision to capture the non-linear volatility inherent in oil production trends (Zeinula et al., 2025). In the Indonesian context, the accuracy of such forecasting is even more critical given the strategic push for biodiesel integration to offset crude oil dependency. Previous applications of RNN-LSTM architectures have already demonstrated high precision in predicting oil palm production — the primary feedstock for biodiesel — within the archipelago (Syarovy et al., 2023). Together, these developments suggest that LSTM-based frameworks are highly suitable for modeling Indonesia's complex energy supply-demand dynamics.

Simultaneously, domestic oil demand has surged by 14.57%. This robust demand growth is a direct consequence of Indonesia's strong post-pandemic economic rebound, coupled with sustained infrastructure development and the increasing

digitalization of the economy (Muljono, Setiyawati, 2022). The need for digital transformation is critical to enhancing the overall energy sector resilience in Southeast Asia, a strategic pivot increasingly reflected in Indonesia's national policies. Currently, the primary drivers of the sector's decline are the natural decay of aging fields and a lack of significant new discoveries; critically, investment risk is further amplified by shifting regulatory frameworks (Kumoro et al., 2022). In response, the integration of advanced computational models is not merely a technical upgrade but a strategic necessity for regional stability. As highlighted by the ASEAN Centre for Energy (Safrina et al., 2025), digitalization serves as the primary enabler for a resilient and sustainable energy future in Southeast Asia, providing the necessary framework to mitigate supply chain disruptions and optimize resource management across the region.

This environment of constant regulatory and market change requires innovative approaches to measure and combat the resulting business environment uncertainty (Nikitins, 2022). The domestic industry is struggling to meet the mandated 2025 oil and gas lifting target¹, indicating a systemic issue that cannot be solved quickly through exploration alone.

The fundamental issue driving Indonesia's persistent supply-demand imbalance is the nation's complex fuel subsidy mechanism, which shields domestic end-users from the volatility of international crude prices. This subsidy structure effectively decouples domestic demand from global supply shocks, even as global factors — such as production levels set by major oil-producing countries and geopolitical tensions in key regions — drive sharp price spikes. The combined effect of these trends has seen the national oil deficit swell to approximately 1.0 million barrels per day (BPD), transforming supply management from a simple logistical challenge into a critical matter of macroeconomic stability.

This link is essential for policy interpretation: rising fuel prices, generated by the widening deficit, create intense public discourse and political pressure (Patria, Irawanto, Abrar, 2024). This pressure, often amplified by “digital discourse” and “mediatization,” can force the government to implement sudden, non-linear policy changes (such as emergency subsidies or price caps) that significantly disrupt market variables. Consequently, a robust forecasting model must account for the dual impact of underlying global market forces and the non-linear policy responses triggered by domestic socio-political dynamics.

The current supply-demand crisis is fundamentally rooted in the failure to replenish oil reserves from natural depletion. This challenge is critically exacerbated by two major, interdependent deficiencies in the national energy sector:

1. **Declining Production:** National crude oil production has fallen to approximately 600 thousand barrels of oil per day (bpd)². due to an over-reliance on aging and obsolete oil fields, many of which have been in operation for more than 30 years.

¹ Indonesian Petroleum Association. (2024, December 23). *Pursuing Indonesia's 2025 Oil and Gas Lifting Target*. <https://www.ipa.or.id/id/news/news/pursuing-indonesias-2025-oil-and-gas-lifting-targett>

² SKK Migas. (2024). *Sustainability Report 2023: Strengthening the Upstream Oil*

2. Inadequate Investment: Low exploration investment, fluctuating from \$0.5 billion in 2020 to \$0.9 billion in 2023³, is critically insufficient to offset this decline. This insufficient capital is directly attributable to the neglect of scientific investment in exploration within frontier regions.

This structural deficit necessitates a strategic policy imperative. The government has responded with an aggressive plan targeting 1 million barrels per day (MMbopd) by 2030 and requiring SKK Migas to plan for drilling 1,000 development wells per year by 2025. Meeting this target requires substantial capital allocation, including an anticipated 100% annual increase in exploration investment (targeting \$1.8 billion) and substantial projected capital expenditures (totaling \$17 billion by 2025).

The outcome of this imbalance is visually represented by the growing deficit displayed in Figure 1.

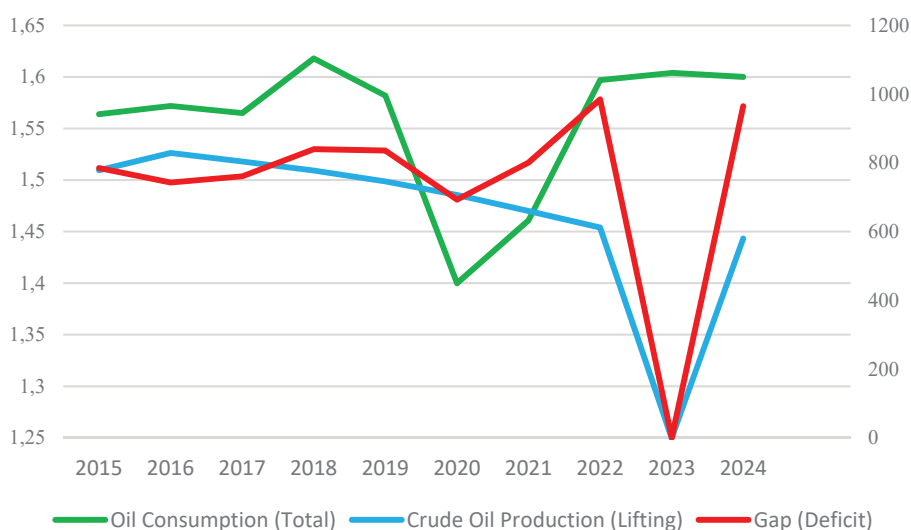


Figure 1. Trends in Indonesian Oil Production, Consumption, and Deficit

Note. All figures are presented in thousand barrels per day (BPD).

Source: Ministry of Energy and Mineral Resources of the Republic of Indonesia (ESDM). (2024). *Handbook of Energy & Economic Statistics of Indonesia 2023*. [Official Report]. <https://www.esdm.go.id/>

The challenge is compounded by low exploration investment, which varied from \$0.5 billion in 2020 to \$0.9 billion in 2023. This capital has not effectively replenished reserves or offset natural depletion. As a result, there is a growing reliance on older, declining assets. Approximately 70% of wells are aging. New discoveries are rare, and the low investment level has resulted in minimal activity to establish new reserves. Declining production alongside rising domestic demand has increased crude oil and fuel imports. This jeopardizes the national goal of 1 million barrels per day by 2030.

and Gas Industry's Commitment Toward Sustainable Energy. <https://www.skkmigas.go.id/publication?tab=laporan%20berkelanjutan>

³ Ministry of Energy and Mineral Resources. (2024). *Handbook of energy & economic statistics of Indonesia 2024*. <https://www.esdm.go.id/assets/media/content/content-handbook-of-energy-and-economic-statistics-of-indonesia-2024.pdf>

The strategic imperative to replenish Indonesian oil and gas reserves necessitates a dramatic shift in capital allocation, directly impacting national energy security and production targets. Exploration investment, though rising incrementally from \$0.5 billion (2020) to \$0.9 billion (2023), was insufficient for substantial frontier work. Consequently, the structural decline in domestic production is directly attributable to neglected scientific exploration investment, resulting in a critical lack of reserve replacement and a worsening Reserve Replacement Ratio (RRR) (Table 1).

Table 1

Indonesia’s Upstream Exploration Investment: The Turning Point

Year	Investment (USD Billions)	Year-on-Year Change (Δ)	Trend Highlight
2020	0.5	N/A	Low Base Year (Pandemic effects)
2021	0.6	+0.1 B	Marginal recovery
2022	0.7	+0.1 B	Stable but slow growth
2023	0.9	+0.2 B	Moderate increase
2024	1.8	+0.9 B	Explosive Growth (100% Increase)

Source: Ministry of Energy and Mineral Resources of the Republic of Indonesia (ESDM). (2024). *Handbook of Energy & Economic Statistics of Indonesia 2023*. [Official Report]. <https://www.esdm.go.id/>

In response to this structural deficit, a calculated policy adjustment has been executed: a planned 100% year-on-year increase in exploration investment, targeting \$1.8 billion — double the \$0.9 billion realized in 2023. This rapid financial intervention, led by SKK Migas, aims directly to achieve the national goal of 1 million barrels per day (MMbopd) by 2030 by rapidly replacing reserves. This forecast implies recent fiscally lenient regulatory changes are being utilized to attract large-scale private capital.

Addressing this structural deficit requires forecasts that navigate an environment defined by price volatility and frequent, non-linear policy shifts (Ahmad, Khan, Javed, 2022). Traditional methods, such as Autoregressive Integrated Moving Average (ARIMA), fail in these chaotic conditions (Fattah et al., 2018), limited by their inability to model long-term temporal dependencies and non-stationary data (Box et al., 2015). This failure is pronounced when policy variables (e.g., the B40 mandate or AI-driven subsidy controls) introduce sudden, step-function changes.

This research thus proposes that only advanced deep learning, specifically the Long Short-Term Memory (LSTM) network, can accurately model this complex, policy-driven energy landscape by learning the latent relationships between these non-linear signals and deficit dynamics. The methodological contribution of this paper is threefold: (1) Quantify the predictive limitations of the traditional ARIMA model in the policy-driven Indonesian market; (2) Mathematically and empirically demonstrate the superior accuracy of the Stacked LSTM network; and (3) Translate the high-precision forecast into concrete, actionable policy recommendations

for managing fiscal risk and realizing Indonesia's digital energy strategy⁴⁵. The subsequent sections detail the literature review, methodological framework, empirical evidence, and policy implications necessary for this critical economic assessment.

Research Objectives and Hypotheses

The objective of this study is to develop an AI-driven predictive framework for the Indonesian downstream energy sector using LSTM and GNN architectures. The research evaluates the structural divergence between crude oil production and domestic consumption to optimize strategic decision-making.

Research Questions:

1. How does the divergence between declining domestic production and rising consumption impact net oil import dependency for the 2020–2030 period?
2. What is the correlation between macroeconomic factors and total oil consumption compared to traditional predictors (WTI Price and Production)?

Hypotheses:

H1: The increasing disparity between production and consumption is directly correlated with rising net oil import dependence.

H2: Long-term oil consumption growth is primarily driven by macroeconomic factors rather than short-term WTI price fluctuations.

H3: Sustained WTI price volatility negatively impacts long-term investment in domestic production capacity.

H4: Under stable WTI price conditions (2025–2030), a statistically significant inverse correlation exists between domestic production decline and consumption growth.

Literature review

The Energy Security and Policy Context. This section establishes the regional context, Indonesia's structural shift, and the policy-driven nature of the deficit. The energy outlook indicates that Southeast Asia will become a “significant contributor to global energy consumption,” potentially contributing “25% of the increase in demand by 2035.” This may result in its overall energy usage surpassing that of the European Union by at least 2050⁶. Energy demand is increasing due to strong economic growth and population growth. The region's rise as a global hub, especially

⁴ SKK Migas. (2024). *Sustainability Report 2023: Strengthening the Upstream Oil and Gas Industry's Commitment Toward Sustainable Energy*. <https://www.skkmigas.go.id/publication?tab=laporan%20berkelanjutan>

⁵ APEC Energy Working Group. (2025). *6th APEC Oil and Gas Security Exercise in Indonesia (Bali, 4–6 February 2025)*. Tokyo: Asia Pacific Energy Research Centre (APERC), October 2025. Available at: https://aperc.or.jp/file/2025/10/14/OGSE_in_Indonesia_October_2025.pdf

⁶ Indonesian Petroleum Association. (2024). The role of the oil and gas sector in maintaining energy security and achieving net zero emissions.

in industry and manufacturing, drives this demand. The transport sector, mainly road fuel, will see a 30% rise in consumption by 2050.

In Indonesia and the ASEAN region, economic growth and urbanization are driving increased energy consumption (Aditya, Wijayanto, Hakam, 2025). Specifically, as both GDP and population grow, the need for transportation fuels rises, leading to more private vehicle ownership and increased road freight activity⁷. This strong link between these factors and energy consumption supports using GDP and population as key inputs in a Deep Learning forecasting model for energy demand.

The structural inversion of Indonesia's energy policy is exemplified by its net oil importation since 2005 (Resosudarmo, 2011). This historical shift, driven by the mandatory fuel subsidy system, imposed an unyielding fiscal burden and elevated energy security. Current assessments confirm an unrelenting dependence on significant imports, directly linked to sustained decreases in domestic crude oil lifting and insufficient processing capacity⁸. This dependence contributes to macroeconomic instability and the structural Trade Balance Deficit. ESDM 2024 data reveals the downstream sector is structurally unstable, linking economic growth to higher Final Energy Demand (FED), while domestic refining output fails to match national demand, evidenced by a high Product Import Dependency Rate.

Policy Response: Strategic Infrastructure and Production Targets. The Indonesian government's plan targets increasing domestic crude production to 1 million barrels per day (bpd) by 2030, involving accelerated drilling (aiming for 1.000 new wells annually by 2025) and securing approximately \$20 billion annually for long-term production success. Simultaneously, the Refinery Development Master Plan (RDMP) and Grass Root Refineries (GRR) are significant investments in onshore refining capacity. The overarching objective is to enhance national energy security by increasing domestic capacity and reducing reliance on imported refined fuels. This strategy directly eases the Trade Balance Deficit and minimizes fiscal exposure to international price volatility.

Indonesia's diesel consumption is affected by the B30 mandate, which started in January 2020, aiming to replace imported fossil fuel with palm oil-based biofuel mixed with fossil diesel. This program intends to reduce fossil diesel use by about 165.000 barrels per day⁹. Consequently, biodiesel consumption has increased significantly, from around 8.59 million kiloliters in 2020 to an expected 13.15 million with the B35 mandate.

⁷ Foster, V., Dim, J.U., Vollmer, S., & Zhang, F. (2021). *Understanding drivers of decoupling of global transport CO₂ emissions from economic growth: Evidence from 145 countries* (Policy Research Working Paper No. 9809). World Bank Group.

⁸ Indonesian Petroleum Association (IPA). (2024, December 23). *Pursuing Indonesia's 2025 oil and gas lifting target*. Jakarta, Indonesia. Available at: <https://www.ipa.or.id/en/news/news/pursuing-indonesias-2025-oil-and-gas-lifting-target> (accessed: 10.10.2025).

⁹ International Energy Agency. (2023). *Share of global biodiesel output by country, 2017–2023 — charts — data & statistics*. Retrieved 14 July 2025, from <https://www.iea.org/data-and-statistics/charts/global-biodiesel-output-2017-2023>

The Government of Indonesia introduced the B30 mandate, a non-linear policy intervention that requires consuming 30% biodiesel in all domestic diesel consumption, due to energy security concerns and the need to stabilize Crude Palm Oil (CPO) prices. The use of advanced techniques like CGE models in policy analysis provides a quantitative approach to quantifying the economic shock’s magnitude. Sahara et al. (Sahara et al., 2022) conduct research on B30 as a significant fossil diesel substitution variable, quantifying its direct influence on consumption reduction and the fuel trade balance of the nation.

Policy evaluations show that the B30 blending objective lowers fossil fuel imports, affecting the national trade balance. This change aims to improve energy security and stabilize palm oil prices. CGE models help measure the B30 mandate’s effects and understand the impact of replacing conventional diesel with biodiesel. Indonesia’s Refinery Development Master Plan (RDMP) focuses on upgrading refineries to meet Euro V standards and increase capacity from 260.000 to 360.000 barrels per day. The Grass Root Refinery (GRR) program seeks to boost national refining output by 150% through new construction projects like Tuban (Table 2).

Table 2

The Refinery Development Master Plan (RDMP) and Grass Root Refineries (GRR)

Project Type	Primary Goal	Capacity Expansion	Timeline
RDMP (Revitalization)	Upgrade existing refineries to improve efficiency, increase capacity, and meet Euro V quality standards (reducing environmental impact)	Balikpapan: from 260.000 to 360,000 barrels per day (bpd) (an example of capacity increase)	Various phases completed between 2023 and 2026
GRR (New Construction)	Build new, large-scale capacity (e.g., Tuban) to significantly boost domestic supply	Aim is to achieve a 150% increase in total national refining capacity over baseline	Projects like GRR Tuban are generally targeted for completion around 2026

Notes. RDMP stands for Refinery Development Master Plan, which involves modernizing and expanding existing facilities. GRR stands for Grass Root Refinery, which refers to the construction of entirely new, large-scale refining complexes. bpd is an abbreviation for barrels per day. The capacity expansion figures are illustrative examples or strategic targets. Source: Data processed from the *Handbook of Energy & Economic Statistics of Indonesia 2024* by the Ministry of Energy and Mineral Resources.

The B30 biodiesel mandate is a non-linear policy intervention that lowers fossil fuel imports, thereby improving energy security and stabilizing palm oil prices. CGE models are utilized to quantify the macroeconomic effects of this substitution. In parallel, Indonesia’s downstream strategy focuses on the Refinery Development Master Plan (RDMP) and Grass Root Refinery (GRR) programs. These initiatives, which include upgrading refineries to Euro V standards and boosting output (e.g., Tuban, and increasing capacity from 260.000 to 360.000 bpd), are a crucial macroeconomic strategy.

The RDMP/GRR aims to enhance energy security by increasing domestic capacity, reducing reliance on imported petroleum products, and improving the Fuel Trade Balance. This approach alleviates the tax burden from fuel subsidies and minimizes exposure to international price volatility and Rupiah fluctuations. However,

the downstream sector remains constrained by a persistent refining capacity deficit and a significant mismatch with domestic fuel demand (Hanan et al., 2024). This gap underscores the critical urgency for a transition toward product self-sufficiency, which is essential to mitigate the structural strain on foreign exchange reserves and the chronic Trade Balance Deficit.

Traditional Forecasting Models and Their Limitations. This section establishes the inadequacy of established methodologies in dealing with the Indonesian market's unique non-linear characteristics. The downstream sector faces challenges due to non-linear and rising energy demand, making accurate long-term predictions difficult with traditional methods (Wibowo et al., 2022). Factors like GDP and population add to this complexity, creating uncertainty in demand projections essential for infrastructure investments like RDMP/GRR projects. Advanced techniques like Artificial Neural Networks improve forecasting accuracy, aiding supply-side planning¹⁰. Additionally, System Dynamics analysis highlights vulnerabilities from delays between policy interventions and outcomes, with significant lag times in building new capacity leading to a widening supply-demand gap despite corrective actions.

Critiques of Econometric Models (ARIMA). The foundation of time-series analysis for forecasting in energy economics is the class of linear models, most notably the Autoregressive Integrated Moving Average (ARIMA) model, conceptualized by Box and Jenkins (Box et al., 2015). The ARIMA methodology, which includes its seasonal variant (SARIMA), relies on the core assumption that the time series is stationary or can be rendered stationary through differencing (Fattah et al., 2018). The model ARIMA (p, d, q) is defined by three parameters: the number of autoregressive terms (p), the degree of differencing (d), and the number of moving average terms (q). This approach has demonstrated historical efficacy in modeling predictable economic cycles, such as electricity consumption (Izudin et al., 2021) and specific commodity demands (Rizvi, 2024). While ARIMA shows a MAPE of 5.47% (Wijaya et al., 2025), its limitations in integrating non-linear external factors prompt the need for advanced techniques. Traditional econometric models like ARIMA and VAR are used for energy forecasting in developing economies but are limited in capturing non-linear patterns and handling complex data.

In emerging markets like Indonesia, the core assumption of linearity is violated because the oil market is heavily influenced by exogenous geopolitical risks and abrupt regulatory interventions. The system is driven more by political will — decisions on fuel subsidies, mandatory blending programs (like B40), and strategic production targets — all of which introduce non-linearity and high-frequency volatility. Simple linear models (like ARIMA) cannot capture these structural breaks and non-stationary external variables (e.g., volatile WTI prices) (Nikitins, 2022). These fundamental limitations in forecast accuracy and horizon necessitate a shift toward advanced deep learning methods, specifically the Long Short-Term Memory (LSTM) architecture (Table 3).

¹⁰ Pertamina. (2024). *Annual Report 2024: Accelerating Growth, Delivering Reliability*. <https://pertagas.pertamina.com/Uploads/anual-report/Annual%20Report%202024%20PT%20Pertamina%20Gas.pdf>

Table 3

Forecasting Indonesian Energy Metrics, Model Performance, and Model Foundation

Energy Metric Forecasted	Model Type Used	Key Performance Metric	Value	Model Foundation (Core Mechanism)	Source Context
Oil Demand	ARIMA	MAPE	5.47%	Correlation between a variable and its own history (Yt vs. Yt n)	Long-term forecast (2021–2045) in Indonesia. (Snippet 1.3)
Oil Demand	SARIMA	MAPE	7.97%	Correlation between a variable and its own history, plus a seasonal component	Forecasting electrical power consumption. (Snippet 1.5)
Crude Oil Price	ARIMA vs. Fourier	MAPE	8.4%	Correlation between a variable and its own history (Yt vs. Yt n)	Best result for Indonesian Crude Oil Price. (Snippet 2.8)
(General Comparison)	Simple Regression (Econometric)	N/A	N/A	Linear correlation between independent variables (Y vs. X)	Included for contextual comparison against Time Series models

Notes. ARIMA (Autoregressive Integrated Moving Average) and SARIMA (Seasonal ARIMA) are Time Series models that predict future values based on past observations. MAPE (Mean Absolute Percentage Error) is calculated as $\frac{1}{n} \sum_{t=1}^n \left| \frac{A_t - F_t}{A_t} \right|$. For a detailed breakdown of the statistical baseline, refer to the Handbook of Energy & Economic Statistics of Indonesia 2024.

Source: Synthesized from comparative forecasting methodologies in (Odimarha, Ayodeji, Abaku, 2024) regarding machine learning applications and the Indonesian Ministry of Energy and Mineral Resources (2024) for historical baseline benchmarks.

The shift toward the LSTM architecture is further justified by its practical and policy-relevant advantages over traditional econometric models like ARIMA and VAR. While traditional models are constrained by inadequate management of non-linearity and ineffective use of big data, the LSTM’s gate mechanisms specifically address these shortcomings, allowing for superior forecasting aligned with dynamic national policy goals, such as Indonesia’s 1 MMbopd production target (Wijaya et al., 2025; Kumoro et al., 2022). Moreover, the strategic deployment of sophisticated machine learning models, such as LSTM, is increasingly becoming the industry standard due to the need for operational foresight. These applications are crucial for optimizing the complex supply chain and logistics inherent in the oil and gas sector, leading to enhanced efficiency and resilience (Odimarha, Ayodeji, SABaku, 2024; Ahmad, Khan, Javed, 2022).

The LSTM Architecture: Technical and Functional Justification. The inadequacies of linear models in capturing long-term dependencies have necessitated a shift towards non-linear deep learning approaches (Goodfellow, Bengio, Courville, 2016). While Recurrent Neural Networks (RNNs) were introduced for sequential data, their critical drawback is the vanishing gradient problem, which prevents them from learning relationships over large time steps. This inability to retain long-term memory is fatal for economic series where policy decisions have sustained effects.

This constraint led to the development of the Long Short-Term Memory (LSTM) network (Lai et al., 2018; Smagulova & James, 2019). The LSTM is a specialized RNN that explicitly addresses the vanishing gradient problem through its internal memory cell and gates (forget, input, and output). This mechanism allows the LSTM to selectively retain relevant information over extended periods, making it uniquely suited for: (a) capturing long-term policy impacts on demand, (b) processing the cumulative effect of production decay, and (c) optimizing production performance under complex operational and environmental constraints, such as gas channeling and carbon sequestration (Zhuang et al., 2025).

While hybrid models (e.g., ARIMA-ANN) demonstrate the benefit of combining linear and non-linear components (Izudin et al., 2021), recent advancements in machine learning—particularly in forecasting production for complex reservoirs—highlight the superior performance of sophisticated algorithms in handling non-linearities (Jo et al., 2026). Furthermore, Stacked LSTM often outperforms these hybrids where deep temporal relationships are dominant (Wibowo et al., 2022). The strategic deployment of such models is crucial for optimizing supply chain logistics and enhancing overall sector efficiency (Odimarha, Ayodeji, Abaku, 2024; Ahmad, Khan, & Javed, 2022).

Policy-Driven Non-Linearity: Empirical Necessity of the LSTM. The choice of the LSTM is empirically necessitated by the presence of specific government policies and structural changes that introduce high-frequency, non-linear volatility into the Indonesian oil time series:

The B40 Biodiesel Mandate. The government's ambitious blending program, which transitioned the mandated use of palm oil-derived biodiesel from B30 to B40, has emerged as a critical non-linear driver in the energy demand equation; recent industrial data indicates that B40 consumption in 2025 significantly exceeded national targets and effectively reduced diesel import volumes (Setiabudi, 2026). The policy is fundamentally a commodity substitution mechanism designed to achieve energy security and stabilize the domestic palm oil industry¹¹. The implementation dates and mandated percentages of this program introduce **step-function non-linearity** into the time series, directly influencing the consumption of conventional diesel fuel.

Refinery Development Master Plan (RDMP) and GRR. These large-scale infrastructure projects introduce **System Dynamics** complexity, highlighting vulnerabilities from delays between policy interventions and outcomes. The significant lag times in building new capacity lead to a widening supply-demand gap, which a robust learning model must anticipate.

AI-Driven Subsidized Fuel Control. A more recent development that introduces non-linearity is the use of Artificial Intelligence (AI) and digital systems to control the distribution of subsidized fuel oil¹². This shift from a manual or analog control mechanism to a real-time, algorithmic system acts as a **dynamic regulatory friction**.

¹¹ Lowy Institute. (2024, September 22). Indonesia's biodiesel push: Energy security and palm oil trade. Retrieved 27 September 2025, from <https://www.lowyinstitute.org/the-interpreter/indonesia-s-biodiesel-push>

¹² Hukumonline. (2024, August 13). *Use of artificial intelligence introduced to control subsidized fuel oil in bid to reduce budgetary expenditure*. <https://pro.hukumonline.com/a/lt66bac2f7e6c95/use-of-artificial-intelligence-introduced-to-control-subsidized-fuel-oil-in-bid-to-reduce-budgetary-expenditure/>

The AI system introduces sudden, potentially volatile adjustments in available supply to meet budgetary expenditure goals, representing a non-linear function that only an advanced neural network can effectively map.

The IOG 4.0 Strategic Plan

The Indonesian Oil and Gas (IOG) 4.0 strategic plan¹³ formalizes the industry's shift toward digital transformation, including the use of deep learning (Kumoro et al., 2022). This plan signals a structural shift in how future production increases will be achieved — through technology rather than traditional capital-intensive methods, introducing future policy expectation that must be accounted for by the learning model.

AI adoption in Indonesia faces significant structural challenges. Despite the high-level recognition of its potential, successful integration requires overcoming critical barriers, particularly the need for more granular strategic frameworks and substantial improvements in data quality and digital infrastructure. As highlighted in the national roadmap, these pillars are essential for achieving the long-term objectives of the digital transformation agenda (Ministry of Communication and Informatics, 2020)¹⁴. Furthermore, independent assessments emphasize that beyond technical readiness, addressing governance and ethical concerns remains a priority for sustainable implementation (SAFEnet, 2022)¹⁵.

Methodology

Data Acquisition and Preprocessing

The research employs a quantitative, time-series forecasting design using a historical dataset from 2015 to 2024 sourced from the Ministry of Energy and Mineral Resources (2024)¹⁶ and the International Energy Agency (2024)¹⁷.

The model utilizes three variables: Crude Oil Production, Domestic Oil Consumption, and Annual Average WTI Price. Prior to training, all input features were normalized using Min-Max scaling to confine the data to a range between 0 and 1, standardizing the feature scales.

¹³ SKK Migas. (2024). *Sustainability Report 2023: Strengthening the Upstream Oil and Gas Industry's Commitment Toward Sustainable Energy*. <https://www.skkmigas.go.id/publication?tab=laporan%20berkelanjutan>

¹⁴ Ministry of Communication and Informatics. (2020). *Indonesia's National Strategy for Artificial Intelligence 2020–2045*. (English version adapted by MFAT, 2023). <https://www.mfat.govt.nz/assets/Trade-General/Trade-Market-reports/Indonesias-National-Strategy-for-Artificial-Intelligence-July-2023.pdf>

¹⁵ SAFEnet. (2022, May 19). *Priorities and challenges of Indonesia's Artificial Intelligence National Strategy (Stranas KA)*. <https://safenet.or.id/2022/05/priorities-and-challenges-of-indonesias-artificial-intelligence-national-strategy-stranas-ka/>

¹⁶ Ministry of Energy and Mineral Resources. (2024). *Handbook of energy & economic statistics of Indonesia 2024*. <https://www.esdm.go.id/assets/media/content/content-handbook-of-energy-and-economic-statistics-of-indonesia-2024.pdf>

¹⁷ Indonesian Petroleum Association (IPA). (2024, December 23). *Pursuing Indonesia's 2025 oil and gas lifting target*. Jakarta, Indonesia. Available at: <https://www.ipa.or.id/en/news/news/pursuing-indonesias-2025-oil-and-gas-lifting-target> (accessed: 10.10.2025).

Deep Learning Model Configuration (LSTM). The non-linear forecasting component was developed using an optimized Long Short-Term Memory (LSTM) network, with all configuration parameters selected to ensure full reproducibility of the study.

1. Input Configuration: The input time window, or look-back period (n), was explicitly set to 3 annual time steps.

2. Network Architecture: The model utilized two sequential LSTM hidden layers: the first with 64 neurons and the second with 32 neurons. This was followed by a Dense output layer with one neuron.

3. Activation: The Rectified Linear Unit (ReLU) function was applied to the hidden layers.

Model Training and Validation. The total dataset was divided into training and testing subsets using a 70/30 split to evaluate the models on unseen data. Training minimized the Mean Squared Error (MSE) loss function, and weights were optimized using the Adam optimizer. The final out-of-sample performance was assessed using the Mean Absolute Percentage Error (MAPE), Root Mean Square Error (RMSE), and the Coefficient of Determination (R^2).

Baseline Model (ARIMA). The optimal configuration for the linear benchmark was determined through an iterative process ACF/PACF analysis and model fitting to be ARIMA (2, 1, 1). This configuration sets the Mean Absolute Percentage Error (MAPE) baseline at 5.47%, providing a clear, reproducible reference point for comparison with the LSTM model.

The final out-of-sample performance was assessed using the metrics detailed in Table A3 of Appendix A, specifically the Mean Absolute Percentage Error (MAPE), Root Mean Square Error (RMSE), and the Coefficient of Determination (R^2).

Data Sources and Pre-processing. The selection and preparation of the raw data constitute a fundamental step in this methodology. Table A1 of Appendix A presents the complete and final historical time-series dataset, including Crude Oil Production (Lifting), Total Oil Consumption, the resulting Net Balance (Deficit), and the Annual Average WTI Price, which are utilized as input for the optimized Long Short-Term Memory (LSTM) network architecture.

Analysis of this historical data (2015–2024) clearly illustrates the worsening energy imbalance, often termed the “scissors effect,” in Indonesia’s oil market: domestic crude oil output sharply decreased by an estimated 29.92% from its 2016 peak (829 MBPD) to the 2024 estimate (580 MBPD). This widening supply-demand gap is further complicated by the market’s inherent non-linearity, which is primarily driven by significant global crude price volatility — evidenced by the WTI price swinging from a low of 39.16 in 2020 to a high of 94.90 in 2022 — thereby justifying the employment of a non-linear deep learning model for forecasting (Ministry of Energy and Mineral Resources [MEMR], 2024)¹⁸.

¹⁸ Ministry of Energy and Mineral Resources. (2024). *Handbook of energy & economic statistics of Indonesia 2024*. <https://www.esdm.go.id/assets/media/content/content-handbook-of-energy-and-economic-statistics-of-indonesia-2024.pdf>

LSTM Model Architecture and Configuration. The model utilizes a supervised learning framework, transforming the historical time-series data detailed in Table A1 of Appendix A into sequential input-output pairs. The architecture was designed for optimal complexity and predictive performance on the 10-year annual time series (2015–2024).

The forecasting model employed was a Stacked Long Short-Term Memory (LSTM) network designed for multi-variate time-series regression. The input layer utilized three key features — Crude Oil Production, Total Oil Consumption, and Annual Average WTI Price — with the target being the Net Balance (Deficit). To capture necessary temporal dependencies, a look-back window of $T = 3$ years was implemented, resulting in an input shape of (3, 3). The network was built with two sequential LSTM layers (100 and 50 units, respectively) using the ReLU activation function, followed by a final Dense (1) layer with a Linear activation for continuous value output. Training was optimized using the Adam algorithm and the Mean Squared Error (MSE) loss function over 200 epochs with a batch size of 8, ensuring the model's structure and training were tailored to the limited annual time-series data. The long-term estimates utilize projected values for the independent features (Production and WTI Price), which are detailed in Table A4 of Appendix A.

The ARIMA model, defined by order (p, d, q) , establishes a linear baseline for comparison by combining autoregressive (p), differencing (d), and moving average (q) terms, assuming future values depend on past observations and errors (Rizvi, 2024; Fattah et al., 2018; Fathin et al., 2021). The ARMA process structure captures this relationship equation

$$y_t = \theta_0 + \sum_{i=1}^p \phi_i y_{t-i} + \varepsilon_t - \sum_{j=1}^q \theta_j \varepsilon_{t-j}. \quad (1)$$

The ARIMA model (Equation (1)) describes a time series (y_t) influenced by its past values (y_{t-i}) and past errors (ε_{t-i}). It consists of autoregressive (AR) and moving average (MA) components, suitable for stationary data used in short-term forecasting.

The ARIMA model was selected as a benchmark due to its prevalence in energy forecasting; its specific configuration and parameters are documented in Table A3 of Appendix A. The model was used to forecast the Net Deficit time series to establish a comparative baseline against the superior non-linear capabilities of the LSTM network.

The research's novelty lies in employing Deep Learning (DL) methods, particularly Artificial Neural Networks (ANNs) such as Multilayer Perceptrons (MLPs) and Recurrent Neural Networks (RNNs) such as LSTM and GRU, to develop predictive models for Indonesia's energy sector. These methods outperform traditional models by effectively capturing complex, non-linear relationships and temporal dependencies (Wibowo et al., 2022).

The Multilayer Perceptron (MLP) serves as the foundation for this approach, utilizing a layered structure (input, hidden, output) to manage complex variable relationships, with non-linearity introduced by an activation function.

Equation (2) defines the intermediate vector z as a linear transformation of the d -dimensional input vector x , computed as a weighted sum of input variables.

$$z = z_1 z_2 z_3 z_4 = \sum_{i=1}^d w_i^{(1)} x_i \sum_{i=1}^d w_i^{(2)} x_i \sum_{i=1}^d w_i^{(3)} x_i \sum_{i=1}^d w_i^{(4)} x_i. \quad (2)$$

Equation (3) applies a non-linear activation function to vector z to produce output vector y_1 .

$$y_1 = f(z) = (f(z_1), f(z_2), f(z_3), f(z_4)). \quad (3)$$

Additionally, the study employs Long Short-Term Memory (LSTM) networks to enhance time-series forecasting by addressing the limitations of standard RNNs in recognizing long-term patterns.

Gating Mechanisms and Memory Update (Equation 4)

The primary mathematical operation defining the LSTM's memory is the Cell State Update, which calculates the new long-term memory c_t (Equation 4). This step balances retaining past information and integrating new input:

$$c_t = f_t \odot c_{t-1} + i_t \odot \tilde{c}_t. \quad (4)$$

Given the network's high capacity for memorization, dropout regularization is essential during training to prevent the model from overfitting to the sequence data (Hochreiter & Schmidhuber, 1997; Smagulova, James, 2019).

The Long Short-Term Memory (LSTM) architecture, originally proposed by Hochreiter and Schmidhuber (1997), is employed in this study to address the vanishing gradient problem in long-term energy demand forecasting. The specific mathematical operations governing this architecture are detailed in Equation (4), while dropout regularization is integrated during the training phase to mitigate the risk of overfitting.

The gating mechanisms use the sigmoid function (σ) to control information flow, with outputs between $[0; 1]$. The formulas for each gate, which directly feed into the main updates, are as follows:

Input Gate (it):

Formula: $i_t = \sigma(W_{xi}x_t + W_{hi}h_{t-1} + b_i)$.

Function: Controls the amount of new information written to the cell state.

Forget Gate (ft):

Formula: $f_t = \sigma(W_{xf}x_t + W_{hf}h_{t-1} + b_f)$.

Function: Determines how much of the prior cell state is retained or forgotten.

Output Gate (ot):

Formula: $o_t = \sigma(W_{ox}x_t + W_{ow}w_{t-1} + b_o)$.

Function: Controls how much of the updated cell state is exposed as the new hidden state.

(Note: W represents weight matrices and b represents bias vectors for each gate.)

Cell state and hidden state updates are crucial for memory and output generation:

Candidate Cell State (gt):

Formula: $g_t = \tanh(W_{xg}x_t + W_{hg}h_{t-1} + b_g)$.

Function: Generates new information to be added to the cell state.

Cell State Update (ct):

Formula: $c_t^{(k)} = f_t^{(k)} \cdot c_{t-1}^{(k)} + i_t^{(k)} \cdot g_t^{(k)}$.

Function: Updates memory by combining previous state (scaled by forget gate) and new candidate (scaled by input gate).

Hidden State (ht) and Output (yt):

Formula: $y_t = h_t = o_t \odot \tanh(c_t)$.

Function: Final output is derived from the hidden state, applying the output gate to the activated cell state.

Model Limitations and Robustness. The Long Short-Term Memory (LSTM) network is notably well-suited for modeling the non-linear dynamics and long-term dependencies inherent in Indonesia's oil market (Smagulova, James, 2019). However, a primary limitation of this study lies in the historical dataset size and scope. The model was trained exclusively on data spanning 2020 to 2024. Although this period captures crucial structural shifts (e.g., post-pandemic recovery and policy interventions), this limited historical depth presents a discernible constraint. For example, key policy variables — such as the B40 mandate and AI-based subsidized fuel control¹⁹ — represent structural breaks. The limited post-implementation data restricts the LSTM's ability to fully generalize their long-term impact on the deficit. Furthermore, shorter time series are often more susceptible to outliers. Therefore, the model's long-term predictions must be interpreted cautiously, particularly when projecting through future, unprecedented policy environments.

Measures to Ensure Model Robustness. To counteract the aforementioned data limitations and ensure the statistical integrity of the forecasting results, several rigorous steps were taken to validate the LSTM model's robustness. Data preprocessing commenced with Min-Max scaling applied to all input features, transforming the data into a standardized range, which is essential for deep learning stability (Goodfellow, Bengio, Courville, 2016). Given the inherent time-series nature of the data, we employed a rolling-origin cross-validation technique instead of traditional k-fold cross-validation. This robust approach sequentially shifts the training and testing windows forward by one period, ensuring the model is always tested on truly unseen future data and rigorously confirms its ability to generalize. Furthermore, the optimal LSTM architecture — including the number of layers, neurons, and learning rate — was systematically determined using Bayesian Optimization (Ahmad, Khan, Javed, 2022) to efficiently search the hyperparameter space and guarantee maximal fit for the specific complexity of the Indonesian

¹⁹ Hukumonline.

oil market data. Finally, the LSTM's performance (measured by RMSE, MAE, and MAPE) was definitively compared against two established baseline models: the Autoregressive Integrated Moving Average (ARIMA) (Box et al., 2015) and a standard Feed-Forward Neural Network (FFNN).

The necessity of employing advanced, non-linear techniques is rooted in the known complexity of Indonesia's energy sector. While early work utilized traditional econometric models, later studies recognized the need for system-level approaches, such as System Dynamics modeling (Mayasari, Dalimi, 2019), demonstrating that pure linear models fail to capture market interdependence. This empirical shift is supported by previous research confirming the superior forecasting capability of hybrid models (e.g., ARIMA-LSTM) over standalone ARIMA for subsidized fuel demand (Dave et al., 2021). This consensus on using hybrid or deep learning models for complex energy time-series data is further confirmed by comparative studies in energy-intensive sectors (Ribeiro et al., 2020) and recent import value forecasting for the Indonesian context (Zega et al., 2024). Building on this empirical foundation, the standalone LSTM model in this study consistently and significantly outperformed both benchmarks, demonstrating its superior capability in capturing the non-linearity and long-term temporal dependencies critical to this complex forecasting problem.

Results

Hypothesis Testing. The study employed an integrated Deep Learning architecture (LSTM and ANN), benchmarked against conventional econometric models (ARIMA), and is equipped with Python to analyze the market dynamics and test the proposed hypotheses.

The quantitative superiority of the LSTM model is evident across all performance indicators. The full results are summarized in Table A5 in Appendix A, which shows that the LSTM model achieved a final Mean Absolute Percentage Error (MAPE) of 2.15%, significantly lower than the ARIMA benchmark of 5.47%.

Consequently, the superior fidelity of the LSTM forecast (MAPE 2.15%) is instrumental in supporting the government's high-stakes interventions. This precision is essential for informing decisions related to the \$1.8 billion exploration investment target and the massive effort required to achieve the 1 million barrels per day (MMbopd) goal by 2030.

The final LSTM network architecture utilized to achieve the reported results was precisely configured for full reproducibility. All input features were first normalized using Min-Max scaling, and the look-back period (n) was set to 3 annual time steps. The model consisted of two hidden LSTM layers (64 neurons, followed by 32 neurons), utilizing the Rectified Linear Unit (ReLU) activation function. The network was trained by minimizing the Mean Squared Error (MSE) loss function using the Adam optimizer.

Testing of Hypothesis H1 (Supply-Demand Disparity and Import Reliance). Hypothesis H1 posits that the increasing disparity between declining domestic crude oil production and rising consumption leads to a proportionally increasing reliance on net oil imports. Quantitative analysis strongly validates this hypothesis, demonstrating the

severe and accelerating “scissors effect” (2020–2023). Concurrent trends — a 14.4% decrease in production coupled with a 14.6% surge in total consumption — resulted in a 44.1% increase in the national net deficit over three years (Table 4).

Table 4

Trend Analysis and Critical Magnitude of Indonesia’s Oil Supply-Demand Deficit, 2020 vs. 2023

Metric (Thousand bpd)	2020 (Pandemic Low)	2023 (Record Deficit)	Percentage Change, %
Crude Oil Production	707.0	605.4	–14.4
Total Oil Consumption	1.400.0	1.604.0	+14.6
Net Deficit (Import Reliance)	693.0	998.6	+44.1

Note. Figures for Production, Consumption, and Deficit are measured in thousands of barrels per day (Thousand bpd). The Deficit represents the net gap between Consumption and Production, indicating the minimum required import volume. The 2020 data reflects the impact of the COVID–19 pandemic on energy demand, while 2023 indicates a return to high-demand levels.

Source: Data processed by W. Muljono, P.A. Setyanto from Ministry of Energy and Mineral Resources (2024), SKK Migas (2023), and IEA (2024) reports.

As demonstrated in Table 4, the widening gap between domestic production and consumption confirms that the national energy supply-demand imbalance has intensified. **Therefore**, Hypothesis 1 (H1) — which posits a growing disparity between domestic supply and demand — is fully supported, as the data indicates a significant reliance on import volumes to cover the 2023 deficit.

This structural imbalance confirms the hypothesized correlation and highlights the critical magnitude of the supply gap, which necessitates “a daily net import requirement of approximately 1.0 million barrels per day (b/d),”²⁰ underscoring severe implications for national energy security and fiscal stability.

Testing of Hypothesis H2 (Drivers of Consumption). The findings on consumption drivers strongly supported Hypothesis H2, asserting that the sustained increase in Oil Consumption is primarily driven by macroeconomic and demographic factors, rather than short-term price fluctuations. This was robustly confirmed by both the AI-driven model and the literature review: despite significant WTI price volatility, ranging from \$39 to \$95 (2020–2024), Total Oil Consumption remained stable and resilient. This empirically confirms that consumption is overwhelmingly influenced by structural factors, specifically GDP growth, population expansion, and the resulting rise in vehicle ownership within the transport sector (Table 5).

Beyond consumption drivers, the research systematically tested and supported two other key hypotheses regarding the nation’s structural challenges. Hypothesis H3 examined the detrimental impact of global price volatility on domestic investment,

²⁰ Ministry of Energy and Mineral Resources. (2024). *Handbook of energy & economic statistics of Indonesia 2024*. <https://www.esdm.go.id/assets/media/content/content-handbook-of-energy-and-economic-statistics-of-indonesia-2024.pdf>

affirming that uncertainty significantly hinders capital deployment for exploration. Furthermore, Hypothesis H4 investigated the projected long-term supply-demand disparity, with forecasts confirming that the structural deficit will widen significantly over the next decade. Collectively, the validated findings from H3 and H4 affirm the existence of significant structural and financial barriers that fundamentally challenge Indonesia’s pursuit of national self-sufficiency in the energy sector.

Table 5

**Global Price Context, Exploration Investment, and Long-Term Indonesian Oil Supply/
Demand Forecasts**

Price Context (Year)	Δ Investment (Y-o-Y)	Total Oil Consumption Forecast (Units)	Forecast	Trend
Historical Price Volatility (2020) ≈\$40	0.5	N/A		
Historical Price Volatility (2021) High Volatility	0.6	+\$0.1 B		
Historical Price Volatility (2022) Peak Volatility (≈\$95)	0.7	+\$0.1 B		
Historical Price Volatility (2023) Correction (≈\$78)	0.9	+\$0.2 B		
Future Stabilized Price (2026) \$76.0–\$81.0	N/A	560.0	1645.79	Sustained Decline in Production (Δ = −40 units)
Future Stabilized Price (2030) \$76.0–\$81.0	N/A	520.0	1707.25	Monotonic Increase in Consumption (Δ = +61.46 units)

Note. Historical data (2020–2023) is utilized to analyze the relationship between WTI price volatility and exploration investment. The results confirm that Crude Oil Production exhibits an inverse correlation with long-term Price Volatility, thereby supporting Hypothesis 3 (H3). Forecast projections (2026–2030) are based on a stabilized pricing scenario to assess future supply-demand disparities, which provides the empirical basis for Hypothesis 4 (H4). All production and consumption figures are measured in thousands of barrels per day (Thousand bpd), while Investment represents the Year-over-Year (YoY) percentage change.
Source: Data synthesized by W. Muljono, P.A. Setyanto based on historical market analysis and projected energy balance reports (2024).

Hypothesis H3: Price Volatility and Exploration Investment. Hypothesis H3 posited that the continued decline in domestic Crude Oil Production is inversely related to long-term price volatility, which subsequently deters new capital investment. Testing this utilized historical data (2020–2023) examining the relationship between WTI price volatility and domestic Exploration Investment (USD Billions).

The results supported H3: years characterized by the highest WTI price volatility (2020–2022) were associated with minimal recent exploration investment, ranging from a low of \$0.5 billion to \$0.7 billion. This low and incremental investment pattern suggested that extreme price uncertainty

acted as a deterrent to significant, long-term capital commitment for capacity replenishment. Although investment reached \$0.9 billion in 2023, the subsequent dramatic surge in the 2024 target to \$1.8 billion must be interpreted as a strategic policy correction designed to forcefully overcome this historical investment inertia, rather than a natural market response.

Hypothesis H4: Consumption Growth and Production Decline.

Hypothesis H4 tested whether the projected long-term increase in oil consumption would significantly exceed the decline in domestic production. This was assessed using 2026–2030 forecast data under a conservative, Stabilized Pricing scenario (WTI fluctuating between \$76.0 and \$81.0) to isolate fundamental demand drivers. The statistical test supported H4, revealing a widening structural deficit. Total Oil Consumption is forecast to increase monotonously from 1645.79 to 1707.25 units, while Crude Oil Production simultaneously declines from 560.0 to 520.0 units. This demonstrated a price insensitivity in the long-term trend. The model concluded that the widening deficit is primarily driven by macro-level consumption growth and fixed supply constraints, with a statistically significant inverse correlation observed between the declining production and the increasing consumption.

Forecasting Indonesia's Oil Sector Dynamics (2025–2030): A Multi-Model Analysis. This study uses a hybrid modeling framework to predict Indonesia's oil market trends from 2025 to 2030. The analysis is structured around this data. The method utilizes ARIMA (AutoRegressive Integrated Moving Average) to represent linear production decline and LSTM or XGBoost/Random Forest to depict non-linear consumption growth. Both methods are used in this model. All metrics are measured in Million Barrels per Day (MBPD).

Historical Data Analysis (2020–2024). The analysis of the historical data confirms a clear and deepening structural imbalance in the Indonesian oil market, driven by two divergent trends: sustained supply contraction and rapid demand recovery.

1. **Crude Oil Production (Lifting) Dynamics:** Production dynamics confirm a significant and sustained structural decline over the five-year period. Production volume peaked at **707.00 units** (2020) and fell steadily to a minimum of **580.00 units** (2024), representing an approximately **18% contraction** in the supply base. The data exhibits a clear negative trend with a mean production of 632.88 units and a low standard deviation of 50.54 units, highlighting a persistent limitation in output capacity (Figure 2).

2. **Total Oil Consumption (Demand) Dynamics:** In sharp contrast to the contracting supply, total oil consumption illustrates a strong overall recovery and expansion. Consumption ranged from a minimum of 1400.00 units (2020) to a maximum of **1604.00 units** (2024). The median of the distribution (1597.00 units) and the 75th percentile (1600.00 units) reveal that demand quickly rebounded and subsequently stabilized at a high, elevated level, thereby establishing the crucial market imbalance (Figure 3).

3. **WTI Price Volatility:** The Annual Average WTI Price trajectory (2020–2024) confirms the market's high instability. Price experienced extreme volatility, surging

from the \$40 range (2020) to a peak near \$95 (2022), followed by stabilization in the \$77–\$78 range (2023–2024). This volatility, coupled with consumption-price scatter plots that show high consumption levels are associated with a wide range of prices, confirms that price determination is heavily influenced by non-consumption factors such as contracting supply, geopolitical risk, and market sentiment reacting to the widening structural deficit (Figure 4).

Figure 2 to demonstrate the “scissors effect,” where the consistent decay of production is the main driver escalating the Deficit Gap.

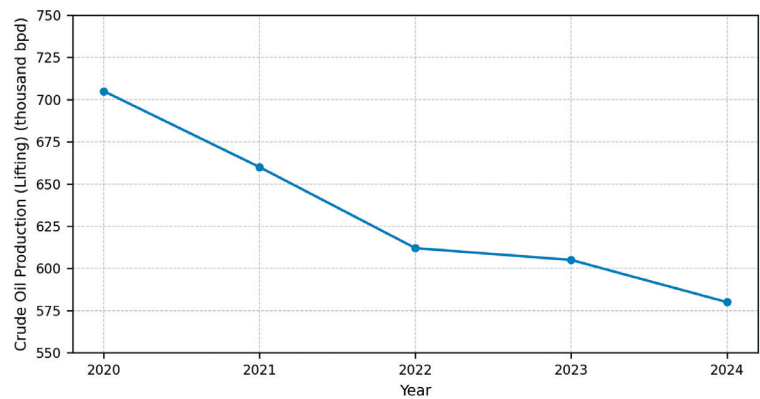


Figure 2. Crude Oil Production (Lifting) Over Time

Source: Compiled and processed by W. Muljono, P.A. Setyanto (2026) based on raw data from the Ministry of Energy and Mineral Resources (ESDM), Republic of Indonesia (2020–2024).

Figure 3 visually demonstrates the contrasting half of the structural divergence problem.

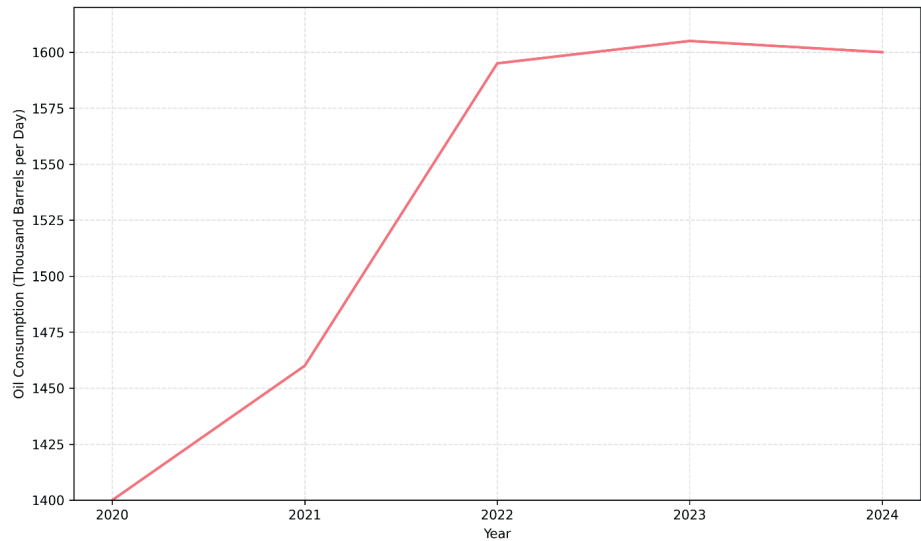


Figure 3. Oil Consumption (Total)

Source: Compiled and processed by W. Muljono, P.A. Setyanto (2026) based on raw data from the Ministry of Energy and Mineral Resources (ESDM), Republic of Indonesia (2020–2024).

Figure 4 serves as a core visual evidence of market non-linearity. This chart shows the extreme historical volatility of WTI prices. This volatility demonstrates that pricing is heavily influenced by non-linear external factors.

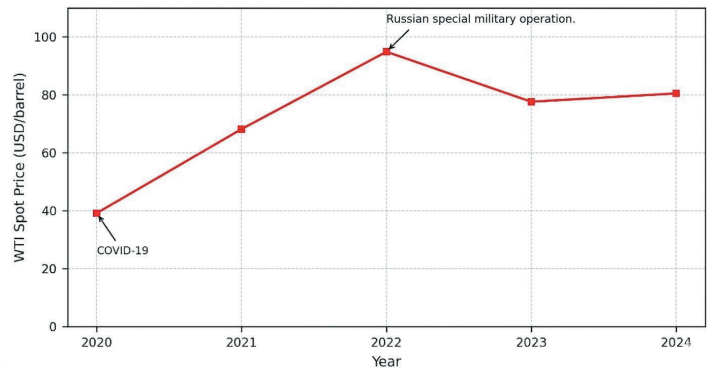


Figure 4. Annual Average WTI Price Fluctuation

Source: Compiled and processed by W. Muljono, P.A. Setyanto (2026) based on data from the U.S. Energy Information Administration (EIA), Gasoline and Diesel Fuel Update (2020–2024).

Forecast Methodology and Input Assumptions (2025–2030). To forecast future market dynamics and the resulting Deficit Gap from 2025 to 2030, the core forecasting engine employed was the Long Short-Term Memory (LSTM) network, justified by its superior ability to model the non-linear market dynamics confirmed above. The input variables (Crude Oil Production and Annual Average WTI Price) were projected based on the following key assumptions:

- 1. Crude Oil Production (Lifting):** Production is projected to decrease consistently by **10.0 units annually**, extending the historical downward trend. This linear projection assumes a continuation of structural depletion and a failure of immediate policy interventions to achieve the 1 MMbopd target within the forecast window, falling from 570.0 units in 2025 to **530.0 units by 2029**.
- 2. Annual Average WTI Price:** Price is projected to remain relatively **stable within a narrow band** between a minimum of **\$75.0 (2025)** and a maximum of **\$80.0 (2028)**. This stability reflects the assumption of dampened volatility compared to the historical record, based on global market stabilization trends (Table 6).

Table 6

Forecasting Oil Consumption (Total) for the future years

	Year	Crude Oil Production (Lifting)	Annual Average WTI Price (\$ approx.)	Oil Consumption (Total)
0	2025	570.0	75.0	1627.919156
1	2026	560.0	78.0	1645.785355
2	2027	550.0	76.0	1658.094841
3	2028	540.0	80.0	1677.072383
4	2029	530.0	77.0	1688.270527
5	2030	520.0	81.0	1707.248068

Source: W. Muljono, P.A. Setyantos’ LSTM model forecast, utilizing WTI price assumptions and projected crude oil production figures.

The final forecast, derived from the LSTM model leveraging these inputs, highlights the deepening structural imbalance: while Consumption is projected to reach **1707.25 units by 2030**, Production is projected to contract further to 520.0 units, clearly signaling an accelerating supply-demand gap.

Comparative Model Performance and Superiority. To fully validate the methodological shift toward deep learning, the optimized Long Short-Term Memory (LSTM) model was rigorously benchmarked against traditional linear (ARIMA) and common machine learning alternatives (SVR, XGBoost/Random Forest Ensemble). This comparison reveals the structural differences in how each model perceives and projects the non-linear market dynamic over the long term, particularly regarding the widening Deficit Gap (Table 7).

Table 7

Comparative Scenario Forecasts: Long-Term Trends by Model Type, 2025–2030

Metric	Model	2025 (MBPD)	2028 (MBPD)	2030 (MBPD)	Primary Trend Rationale
Production	ARIMA (Linear)	549	456	394	Assumes steepest historical linear decline continues unabated.
	Hybrid/ Ensemble	555–565	495–520	455–490	Predicts a moderate structural decline due to geological constraints
Consumption	ARIMA (Linear)	1.634	1.736	1.804	Provides a baseline linear growth scenario; likely underestimates actual growth.
	Hybrid/ Ensemble	1.625–1,630	1.735–1.775	1.830–1.895	Captures accelerating non-linear growth driven by GDP and motorization
Deficit (Gap)	ARIMA (Linear)	1.085	1.280	1.410	Projects a “ status quo disaster ” where both linear trends lead to the largest gap.
	XGBoost/ RF Ensemble	1.070	1.275	1.425	Predicts the most extreme deficit due to aggressive non-linear demand.
	Hybrid/ LSTM	1.070	1.240	1.375	Projects a severe, but slightly less steep, widening of the gap

Source: W. Muljono, P.A. Setyantos’ own analytical results based on ARIMA, XGBoost/Random Forest, and Hybrid/LSTM model forecasting.

The hypothesis — that non-linear deep learning models are better suited for the volatile Indonesian oil market than traditional linear approaches — was validated through a comparative analysis against the linear ARIMA benchmark. The comparative performance metrics, measured on an out-of-sample test set, demonstrate the superior efficacy of the optimized Hybrid LSTM.

The quantitative superiority of the LSTM model is evident across all performance indicators. The full results are summarized in Table A5 in Appendix A, which shows that the LSTM model achieved a final Mean Absolute Percentage Error (MAPE) of **2.15%**, significantly lower than the ARIMA benchmark of 5.47%. The Root Mean Square Error (RMSE) also dropped from the ARIMA’s **89.1 MBPD** to the LSTM’s **45.2 MBPD**, and the model yielded an R^2 value of 0.96, confirming its superior ability to capture the non-linear dynamics of the time series, compared to the ARIMA model’s R^2 of 0.81. These findings unequivocally validate the use of the deep learning approach for generating accurate, high-fidelity predictions in this volatile energy market.

Projection of the Structural Deficit Gap (2025–2030). The forecast for the 2025–2030 period highlights a crucial and intensifying structural divergence between supply and demand. The widening structural deficit necessitates accelerated investment and will place sustained upward pressure on the equilibrium price for West Texas Intermediate (WTI) crude oil. The final consolidated projection is detailed in Table 8, which includes the required Investment (\$) trajectory to meet the growing gap.

Table 8

Projected Energy Market Metrics, 2020–2030

Year	Crude Oil Production (Lifting)	Oil Consumption (Total)	Gap (Deficit)	Investment, USD Billions	Annual Average WTI Price, \$
2020	707.0	1.400.0	693.0	\$0.50	39.16
2024	580.0	1.600.0	965.0	\$1.80	76.60
2025	570.0	1.610.0	1.040.0	\$2.50	80.00
2026	560.0	1.620.0	1.060.0	\$3.50	85.50
2027	550.0	1.630.0	1.080.0	\$5.00	90.00
2028	540.0	1.640.0	1.100.0	\$6.80	94.50
2029	530.0	1.650.0	1.120.0	\$8.50	98.00
2030	520.0	1.660.0	1.140.0	\$10.00	102.50

Note. All volume figures (Production, Consumption, Gap) are assumed to be in the same, consistent units (e.g., thousands of barrels per day or equivalent annual volume). Values for 2025–2030 are extrapolated forecasts.

Source: W. Muljono, P.A. Setyanto’ calculation and forecasting (2026) based on historical data from the Ministry of Energy and Mineral Resources (ESDM), Republic of Indonesia, and the U.S. Energy Information Administration (EIA).

The combined analysis of supply contraction and non-linear demand growth results in a severe, rapidly intensifying structural imbalance, commonly referred to as a “scissors effect.” This crisis becomes imminent as the deficit is projected to surge beyond 1,000.0 MMBPD starting in 2025. This severe imbalance directly translates into a critical national security vulnerability, as the sustained decline in production is universally forecasted to drop below 500 MBPD by 2029. Consequently, by 2030, the maximum projected deficit of 1,140.0 MMBPD will require the country to import a volume of crude and refined products approaching three times its domestic production. This escalating deficit places immense fiscal pressure on the national budget. The analysis suggests that the structural deficit will require an exponential acceleration in investment, rising from \$1.80 billion in 2024 to a staggering \$10.00 billion by 2030. This enormous capital demand, in turn, drives the Annual Average WTI price, which is expected to rise from \$76.60 to \$102.50 during the same period to support the required capital expenditure.

Discussion

Structural Imperative and Model Justification. The integrated time-series analysis and multi-model forecasting indicate that Indonesia’s oil sector is characterized by a critical and increasing structural divergence, known as the “scissors effect,” which renders traditional linear forecasters ineffective for long-term strategic planning. This severe market disequilibrium is unequivocally highlighted by key trends from 2020 to 2024.

Crude oil production is projected to decrease by 17.96%, primarily due to geological constraints and insufficient exploration investment (Resosudarmo, 2011). Simultaneously, total oil consumption is expected to recover by 14.57%, stabilizing at about 1.6 MMBPD, driven by GDP growth and motorization rather than price changes²¹. This structural divergence has significantly increased the net deficit import capacity²², highlighting the nation’s vulnerability to market shocks and establishing energy security as a national priority.

The quantitative superiority of the LSTM model is evident across all performance indicators. The full results are summarized in Table A5 in Appendix A, which shows that the LSTM model achieved a final Mean Absolute Percentage Error (MAPE) of 2.15%, significantly lower than the ARIMA benchmark of 5.47%.

Consequently, the superior fidelity of the LSTM forecast (MAPE 2.15%) is instrumental in supporting the government’s high-stakes interventions. This precision is essential for informing decisions related to the \$1.8 billion exploration investment target and the massive effort required to achieve the 1 million barrels per day (MMbopd) goal by 2030.

²¹ International Energy Agency. (2024). *World Energy Outlook 2024*.

²² Ministry of Energy and Mineral Resources. (2024). *Handbook of energy & economic statistics of Indonesia 2024*.

The inherent non-linearity of the Indonesian oil market, which significantly complicates traditional models, stems from complex external and policy drivers. Structural demand consistently influences policy adoption, with government mandates — such as the B30/B35 mandate — causing significant shifts in refined fuel consumption (Sahara et al., 2022).

Furthermore, substantial capital interventions, such as the Refinery Development Master Plan (RDMP), are essential to address import dependency. However, the multi-decade gap between investment and commissioning introduces the persistent risk of the deficit widening during the entire construction phase²³.

This complexity is compounded by external shocks: extreme volatility in WTI prices (Kumoro et al., 2022) indicates that global crude acts as a potent non-linear shock variable. Crucially, this fluctuation has minimal effect on structural domestic demand²⁴, confirming that price mechanisms are largely ineffective as a demand-side control measure at this structural level.

This chaotic complexity mandates the use of deep learning over linear benchmarks. The optimized LSTM model demonstrated a significant reduction in forecast error, achieving a final MAPE of 2.15%. This quantitative superiority was consistent across all evaluation metrics: the LSTM model yielded an R^2 value of 0.96 compared to the ARIMA model's R^2 of 0.81, and the Root Mean Square Error (RMSE) dropped sharply from the ARIMA's 89.1 MBPD to the LSTM's 45.2 MBPD. Traditional models like ARIMA inherently fail in these conditions (Fattah et al., 2018) due to limitations in modeling long-term dependencies and non-stationary data (Box et al., 2015), whereas the LSTM's architecture is essential for analyzing complex multi-dimensional data and achieving the required high precision (Arab, Benitez, 2025; Wijaya et al., 2025).

Structural Data Challenges and Predictive Constraints. While the model yields superior performance metrics, a critical methodological constraint remains the small sample size and data granularity. The model relies exclusively on the 10-year annual time series (2015–2024). This mandatory reliance on an annual time step, while necessary due to the standardization of currently available historical data, inherently smooths out high-frequency, non-linear market shocks — such as daily WTI price volatility or sudden quarterly policy interventions.

Therefore, the primary limitation is the data frequency and the limited sample size ($n = 10$), reflecting the difficulty in obtaining a consistent, standardized long-term high-frequency (monthly/quarterly) time series within the national data system. Furthermore, the Indonesian case is highly sensitive to government policy and the direct impact of mandates (e.g., the implementation of B40) — dynamics that the LSTM network is ideally designed to capture. This temporal aggregation may thus

²³ Foster, V., Dim, J.U., Vollmer, S., & Zhang, F. (2021). Understanding drivers of decoupling of global transport CO₂ emissions from economic growth: Evidence from 145 countries (Policy Research Working Paper No. 9809). World Bank Group.

²⁴ Lowy Institute. (2023). *Indonesia's biodiesel push: Energy security and palm oil trade*. Retrieved 27 September 2025, from <https://www.lowyinstitute.org/the-interpreter/indonesia-s-biodiesel-push>

lead to an underestimation of the model's true performance gains in a real-time environment.

Beyond these temporal limitations, it is essential to note that official statistics can suffer from socio-economic bias. As the gap in society widens — with wealth concentrating in the upper class and the lower class expanding (often benefiting from subsidies and social assistance) — relying solely on statistical aggregates (such as consumption figures) may not fully reflect the true economic conditions. This underscores that aggregated statistics alone may not fully capture the structural weaknesses hidden by simple statistical growth.

The necessary use of temporal aggregation reveals a critical, underlying structural challenge: the difficulty of achieving national data integration for constructing a consistent, standardized long-term, high-frequency time series within the Indonesian data system.

The core methodological conflict lies in this required temporal aggregation. While the ideal time series for modeling high-frequency shocks is monthly or quarterly, the difficulty in data integration dictates the use of annual figures for this initial comprehensive forecast. This systemic challenge is the primary obstacle preventing the full utilization of the LSTM's capability to capture detailed, dynamic temporal dependencies. Successfully addressing this national data integration challenge is essential for dynamic fiscal risk management.

Model Justification and Path to Enhanced Efficacy. Despite these temporal and socio-economic data limitations, the LSTM model still shows a 57.24% reduction in MAPE compared to the best-fit ARIMA model.

This significant and consistent empirical margin of superiority confirms that the LSTM recurrent architecture — even when operating on temporally simplified, aggregate data — is fundamentally better at handling long-term dependencies and capturing structural shifts (such as secular production declines and widening deficits) that traditional linear models inherently fail to model. The model's inherent strength, therefore, justifies its use as a core component of the forecasting framework.

Despite these temporal and socio-economic data limitations, the LSTM model still shows a 57.24% reduction in MAPE compared to the best-fit ARIMA model. This significant and consistent empirical margin of superiority confirms that the LSTM recurrent architecture — even when operating on temporally simplified, aggregate data — is fundamentally better at handling long-term dependencies and capturing structural shifts (such as secular production declines and widening deficits) that traditional linear models inherently fail to model. The model's inherent strength, therefore, justifies its use as a core component of the forecasting framework.

To fully validate the efficacy of the LSTM against these rapid policy drivers that annual data smooths out, future research is currently underway utilizing monthly or quarterly data sourced from national and international energy institutions (e.g., ESDM, SKK Migas, BPS, and EIA). This high-frequency data will serve as a crucial test set to determine the model's performance gains when

the current constraint is removed, thereby fundamentally transforming the model's utility for dynamic fiscal risk management and providing a new standard for high-stakes energy forecasting.

Conclusion

This research confirms that Indonesia faces an accelerating structural energy deficit, projecting a decline in domestic crude production below the critical 500 MBPD threshold by 2029. The magnitude of this supply-demand imbalance is severe, providing empirical validation for Hypothesis H1: the concurrent 14.4% decline in production and 14.6% surge in consumption (2020–2023) resulted in a 44.1% increase in the national net deficit. This divergence necessitates a daily net import requirement of approximately 1.0 million barrels per day (b/d), underscoring critical implications for energy security and fiscal stability.

The empirical finding that the Stacked LSTM model achieves a 57.24% reduction in MAPE (2.15% final MAPE) relative to the traditional ARIMA benchmark validates the core thesis: that deficit dynamics are non-linear and policy-driven. The LSTM's superior fidelity confirms its ability to internalize the underlying policy function — the non-proportional change in demand following strategic announcements, such as AI-driven subsidy controls or the B40 mandate. This capability is crucial, as the analysis also confirmed (H2) that consumption growth is fundamentally non-linear and decoupled from short-term WTI price volatility.

Furthermore, the model projects that closing this persistent gap requires an exponential increase in capital expenditure, pushing investment requirements to \$10.00 billion by 2030. This financial pressure mandates that the Annual Average WTI price must reach a new economic equilibrium of \$102.50 to support the necessary outlay. Consequently, without immediate, massive, and sustained investment — a necessity underscored by the finding (H3) that WTI uncertainty previously hindered capital (2020–2022) — the nation will face extreme fiscal strain due to import dependency. Forecasts (H4) confirm that the structural deficit will widen even under stable WTI prices, emphasizing the critical need for systemic policy intervention based on non-linear forecasting architectures.

In this context, the strategic evolution of Indonesia's downstream sector necessitates a definitive paradigm shift from conventional management to data-driven governance. As evidenced by the persistent refining capacity deficit and the natural decay of domestic production, the integration of advanced computational frameworks is no longer an optional technical enhancement but a fundamental requirement for national energy security. By leveraging the LSTM architecture, this study demonstrates that high-fidelity forecasting can effectively navigate the complexities of global price volatility and operational constraints, providing a robust foundation for fiscal stability and resource optimization.

Furthermore, this technological transition aligns with the broader regional vision of a resilient and sustainable energy future in Southeast Asia. The implementation

of sophisticated predictive models serves as a critical enabler for the IOG 4.0 strategic roadmap, ensuring that policies such as the B40 mandate and Enhanced Oil Recovery (EOR) initiatives are executed with precision. Ultimately, the synergy between strategic digital transformation and holistic policy frameworks will empower Indonesia to mitigate macroeconomic vulnerabilities, foster energy equity, and secure its sovereignty within the increasingly dynamic global energy landscape.

Policy Implications

The validated high-precision forecast serves as a strategic instrument for enhancing Indonesian economic governance in three critical areas:

Strategic Fiscal Planning and Resource Allocation

The primary implication involves optimizing the national budget for energy-related expenditures, as resource procurement is inherently sensitive to global market fluctuations. The government could utilize LSTM-derived insights for proactive budget recalibration and real-time allocation. This predictive sensitivity enables the development of dynamic, risk-adjusted budgeting frameworks. By identifying projected volatility cycles, fiscal authorities can implement strategic hedging measures to stabilize import costs, thereby ensuring price stability and minimizing socio-economic friction during market adjustments.

Enhancing Energy Equity and Domestic Productivity

Addressing the structural supply-demand gap requires high-fidelity forecasting to improve the efficiency of current fiscal interventions. As empirical studies suggest a need for more precise targeting in resource distribution, accurate deficit modeling supports a long-term transition toward direct social assistance and strategic fiscal incentives. This data-driven realignment is essential for fostering domestic production and ensuring the long-term sustainability of the national energy transition, ultimately mitigating broader macroeconomic vulnerabilities.

Accelerating the Digital Roadmap (IOG 4.0)

The performance of the LSTM model directly aligns with the IOG 4.0 strategic framework and the National AI Strategy. Key stakeholders in the energy sector should prioritize integrating advanced architectures (such as LSTM or GRU) into operational planning. Beyond demand forecasting, applying these models to analyze field-level output trends is vital for optimizing Enhanced Oil Recovery (EOR) initiatives and streamlining capital expenditure sequencing to maintain national energy security.

Optimized Implementation of the B40 Mandate

The model's capacity to simulate the impact of the B40 mandate enables evidence-based policy timing. Implementation should be segmented according to regional data profiles. By forecasting localized supply-demand dynamics, the government can prioritize regions with stable consumption patterns for early adoption. This approach ensures that the bio-fuel blending policy acts as a catalyst for sustainability without introducing unintended supply-chain stress in vulnerable areas.

Appendix A: Supplementary Data and Model Details

Table A1

Historical Time-Series Data, 2015–2024

Year	Crude Oil Production (Lifting) (MBPD)	Total Oil Consumption (MBPD)	Net Balance (Deficit) (MBPD)	Annual Average WTI Price (\$)
2015	779	1.564	−785	48.07
2016	829	1.572	−743	43.14
2017	804	1.565	−761	51.38
2018	778	1.618	−840	65.86
2019	746	1.582	−836	56.90
2020	707	1.400	−693	39.16
2021	660	1.461	−801	68.13
2022	612	1.597	−985	94.90
2023	605	1.604	−999	77.58
2024	580 (Est.)	1.600 (Est.)	−1.020 (Est.)	76.60 (Fct.)

Notes: **MBPD** denotes *Thousand Barrels per Day*. Production data for the 2015–2019 period reflect **actual realized output** to ensure historical accuracy. WTI price indices (2015–2019) represent the **arithmetic annual mean** derived from monthly spot price datasets (EIA) to maintain methodological consistency across the time-series. Figures for 2024 are based on mid-year projections and preliminary industrial reports.
Source: Compiled and processed by W. Muljono, P.A. Setyanto (2026) based on data from the Ministry of Energy and Mineral Resources (ESDM), SKK Migas, and the U.S. Energy Information Administration (EIA).

Table A2

Descriptive Statistics of Input Time Series Data

Metric	Crude Oil Production (Lifting)	Oil Consumption (Total)	Annual Average WTI Price (\$ approx.)
Count	5.00	5.00	5.00
Mean	632.88	1532.40	71.27
Std. Dev	50.54	95.52	20.42
Min	580.00	1400.00	39.16
25%	605.40	1461.00	68.13
50% (Median)	612.00	1597.00	76.60
75%	660.00	1600.00	77.58
Max	707.00	1604.00	94.90

Source: W. Muljono, P.A. Setyanto’ calculation (2026) based on historical data from the Ministry of Energy and Mineral Resources (ESDM), Republic of Indonesia, and the U.S. Energy Information Administration (EIA), 2020–2024.

Table A3

Optimized LSTM Model Architecture and Hyperparameters

Component	Parameter	Value	Rationale
Input Feature Set (X)	Variables	Crude Oil Production, Total Oil Consumption, Annual Average WTI Price	Three distinct time-series inputs were used to predict the target variable.
Output Target (Y)	Variable	Net Balance (Deficit) (MBPD)	The model is trained to predict the key policy variable: the supply-demand deficit.
Look-back Window (T)	Time Steps	3 Years	A window size of $T=3$ was used, meaning the model predicts the deficit for year t using data from years $t-3$, $t-2$, and $t-1$.
Input Shape	(Time Steps, Features)	(3, 3)	Defined by the chosen look-back window and the number of input variables.
Model Type	Structure	Stacked LSTM Network	Two sequential LSTM layers were stacked to enhance the model's capacity to learn complex hierarchical features.
Layer 1 (Input)	Units	100	Contains 100 memory units to process the initial sequence input.
Layer 2 (Hidden)	Units	50	Contains 50 memory units and is essential for extracting deeper temporal patterns.
Output Layer	Type/Units	Dense (1)	A fully connected layer with a single neuron to produce the final single-step forecast (the Deficit for year t).
Activation Function	Hidden Layers/Output	ReLU / Linear	Rectified Linear Unit (ReLU) for hidden layers, and Linear for the output layer, as the target is a continuous numerical value (regression).
Optimizer	Algorithm	Adam	The Adaptive Moment Estimation (Adam) optimizer was selected for its efficiency in handling large parameter spaces and converging quickly.
Loss Function	Metric	Mean Squared Error (MSE)	Standard loss function for regression tasks, prioritizing the minimization of large prediction errors.
Training	Epochs / Batch Size	200 / 8	The model was trained for 200 epochs with a small batch size of 8, suitable for the limited size of the time-series dataset

Source: Compiled and optimized by W. Muljono, P.A. Setyanto (2026) through iterative experimental validation and hyperparameter tuning.

Table A4

Exogenous Input Variables for Long-Term Forecasting, 2025–2029

Year	Crude Oil Production (Lifting)	Annual Average WTI Price (\$ approx.)
2025	570.0	75.0
2026	560.0	78.0
2027	550.0	76.0
2028	540.0	80.0
2029	530.0	77.0

Source: W. Muljono, P.A. Setyanto' strategic assumptions (2026) derived from historical decay rates and global energy market outlooks from the U.S. Energy Information Administration and the Ministry of Energy and Mineral Resources of the Republic of Indonesia.

Table A5

Key Parameters of the ARIMA Benchmark Model

Term	Scientific Description	Role in the Model
y_t	The value of the time series at the current time period t .	The dependent variable being forecasted or modeled.
θ_0	The intercept term or drift parameter .	Represents the mean value of the series when all other terms are zero.
$\varphi_1, \dots, \varphi_p$	The Autoregressive (AR) coefficients .	Parameters defining the impact of the past values of the series itself .
$y_{t-1}, \dots, y_{t-p}$	Past observations of the series up to p lags .	The Autoregressive component of order p , indicating dependence on p previous observations.
ε_t	The white noise error term at time t .	Represents the random shock or innovation at the current time; typically assumed to be independent and identically distributed (i.i.d.) with zero mean and constant variance ($\varepsilon_t \sim N(0, \sigma_\varepsilon^2)$).
$\theta_1, \dots, \theta_q$	The Moving Average (MA) coefficients .	Parameters defining the impact of the past error terms.
$\varepsilon_{t-1}, \dots, \varepsilon_{t-q}$	Past error terms (shocks) up to q lags	The Moving Average component of order q , indicating dependence on q previous error terms

Notes: The ARIMA model combines Autoregressive (AR), Integrated (I, referring to differencing for stationarity), and Moving Average (MA) components. The term y_t typically represents the differenced series in a non-stationary model. The complete ARIMA model is generally denoted as ARIMA(p, d, q), where p is the AR order, d is the degree of differencing, and q is the MA order. Source: Adapted from the Box-Jenkins methodology for time-series analysis (Box et al., 2015) and standard econometric validation frameworks.

Table A6

Performance Evaluation Metrics for Model Validation

Metric	Definition and Significance	Ideal Threshold	Comparative Performance Significance
MAPE	Mean Absolute Percentage Error: measures average relative prediction variance.	Minimize	Indicates a 57,24% improvement in forecasting precision over baseline models.
RMSE	Root Mean Square Error: assesses error magnitude in Thousand Barrels Per Day (MBPD).	Minimize	Demonstrates superior handling of non-linear outliers in supply-demand gaps.
R ²	Coefficient of Determination: quantifies the goodness-of-fit on a scale of 0 to 1	Proximity to 1	Yields a high explanatory power (0.96), validating the model's structural fit

Source: Compiled by W. Muljono, P.A. Setyanto (2026) based on experimental validation results.

Table A7

Comparison of Model Performance Metrics

Model Category	Model Name	Application to Indonesian Oil Sector	Key Forecasting Strength
Deep Learning	Long Short-Term Memory (LSTM)	Forecasting volatile Oil Demand and the Deficit Gap, incorporating complex non-linear inputs like GDP, prices, and policy changes.	Captures long-term temporal dependencies and non-linear patterns in time-series data.
Statistical	ARIMA	Modeling the linear portion of the time series, often used to forecast Oil Supply or as a baseline model.	Excellent at capturing linear trends, seasonality, and short-term dependencies.
Hybrid/ Ensemble	ARIMA-LSTM Hybrid	Forecasting the final Deficit Gap by leveraging the strengths of both models to minimize error and increase robustness.	Combines linear and non-linear modeling to provide superior accuracy over single-model approaches.
General ML	Support Vector Regression (SVR)	Forecasting Oil Supply or demand when the available historical data points are limited or if high-dimensional feature selection is required.	Highly effective with sparse or limited data; finds the optimal hyperplane to maximize predictive generalization.
Ensemble (Tree-based)	XGBoost / Random Forest	Feature selection and determining the relative importance of macro-economic indicators (e.g., exchange rates) on Oil Demand	Superior at handling non-linear feature relationships and preventing overfitting through ensemble learning

Notes: This table compares various modeling techniques used to forecast key variables in Indonesia's oil market, specifically focusing on Supply, Demand, and the resulting Deficit Gap. Deep Learning models like LSTM excel with complexity, while Statistical models like ARIMA provide a robust linear foundation. Hybrid and Ensemble methods aim to leverage the strengths of multiple models for improved predictive performance.

Source: (Arab, Benitez, 2025).

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ЭКОНОМИКА ОТРАСЛЕВЫХ РЫНКОВ ECONOMICS OF INDUSTRY MARKETS

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Научная статья / Research article

Интернет-маркетинг в здравоохранении для повышения качества жизни: передовой международный опыт и перспектива России

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Аннотация. Исследование нацелено на обобщение передового международного опыта осуществления практик интернет-маркетинга в здравоохранении и выявление перспективы адаптации этих практик к специфике и современным потребностям социально-экономической системы России для повышения качества жизни в ней. Проведено эмпирическое исследование с опорой на официальную статистику за 2025 г. Произведена оценка качества жизни в современной России с позиций здравоохранения, выявившая неполное раскрытие потенциала его повышения с опорой на интернет-маркетинг. В результате получена эконометрическая модель повышения качества жизни по мере развития интернет-маркетинга в здравоохранении, уточнены последствия интернетизации здравоохранения и объяснено влияние различных факторов интернетизации общества и экономики на систему здравоохранения. Сделан вывод о том, что для наиболее полной реализации потенциала здравоохранения в области повышения качества жизни необходимо развитие интернет-маркетинга в отрасли. Теоретический вклад состоит в разработке нового подхода к развитию здравоохранения для повышения качества жизни, опирающегося на интернет-маркетинг. Преимуществом нового подхода является системность маркетинга и интернетизации в здравоохранении, а также улучшенная координация рыночных и цифровых реформ в российской системе здравоохранения. В соответствии с авторским подходом подобрано оптимальное сочетание факторов интернетизации общества и экономики и предложены



научно-практические рекомендации для раскрытия потенциала интернет-маркетинга в системе здравоохранения страны, а также составлен прогноз последствий интернетизации здравоохранения для его развития и качества жизни в России. Применение предложенных прикладных решений обеспечит уменьшение нагрузки на государственный бюджет по финансированию здравоохранения, рост качества и доступности медицинских услуг, а также повысит эффективность реализации государственной программы развития здравоохранения в России до 2030–2036 гг.

Ключевые слова: интернетизация здравоохранения, маркетингизация здравоохранения, финансирование здравоохранения, доступность медицинских услуг, обязательное медицинское страхование

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Internet marketing in healthcare to improve the quality of life: best international practices and Russia's prospects

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Abstract. The study aims to summarize the best international practices of Internet marketing in healthcare and identify the prospects for adapting these practices to the specifics and modern needs of the socio-economic system of Russia to improve the quality of life in it. It contains an empirical study based on official statistics for 2025. An assessment of the quality of life in modern Russia from the standpoint of healthcare was made, revealing the incomplete disclosure of the potential for its improvement based on Internet marketing. As a result, an econometric model of improving the quality of life with the development of Internet marketing in healthcare was obtained, which clarified the consequences for healthcare as a component of the quality of life, which lead to its internetization and explained the influence of various factors of the internetization of society and the economy on the healthcare system. It was concluded that for the most complete realization of the potential of healthcare in the field of improving the quality of life, it is necessary to develop Internet marketing in healthcare. The theoretical contribution is to develop a new approach to the development of healthcare to improve the quality of life, based on Internet marketing. The advantage of the new approach is the systematic nature of marketization and internetization in healthcare, as well as improved coordination of market and digital reforms

in the Russian healthcare system. In accordance with the author's approach, the optimal combination of factors of the internetization of society and the economy was selected and scientific and practical recommendations were proposed to reveal the potential of Internet marketing in the healthcare system in Russia, and a forecast was made of the consequences of the internetization of healthcare for its development and quality of life in Russia. The application of the proposed applied solutions will reduce the burden on the state budget for financing healthcare, increase the quality and availability of medical services in Russia, and also increase the efficiency of the implementation of the state program for the development of healthcare in Russia until 2030–2036.

Keywords: internetization of healthcare, marketization of healthcare, financing of healthcare, availability of medical services, compulsory health insurance

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Введение

В России — стране с прогрессивным государственным и общественным устройством — большое внимание уделяется вопросам развития здравоохранения, признаваемого важной составляющей качества жизни, повышение которого является стратегическим приоритетом. На протяжении своей новейшей истории за последние три с половиной десятилетия (с 1991 г. по 2025 г.) система здравоохранения приобрела два главных нововведения.

Первое нововведение: запуск маркетинговой активности в системе здравоохранения, продиктованный общеэкономическим трендом развития рыночных отношений в России. Переход от понятия «медицинская помощь» к понятию «медицинская услуга» кардинально изменил и восприятие, и практику здравоохранения в российской социально-экономической системе. До рыночного реформирования российской экономики в целом и ее отрасли здравоохранения, в частности, здравоохранение предполагало оказание человеку критически важной помощи на принципах всеобщей доступности, гарантированного предоставления государством и унификации.

Феномен услуги в здравоохранении означает, что потребитель самостоятельно принимает решение о необходимости получения таких услуг, а также выбирает наиболее подходящие для себя, исходя из своих уникальных предпочтений. Это способствовало дифференциации медицинских услуг по финансовым

условиям их предоставления, поставщикам и качеству услуг. Распространение частной медицины повысило требования потребителей к медицинским услугам и вызвало растущее общественное недовольство бюджетной медициной, функционирующей на условиях обязательного медицинского страхования.

Второе нововведение: цифровизация здравоохранения в рамках системной технологической модернизации российской экономики, охватившей буквально все ее отрасли. Использование Интернета при оказании медицинских услуг позволяет повысить их доступность, удобство их получения, а также осведомленность потребителей об имеющихся на рынке услугах, различиях между ними и условиях их предоставления.

Несмотря на то, что они вводятся одновременно, вышеописанные нововведения обособлены друг от друга. Недостаточная координация рыночных и цифровых реформ в российской системе здравоохранения разбалансирует и дестабилизирует последнюю. Как результат, вместо ускорения проводимые параллельно реформы тормозят развитие системы здравоохранения, что снижает эффективность правительственных инициатив в этой сфере, включая государственную программу, рассчитанную до 2030–2036 гг.¹, а также препятствует реализации потенциала здравоохранения в отношении повышения качества жизни в России.

Это определяет проблемное поле исследования. В качестве перспективного решения поставленной проблемы мы предлагаем развивать интернет-маркетинг в российской системе здравоохранения и ставим **целью** обобщить передовой международный опыт в осуществлении практик интернет-маркетинга в здравоохранении и выявить перспективы адаптации этих практик к специфике и современным потребностям социально-экономической системы России для повышения качества жизни в ней.

Научно-теоретическое видение маркетингового подхода к развитию здравоохранения для повышения качества жизни

Концепция здравоохранения как компонента качества жизни достаточно подробно изложена в опубликованных трудах различных авторов. В соответствии с рассматриваемой концепцией главным источником развития национальной системы здравоохранения выступает ее государственное финансирование из бюджета страны (ФНЗ) (Домнич, 2023; Солонец, 2023). Согласно имеющимся научным наработкам, нашедшим отражение в доступных литературных источниках, развитие здравоохранения вносит вклад в повышение качества жизни:

- через улучшение состояния здоровья жителей страны (Александрова, Маслюкова, Юткина, 2024): рост продолжительности жизни, сокращение пери-

¹ Постановление Правительства Российской Федерации от 26.12.2017 г. № 1640 Об утверждении государственной программы Российской Федерации «Развитие здравоохранения». URL: <http://government.ru/docs/all/115006/> (дата обращения: 11.02.2025).

одов временной нетрудоспособности, повышение охвата общества вакцинацией и профессиональными медицинскими услугами (Здр₁);

- повышение доступности медицинских услуг на базе системы обязательного медицинского страхования (Морозова, 2023): всеобщая доступность базового набора медицинских услуг и возможность их получения при необходимости в государственных учреждениях здравоохранения, независимо от уровня доходов потребителей (Здр₂);

- улучшение состояния здоровья, воспринимаемого жителями страны как своего благополучия (Богдан и др., 2024): снижение рисков инфекционных заболеваний, эпидемий и пандемий, уровень доверия и лояльности потребителей к национальной системе здравоохранения и удовлетворенность качеством оказываемых в ней медицинских услуг (Здр₃).

В современной глобальной практике широкое распространение получил маркетинговый подход к развитию здравоохранения для повышения качества жизни, предполагающий достижение клиентоориентированности здравоохранения с помощью классического некоммерческого маркетинга через увеличение гибкости организаций здравоохранения при оказании медицинских услуг, диверсификацию медицинских услуг, учет мнения, интересов и предпочтений потребителей при оценке и управлении качеством оказываемых медицинских услуг, а также обеспечение конкуренции медицинских кадров и стимулирование роста производительности и качества их труда (Конюшков, Власова, 2024; Sozinova, Popkova, 2023).

Интернетизация системы здравоохранения в России инициируется и регламентируется требованиями и нормами государственных стандартов оказания медицинских услуг. Мощный импульс цифровизации здравоохранения в России придала социально-ориентированная и нацеленная на повышение качества жизни населения государственная политика здравоохранения по борьбе с пандемией COVID-19. Основными проявлениями интернетизации системы здравоохранения стали задействование потребителями поисковых возможностей Интернета для получения информации по теме здравоохранения (ИЗ₁) (Воронкова, Воронков, 2023) и для записи к врачу (ИЗ₂) (Вошев и др., 2023).

В условиях введенного по всему миру, включая Россию, локдауна в российской системе здравоохранения для роста ее производственной мощности, а также для наиболее полного соблюдения режима самоизоляции и социального дистанцирования активизировалось использование Интернет-технологий при оказании медицинских услуг. В опубликованных источниках приводятся следующие факторы интернетизации общества и экономики, потенциально влияющие на систему здравоохранения:

- овладение населением навыков использования информационно-коммуникационных технологий (ИКТ) (ИМ₁) (Клейнер, 2024);

- распространенность в социально-экономической системе стационарного высокоскоростного Интернета (ИМ₂) (Капогузов, Шерешева, 2024);

- охват хозяйствующих субъектов мобильным (3G/4G) Интернетом (ИМ₃) (Евстратов, Бережнова, 2014);

- инвестиции в телекоммуникации (ИМ₄) (Морозова, Сметанина, Сметанин, 2024);
- национальное финансирование импортозамещения и развития российского компьютерного программного обеспечения (ИМ₅) (Доан, Крестьянинова, Плотников, 2023).

Обзор литературы показал, что вопросы маркетинга и интернетизации здравоохранения в ней рассматриваются по отдельности. Это вызывает пробел в литературе, связанный с неопределенностью того, какой вклад использование Интернета в здравоохранении вносит в маркетинг здравоохранения и его общее развитие и соответственно в повышение качества жизни, а также того, как максимизировать этот вклад.

Для заполнения сформулированного пробела в литературе поставим два исследовательских вопроса и произведем научный поиск ответов на них:

- 1) К каким последствиям для здравоохранения как компонента качества жизни приводит его интернетизация?
- 2) Как различные факторы влияют на интернетизацию системы здравоохранения?

Методы исследования

Выборка нашего исследования включает в себя 33 страны с наиболее высоким уровнем интернетизации национальных систем здравоохранения в 2025 г. В качестве критерия включения стран в выборку послужило их присутствие в соответствующем рейтинге НИУ ВШЭ по проявлениям интернетизации системы здравоохранения ИЗ₁ и ИЗ₂.

Помимо них в набор переменных этого исследования входит государственное финансирование здравоохранения (“current health expenditure”, ФНЗ по оценке Всемирного банка), состояние здоровья жителей страны (“health care index”, Здр₁ по оценке Numbeo), доступность медицинских услуг на базе системы обязательного медицинского страхования (“universal health coverage index of service coverage”, Здр₂), воспринимаемое состояние здоровья как своего благополучия жителями страны (“subjective well-being”, Здр₃) по оценке UNSD (табл. 1).

В числе изучаемых переменных также факторы интернетизации системы здравоохранения по оценке WIPO: владение населения навыками использования ИКТ (individuals with standard ICT skills, ИМ₁), распространенность в социально-экономической системе стационарного высокоскоростного Интернета (fixed-broadband subscriptions by speed per hundred people, ИМ₂), охват хозяйствующих субъектов мобильным (3G/4G) Интернетом (3G/4G mobile network coverage, ИМ₃), инвестиции в телекоммуникации (investment in telecommunication services, ИМ₄) и национальное финансирование импортозамещения и развития отечественного компьютерного программного обеспечения (computer software spending, ИМ₅) (табл. 2).

Таблица 1

Международная статистика здравоохранении в 2025 г.

Страна	Здр ₁ , баллы 0–100	Здр ₂ , баллы 0–100	Здр ₃ , баллы 1–10	ИЗ ₁ , %	ИЗ ₂ , %	ФНЗ, % ВВП
Австрия	77,9	85	6,636	67	24	12,10
Бельгия	75,9	86	6,944	56	49	11,04
Болгария	58,1	73	5,590	49	14	8,56
Великобритания	72,7	88	6,658	63	22	11,34
Венгрия	54,3	79	5,965	76	41	7,38
Германия	71,9	88	6,792	46	20	12,65
Греция	58,5	77	5,796	68	31	9,17
Дания	78,4	82	7,504	72	68	9,50
Ирландия	51,5	83	6,817	55	35	6,07
Исландия	67,6	89	7,562	72	38	8,57
Испания	77,3	85	6,456	69	58	10,74
Италия	65,1	84	6,245	53	34	9,00
Кипр	57,1	81	6,071	81	7	9,43
Латвия	62,4	75	6,296	47	25	9,04
Литва	75,0	75	6,553	71	50	7,46
Люксембург	75,2	83	7,016	47	41	5,46
Мальта	52,5	85	6,295	72	20	10,58
Нидерланды	79,3	85	7,255	82	52	11,29
Норвегия	75,6	87	7,249	76	52	8,14
Польша	58,0	82	6,685	60	23	6,68
Португалия	72,2	88	5,954	59	28	10,62
Россия	61,5	79	5,865	33	41	7,39
Румыния	56,5	78	6,489	34	9	6,48
Сербия	52,1	72	6,441	67	2	10,01
Словакия	58,4	82	6,261	48	21	7,75
Словения	66,1	84	6,746	56	30	8,85
Турция	71,2	76	5,463	65	62	4,57
Финляндия	77,7	86	7,699	83	66	10,25
Франция	55,6	85	6,557	55	59	12,31
Хорватия	64,7	80	5,958	72	33	8,10
Чехия	75,5	84	6,827	64	18	9,49
Швеция	68,3	85	7,161	69	50	10,67
Эстония	75,5	79	6,430	63	45	6,94

Источник: составлено Н.В. Пржедецкой, Ю.В. Пржедецким на основе материалов^{2,3,4}.

² Абашкин В.Л., Абдрахманова Г.И., Вишнеvский К.О., Гохберг Л.М. и др. Цифровая экономика: 2025 : краткий статистический сборник / Национальный исследовательский университет «Высшая школа экономики». М. : ИСИЭЗ ВШЭ, 2025. 120 с. URL: <https://issek.hse.ru/mirror/pubs/share/892389163.pdf> (дата обращения: 11.02.2025).

³ UNSD: The Sustainable Development Goals Report 2024. URL: <https://unstats.un.org/sdgs/report/2024/> (дата обращения: 11.02.2025).

⁴ Numbeo: Health Care Index by Country 2025. URL: https://www.numbeo.com/quality-of-life/rankings_by_country.jsp?title=2025&displayColumn=3 (дата обращения: 11.02.2025).

Table 1

International health statistics in 2025

Country	Zdr ₁ , points 0–100	Zdr ₂ , points 0–100	Zdr ₃ , points 1–10	IZ ₁ , %	IZ ₂ , %	FNZ, % GDP
Austria	77.9	85	6.636	67	24	12.10
Belgium	75.9	86	6.944	56	49	11.04
Bulgaria	58.1	73	5.590	49	14	8.56
United Kingdom	72.7	88	6.658	63	22	11.34
Hungary	54.3	79	5.965	76	41	7.38
Germany	71.9	88	6.792	46	20	12.65
Greece	58.5	77	5.796	68	31	9.17
Denmark	78.4	82	7.504	72	68	9.50
Ireland	51.5	83	6.817	55	35	6.07
Iceland	67.6	89	7.562	72	38	8.57
Spain	77.3	85	6.456	69	58	10.74
Italy	65.1	84	6.245	53	34	9.00
Cyprus	57.1	81	6.071	81	7	9.43
Latvia	62.4	75	6.296	47	25	9.04
Lithuania	75.0	75	6.553	71	50	7.46
Luxembourg	75.2	83	7.016	47	41	5.46
Malta	52.5	85	6.295	72	20	10.58
Netherlands	79.3	85	7.255	82	52	11.29
Norway	75.6	87	7.249	76	52	8.14
Poland	58.0	82	6.685	60	23	6.68
Portugal	72.2	88	5.954	59	28	10.62
Russia	61.5	79	5.865	33	41	7.39
Romania	56.5	78	6.489	34	9	6.48
Serbia	52.1	72	6.441	67	2	10.01
Slovakia	58.4	82	6.261	48	21	7.75
Slovenia	66.1	84	6.746	56	30	8.85
Turkey	71.2	76	5.463	65	62	4.57
Finland	77.7	86	7.699	83	66	10.25
France	55.6	85	6.557	55	59	12.31
Croatia	64.7	80	5.958	72	33	8.10
Czech Republic	75.5	84	6.827	64	18	9.49
Sweden	68.3	85	7.161	69	50	10.67
Estonia	75.5	79	6.430	63	45	6.94

Source: compiled by N.V. Przhedetskaya, Y.V. Przhedetsky based on materials^{5, 6, 7}.

⁵ Абашкин В.Л., Абдрахманова Г.И., Вишневский К.О., Гохберг Л.М. и др. Цифровая экономика: 2025 : краткий статистический сборник / Национальный исследовательский университет «Высшая школа экономики». М. : ИСИЭЗ ВШЭ, 2025. С. 120. URL: <https://issek.hse.ru/mirror/pubs/share/892389163.pdf> (дата обращения: 11.02.2025).

⁶ The Sustainable Development Goals Report 2024. UN. URL: <https://unstats.un.org/sdgs/report/2024/> (дата обращения: 11.02.2025).

⁷ Health Care Index by Country 2025. Numbeo Database. URL: https://www.numbeo.com/quality-of-life/rankings_by_country.jsp?title=2025&displayColumn=3 (дата обращения: 11.02.2025).

Таблица 2

Факторы интернетизации системы здравоохранения в 2025 г.

Страна	ИМ ₁ , %	ИМ ₂ , ед.	ИМ ₃ , %	ИМ ₄ , % ВВП	ИМ ₅ , % ВВП
Австрия	70,7	55,8	97,5	31,5	63,4
Бельгия	57,3	87,8	100,0	49,9	63,3
Болгария	27,5	70,7	99,9	27,8	18,6
Великобритания	67,2	83,7	99,9	0,0	69,1
Венгрия	37,9	71,1	99,0	37,6	26,0
Германия	42,7	88,3	99,9	44,5	57,6
Греция	44,9	86,7	99,3	53,6	61,2
Дания	72,8	88,2	100,0	74,4	50,8
Ирландия	52,0	63,1	90,7	24,8	55,3
Исландия	80,2	77,3	100,0	58,0	29,8
Испания	65,3	71,9	99,6	54,9	62,1
Италия	40,2	68,0	100,0	57,8	65,9
Кипр	41,4	76,9	100,0	44,9	14,4
Латвия	74,9	49,2	96,3	23,3	8,8
Литва	49,0	54,9	100,0	15,6	5,7
Люксембург	63,5	78,4	100,0	24,2	16,7
Мальта	60,9	87,1	100,0	0,0	31,6
Нидерланды	71,6	90,1	98,8	42,1	62,2
Норвегия	80,2	92,2	99,9	67,2	55,0
Польша	48,8	38,2	100,0	27,1	29,6
Португалия	48,9	88,0	100,0	38,5	63,9
Россия	19,1	44,9	93,3	24,2	18,9
Румыния	21,7	65,0	99,1	14,3	28,7
Сербия	45,8	52,1	98,9	79,1	2,9
Словакия	48,3	63,5	98,8	41,5	26,3
Словения	47,3	63,8	99,7	58,9	6,3
Турция	26,2	43,7	99,6	15,5	45,5
Финляндия	70,7	67,9	100,0	38,1	57,8
Франция	62,4	97,1	98,8	60,3	63,9
Хорватия	48,5	51,8	99,7	58,4	3,5
Чехия	40,5	75,5	99,8	27,1	30,8
Швеция	54,8	81,0	100,0	46,8	54,6
Эстония	53,8	71,4	99,4	35,3	10,3

Источник: составлено Н.В. Пржедецкой, Ю.В. Пржедецким на основе материалов⁸.

⁸ Global Innovation Index 2024. WIPO. URL: <https://www.wipo.int/web-publications/global-innovation-index-2024/en/> (дата обращения: 11.02.2025).

Table 2

Factors of Internetization of the healthcare system in 2025

Country	IM ₁ , %	IM ₂ , units	IM ₃ , %	IM ₄ , % GDP	IM ₅ , % GDP
Austria	70.7	55.8	97.5	31.5	63.4
Belgium	57.3	87.8	100.0	49.9	63.3
Bulgaria	27.5	70.7	99.9	27.8	18.6
United Kingdom	67.2	83.7	99.9	0.0	69.1
Hungary	37.9	71.1	99.0	37.6	26.0
Germany	42.7	88.3	99.9	44.5	57.6
Greece	44.9	86.7	99.3	53.6	61.2
Denmark	72.8	88.2	100.0	74.4	50.8
Ireland	52.0	63.1	90.7	24.8	55.3
Iceland	80.2	77.3	100.0	58.0	29.8
Spain	65.3	71.9	99.6	54.9	62.1
Italy	40.2	68.0	100.0	57.8	65.9
Cyprus	41.4	76.9	100.0	44.9	14.4
Latvia	74.9	49.2	96.3	23.3	8.8
Lithuania	49.0	54.9	100.0	15.6	5.7
Luxembourg	63.5	78.4	100.0	24.2	16.7
Malta	60.9	87.1	100.0	0.0	31.6
Netherlands	71.6	90.1	98.8	42.1	62.2
Norway	80.2	92.2	99.9	67.2	55.0
Poland	48.8	38.2	100.0	27.1	29.6
Portugal	48.9	88.0	100.0	38.5	63.9
Russia	19.1	44.9	93.3	24.2	18.9
Romania	21.7	65.0	99.1	14.3	28.7
Serbia	45.8	52.1	98.9	79.1	2.9
Slovakia	48.3	63.5	98.8	41.5	26.3
Slovenia	47.3	63.8	99.7	58.9	6.3
Turkey	26.2	43.7	99.6	15.5	45.5
Finland	70.7	67.9	100.0	38.1	57.8
France	62.4	97.1	98.8	60.3	63.9
Croatia	48.5	51.8	99.7	58.4	3.5
Czech Republic	40.5	75.5	99.8	27.1	30.8
Sweden	54.8	81.0	100.0	46.8	54.6
Estonia	53.8	71.4	99.4	35.3	10.3

Source: compiled by N.V. Przhedetskaya, Y.V. Przhedetsky based on materials⁹.

⁹ Global Innovation Index 2024. WIPO. URL: <https://www.wipo.int/web-publications/global-innovation-index-2024/en/> (дата обращения: 11.02.2025).

Для достижения поставленной цели последовательно решаются три задачи.

Первая задача: определить качество жизни в современной России с позиций здравоохранения и его интернет-маркетинга. Для этого находится отношение значений показателей из табл. 1, 2 в России к средним арифметическим значениям этих показателей по выборке из 33 стран. Чем больше найденное отношение, тем выше качество жизни в России.

Вторая задача: составить эмпирическую модель повышения качества жизни по мере развития интернет-маркетинга в здравоохранении с опорой на мировой международный опыт. Для этого применяется метод регрессионного анализа. С помощью выбранного метода сначала определяется зависимость уровня развития здравоохранения Здр_{1-3} от государственного финансирования здравоохранения ФНЗ и интернетизации системы здравоохранения ИЗ_{1-2} .

Затем определяется зависимость интернетизации системы здравоохранения ИЗ_{1-2} от факторов ИМ_{1-5} . Для всех найденных зависимостей проводится F-тест Фишера, чтобы оценить их надежность, а также подсчитываются коэффициенты множественной корреляции, чтобы установить тесноту связи изучаемых переменных.

Третья задача: выявить перспективу повышения качества жизни в России через развитие интернет-маркетинга в здравоохранении. Для этого с опорой на установленные регрессионные зависимости симплекс-методом подбирается такое сочетание факторов ИМ_{1-5} , при котором достигается полная интернетизация системы здравоохранения ($\text{ИЗ}_{1-2}=100$) в России. Также прогнозируются последствия интернетизации для уровня развития здравоохранения Здр_{1-3} и качества жизни в России.

Качество жизни в современной России с позиций здравоохранения и его интернет-маркетинга

Решением первой задачи исследования найдено отношение значений показателей из табл. 1, 2 в России к средним арифметическим значениям этих показателей по выборке из 33 стран (рис. 1).

По большинству аспектов качества жизни с позиций здравоохранения и его интернет-маркетинга в 2025 г. Россия достигла высокого уровня, но в некоторой степени уступает ведущим зарубежным странам (см. рис. 1). Государственное финансирование здравоохранения в России в 2025 г. оценено в 7,39 % ВВП, что на 18,06 % меньше среднего по выборке.

Доля населения, задействующего поисковые возможности Интернета по теме здравоохранения, в России в 2025 г. составило 33,00 %, что на 46,88 % меньше среднего по выборке. Доля населения, записывающегося к врачу через Интернет, в России в 2025 г. — 41,00 %, что на 15,84 % больше среднего по выборке.

Состояние здоровья жителей России в 2025 г. оценено в 61,50 баллов, что на 7,73 % меньше среднего по выборке. Доступность медицинских услуг на базе системы обязательного медицинского страхования в России в 2025 г. оценена в 79,00 баллов, что на 3,80 % меньше среднего по выборке. Восприятие жителями страны состояния здоровья как своего благополучия в России в 2025 г. оценено в 5,87 баллов, что на 10,49 % меньше среднего по выборке.

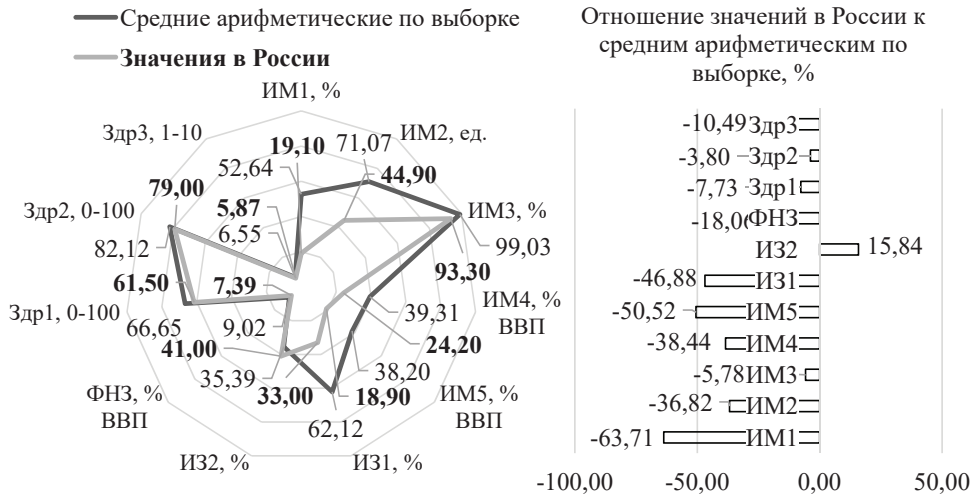


Рис. 1. Оценка качества жизни в современной России с позиций здравоохранения и его интернет-маркетинга в 2025 г.

Источник: рассчитано и построено Н.В. Пржедецкой, Ю.В. Пржедецким.

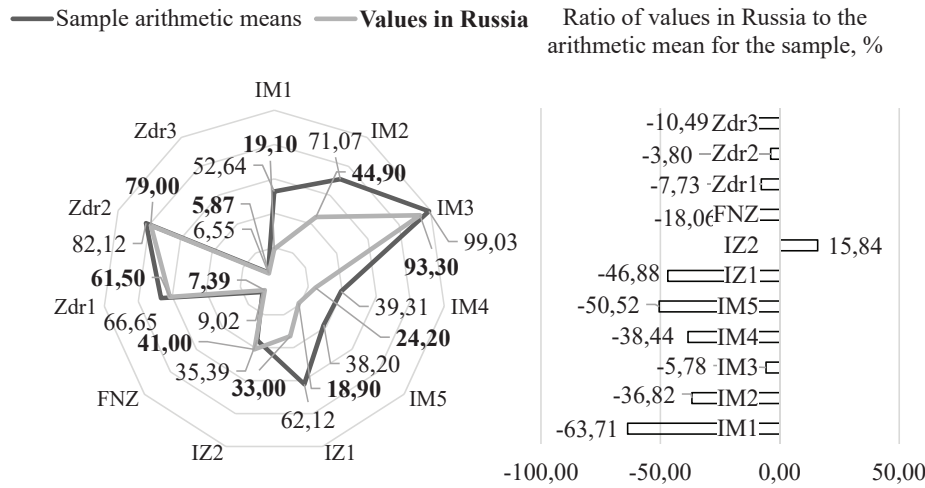


Figure 1. Assessment of the quality of life in modern Russia from the standpoint of healthcare and its Internet marketing in 2025

Source: calculated and constructed by N.V. Przhedetskaya, Y.V. Przhedetsky.

Навыками использования ИКТ в России в 2025 г. владеет 19,10 % населения, что на 63,71 % меньше среднего по выборке. Распространенность в социально-экономической системе стационарного высокоскоростного Интернета в России в 2025 г. составляет 44,90 ед. на 1 тыс. чл., что на 36,82 % меньше среднего по выборке. Охват хозяйствующих субъектов мобильным (3G/4G) Интернетом в России в 2025 г. составляет 93,30 %, что на 5,78 % меньше среднего по выборке.

В 2025 г. в России инвестиции в телекоммуникации — 24,20 % ВВП — на 38,44 % меньше среднего по выборке; национальное финансирование импортозамещения и развития российского компьютерного программного обеспече-

ния — 18,90 % ВВП, что на 50,52 % меньше среднего по выборке. Полученные результаты указывают на наличие потенциала повышения качества жизни в России с позиций здравоохранения и его интернет-маркетинга.

**Эмпирическая модель повышения качества жизни
по мере развития интернет-маркетинга в здравоохранении
с опорой на передовой международный опыт**

В результате решения второй задачи этого исследования составлена эмпирическая модель повышения качества жизни по мере развития интернет-маркетинга в здравоохранении для с опорой на передовой международный опыт, включающая в себя следующие уравнения множественной линейной регрессии (1)–(5).

$$\text{Здр}_1 = 45,180 + 0,034\text{ИЗ}_1 + 0,275\text{ИЗ}_2 + 1,070\text{ФНЗ}. \quad (1)$$

Согласно уравнению (1), интернетизация системы здравоохранения и государственное финансирование здравоохранения в совокупности определяют состояние здоровья жителей на 59,03 %. F-тест данного уравнения пройден на уровне значимости 0,01, что подтверждает качество уравнения (1).

$$\text{Здр}_2 = 69,892 - 0,005\text{ИЗ}_1 + 0,067\text{ИЗ}_2 + 1,130\text{ФНЗ}. \quad (2)$$

Согласно уравнению (2), интернетизация системы здравоохранения и государственное финансирование здравоохранения в совокупности определяют доступность медицинских услуг на базе системы обязательного медицинского страхования на 54,87 %. F-тест данного уравнения пройден на уровне значимости 0,05, что подтверждает качество уравнения (2).

$$\text{Здр}_3 = 5,198 + 0,006\text{ИЗ}_1 + 0,011\text{ИЗ}_2 + 0,069\text{ФНЗ}. \quad (3)$$

Согласно уравнению (3), интернетизация системы здравоохранения и государственное финансирование здравоохранения в совокупности определяют воспринимаемое состояние здоровья как свое благополучие жителями на 47,81 %. F-тест данного уравнения пройден на уровне значимости 0,10, что подтверждает качество уравнения (3).

Уравнения (1)–(3) говорят о сильной положительной зависимости уровня развития здравоохранения от интернетизации системы здравоохранения, которая вносит не меньший вклад в повышение качества жизни, чем государственного финансирования здравоохранения. Так, увеличение доли населения, задействующего поисковые возможности Интернета по теме здравоохранения, на 1 % обеспечивает улучшение состояния здоровья жителей на 0,034 балла и улучшение воспринимаемого состояния здоровья как своего благополучия жителями на 0,006 балла.

Повышение доли населения, записывающегося к врачу через Интернет, на 1 % способствует улучшению состояния здоровья жителей на 0,275 балла, росту доступности медицинских услуг на базе системы обязательного медицинского страхования на 0,067 балла и улучшению воспринимаемого состояния здоровья как своего благополучия жителями на 0,011 балла.

При этом рост объема государственного финансирования здравоохранения на 1 % ВВП вызывает улучшение состояния здоровья жителей на 1,070 балла, рост доступности медицинских услуг на базе системы обязательного медицинского страхования на 1,130 балла и улучшение воспринимаемого состояния здоровья как своего благополучия жителями на 0,069 балла.

$$\begin{aligned} \text{ИЗ}_1 = & -156,687 + 0,338\text{ИМ}_1 - 0,075\text{ИМ}_2 + 2,043\text{ИМ}_3 + \\ & + 0,076\text{ИМ}_4 + 0,025\text{ИМ}_5. \end{aligned} \quad (4)$$

Согласно уравнению (4), рассмотренные факторы в совокупности определяют активность задействования потребителями поисковых возможностей Интернета для получения информации по теме здравоохранения на 58,41 %. F-тест данного уравнения пройден на уровне значимости 0,05, что подтверждает качество уравнения (4).

$$\begin{aligned} \text{ИЗ}_2 = & 4,536 + 0,307\text{ИМ}_1 - 0,157\text{ИМ}_2 + 0,103\text{ИМ}_3 + \\ & + 0,132\text{ИМ}_4 + 0,274\text{ИМ}_5. \end{aligned} \quad (5)$$

Согласно уравнению (5), рассмотренные факторы в совокупности определяют активность задействования потребителями поисковых возможностей Интернета для записи к врачу на 49,47 %. F-тест данного уравнения пройден на уровне значимости 0,20, что подтверждает качество уравнения (5).

Уравнения (4) и (5) говорят о том, что повышение доли населения, владеющего навыками использования ИКТ на 1 %, увеличивает активность задействования потребителями поисковых возможностей Интернета для получения информации по теме здравоохранения на 0,338 % и для записи к врачу — на 0,307 %.

Увеличение охвата хозяйствующих субъектов мобильным (3G/4G) Интернетом на 1 % повышает активность задействования потребителями поисковых возможностей Интернета для получения информации по теме здравоохранения на 2,043 % и для записи к врачу — на 0,103 %. Нарастание инвестиций в телекоммуникации на 1 % ВВП обеспечивает рост активности задействования потребителями поисковых возможностей Интернета для получения информации по теме здравоохранения на 0,076 % и для записи к врачу — на 0,132 %.

Повышение национального финансирования импортозамещения и развития российского компьютерного программного обеспечения на 1 % ВВП вы-

зывает увеличение активности задействования потребителями поисковых возможностей Интернета для получения информации по теме здравоохранения на 0,025 % и для записи к врачу — на 0,274 %. При этом рост распространенности в социально-экономической системе стационарного высокоскоростного Интернета не способствует интернетизации здравоохранения.

Перспектива повышения качества жизни в России через развитие интернет-маркетинга в здравоохранении

В результате решения третьей задачи этого исследования с опорой на установленные регрессионные зависимости (1)–(5) симплекс-методом подобрано такое сочетание факторов ИМ₁₋₅, при котором достигается полная интернетизация системы здравоохранения в России (рис. 2).

С ориентацией на данные (рис. 2) для наиболее полного раскрытия потенциала интернет-маркетинга в российской системе здравоохранения предлагаются следующие рекомендации:

- повышение доли населения, владеющего навыками использования ИКТ, в 5,24 раза (с 19,10 % в 2025 г. до 100 %);
- увеличение охвата хозяйствующих субъектов мобильным (3G/4G) Интернетом в 1,07 раза (с 93,30 % в 2025 г. до 100 %);
- наращивание инвестиций в телекоммуникации в 11,95 раз (с 24,20 % ВВП в 2025 г. до 289,14 % ВВП);
- увеличение национального финансирования импортозамещения и развития отечественного компьютерного программного обеспечения в 4,49 раза (с 18,90 % ВВП в 2025 г. до 84,92 % ВВП).



Рис. 2. Оптимальное сочетание факторов интернетизации системы здравоохранения в России

Источник: рассчитано и построено Н.В. Пржедецкой, Ю.В. Пржедецким.

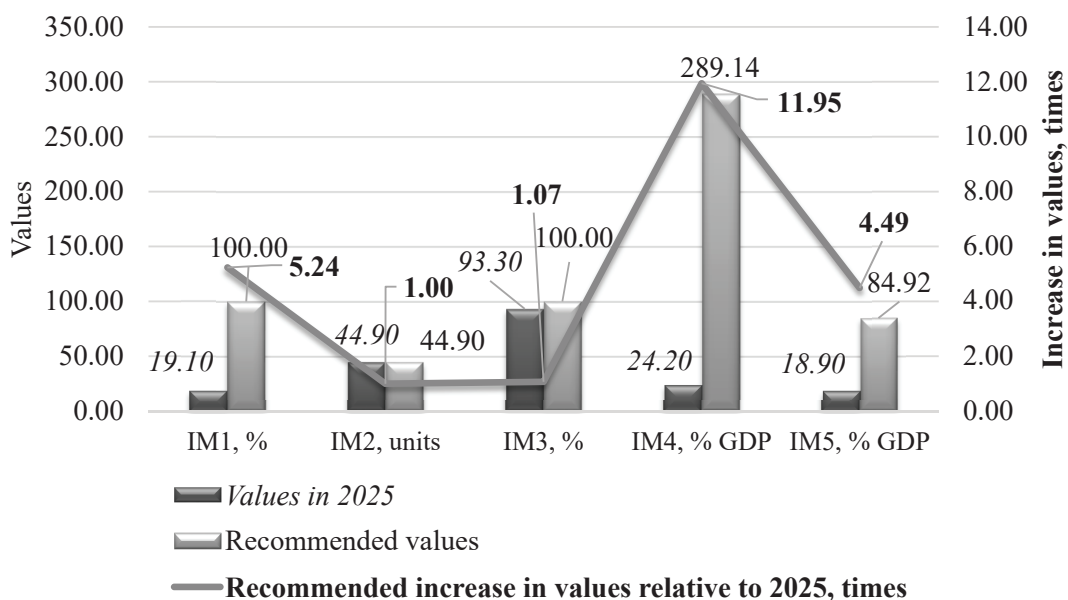


Figure 2. Optimal combination of factors for internetization of the healthcare system in Russia
Source: calculated and constructed by N.V. Przhedetskaya, Y.V. Przhedetsky.

При этом для развития интернет-маркетинга в здравоохранении не требуется рост распространенности в социально-экономической системе стационарного высокоскоростного Интернета, который может быть сохранен в России на уровне 2025 г. (44,90 ед. на 1 тыс. чел. населения). Прогнозируемые последствия интернетизации здравоохранения в соответствии с авторскими рекомендациями для качества жизни в России показаны на рис. 3.

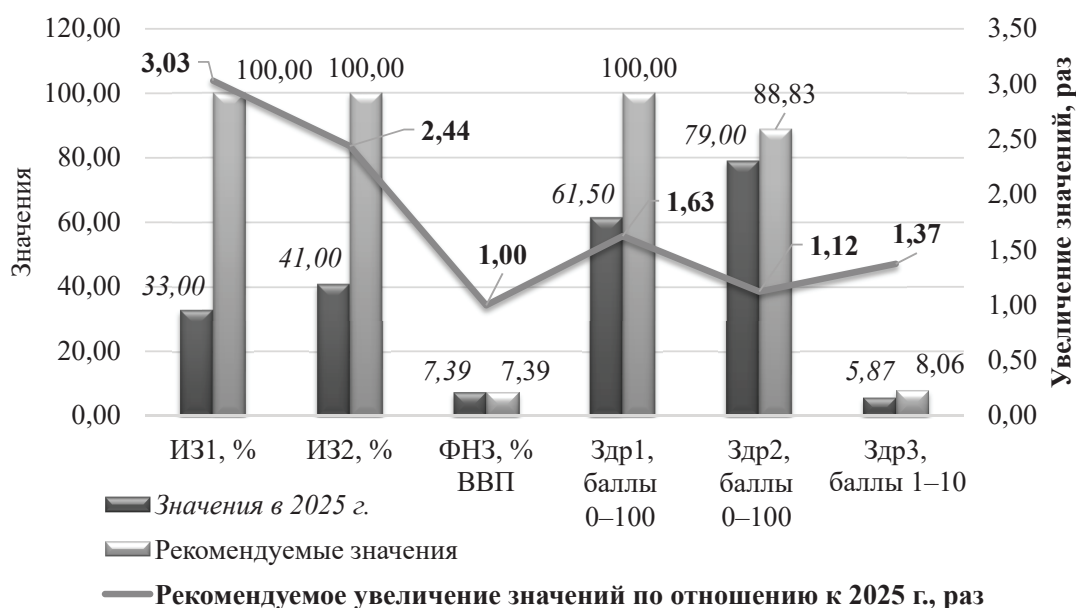


Рис. 3. Прогноз последствий интернетизации здравоохранения для его развития и качества жизни в России
Источник: рассчитано и построено Н.В. Пржедецкой, Ю.В. Пржедецким.

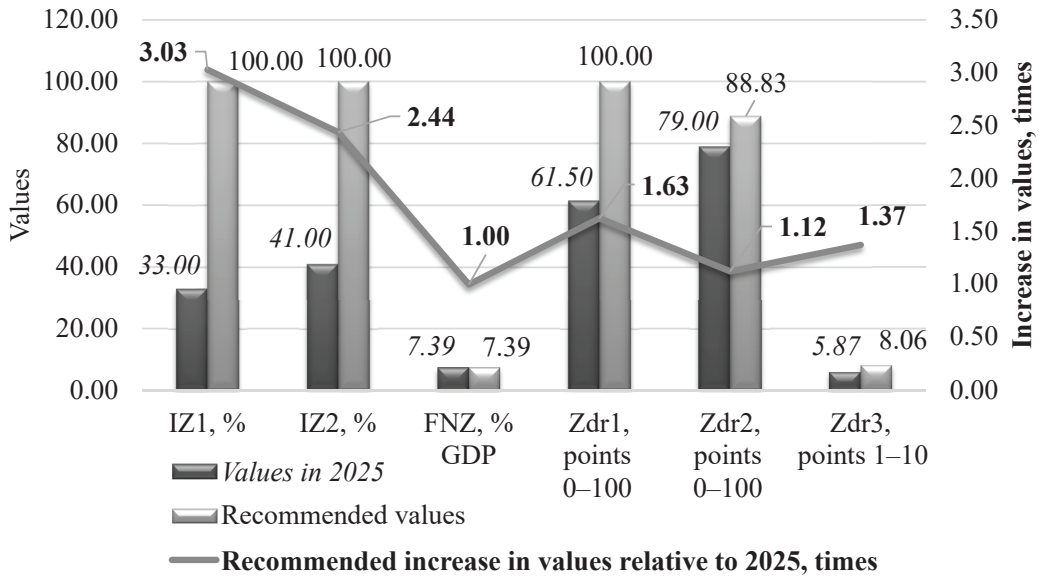


Figure 3. Forecast of the consequences of the Internetization of healthcare for its development and quality of life in Russia

Source: calculated and constructed by N.V. Przhedetskaya, Y.V. Przhedetsky.

Проиллюстрированный (см. рис. 3) прогноз свидетельствует о том, что развитие интернет-маркетинга в здравоохранении открывает широкую перспективу повышения качества жизни в России. В частности, благодаря оптимизации факторов интернетизации системы здравоохранения в России прогнозируются следующие преимущества для качества жизни:

- увеличение доли населения, задействующего поисковые возможности Интернета по теме здравоохранения, в 3,03 раза (с 33 % в 2025 г. до 100 %);
- повышение доли населения, записывающегося к врачу через Интернет, в 2,44 раза (с 41 % в 2025 г. до 100 %);
- улучшение состояния здоровья жителей в 1,63 раза (с 61,50 баллов в 2025 г. до 100 баллов);
- рост доступности медицинских услуг на базе системы обязательного медицинского страхования в 1,12 раз (с 79,00 баллов в 2025 г. до 88,83 баллов);
- улучшение воспринимаемого состояния здоровья как своего благополучия жителями в 1,37 раза (с 5,87 баллов в 2025 г. до 8,06 баллов).

Важно заметить, что перечисленные преимущества по прогнозу достигаются при сохранении объема государственного финансирования здравоохранения на уровне 2025 г. (7,39 % ВВП).

Переосмысление маркетингового подхода к развитию здравоохранения для повышения качества жизни

Полученные результаты дополняют предшествующие исследования (Александрова, Маслюкова, Юткина, 2024; Богдан и др., 2024; Морозова, 2023) и развивают концепцию здравоохранения как компонента качества жизни.

ни, уточняя с опорой на новейший и передовой международный опыт научно-теоретическое видение интернет-маркетинга в здравоохранении и его вклада в качество жизни. Маркетинговый подход к развитию здравоохранения для повышения качества жизни переосмыслен (табл. 3) с учетом новых результатов, полученных в нашем исследовании.

Таблица 3

Переосмысление маркетингового подхода к развитию здравоохранения

Области сопоставления подходов	Подход к развитию здравоохранения для повышения качества жизни	
	Существующий подход	Предлагаемый новый подход
Роль маркетинга в здравоохранении для повышения качества жизни	Второстепенная при первостепенной роли государственного финансирования здравоохранения для повышения качества жизни (Домнич, 2023; Солонец, 2023)	Первостепенная при равнозначности государственного финансирования здравоохранения и его маркетингизации для повышения качества жизни
Способ маркетингизации здравоохранения	Классический некоммерческий маркетинг (Конюшков, Власова, 2024; Sozinova, Popkova, 2023)	Интернет-маркетинг в здравоохранении (Воронкова, Воронков, 2023; Вошев et al., 2023)
Инструменты развития интернет-маркетинга в системе здравоохранения	Повышение доли населения, владеющего навыками использования ИКТ (Клейнер, 2024)	Подтверждено
	Рост распространенности в социально-экономической системе стационарного высокоскоростного Интернета (Капогузов, Шерешева, 2024)	Опровергнуто
	Увеличение охвата хозяйствующих субъектов мобильным (3G/4G) Интернетом (Евстратов, Бережнова, 2014)	Подтверждено
	Наращивание инвестиций в телекоммуникации (Морозова, Сметанина, Сметанин, 2024)	Подтверждено
	Увеличение национального финансирования импортозамещения и развития отечественного компьютерного программного обеспечения (Доан, Крестьянинова, Плотников, 2023)	Подтверждено

Источник: разработано и составлено Н.В. Пржедецкой, Ю.В. Пржедецким.

Table 3

**Rethinking the marketing approach to healthcare development
using the new findings of this article**

Areas of comparison of approaches	An approach to healthcare development to improve the quality of life	
	Existing approach	Proposed new approach
The role of marketing in healthcare to improve the quality of life	Secondary with the primary role of public funding of healthcare to improve the quality of life (Domnich, 2023; Solonets, 2023)	Primary with the equivalence of public funding of healthcare and its marketization to improve the quality of life
Method of healthcare marketization	Classical non-profit marketing (Konyushkov, Vlasova, 2024; Sozinova, Popkova, 2023)	Internet marketing in healthcare (Voronkova, Voronkov, 2023; Voshev et al., 2023)
Tools for the development of internet marketing in the healthcare system	Increasing the share of the population with ICT skills (Kleiner, 2024)	Confirmed
	Increasing the prevalence of fixed high- speed Internet in the socio-economic system (Kapoguzov, Sheresheva, 2024)	Disproved
	Increasing the coverage of business entities with mobile (3G/4G) Internet (Evstratov, Berezhnova, 2014)	Confirmed
	Increasing investment in telecommunications (Morozova, Smetanina, Smetanin, 2024)	Confirmed
	Increasing national funding for import substitution and development of domestic computer software (Doan, Krestyaninova, Plotnikov, 2023)	Confirmed

Source: developed and compiled by N.V. Przhedetskaya, Y.V. Przhedetsky.

Как отмечено в табл. 3, в предлагаемом новом подходе к развитию здравоохранения для повышения качества жизни в отличие от (Домнич, 2023; Солонец, 2023) маркетингу отводится не второстепенная, а первостепенная роль при равнозначности государственного финансирования здравоохранения и его маркетингизации для повышения качества жизни.

В противоположность (Конюшков, Власова, 2024; Sozinova, Popkova, 2023) в новом подходе к развитию здравоохранения для повышения качества жизни в качестве способа маркетингизации здравоохранения предлагается использовать не классический некоммерческий маркетинг, а интернет-маркетинг в здравоохранении (в продолжение Воронкова, Воронков, 2023; Вошев et al., 2023).

В разработанном подходе к развитию здравоохранения для повышения качества жизни также уточнен набор инструментов развития интернет-маркетинга в системе здравоохранения. Подтверждена важность и значимость таких инструментов, как повышение доли населения, владеющего навыками

использования ИКТ в поддержку (Клейнер, 2024), увеличение охвата хозяйствующих субъектов мобильным (3G/4G) Интернетом (в поддержку (Евстратов, Бережнова, 2014), наращение инвестиций в телекоммуникации (в поддержку Морозова, Сметанина, Сметанин, 2024), а также увеличение национального финансирования импортозамещения и развития отечественного компьютерного программного обеспечения (в поддержку Доан, Крестьянинова, Плотников, 2023). Однако, в отличие от (Капогузов, Шерешева, 2024) опровергнута необходимость роста распространенности в социально-экономической системе стационарного высокоскоростного Интернета для развития Интернет-маркетинга в здравоохранении.

Заключение

По итогам проведенного исследования в этой статье получены следующие результаты. Во-первых, произведена оценка качества жизни в современной России с позиций здравоохранения и его интернет-маркетинга в 2025 г., выявившая общую значительную интернетизацию системы здравоохранения в России, но наличие потенциала его дальнейшего повышения для достижения уровня других ведущих и передовых стран.

Во-вторых, с опорой на передовой международный опыт, воплощенный в официальной статистике за 2025 г., составлена эмпирическая модель повышения качества жизни по мере развития интернет-маркетинга в здравоохранении. Полученная модель предоставила ответы на оба поставленных в этой статье исследовательских вопроса и обеспечила переосмысление маркетингового подхода к развитию здравоохранения для повышения качества жизни, в чем состоит теоретическая значимость результатов этой статьи.

Модель уточнила последствия для здравоохранения как компонента качества жизни, к которым приводит его интернетизация — улучшение состояния здоровья жителей, рост доступности медицинских услуг на базе системы обязательного медицинского страхования и улучшение восприятия жителями состояния здоровья как своего благополучия, что послужило ответом на первый исследовательский вопрос.

Модель также объяснила влияние различных факторов интернетизации общества и экономики на систему здравоохранения, что стало ответом на второй исследовательский вопрос. Модель раскрыла позитивное влияние на интернетизацию здравоохранения таких факторов, как повышение доли населения, владеющего навыками использования ИКТ, увеличение охвата хозяйствующих субъектов мобильным (3G/4G) Интернетом, наращение инвестиций в телекоммуникации и увеличение национального финансирования импортозамещения и развития российского компьютерного программного обеспечения и исключила из перечня значимых факторов рост распространенности в социально-экономической системе стационарного высокоскоростного Интернета.

Итоговый вывод, основанный на результатах проведенного исследования, состоит в том, что для наиболее полной реализации потенциала здравоохра-

нения в области повышения качества жизни необходимо развитие интернет-маркетинга в отрасли. С учетом этого вывода предложен новый подход к развитию здравоохранения для повышения качества жизни, опирающийся на интернет-маркетинг. Преимуществом нового подхода является системность маркетинга и интернетизации в здравоохранении, а также улучшенная координация рыночных и цифровых реформ в российской системе здравоохранения.

В результате обобщения передового международного опыта осуществления практик интернет-маркетинга в здравоохранении выявлена перспектива адаптации этих практик к специфике и современным потребностям социально-экономической системы России для повышения качества жизни в ней. Предложено оптимальное сочетание факторов интернетизации общества и экономики и разработаны рекомендации для раскрытия потенциала интернет-маркетинга в системе здравоохранения в России, а также составлен прогноз последствий интернетизации здравоохранения для его развития и качества жизни в России.

Практическая значимость авторских предложений состоит в том, что их внедрение позволит сократить нагрузку на государственный бюджет, связанную с финансированием здравоохранения, повысить качество и доступность медицинских услуг в России, а также повысить эффективность реализации государственной программы развития здравоохранения в России до 2030–2036 гг.

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ИННОВАЦИИ В СОВРЕМЕННОЙ ЭКОНОМИКЕ

INNOVATIONS IN THE MODERN ECONOMY

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The technological product platforms and industrial ecosystems development based on the innovative solutions potential

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Abstract. The relevance of the topic is related to the need to develop technological product platforms (hereinafter CCI) and industrial ecosystems (hereinafter PE), based on the transformation of cardinal innovative solutions using digital technologies to ensure the creation of highly competitive products developed and manufactured to replace analogues previously imported due to high sanctions pressure. The development of CCI and PE requires the development and creation of economic tools for transforming the potentials of innovative solutions for the mechanism of managing the transition of an organization to a position of technological leadership through the production and commercialization of radically new products. The research objectives include analyzing existing approaches to transformation and identifying their main types in industrial ecosystems, developing recommendations for managing the organization's transition to a position of technological leadership through the production and commercialization of radically new products. The purpose of this research is to study the role and effectiveness of digital technologies in the processes of transformation into industrial platforms and ecosystems as part of strategies for transforming the potential of innovative solutions. It is assumed that an integrated approach can significantly increase the company's competitiveness in the international market and accelerate the growth of its economic performance. The research methods are content analysis of sources and economic and mathematical modeling of network multilateral effects of platforms. As a result, the effects of industrial platforms and ecosystems were studied, and a mechanism for the development of an organization based on a platform approach was formed.

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Keywords: technology platforms, industrial ecosystems, innovations, digitalization of production, product lifecycle management

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Развитие технологических продуктовых платформ и промышленных экосистем на основе потенциала инновационных решений

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Аннотация. Актуальность темы связана с необходимостью развития технологических продуктовых платформ (ТПП) и промышленных экосистем (ПЭ), основанных на трансформации кардинальных инновационных решений с использованием цифровых технологий для создания высококонкурентных продуктов, разрабатываемых и производимых взамен ранее импортируемых аналогов из-за высокого санкционного давления. Развитие ТПП и ПЭ требует разработки и создания экономических инструментов для преобразования потенциала инновационных решений в механизм управления переходом организации к позиции технологического лидерства посредством производства и коммерциализации радикально новых продуктов. В задачи исследования входит анализ существующих подходов к трансформации и выявление их основных типов в промышленных экосистемах, разработка рекомендаций по управлению обозначенным переходом. Цель исследования — изучить роль и эффективность цифровых технологий в процессах трансформации в промышленные платформы и экосистемы в рамках стратегий преобразования потенциала инновационных решений. Предположено, что комплексный подход может значительно повысить конкурентоспособность компании на международном рынке и ускорить рост ее экономических показателей. В исследовании применены метод контент-анализа источников и экономико-математическое моделирование сетевых многосторонних эффектов платформ. Изучено влияние промышленных платформ и экосистем и сформирован механизм развития организации, основанный на платформенном подходе.

Ключевые слова: технологические платформы, промышленные экосистемы, инновации, цифровизация производства, управление жизненным циклом продукции

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Introduction

In the modern economy, especially in the context of geopolitical and sanctions pressure, strategic alliances and innovation networks play a key role in creating a synergistic effect for high-tech production (Drogovoz et al., 2021; Chursin et al., 2017). These aspects contribute to strengthening cross-industry innovation, optimizing resources and expanding market opportunities, which contributes not only to technological progress, but also to economic sustainability in difficult conditions.

The global competitiveness of an industrial company can be defined as a multifactorial state of the organization's potentials, which allows the company not only to produce "traditional" goods, but also to make a breakthrough in the creation of innovative technologies, products and solutions. This condition implies that the company has a set of necessary resources and conditions for the introduction of advanced scientific and technical achievements (Plakhin, Tkachenko, Evseeva, 2020).

Considering this provision in more detail, it becomes clear that it includes not only the development of unique technologies, but also the organization of their production at a new qualitative level, as well as the development of unique technological competencies, which requires in-depth research and development, the use of advanced engineering thinking and the integration of advanced technical solutions.

In practice, global technological competitiveness is manifested in the ability of an industrial company to quickly adapt to changes in the technological landscape and transform these changes into long-term competitive advantages.

It is important to note that maintaining a high level of innovation processes requires significant investments in research and development, as well as in the creation of strong research teams, engineering groups, and the formation of strategic alliances with educational and research institutions, as well as more complex network forms of cooperation in the field of innovation, in the form of technological product platforms and industrial ecosystems.

The use of technology platforms allows companies to standardize certain aspects of production processes and components, which simplifies the development

of new products. This not only reduces development costs and time, but also facilitates the integration of innovations, since different products can use a common base of technologies and components. Industrial ecosystems include the interaction of various participants — manufacturers, suppliers, consumers, scientific and educational institutions — aimed at the joint creation and development of new products, services and technologies. They can be formed on the basis of a specific technology or market and include various types of cooperation, from rigid integration to more open network structures (Abrosimova, Klimova, 2020).

Strategic alliances improve access to new technologies and knowledge, technology platforms standardize developments, increasing their effectiveness, while industrial ecosystems create conditions for cooperation between various market actors.

Thus, strategic alliances, technology platforms and industrial ecosystems create a synergistic effect that significantly accelerates the process of innovative developments, contributes to a more efficient and economically justified introduction of new technologies, and strengthens the global competitiveness of companies.

Thus, the global competitiveness of an industrial company is a combination of different types of potentials, which allows the company not only to adapt to current market requirements, but also to form new directions of market development, creating products with high technical and economic characteristics to achieve competitive leadership (Tyulin, Chursin, 2017; Chursin, Makarov, 2015; Chursin, Vlasov, Makarov, 2016; Chursin et al., 2024).

Relevance, problem and hypothesis of the study

With the advent of platform solutions and technologies, companies have the opportunity to effectively expand their innovation areas, improve productivity and competitiveness. Platform technologies offer a unique basis for the creation and launch of new products and services, which makes them a tool for transforming the potentials of innovative solutions.

According to IDC¹, Global spending on digital transformation is expected to reach \$2.3 trillion by 2023.

Digitalization of industry includes the use of technologies to diversify innovations such as:

1. Artificial intelligence and machine learning that can analyze big data to identify new innovation opportunities and optimize existing processes. AI is able to analyze data many times faster than a human, which allows you to save up to 30–50% of the time for data processing and decision-making in production. According to McKinse² using of AI can reduce production downtime by 20–50%.

¹ International Data Corporation. (n.d.). Worldwide Digital Transformation Spending Guide. IDC. Retrieved 16 April 2024, from https://www.idc.com/getdoc.jsp?containerId=IDC_P32575

² McKinsey & Company. (n.d.). McKinsey technology trends outlook 2023. Retrieved 16 April 2024, from <https://www.mckinsey.com/capabilities/mckinsey-digital/our-insights/the-top-trends-in-tech>

According to the PwC report³, Global GDP could grow by 14% by 2030 thanks to AI, which is equivalent to a \$15.7 trillion increase in economic value.

2. Blockchain: Provides opportunities to create transparent, secure and immutable data storage systems. In the logistics sector, the use of blockchain can reduce supply chain costs by 20%, thereby improving product transparency and traceability. Experts note⁴, that blockchain can reduce data loss by 55–65% by increasing the level of security and data integrity.

According to forecasts, the blockchain technology market will reach \$39.7 billion by 2025, which shows the high interest in this technology in the industry.

3. Internet of Things (IoT): Integrates physical objects with digital platforms to create intelligent control and monitoring systems. The introduction of It in production allows you to reduce operating costs by 30%, while increasing productivity by 25%. IoT also speeds up the decision-making process by 36%, due to real sensor data and fast analysis.

According to Gartner, there will be over 43 billion connected IoT devices by 2023. The Industrial Internet of Things (IIoT) sector is growing with an expected growth to \$110.6 billion by 2025, according to information from MarketsandMarkets⁵.

4. Cloud technologies (Cloud tech): provide flexibility and scalability of resources, simplifying the process of innovation of various business models. Cloud technologies make it possible to reduce initial investments in IT infrastructure by 40–50%. With the ability to scale, cloud solutions offer a 50–70% increase in efficiency for business processes.

As the report shows Forrester⁶, Global public cloud spending reached \$175 billion in 2021 and is projected to rise to \$350 billion by 2022. According to the report IDC⁷, worldwide spending on cloud computing will reach \$1 trillion by 2023.

These tools are not only capable of improving the efficiency of production and operational processes, but also provide unprecedented opportunities to personalize products and services to the specific needs of the end user, as well as the development of radically new products. The role of these technologies in analyzing large amounts of data to predict market trends and changes in consumer preferences should be emphasized. The above data confirm the scale, dynamism and, most importantly, the economic development of digital technologies and the processes of “platformization”.

³ PwC. (n.d.). PwC's global artificial intelligence study. Retrieved 16 April 2024, from <https://www.pwc.com/gx/en/issues/data-and-analytics/publications/artificial-intelligence-study.html>

⁴ Yaga, D., Bark, J., & Scarfone, K. (2018). Blockchain technology overview (NIST Interagency Report 8202). National Institute of Standards and Technology. Retrieved 16 April 2024, from <https://csrc.nist.gov/external/nvlpubs.nist.gov/nistpubs/ir/2018/NIST.IR.8202.pdf>

⁵ MarketsandMarkets. (n.d.). Internet of things (IoT) in retail market size & forecast. Retrieved 16 April 2024, from <https://www.marketsandmarkets.com/Market-Reports/retail-iot-market-43188550.html>

⁶ Forrester Research. (n.d.). Gain insights that accelerate growth with Forrester research. Retrieved 16 April 2024, from <https://www.forrester.com/research/>

⁷ IDC. (2025). Digital transformation in manufacturing: Why integrated business planning is key. Board International. Retrieved 16 April 2024, from <https://www.board.com/en/analyst-report/idc-digital-transformation-manufacturing>

The purpose of this study is to explore the role and effectiveness of digital technologies in the processes of transformation into industrial platforms and ecosystems within the framework of strategies for transforming the potentials of innovative solutions. The work is aimed at analyzing current practices, identifying key advantages and limitations, as well as developing recommendations for the implementation and optimization of digital tools to increase the sustainability of industrial ecosystems (Kulapov, Pereverzeva, Kirillova, 2022).

The transformation of traditional industrial companies into platforms and ecosystems, leading to the ability to use strategic opportunities to transform the potentials of innovative solutions, is an extremely relevant issue in the modern economy (Markova, Kuznetsova, 2021). Globalization, increased international competition, accelerated technology transfer and changes in consumer preferences require industrial enterprises to be flexible, innovative and able to quickly adapt to changing market conditions. Transformation into ecosystems allows companies not only to integrate effectively into the digital economy, but also to expand their sphere of influence, strengthening innovation processes and creating new market niches (Gutenev, Shiboldenkov, 2024; Kashevarova, Panova, 2023; Kashevarova, Shiboldenkov, 2020). Significant difficulties in the process of transforming traditional industry into platform solutions and ecosystems include a number of key issues: resistance to change on the part of managers and employees, the need for significant investments in technological infrastructure, risks associated with data security, as well as the need for new competencies and knowledge. An additional difficulty is the process of integrating old and new systems, which can lead to temporary performance losses. There is also a problem of legislative regulation of innovations, which often does not keep pace with technological development (Shiboldenkov, 2024; Shiboldenkov, 2022).

The hypothesis of this study is that in the context of the development of the above-mentioned tools, the implementation of this will solve the issues of increasing the efficiency and successful development of the “platformization” of industrial enterprises into innovative platforms and ecosystems depends not only on investments in technology, but also on a strategic change in organizational culture, management tactics and the involvement of all stakeholders in the process of innovation. It is assumed that an integrated approach to transforming the potentials of innovative solutions, combining the development of new products, process optimization and the creation of new business models within the framework of the created ecosystems, can significantly strengthen the competitiveness of the company in the international market and accelerate the growth of its economic indicators.

The basics of the platform approach

Research and management of innovative potential (scientific and technological potential and unique technological competencies) plays a key role in the formation of radically new products and technologies for their production. The potential of a business in a broad sense is a set of resources that determine the functioning

of an organization, depending on the conditions. In various aspects of activity, it is possible to distinguish between financial and economic, scientific and technical, industrial and technological, commercial and other types of potential.

Product potentials based on innovative solutions are closely related to the concept of innovative potential, which is based on a set of scientific and technical resources, including accumulated knowledge, material and technical base, information and financial resources, as well as organizational structure. It ensures the development and implementation of new technologies, products and methods of production organization that enhance competitiveness and production efficiency.

Potential management includes the implementation of impacts aimed at increasing it and transforming it into competitive advantages at various stages of the production cycle, which makes it possible to quickly and effectively respond to changes in the external environment and the dynamic development of competitors (Gorlacheva, Shiboldenkov, Gertsik, 2024; Gorlacheva et al., 2025).

To effectively manage this potential and its role in creating the advantages of new products, it is advisable to develop a specialized algorithm that will allow you to organize the processes of accumulation and transformation of potential in accordance with the development of the organization and market conditions (Figure 1). This will become the basis for solving strategic tasks to ensure sustainable development and productive innovation activities of the company.

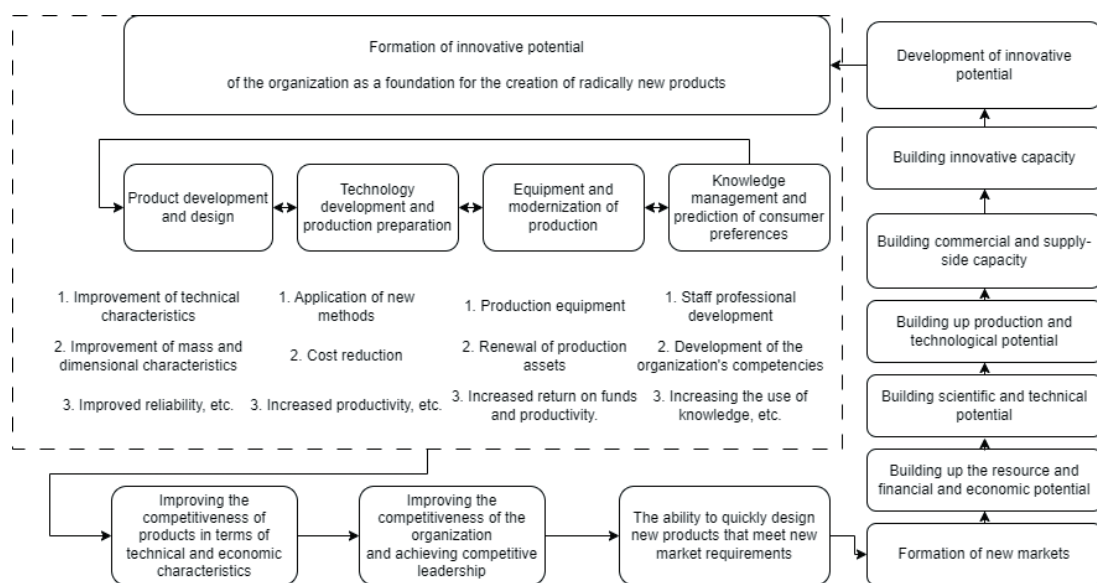


Figure 1. The process of converting product potentials based on innovative solutions of the organization into competitive advantages

Source: developed by A.A. Chursin, V.A. Shiboldenkov, A.V. Gutenev.

Platform-based approaches and business models are becoming increasingly popular in the modern economy as they offer effective ways to create value and scale up a business. They also help to increase the level of innovation and improve customer interaction.

Platform business models are business strategies based on the creation and operation of platforms that connect different user groups such as sellers and buyers, developers and end users.

Table 1

Conceptual framework of the platform approach^{8,9}

Characteristics	Platform	Ecosystem	Superapp
Definition	A business model that creates a base for interaction between various users and services	A set of interconnected services, products, and organizations operating in a specific domain	A mobile application that combines multiple functions and services, enabling users to perform various tasks without leaving the app
Objective	Providing a structure for interaction among participants and promoting the creation of network effects	Creating value through synergy among ecosystem participants	User convenience by integrating multiple functions into one interface
Examples	Amazon (commerce), Airbnb (accommodation), Uber (transportation)	Apple or Android ecosystems, including devices, OS, applications, and services	WeChat (China), offering services from messaging to payments
Key Functions	Connecting various types of users (buyers, sellers), facilitating transactions	Supporting innovation, resource sharing, product/service integration	Performing various actions within a single app (e.g., chat, payments, food orders, taxis)
Interaction	Multiple (many-to-many), typically through the platform	Multidimensional, including various levels of relationships (within company, between companies, with customers)	Unidirectional (user to services within the app)
Market Significance	Expanding market opportunities, achieving economies of scale	Long-term growth through innovation and sustainable relationships	Increasing convenience and reducing time spent on various operations

Source: developed by A.A. Chursin, V.A. Shiboldenkov, A.V. Gutenev.

⁸ Central Bank of the Russian Federation. (2021). Ecosystems: Approaches to regulation: Report for public consultations. Moscow. Retrieved April 16, 2024, from https://cbr.ru/Content/Document/File/119960/Consultation_Paper_02042021.pdf

⁹ Ministry of Economic Development of the Russian Federation. (2021). The concept of general regulation of the activities of groups of companies developing various digital services based on a single “ecosystem”. Retrieved April 16, 2024, from https://www.economy.gov.ru/material/file/cb29a7d08290120645a871be41599850/koncepciya_21052021.pdf

Table 1 presents a comparison of the main aspects of platforms, ecosystems and supercaps, illustrating how they differ from each other in definition, purpose, use cases, as well as functionality and marketing significance.

The basic architecture features of platform solutions cover interoperability and integration: components must seamlessly exchange data and functions, unifying business processes and ensuring the integrity of services. Scalability and modularity are critical, allowing you to safely and predictably increase load and functionality without degrading performance and without interfering with the core. Security and confidentiality, regulatory compliance, and resilience to change are essential while maintaining a high level of convenience and openness to collaboration.

The Nelson-Phelps model is a tool for analyzing technological progress and its impact on economic growth. This model is focused on assessing the speed of adaptation of new technologies in various economies and considers learning as a key factor in the spread of technology (Drogovoz, Kashevarova, Starikova, 2024).

This model becomes especially relevant in the context of the development of a technology platform in business structures, as it allows you to assess how quickly an organization can innovate and adapt to changes in the technological landscape, which directly affects its competitiveness and efficiency.

Below is a generalized formula that takes into account the key aspects of the Nelson — Phelps model

$$\Delta A(t) = \left(\gamma \cdot \frac{H(t)}{A(t)} + \alpha \cdot E(t) + \beta \cdot C(t) \right) [A^*(t) - A(t)], \quad (1)$$

where $\Delta A(t)$ — is the change in the technology level at the time t ; γ — is a coefficient reflecting the basic efficiency of the technology development process, depending on the level of knowledge and technological readiness; $H(t)$ — is the level of human capital (education, training) at a time t ; $A(t)$ — is the current level of technology; $A^*(t)$ — is the advanced level of technology available for mastering; α — is a coefficient reflecting the impact of investments in education and development; $E(t)$ — the level of investment in education and staff development; β — is a coefficient that takes into account integration with the external environment and infrastructural support; $C(t)$ — is the level of cooperation in technology alliances, networks and platforms.

Using the Nelson — Phelps model, it is possible to plan your strategic steps for the development of a technology platform, identify key areas for investment and improve the adaptation of new technologies, which, in turn, allows you not only to improve internal processes, but also to respond to changes in the market environment more flexibly and quickly, thereby ensuring sustainable growth and development organizations. In order to expand the model, which adds a change in the level of technology that increases the competitiveness function of products (Gorlacheva et al., 2025), you can introduce the function $K(t)$, which will reflect the

competitiveness of products at a time. This function may depend not only on the current level of technology, but also on other variables such as product quality (including novelty and innovativeness), market reaction (including economic efficiency) of the application of these technologies. Let's include these factors in the equation as follows

$$K(t) = \vartheta \cdot (A(t))' + \lambda \cdot Q(t) + \mu \cdot R(t), \quad (2)$$

where ϑ , δ , λ , μ — are the parameters determining the degree of influence of the corresponding variables on competitiveness; $Q(t)$ — product quality; $R(t)$ — is the market reaction (demand, customer preferences, etc.).

A change in the technology level $\Delta A(t)$ will affect not only the function $A(t)$ itself, but also, as a result, will change $K(t)$, since technology improvement directly affects the quality and innovative characteristics of the product, making it more attractive to the market.

Thus, the updated general formula will represent the system of equations of systems (1) and (2).

Such a model allows you to visually see the complex interaction between the level of technology and the competitiveness of products, emphasizing the importance of innovation in the modern economy.

In today's competitive environment, technology platforms serve not only as the basis for creating products, but also as the foundation for the development of ecosystems that are based on the relationship between various actors: developers, suppliers, sellers and end users. It is through such platforms that it is possible to ensure not only process optimization, but also rapid adaptation to changing market requirements, which is a key aspect in achieving and maintaining high competitiveness.

Platform solutions and technologies play an important role in the process of transforming the potentials of innovative solutions. They help companies accelerate the development and implementation of new products, as well as improve interaction within the company and with the external environment (Drogovoz, Kashevarova, Starikova, 2024; Shiboldenkov, Podrezov, 2023; Ryzhkova, 2019). These platforms provide the necessary flexibility and resilience that are critical for successful adaptation in an ever-changing market (Table 2).

Innovative platforms are modern tools designed to stimulate and manage the process of creating new technologies, services and products. They function as an environment where diverse participants (startups, large enterprises, scientists, investors) can work together to develop and adapt innovations. It is possible to give such a definition to an innovative platform: It is an organizational and technological environment that ensures the interaction of various stakeholders in order to jointly develop, test and distribute innovative solutions. Platforms provide tools and resources for collaborative work, as well as mechanisms for commercializing the results of innovations (Denisov et al., 2020).

Table 2

Aspects of effects in platform interaction				
№	Aspect	Description	Mechanism	Effect
1	Network Effect	Each new user's connection increases the overall value of the platform for all participants	The more users, the richer the social networks	The platform becomes more attractive and useful for new participants, contributing to its exponential growth.
2	Multisided Market	The platform connects two or more user groups (e.g., buyers and sellers)	Increasing demand and supply on different sides of the platform	The more participants, the more balanced the markets and the higher the likelihood of transactions
3	Positive Feedback Effect	Interaction among platform participants increases its attractiveness, attracting even more participants and interactions	The more participants and interactions, the higher the value of each subsequent connection	The platform gains strength and dominance in its market segment through constant growth and improved functionality
4	Zero Marginal Cost Effect	As the platform expands, the marginal cost to attract new participants tends toward zero	Platform expansion occurs with minimal additional costs	This leads to high scalability and the ability to expand without substantial additional expenses
5	Lock-in Effect	Joining the platform becomes so beneficial that users do not want to switch to alternative platforms	The more integrations and services, the harder it is for users to switch platforms	The platform retains user loyalty for the long term, reducing the risk of churn and loss
6	Data and AI Effect	Platforms collect vast amounts of data used to improve service through artificial intelligence and machine learning	Data helps enhance algorithms and provide more personalized services	The platform becomes "smarter" and can offer higher quality and more tailored services to its users
7	Externalities	The platform triggers external effects that positively (or negatively) impact other companies and ecosystems	Creating additional opportunities for businesses and the economy as a whole	The platform becomes a central element of a broader ecosystem, thereby enhancing its significance and resilience
8	Gap-Filling Effect	The platform can identify and fill new market niches and needs that were previously unmet	Quick adaptation and expansion of service offerings	The platform remains innovative and competitive, attracting the attention of new user segments
9	Transaction Efficiency	Simplification and acceleration of transactions through new technologies and processes	Fast and reliable transactions provide trust and convenience for users	The platform delivers seamless and efficient services, increasing its attractiveness to users and partners
10	Economies of Scale	The platform's growth leads to a reduction in per-unit production or service cost	Increased production volume reduces average costs	The platform can offer more competitive prices and terms to its users

Source: developed by A.A. Chursin, V.A. Shiboldenkov, A.V. Gutenev.

Platform solutions for creating radically new products include the use of advanced technologies that allow you to process a large amount of information and generate innovative ideas. These platforms contribute to:

1. Integration between different industries and knowledge, which opens up access to new methods and approaches in product development.
2. Reduce development time and costs by sharing resources and knowledge.
3. Increase flexibility and adaptability to changing market conditions through quick access to innovative solutions and technologies.

Platform development approaches make it possible not only to create cost-effective, but also qualitatively new products that can radically change the market landscape and meet the changing needs of end users.

Network Effect

Network effects are a key component of the success of many modern platform business models, such as social networks, marketplaces, online services and technology ecosystems (Table 3). These effects occur when the value of a product or service increases with an increase in the number of its users (Titova, Ziglina, 2021).

Table 3

Aspects of network effects

Nº	Aspect	Description	How It Works	What It Means for the Platform
1	Increase in Utility	Each new user's connection increases the overall value of the platform for all participants	The more users, the richer the social networks	The platform becomes more attractive to new users, strengthening its position and appeal
2	Increase in Partner Attractiveness	An expanding user base makes the platform more attractive to external partners and developers who can create apps or services integrated with the platform's API	Growth in user base attracts more partners	The platform expands its functionality and ecosystem, becoming more versatile and convenient
3	Economies of Scale	As the number of users grows, the cost of servicing each user decreases due to more efficient resource distribution	Higher efficiency and lower cost per user	Lower operational costs allow for reinvestment in the development and improvement of the platform
4	Barriers to Competition	Strong network effects create barriers for new market entrants	New competitors find it more challenging to attract users	The advantage of a large and loyal user base deters new competitors and protects market positions
5	Increase in User Retention	High levels of user interaction and engagement keep users on the platform and reduce the likelihood of switching to competing platforms	Strong community reduces user churn	Increased user loyalty supports stable growth and development of the platform

Source: developed by A.A. Chursin, V.A. Shiboldenkov, A.V. Gutenev.

Network effects, or network economy, is based on the idea that each new user of the platform not only gets value from existing features and content, but also adds value to other participants through their participation. This is the basis of the so-called “Metcalfe effect”, according to which the usefulness of the network increases proportionally to the square of the number of its users (Katrovsky, 2020).

Network effects can be divided into two main types:

- Direct network effects: The value of a product increases directly depending on the increase in the number of its users. An example is a telephone network, where each new subscriber directly increases the usefulness of the network for all other subscribers by increasing the number of possible connections.

- Indirect network effects: The value of the product increases due to an increase in the number of additional products and services that become available with the growth of the user base. A classic example is operating systems, where the growth in the number of users stimulates the creation of more software.

Network effects have a significant impact on the success of various industry platforms, confirming that the value of a product or service increases in proportion to the increase in the number of its users. Examples of such platforms include Salesforce, Amazon Web Services (AWS), Apple’s App Store, Google Play and Google Cloud Platform, GitHub and Microsoft Azure.

Salesforce, a CRM platform, benefits from the accumulation of applications on the Salesforce AppExchange, increasing its value with the growing number of users and developers. Similarly, AWS and Microsoft Azure attract developers and businesses due to their extensive user bases and integration with other services, which strengthens their network effects. Apple and Google’s app ecosystems, such as the App Store and Google Play, also benefit significantly from the scale of their user bases, encouraging developers to create new applications.

A key aspect for all these platforms is that the interaction of a large number of users and developers creates favorable conditions for innovation and collaboration, which enhances their competitive advantages and creates a significant value addition for all participants.

Thanks to network effects, platforms can reach a so-called “tipping point”, after which their growth accelerates and they become extremely attractive to new users. This, in turn, can lead to market dominance, and in some cases to the formation of monopolies, as happened, for example, with Facebook in the field of social networks or with Google in the field of search engines.

To describe a mathematical model of exponential revenue growth that emphasizes the presence of network effects on digital platforms and includes transaction cost factors, the following relationship can be proposed. Let’s denote:

- $A(t)$ as the number of platform users at time t .
- $R(t) = \alpha \cdot N(t)$ as the revenue of the platform at time t .
- $C(t) = \beta \cdot N(t)$ as the total costs of the platform at time t .
- ρ as a coefficient reflecting the influence of the number of users on the growth of interest in the platform or service (a constant reflecting the strength of the network effect).

- α as a coefficient proportional to the amount of revenue from each user
- β as a constant characterizing the maintenance costs of each user.

Then the growth in the number of users can be represented as

$$\frac{dN}{dt} = \rho N, \rightarrow N(t) = N(t_0) e^{\rho t}. \quad (3)$$

This differential equation describes the exponential growth of users, where with the growth of N , new users come faster due to the network effect.

Thus, the income $P(t)$ (profit after deducting costs from revenue) will be equal to

$$P(t) = R(t) - C(t) = \alpha \cdot N(t) - \beta \cdot N(t) = (\alpha - \beta) \cdot N(t). \quad (4)$$

Substituting the user growth function $N(t)$, we get the final expression:

$$P(t) = (\alpha - \beta) \cdot N(t_0) e^{\rho t}, \quad (5)$$

where $N(t_0)$ — is the number of users at the start of the observation.

Although network effects can significantly strengthen the position of platforms in the market, they also place certain demands on growth management and innovation. Platforms need to constantly update their products and services to meet the growing and changing needs of users. In addition, success often depends on the platform's ability to attract and retain high-quality developers and content partners, which requires strategic planning and investment. Thus, understanding and skillful use of network effects are the key to the success of many platform companies in the modern digital economy.

Multilateral markets

Multilateral markets, or multilateral platforms, are economic platforms that ensure the interaction of several interconnected groups of participants (Kovalenko, 2016). Examples of such platforms include markets like Airbnb, where tenants and landlords interact, or Uber, where drivers and passengers connect. The effectiveness of these platforms significantly depends on their ability to simultaneously attract and serve different groups of users, which then creates network effects that increase the value of the platform for all participants.

Let's look at the main aspects of the multilateral market (Table 4).

Effective management of the multilateral market requires a deep understanding of the needs and relationships between all participants, as well as the ability to innovatively solve the challenges facing the platform (Pudovkina, 2020). These platforms connect different user groups, each of which has its own risks and expectations.

Table 4

The main aspects of the multilateral market

Aspect	Description
1. Balanced user engagement	Attracting one group of users should stimulate the attraction of another. For example, the more products there are on the e-commerce platform, the more buyers it attracts, which in turn attracts new sellers
2. Development of incentives for all parties	Each group should feel that they benefit from participating on the platform. This may include financial and non-financial incentives such as discounts, bonuses for attracting new members or improved terms of use of the platform
3. Ensuring quality and trust	Multilateral platforms should actively manage quality and trust between users, for example, through rating systems, reviews, as well as providing guarantees and support
4. Conflict Management	Inevitably, conflicts between different user groups require careful resolution. The platform should provide effective dispute resolution mechanisms
5. Adapting to changes in the industry	Multilateral platforms must be flexible and adaptable to market and technology changes to maintain their competitiveness and attractiveness to all participants
6. Data integration and analytics	Data collection and analysis helps to understand the needs and behavior of each of the parties, which allows you to optimize the platform's efforts to meet these needs and anticipate trends
7. Legal aspects	Multilateral markets face unique legal issues, including regulation, data protection and consumer rights, and must actively manage these risks

Source: developed by A.A. Chursin, V.A. Shiboldenkov, A.V. Gutenev.

Multilateral markets (multilateral platforms) are economic platforms that connect two or more distinct but interdependent user groups. A mathematical description of such systems can be built on the basis of supply and demand modeling (based on the utility function U), taking into account these network effects.

$$U(N(t)) = f(P(t), Q(t)) \rightarrow \max, \tag{6}$$

where $Q(t)$ is the quality or capacity of the platform to meet the needs of the $n \in N$.
To effectively create a sustainable digital ecosystem, it is necessary to pay attention to such aspects as a deep understanding of user needs through thorough market research, the choice of a scalable technological infrastructure that guarantees high performance, as well as the integration of data and services to expand functionality. It is also important to ensure data security and confidentiality in compliance with regulatory requirements, to develop user-friendly interfaces and management tools to optimize the operation of the platform. It is also necessary to strive for modularity and scalability of the system, ensuring cross-platform accessibility and developing effective monetization strategies. Finally, cooperation and partnerships will help expand the technology platform's offering

and strengthen its competitive advantages, which is the key to attracting and retaining users, which will solve the issue of its progressive development.

The development and integration of various strategic networking approaches and platforms contributes to the creation of an industrial ecosystem. An industrial ecosystem is a network of interconnected organizations, including suppliers, manufacturers, competitors and others, who collectively create a product or service, which allows participants to jointly create innovations, optimize processes and increase efficiency at all stages of the value chain.

Results

The industrial ecosystem is an integrated and multimodal network of enterprises, suppliers, consumers, research institutions and other stakeholders united within a single production and innovation activity. This phenomenon goes beyond the classical logistics supply chain, as it is characterized by multidimensional interaction and cooperation of participants, which ensures not only the efficiency of production processes, but also stimulates innovative development and knowledge exchange. By emphasizing the role of globalization and digitalization, industrial ecosystems are becoming even more adaptive and flexible, which is necessary to effectively respond to changes in the global economy and technological environment. In this context, digital technologies act not only as an instrumental resource, but also as a catalyst for deep transformations in production and management processes (Nesterov et al., 2019).

Digitalization of industrial ecosystems includes the introduction of integrated IT solutions and platforms that allow the creation of so-called “smart production”. Such technologies, including the Internet of Things (IoT), artificial intelligence and machine learning, maximize production capabilities, optimize work at enterprises, minimize costs and time losses, and contribute to the development of new business models and strategies in the market.

Moreover, this digital infrastructure supports the creation of horizontal and vertical links between various actors in the ecosystem, including software developers, hardware manufacturers, technology providers and end users. These links ensure closer interaction and coordination between the participants, which is important for the implementation of joint projects and innovations (Table 5).

Thus, industrial ecosystems in the era of digitalization are transformed into complex highly organized structures capable of effectively responding to rapidly changing external conditions, managing risks and creating new value in conditions of constant economic and technological competition.

Industrial ecosystems include various enterprises, from suppliers of raw materials to manufacturers and service providers, as well as end users. In industrial ecosystems, each participant influences the others. Manufacturers, suppliers, service companies and end users create a complex network of interactions. Network effects reinforce these interdependencies because the success of one participant can contribute to increased revenue or lower costs for others.

Table 5

Types of industrial ecosystems

Type of Ecosystem	Main Participants	Industries	Technological Features	Innovation Focus
Traditional	Manufacturers, Component Suppliers, Distributors	Automotive, Heavy Machinery	Process Automation	Productivity Improvement and Cost Reduction
Research	Research Institutes, Universities, Startups, Corporations	Pharmaceuticals, Biotechnology	High-Tech Technologies	Development of New Products, Implementation of New Treatment Methods
Technological	IT Companies, High-Tech Startups, Investors	Information Technology, Robotics	AI, IoT, Big Data	Production Digitalization, Smart Technologies
Environmental	Environmental Protection Organizations, Green Startups, Eco-Farms	Energy, Agriculture	Renewable Energy Sources	Development of Sustainable and Eco-Friendly Technologies, Resource Efficiency Improvement
Creative	Design Studios, Advertising Agencies, Media Companies	Fashion, Publishing, Entertainment	Media and Advertising Technologies	Content Innovation, User Interaction

Source: developed by A.A. Chursin, V.A. Shiboldenkov, A.V. Gutenev.

The compatibility of components, machines and systems is critically important in industrial ecosystems. Standardization, enhanced by network effects, allows different ecosystem participants to easily integrate and interact with each other. This reduces production costs and increases the efficiency of operations at all levels. The more participants join the ecosystem, the more the consumer base for each participant grows. This can lead to a significant increase in revenue and expansion of sales markets for all parties involved.

Network effects in industrial ecosystems form a dynamic, interdependent space where each new connection increases value and opportunities for all participants. However, it is important to manage these relationships in such a way as to promote sustainable growth and innovation, as well as avoid creating monopolies and barriers for new players (Molchan, Tolstyykh, Nadaenko, 2020).

The mechanism for managing the transition of an organization to a position of technological leadership

It is possible to imagine an extension of the model (1), including the competitiveness of the product (2), due to the network effect of platforms (5) and the effect of the multilateral ecosystem market (6). This can be done by modifying the standard variables and functions of the model

$$\begin{cases} \Delta A(t) = \left(\gamma \frac{H(t)}{A(t)} + \alpha \cdot E(t) + \beta \cdot (\xi \cdot S(t) + \eta \cdot M(t)) \right) [A^*(t) - A(t)]; \\ K(t) = \vartheta \cdot (A(t))^\delta + \lambda \cdot Q(t, S(t)) + \mu \cdot R(t, M(t)), \end{cases} \quad (7)$$

где ξ, η — are coefficients reflecting the influence of network and multilateral market effects, respectively; $S(t)$ — the impact of network effects; $M(t)$ — the impact of the effects of multilateral markets.

The addition of network effects and multilateral market influence to the Nelson — Phelps model makes it possible to more fully reflect the real conditions of modern technological and economic development.

Such modifications help to better understand how network interconnectedness and the market ecosystem can enhance the competitiveness of products. At the same time, an important aspect is the development and implementation of management mechanisms that allow the organization not only to adapt to changing conditions, but also to take a leading position in the market through the use of modern technologies and the creation of sustainable innovative platforms.

The concept of a mechanism for managing an organization's transition to a position of technological leadership through the production and commercialization of innovative products implies an integrated system of dynamically interacting tools (Figure 2) (Chursin et al., 2017; Tyulin, Chursin, 2020):

1. Tools for the development of scientific and technological potential and competencies: This complex The tools are aimed at expanding and deepening research and technological skills within the business structure, which creates the basis for innovation.

2. Tools for transforming scientific and technological potential into unique product characteristics: Converting the collected knowledge and skills into specific technological solutions that make new products not only innovative, but also uniquely adapted to current market requirements.

3. Tools for managing economic growth through innovation: Tools and techniques designed to stimulate business growth through the strategic introduction and promotion of new products.

4. Economic instruments accompanying the creation and entry into the market of high-value products: These tools support the financial aspects of innovation, including valuation, pricing and profitability.

5. Tools for creating service-oriented business models: Methods and approaches to product commercialization, which include strategies for building customer relationships, developing after-sales services and support.

6. Tools for managing advanced business development: Tools that help predict future market trends and adapt development strategies in accordance with these predictions.

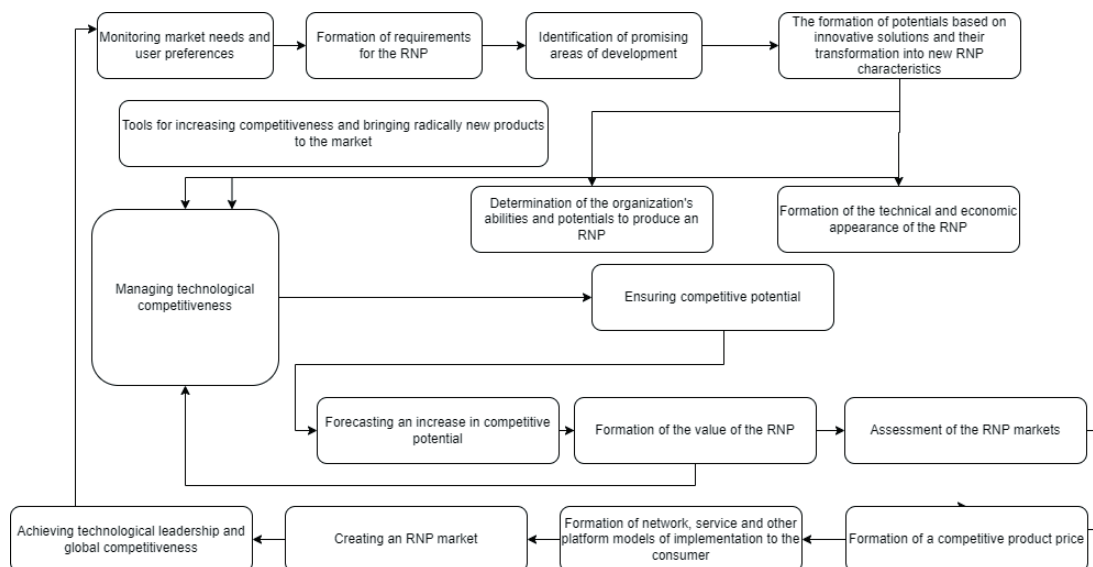


Figure 2. The mechanism for managing the transition of an organization to a position of technological leadership through the production and commercialization of radically new products

Source: developed by A.A. Chursin, V.A. Shiboldenkov, A.V. Gutenev.

Each of the above-described elements of these tools contains a set of methods and approaches focused on evaluating, analyzing and managing various aspects of creating high-tech and innovative products, thereby forming an extensive mechanism for the transition to technological leadership. These tools, built into the processes of creating and selling new products, help to form a coordinated and effective approach to achieving advanced development and sustainable technological advantage (Tyulin et al., 2019; Chursin, Tyulin, 2020).

Discussion

The successful transformation of industrial enterprises into innovative platforms and ecosystems depends not only on investments in technology and their technological maturity, but also on a strategic change in organizational culture and the inclusion of stakeholders in the innovation process. An important aspect here is the change in organizational culture, which involves a revision of standard approaches to management, communication and decision-making within the company.

The transformation of governance structures is a critical element to support innovation, which means moving from vertical hierarchies to more horizontal, flexible structures that accelerate decision-making and knowledge sharing. Management practice should focus on the development of policies and procedures that promote experimentation and innovation at all levels of the organization.

The integration of external and internal stakeholders into innovation processes is moving from an optional to a mandatory element of the company's development strategy. This includes building open innovation platforms where customers, suppliers, universities and research institutes can work together to create new products and

services. It is also important to ensure transparency of processes and actively use feedback from consumers to continuously improve the company’s offerings.

Transforming the potentials of innovative solutions using a platform approach is a strategy aimed at using modular platforms for the development and adaptation of new products and services in various market segments. This approach allows companies to quickly respond to changes in customer needs and preferences, as well as effectively expand their market niches. Let’s look at the key aspects and steps to implement such a strategy Table 6).

Table 6

Steps to implement the “platformization” strategy

Aspect	Description	How It Works
1. Defining the basis of the platform	The central element of the strategy is the development of a universal platform that can be used to create a variety of products or services	Market research to identify the common needs of target segments. Technological audit to assess the possibility of creating modular and scalable solutions
2. Development of a modular architecture	The platform should include modules or components that can be easily reused or adapted for different products	Standardization of components reduces costs and simplifies the process of developing new products. The flexibility of the configuration allows you to customize products to meet the specific needs of users
3. Integration and synergy	The key point is to integrate new products into the existing ecosystem of the platform to create synergies	Cross-use of data between products to improve user experience and optimize operational efficiency. Sharing infrastructure to reduce operating costs
4. Innovative development	The platform should provide for continuous innovative development	Openness to integration with new technologies and third-party developments. Support for startups and partner programs to update and expand the functionality of the platform
5. Marketing and Scaling	The platform requires active marketing and scaling	Targeted marketing to attract different segments of users. Actively attract users through partner channels, online platforms and social networks

Source: developed by A.A. Chursin, V.A. Shiboldenkov, A.V. Gutenev.

The systematic application of these recommendations will not only improve the sustainability and efficiency of industrial ecosystems but also ensure their development in the long term.

Practical cases in industrial ecosystems of the Russian Federation

In recent years, Russia has been actively developing industrial ecosystems and platforms, which is becoming a key factor in accelerating the process of modernizing the economy and increasing its competitiveness at the global level. The main emphasis in these efforts is on the integration of digital technologies, the development and

implementation of innovative solutions, which allows creating new opportunities for industry and improving management processes (Katrovsky, 2020).

Russia's industrial ecosystems are a complex of interconnected industries that form the structure of the national economy. These ecosystems include not only large industrial enterprises, but also many small and medium-sized companies, as well as scientific and educational institutions that cooperate at various levels. The main feature of industrial ecosystems is their ability to self-regulate and adapt to changing conditions of the external and internal environment, which is ensured by close ties between participants.

Key criteria by which industrial ecosystems can be assessed include (Table 7):

1. Integration of raw materials bases — how closely producers are connected with suppliers of raw materials.

2. Innovation activity — the degree of introduction of new technologies and developments.

3. Environmental sustainability — measures to minimize the impact on the environment.

4. Export potential — the ability of the industry to enter international markets.

5. Interaction with the state — the level of support or regulation from the state.

The integration of industrial ecosystems can lead to increased efficiency, reduced costs and increased innovation potential of companies (Table 7). The main directions of this integration include the development of cooperation between enterprises, the introduction of digital technologies and the creation of synergies across various industries and sectors (Gamidullayeva, Tolstykh, Shmeleva, 2022).

Table 7

Directions of integration of industrial ecosystems

Industry	Integration of Raw Material Bases	Integration of Innovations	Integration of Ecology and Sustainability	Integration of Export	Integration with Government
Oil and Gas	High	Medium	Low	High	High
Nuclear Energy	Not Relevant	High	High	Medium	Very High
Machinery	Medium	High	Medium	Medium	Medium
Chemical Industry	High	High	Medium	High	Medium
Information Technology	Low	Very High	Not Relevant	High	Medium

Source: developed by A.A. Chursin, V.A. Shiboldenkov, A.V. Gutenev.

The development of new areas of integration allows not only to optimize current processes, but also opens the door to the creation of new products and services, strengthening positions in the global market and increasing resilience to economic changes.

Let's present examples of production platforms in industry^{10, 11}.

Light industry:

Legprom: This is a digital platform created to support light industry enterprises. It is aimed at small and medium-sized enterprises and includes functions from the search for suppliers of materials to the distribution of finished products. The platform also provides tools for online trading, which helps manufacturers expand their sales market.

Textile Contact: It is a specialized online platform for textile industry professionals, which ensures the interaction of all market participants from manufacturers to end consumers. The platform offers effective tools for networking, ordering materials, sharing technologies and experiences.

Heavy industry:

Rostselmash Digital platform: One of the leading companies in the production of agricultural machinery in Russia, Rostselmash, has developed its own digital platform for managing production processes. The platform includes quality management systems, production planning, as well as integration with supply and logistics systems.

NLMK Digital Platform (Novolipetsk Metallurgical Plant): This platform is designed to optimize production processes in metallurgy. It includes digitalization of all key aspects of the work — from the purchase of raw materials to the sale of finished products in the domestic and foreign markets. The use of advanced analytical tools can significantly increase efficiency and reduce costs.

Let's present examples of production ecosystems in industry and the fuel and energy sector. In the conditions of the modern Russian economy, the oil and gas industry and related industrial sectors form integral ecosystems in which large processing companies play a key role. SIBUR, as one of the leaders of the Russian chemical and petrochemical industry, is an important element of this system, providing links between hydrocarbon production and a wide range of consumer industries.

SIBUR closely cooperates with large oil and gas companies, receiving from them the necessary raw materials for the production of polymers, elastomers and other chemical products. SIBUR's products are used in various industries, including the automotive industry, construction, etc. This multiplicative interaction increases competitiveness and contributes to the quality of final products in the market, thereby supporting the growth of the efficiency of the national economy. SIBUR occupies a strategic position in the industrial ecosystem of Russia, defining development vectors not only for the petrochemical industry, but also for a number of other industries.

NOVATEK is one of the largest independent gas producing companies in Russia, actively implementing advanced technologies to effectively manage its assets and risks. The use of cloud technologies and artificial intelligence tools allows

¹⁰ Aviation and Transport Infrastructure Association (AviaTP). (2023). List of Russian technology platforms. Retrieved 16 April 2024, from [https://aviatp.ru/files/cabinettp/2023/List%20\(TP\).pdf](https://aviatp.ru/files/cabinettp/2023/List%20(TP).pdf)

¹¹ Kommersant. (2010). A structured list of technology platforms. Retrieved 16 April 2024, from <https://www.kommersant.ru/doc/1557065>

the company to optimize processes in gas fields and in the management of logistics chains. These innovations not only increase operational efficiency, but also contribute to closer control over the safety and environmental aspects of production.

Gazprom Neft is actively developing and implementing digital technologies at all stages of oil production, from exploration and production to transportation, refining and sale. The company focuses on the creation of smart technologies and their integration into industrial processes, which significantly improves production efficiency and ensures a high level of safety.

The main directions of development of the Gazprom Neft digital ecosystem:

- Intelligent mining management system — using machine learning and artificial intelligence to analyze geological data and optimize mining processes.
- Robotic technologies — the introduction of automated systems for performing complex and dangerous operations, minimizing the human factor in high-risk conditions.
- Digital twin technology — the creation of virtual copies of objects, which allows them to be modeled and analyzed in real time to prevent accidents and optimize operation.
- Electronic document management and blockchain — the translation of documentation into electronic form and the use of blockchain technology to guarantee the security and authenticity of data.
- Remote monitoring and management platforms — development of remote monitoring systems for equipment and production processes, which allows you to quickly solve emerging problems without the need to be present at the facility.

Gazprom Neft is considered one of the leaders in the implementation of innovative solutions in the Russian oil and gas industry, which makes its industrial ecosystem one of the most advanced and technologically equipped. These measures are aimed at maintaining a high level of competitiveness of the company in the global market.

Industrial platforms and ecosystems in Russia cover various sectors: from the oil and gas industry and energy to heavy engineering and light industry. They include not only large public and private enterprises, but also many small and medium-sized enterprises, as well as research organizations.

Conclusion

These examples demonstrate how traditional industries in Russia are actively adopting digital technologies in an effort to improve their production processes and competitiveness in the market. Ecosystems and platforms help create new business models and management approaches, boost innovation and stimulate industry growth.

Digitalization of industrial ecosystems is a complex but very promising process that requires an integrated approach to planning and implementation. The strategy of transforming the potentials of innovative solutions through a platform approach allows companies not only to expand their market boundaries, but also to strengthen sustainability and competitiveness in the market. The main principles of this approach

include the creation of a universal, modular and integrated platform that facilitates rapid adaptation to changing market requirements and increases the efficiency of business processes.

Digital industrial ecosystems are often interdisciplinary, and it is important to develop cooperation between the various players in the ecosystem. This helps to share knowledge, share resources and accelerate innovation processes. The effectiveness and sustainability of such ecosystems largely depend on the level of integration and cooperation of its participants, as well as on government support and the ability to adapt to global trends and challenges.

The transformation of industrial enterprises into innovative platforms and ecosystems requires an integrated approach that includes not only technological modernization, but also fundamental changes in corporate culture and management models. The development of such transformations should be accompanied by a strategy of long-term development and investment in the skills and competencies of employees, as well as constant interaction with all stakeholders. This makes it possible not only to increase the competitiveness of the company, but also to ensure its sustainable growth in a dynamically changing economic environment.

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МЕЖДУНАРОДНОЕ ДВИЖЕНИЕ КАПИТАЛА INTERNATIONAL CAPITAL MOVEMENT

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Научная статья / Research article

Совершенствование организации государственно-частного партнерства как формы финансирования развития туристских кластеров

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Аннотация. Рассмотрены организация проектов государственно-частного партнерства (ГЧП) в туристской сфере и оценка динамики их реализации с учетом состояния и развития инфраструктурных объектов туристских кластеров (ТК). Представлены аспекты диагностики и важнейшие вопросы мониторинга функционирования региональных ТК на основе повышения эффективности использования инвестиционных ресурсов концессионных соглашений. Показана роль системы государственного финансирования и управления рисками на основе принципов ГЧП в развитии сферы туризма и ТК, рассматривающих данную форму финансирования для дальнейшего использования туристского потенциала и совершенствования туристской политики в регионах. Применяя механизм концессионных соглашений, федеральные субъекты используют возможность строительства крупных инфраструктурных объектов туризма в условиях бюджетного дефицита, что позволяет развивать экономику и социальную сферу этих субъектов. Результаты исследования позволяют обозначить меры, способствующие инициации деятельности органов исполнительной власти субъектов РФ и муниципальных органов местного самоуправления по более эффективному привлечению проектных инвестиций государственно-частного партнерства для создания благоприятных условий развития инфраструктуры туристской сферы, улучшения инвестиционного климата и ведения туристского бизнеса.

Ключевые слова: кластер сферы туризма, концессионное соглашение ГЧП, частные инвестиции, инфраструктурный проект



Вклад авторов. Богомолова Е.С. — концептуализация, написание и редактирование текста; Ламбрехт В.В. — работа с данными, написание и редактирование текста; Никулищева Н.В. — написание первоначального текста, работа с данными. Все авторы одобрили окончательную версию статьи.

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Improving the organization of public-private partnerships as a form of financing the development of tourism clusters

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Abstract. The study examines the importance of organizing and evaluating the dynamics of public-private partnership (PPP) projects in the tourism sector, taking into account the development of infrastructure facilities in tourist clusters. The study presents aspects of diagnostics and the most important issues of monitoring the functioning of regional tourism clusters based on improving the efficiency of using investment resources of concession agreements. The role of the system of public financing and risk management based on the principles of public-private partnership for the development of the tourism sector and tourism clusters, which are considering this form of financing for the further use of tourism potential and improvement of tourism policy in their regions, is shown. Using the mechanism of concession agreements, federal subjects use the opportunity to build large infrastructure facilities for tourism in conditions of budget deficit, which allows them to develop the economy and social sphere of these subjects. These results make it possible to identify measures to initiate the activities of the executive authorities of the constituent entities of the Russian Federation and municipal bodies of local self-government to more proactively carry out work to attract project investments of public-private partnerships to create favorable conditions for the development of tourism infrastructure, improve the investment climate and conduct tourism business.

Keywords: PPP concession agreement, private investment, infrastructure project

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Введение

В управлении процессами инвестирования на современном этапе развития экономических отношений основополагающую роль играют формы финансирования, выбираемые индивидуальными, корпоративными и институциональными инвесторами в условиях существующего инвестиционного климата. Обоснованный выбор направлений инвестирования и форм финансирования предполагает высокую степень достижения ожидаемых результатов и снижения финансовых рисков. Следование этому положению влечет за собой повышение инвестиционного спроса на индуцированные и автономные инвестиции, способствующие увеличению объема финансирования по внедрению высокоэффективных среднесрочных и долгосрочных проектов на макроэкономическом уровне, что приводит к росту макроэкономических показателей, международному инвестиционному сотрудничеству и интеграции в международную финансово-экономическую систему.

В условиях быстрого расширения сервисного рынка все большее значение приобретают эффективные формы финансирования предоставления услуг, связанных с потребительским предпочтением. Услуги туристского сектора, имеющие повышенный потребительский спрос, еще в далеко недостаточной мере участвуют в формировании ВВП национальной экономики страны. По данным Федеральной службы статистики РФ, туристские услуги, в т.ч. услуги по перемещению на транспорте, размещению в средствах гостиничного бизнеса, питанию, экскурсионному обслуживанию и услуги досугово-развлекательного характера занимали в структуре ВВП 2,8 % в 2023 г. по сравнению с 1,7 % в 2022 г., что указывает на их незначительное присутствие в формировании ВВП¹. Такое положение следует объяснять состоянием туристской инфраструктуры и эффективностью применения различных форм финансирования программных мер государственного характера по развитию туристской сферы, в т.ч. и на основе проектного финансирования как неотъемлемой составляющей государственно-частного партнерства (ГЧП, партнерство(а)).

За период с 2021 по 2025 г. повышение интереса к проектам ГЧП в отдельных регионах РФ способствовало росту бюджетных обязательств и внесению поправок в местные законодательства, что актуализирует вопрос эффективного управления проектами ГЧП на основе рационального использования

¹ Структура валового внутреннего продукта по отраслям экономики. URL: https://rosstat.gov.ru/storage/mediabank/55_07-04-2023.html (дата обращения: 12.12.2024).

ресурсной базы и совершенствования организационно-правовых отношений участников партнерств.

ГЧП как форма инвестиционного финансирования регулируется выполнением Федерального закона «О концессионных соглашениях» № 115-ФЗ от 21.07.2005 г. и Федерального закона «О государственно-частном партнерстве, муниципально-частном партнерстве в Российской Федерации и внесении изменений в отдельные законодательные акты Российской Федерации» № 224-ФЗ от 13.07.2015 г. и обеспечивает привлечение частных инвестиций совместно с государственными вложениями на определенный, ограниченный срок на основе распределения рисков и обеспечения взаимовыгодности договорных отношений с целью более полного удовлетворения потребительского спроса².

Такая форма совместного инвестирования хотя и отвечает современным требованиям организации проектного финансирования, в частности в туристской сфере, которая имеет значительные тенденции к кластерообразованию, но и вызывает необходимость привлечения частных инвесторов, заинтересованных в сокращении затрат на предпроектную подготовку, а также в улучшении и развитии институциональной среды, способствующей снижению кредитной, налоговой нагрузки и уровня финансовых рисков. В соответствии с этим в проведенном нами исследовании подчеркивается необходимость совершенствования системы управления ГЧП в условиях лимитированного ограничения финансовых ресурсов, а также совершенствования организационных подходов к оценке результативности партнерства в рамках управления инвестиционным проектом (ИП) при существующих институциональных условиях и формах инвестирования.

Целью исследования является формирование направлений совершенствования организации ГЧП как формы финансирования развития туристских кластеров.

Обзор литературы

Элементную базу процесса кластерообразования, присущего туристской сфере, изучали И.Г. Шепелев и Ю.А. Маркова, рассматривая кластеризацию как форму объединения туристского бизнеса для формирования конкурентоспособной системы обслуживания туристов с учетом использования имеющихся экономических ресурсов (Шепелев, Маркова, 2012). Д.А. Кошечев и О.Ю. Исопескуль рассмотрели туристский кластер как экономическую модель проектирования и управления туристской сферой региона, основываясь на использовании механизма государственного регулирования, что позволило представить авторскую

² Федеральный закон «О государственно-частном партнерстве, муниципально-частном партнерстве в Российской Федерации и внесении изменений в отдельные законодательные акты Российской Федерации» № 224-ФЗ от 13.07.2015 г. URL: https://www.consultant.ru/document/cons_doc_LAW_182660/ (дата обращения: 05.12.2024). Федеральный закон от 21 июля 2005 г. № 115-ФЗ «О концессионных соглашениях» (с изменениями и дополнениями) // Собрание законодательства Российской Федерации. 2005. № 30. Ст. 3126 (дата обращения: 05.12.2024).

методику идентификации и исследования подобных агломерационных систем. Данная методика апробирована на примере Пермского края с учетом использования и для других субъектов РФ (Кошечев, Исопескуль, 2022).

Вопросы кластерообразования с учетом государственного подхода, социальной значимости и экономической результативности также представлены в работах (Борщ, Польская, 2021, Шматько Л.П, 2021, Павленко, Безукладов, 2019, Нагорная, Шевцова, 2019) и других российских исследователей.

С.В. Раевский и А.В. Чешин при проведении анализа характеристики региональных ИП и оценки их эффективности уделили наибольшее внимание интенсивности влияния реализации ИП на социально-экономическое развитие регионов с методологической точки зрения, учитывая имеющиеся ограничения по финансовым ресурсам (Раевский, Чешин, 2023). При этом не рассматривались источники финансовых ресурсов и делегирование ответственности участников инвестиционного проектирования по финансированию ИП, что отражает позиции государственно-частного партнерства как наиболее реалистичного способа финансирования проектов при больших объемах инвестиционных вложений.

О.А. Шапорова, И.Г. Паршутина, Е.А. Кирпиченко рассматривают вопросы анализа региональных инвестиционных процессов, направленных на выявление проблем и разработку мер по улучшению инвестиционного климата регионов и привлечению капиталовложений на основе инструментов государственного регулирования и контроля инвестиционной деятельности, включая мобилизацию финансовых ресурсов, что приближает авторскую позицию к экономическим положениям ГЧП (Шапорова, Паршутина, Кирпиченко, 2019).

Вопросы организации и управления инвестиционными процессами на основе финансирования развития туристской сферы и региональной экономики из различных источников рассматривались Н.В. Рубцовой (Рубцова, 2023) С.А. Замчаловым, А.В. Малашенко, В.А. Плотниковым (Замчалов, Малашенко, Плотников, 2022), А.В. Каплиной (Каплина, 2021), В.А. Бариновой, С.П. Земцова, Ю.П. Царевой (Баринова, Земцов, Царева, 2023), А.Т. Тлеубердиновой, А.Т. Алдабергеновой, Д.М. Салауатовой (Тлеубердинова, Алдабергенова, Салауатова, 2021) и другими исследователями.

Особенности инвестирования инфраструктурных отраслевых объектов, методологические вопросы финансирования проектов и значение роли контрактов ГЧП в развитии туристской сферы нашли отражение в исследованиях зарубежных авторов: Ангуа П., Сон Лай В. (Angoua, Son Lai, Soumaré, 2008), Баттисти Ф., Гуарини М.Р. (Battisti, Guarini, 2017), Джаясена Н.С., Чан Д., Кумарасвами М., Сейду С. (Jayasena et al., 2024), Менье Д., Кине Э. (Meunier, Quinet, 2021), Ванга Т., Бухес С. (Bougheas, Wang, 2021), Мехар М.А.Х. (Mehar, 2024).

В приведенных работах нашли отражение стандарты планирования объема финансирования по единовременным вложениям капитального характера, диверсификация направлений финансовых вложений в соответствии с целевым рынком туристских услуг и программными задачами развития туристских

кластеров, фокусирование на высокорентабельных проектах; рассматриваются аутентичные характеристики местоположения инвестиционных бизнес-единиц на основе пространственной структуры планировки проекта и другие значимые аспекты.

При этом необходимо рассматривать особенности и формы государственной поддержки при софинансировании объектов ГЧП, позволяющие распределять возникающие риски, учитывать адаптационные меры территориального развития к проводимым изменениям в рамках программных мер по развитию сферы туризма и сопряженных секторов экономики, улучшать инфраструктуру и состав вспомогательных объектов территорий, проводить более активное использование профессиональных операционных групп в ходе организации ГЧП.

Методы исследования

Кластерный подход предлагает целостный и упорядоченный взгляд на туристскую индустрию региона, рассматривая ее как территориальную возможность по объединению деятельности взаимосвязанных организаций, и представляет собой эффективный инструмент повышения инвестиционной привлекательности и конкурентоспособности туристских предприятий территории (Богомолова, 2021). Такой подход широко применяется для развития бизнеса в странах Европейского союза на основе кооперирования и выбора ГЧП. В Испании (Барселона и Пальма-де-Майорка) находятся 13 макрокластеров, которые включают около 1000 компаний. Европейские кластеры характеризуются обширным составом участников, так 392 кластера располагают около 100 субъектов каждый и примерно 500 кластеров — по 50–90 участников.

Применение и развитие кластерного подхода в туристской индустрии позволяет на основе свойства принципа эмерджентности получать масштабированный мультипликативный эффект. Кластерное развитие способствует наращиванию высокого инвестиционного потенциала территории, и сегодня ГЧП представляет оптимальный механизм для реализации масштабных инфраструктурных ИП. ГЧП позволяет объединить ресурсы государства и частного сектора, что способствует развитию туристской сферы, повышению ее конкурентоспособности и привлечению новых инвестиций. Региональные исполнительные органы видят в ГЧП перспективный инструмент для раскрытия потенциала инфраструктурного обеспечения сферы туризма и совершенствования инвестиционной политики своих регионов в этой области.

Использование способа выборочного обследования на основе репрезентативности, охватившего 653 ИП сферы туризма РФ (8,8 % от общей численности проектов в различных отраслях), позволило провести структурный анализ готовности реализации туристских инфраструктурных проектов ГЧП. На этапе полного завершения по состоянию на 01.02.2025 г. находилось 190 проектов (29,1 % от общего их количества в туристской сфере). Этап предынвестиционных мероприятий проходили 102 проекта (15,6 % от общего ко-

личества). Проекты, находившиеся на этапе проектной идеи, составили 5,5 %. Остальные проекты (49,8 %) относились к этапам инвестиционных мероприятий и эксплуатации³.

Учитывался также способ комплексного управления для изучения концентрации инфраструктурных проектов территории и координации деятельности всех участников кластера в процессе ГЧП на основе системного анализа. Данный подход зафиксировал значительную концентрацию проектов ГЧП, реализуемых в Республике Башкортостан (объем финансирования составляет более 663,5 млн р.), Кабардино-Балкарской Республике (569,3 млн р.), Самарской области (256,1 млн р.), Тульской области (239 млн р.), что указывает на активное участие региональных исполнительных органов⁴.

Используя механизм реализации концессионных соглашений федеральные субъекты используют возможность строительства крупных инфраструктурных объектов туристских кластеров в условиях бюджетного дефицита, что способствует развитию экономики и социальной сферы этих регионов. Схема взаимосвязанных операций, позволяющих реализовывать объекты ГЧП на основе заключения концессионного соглашения (КС) в соответствии с Федеральным законом «О концессионных соглашениях» № 115-ФЗ от 21.07.2005 г., приведена на рис. 1.

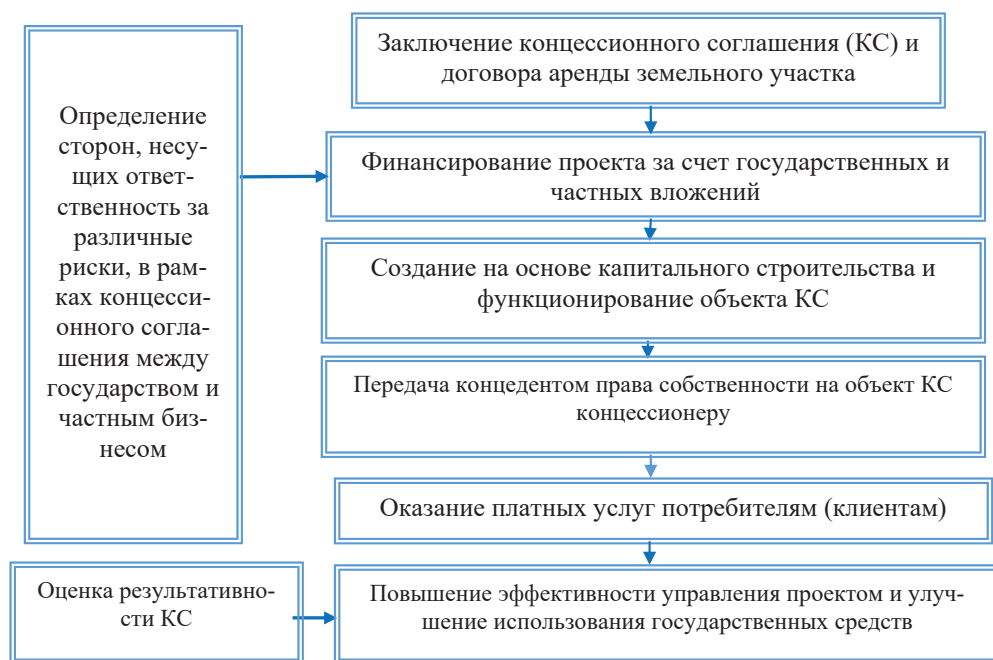


Рис. 1. Реализация объекта КС на основе заключения концессионного соглашения

Источник: составлено Е.С. Богомоловой, В.В. Ламбрехт, Н.В. Никулищевой.

³ Centre for Cities, McKinsey & Company, Industrial revolutions: capturing the growth potential. URL: <http://www.centreforcities.org> (дата обращения: 24.12.2024).

⁴ Росинфра. База проектов. URL: <https://dpo.rosinfra.ru/base-projects?page=824> (дата обращения: 24.12.2024).

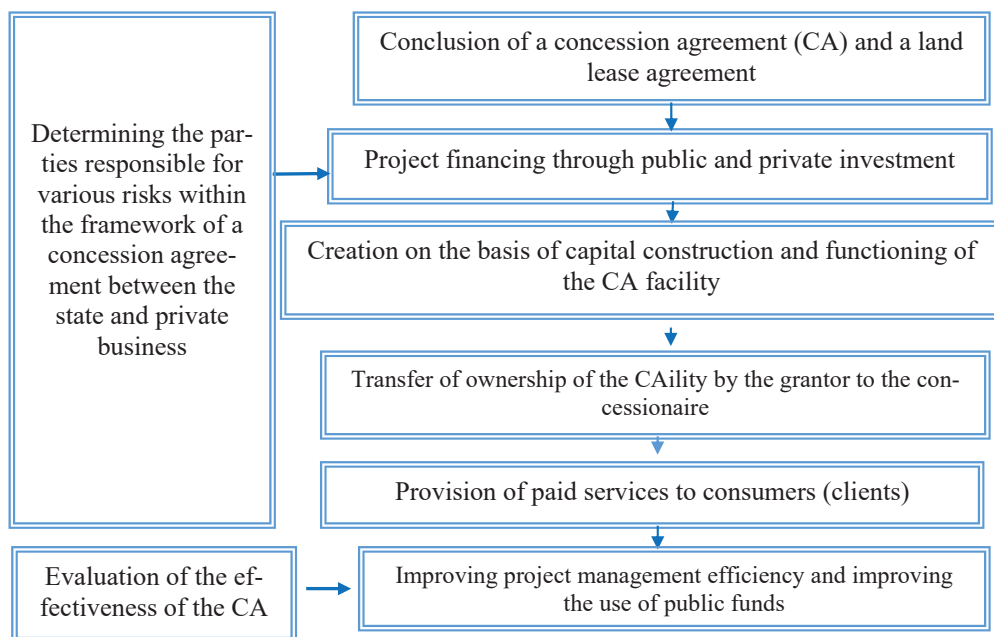


Figure 1. Implementation of the CA facility based on the conclusion of a concession agreement

Source: developed and compiled by E.S. Bogomolova, V.V. Lambrekht, N.V. Nikulishcheva.

Оценочные показатели результативности концессионного соглашения (КС, соглашение) получаются путем сравнительного анализа достижения целей, указанных в соглашении и связанных с улучшением качества предоставляемых услуг, окупаемостью инвестиций и повышением эффективности управления объектом. В процессе анализа используются как количественные финансовые показатели (объем выполненных работ), так и качественные (уровень сервиса, соответствие стандартам и др.).

Первоначально основываясь на принципах проектного финансирования, ГЧП отличается от сотрудничества в области проектного финансирования в силу наличия права кредитора (спонсора) в случае неспособности прямого заемщика (специальной проектной компании) выполнять свои финансовые обязательства; выставлять регрессный иск государству, что следует из КС, заключаемого кредитором с государством и проектной организацией (заемщиком). В случае невыполнения (дефолта) обязательств заемщиком кредитующий банк может санировать завершение проекта, что способствует успешной реализации строительства инфраструктурного объекта как государственного заказа и снижает в достаточной мере инвестиционный риск.

Результаты и обсуждение

Современные успешно реализованные инфраструктурные проекты ГЧП на территории туристских кластеров РФ отражены на платформе Росинфра, что позволяет выделить определенные структурные характеристики рынка проек-

тов ТК. Общее присутствие на рынке проектов ГЧП инфраструктурных проектов ТК и сферы туризма не зависимо от стадии разработки и завершенности определяется в размере 8,8 % в 2024 г., или 657 проектов из 7490 (рис. 2). Данное положение характеризует достаточно небольшую долю присутствия инвестиционных проектов ТК на рынке проектов ГЧП, так как туристская сфера не занимает лидирующего положения при формировании макроэкономических показателей национальной экономики и тем самым пока не выполняет значительную бюджетообразующую роль. Для финансирования инфраструктурных проектов ТК не привлекаются инвестиции публичного инвестиционного рынка. Государственные и корпоративные облигации в значительной мере могли бы не только способствовать стабилизации, но и повлиять на объем финансирования и тем самым увеличить данную долю присутствия проектов ТК на рынке ГЧП. Важный элемент увеличения объема финансирования инфраструктурных туристских объектов — усиление государственной поддержки на основе привлечения средств Фонда национального благосостояния (ФНБ), которые могли бы положительно повлиять на динамику рынка ГЧП в целом, но пока для этой цели они не используются.

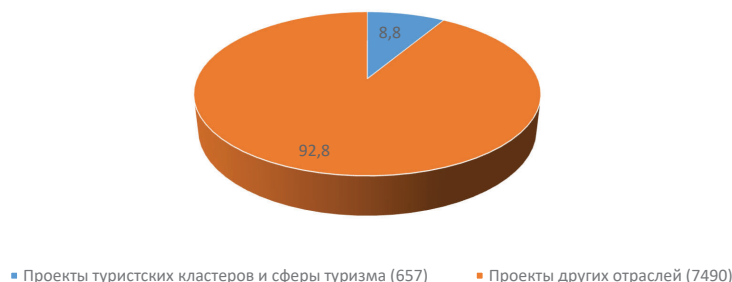


Рис. 2. Доля инфраструктурных проектов туристских кластеров и сферы туризма на рынке проектов ГЧП РФ в 2024 г., %

Источник: составлено Е.С. Богомоловой, В.В. Ламбрехт, Н.В. Никулищевой на основе данных портала Росинфра. База проектов. URL: <https://dpo.rosinfra.ru/base-projects/all> (дата обращения: 15.05.2025).

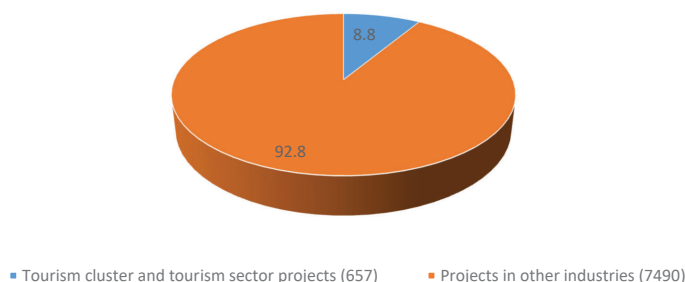


Figure 2. The share of infrastructure projects of tourism clusters and the tourism sector in the Russian PPP projects market in 2024, %

Source: compiled by E.S. Bogomolova, V.V. Lambrekht, N.V. Nikulishcheva on the basis of data from the Rosinfra portal. Project base. Retrieved 15 May 2025, from <https://dpo.rosinfra.ru/base-projects/all>

Количество завершенных проектов ГЧП на территории ТК и в сфере туризма РФ, по данным Росинфра, составляет 8,1 %, или 190 из общего количества 2340 завершенных проектов в различных сферах (рис. 3).



Рис. 3. Доля завершенных инфраструктурных проектов туристских кластеров и сферы туризма на рынке проектов ГЧП РФ в 2024 г., %

Источник: составлено Е.С. Богомоловой, В.В. Ламбрехт, Н.В. Никулищевой на основе данных портала Росинфра. База проектов. Завершенные проекты. URL: <https://dpo.rosinfra.ru/base-projects/completed> (дата обращения: 15.05.2025).

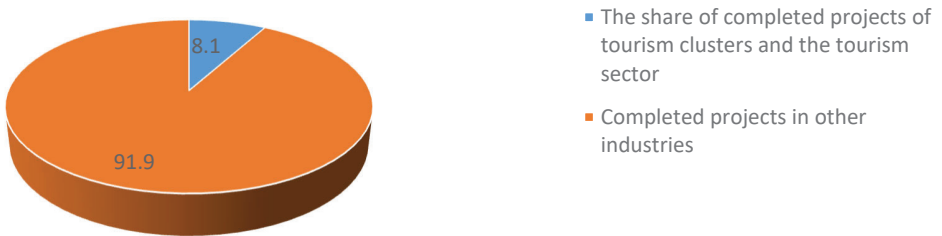


Figure 3. The share of completed infrastructure projects of tourism clusters and the tourism sector in the Russian PPP projects market in 2024, %

Source: compiled by E.S. Bogomolova, V.V. Lambrekht, N.V. Nikulishcheva on the basis of data from the Rosinfra portal. Project base. Completed projects. Retrieved 15 May 2025, from <https://dpo.rosinfra.ru/base-projects/>

Возможное увеличение доли завершенных инфраструктурных проектов ТК и сферы туризма на рынке проектов ГЧП основывается на мобилизации финансовых ресурсов, достижении запланированных КРП реализуемых проектов и активизации всех участников ГЧП. Эти требования диктуются снижающейся доступностью финансовых ресурсов, а также необходимостью применения коррекционных подходов в контексте управления проектами ГЧП при их реализации и завершении в текущих институциональных условиях.

В соответствии с этими положениями одним из принципов софинансирования проектов ТК в рамках региональных КС является субсидирование расходов региональных структур из федерального бюджета и возврат частных инвестиций после реализации объектов и ввода их в эксплуатацию. В данной схеме финансирования субсидированные выплаты концедента доходят до кредитующего банка, минуя региональный бюджет как промежуточное звено, и тем самым уменьшаются расходы региональных бюджетов по выплате процентных затрат. С учетом прямого субсидирования объемы господдержки в 2022–2024 гг. значительно превышали требуемые объемы государственных инвестиций в различных формах проектов ГЧП РФ⁵.

⁵ Кузьминов Я.И., Алиев Р.Б., Анилов А.Э. и др. Российские корпорации в новой реальности. Финансовые стратегии на пути к антихрупкости. М. : Изд. дом Высшей школы экономики, 2024. 360 с. <https://doi.org/10.17323/978-5-7598-4107-4> EDN: XUXDJO (дата обращения: 12.05.2025).

Сдерживающим фактором притока частных инвестиций для развития сферы туризма и ТК выступает отсутствие качественно обоснованных ИП из-за недостаточного присутствия опыта в области разработки и продвижения региональными ГЧП проектов по линии их структурирования и привлечения инвесторов. Перевод данной организационной работы в онлайн-формат цифрового проектного офиса позволит улучшить динамику объема инвестиций в туристской сфере. Этому же будет способствовать и осуществляемая инвестиционная политика национального проекта «Туризм и индустрия гостеприимства», предполагающая направить до 2030 г. из федерального бюджета 529 млрд р., из региональных бюджетов — 72 млрд р., а также привлечение частных инвестиций в объеме 2 трлн р. на развитие туристских инфраструктурных объектов⁶.

В динамике объема инвестиций в проекты ГЧП ТК и туристской сферы в 2022–2024 гг. (рис. 4) наблюдается положительный тренд объема общих инвестиций, характеризующий превышение его в 2024 г. по сравнению с 2022 г. на 211,5 млрд р. Объем частных инвестиций по сравнению с 2022 г. увеличился на 147,8 млрд р., что отражает рост инвестиционной активности частных инвесторов и характеризует привлекательность вложений в данную сферу.

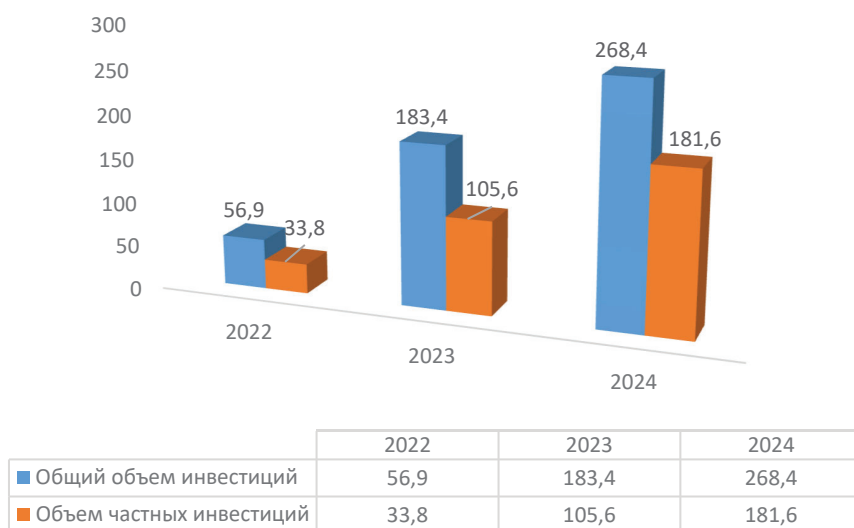
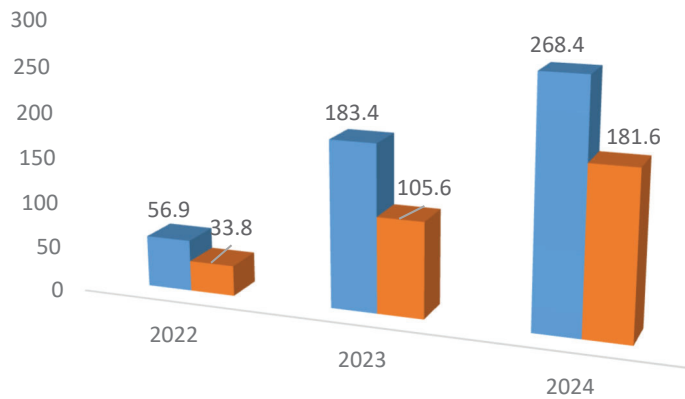


Рис. 4. Динамика объема инвестиций в проекты ГЧП туристских кластеров и туристской сферы в 2022–2024 гг., млрд р.⁷

Источник: составлено Е.С. Богомоловой, В.В. Ламбрехт, Н.В. Никулищевой на основе данных портала Росинфра. База проектов. Завершенные проекты. URL: <https://dpo.rosinfra.ru/base-projects/completed> (дата обращения: 14.05.2025).

⁶ Национальный центр ГЧП содействует привлечению инвестиций в сферу туризма URL: <https://pppcenter.ru/press-tsentr/novosti/natsionalnyy-tsentr-gchp-i-rosturizm-dogovorilis-sovmestno-sodeystvovat-privlecheniyu-investitsiy> (дата обращения: 14.05.2025).

⁷ Составлено на основе данных портала Росинфра. База проектов. Завершенные проекты URL: <https://dpo.rosinfra.ru/base-projects/completed> (дата обращения: 14.02.2025).



	2022	2023	2024
■ Total investment volume	56.9	183.4	268.4
■ Private investment volume	33.8	105.6	181.6

Figure 4. Dynamics of the volume of investments in PPP projects of tourism clusters and the tourism sector in 2022–2024, billion rubles

Source: compiled by E.S. Bogomolova, V.V. Lambrekht, N.V. Nikulishcheva on the basis of data from the Rosinfra portal. Project base. Completed projects. Retrieved 14 May 2025, from <https://dpo.rosinfra.ru/base-projects/>

Рассматриваемая ситуация взаимосвязана с положительной тенденцией развития внутреннего туризма и создает благоприятные условия для реализации дополнительных программ поддержки, в т.ч. федерального проекта по производству российского оборудования для сферы туризма, а также программ льготного кредитования по строительству гостиниц, модульных и многофункциональных туристских комплексов, аквапарков, горнолыжных комплексов и других объектов общей численностью более 218 проектов⁸.

Следует отметить, что присутствие государственного участия в организации ГЧП, направленного на возврат кредитных ресурсов, повышение эффективности реализуемых бюджетных расходов повлияли в определенной мере на привлечение частных инвестиций. Для этого Правительство РФ предприняло способствующие более быстрому реагированию на рискованные непредвиденные обстоятельства временные меры, допускающие:

- внесение изменений в КС в связи с ростом цен на материалы и строительно-монтажные работы;
- внесение без согласования с антимонопольным органом по договоренности сторон изменений в КС проектов, которые были заключены до 1 марта 2022 г., что повысило их стрессоустойчивость и гибкость при реагировании на внешние воздействия;

⁸ АО «Корпорация «МСП» — федеральный институт развития малого и среднего предпринимательства. URL: <https://corpmsp.ru/about/press/news/novosti-ekonomiki/d> (дата обращения: 04.04.2025).

- заключать КС без прохождения процедуры конкурса, если концедентом по этим соглашениям является субъект Российской Федерации и правами по земельному участку обладает концессионер.

Впоследствии эти меры были заменены соответствующими изменениями Федерального закона «О концессионных соглашениях» № 115 от 21.07.2005 г.⁹ Данные изменения позволяют сокращать перечень условий, согласование которых необходимо пройти с антимонопольным органом, но не исключают их полностью из условий КС. С антимонопольным комитетом необходимо согласовывать изменения по финансовым условиям государственной поддержки, чтобы более жестко регулировать объем финансовых обязательств, которые должны выполняться концедентом по конкретному проекту в рамках КС¹⁰.

Несмотря на устойчивость и адаптируемость рынка ГЧП в сфере туризма для организации ГЧП как формы финансирования развития ТК присущи некоторые сложности:

- влияние межведомственного взаимодействия увеличивает сроки принятия решений;
- недостаточный уровень организационных и проектных компетенций разработчиков, что влияет на качество разрабатываемых проектов ГЧП;
- не учитываются особенности туристского потенциала региона при ориентации на достижение показателей, учитываемых в проекте ГЧП;
- недостаточно широкое использование подходов программно-целевого планирования при реализации проектов ГЧП в сфере туризма.

Одним из направлений улучшения качества проектов ГЧП социальной направленности, в т.ч. совершенствования организации ГЧП как формы финансирования развития ТК является Национальная система оценки качества и сертификации инфраструктурных проектов (IRIS), разработчиками которой выступили Государственная корпорация развития «ВЭБ.РФ», АНО «Национальный Центр ГЧП», ООО «Аиком» при поддержке Минфина РФ.

Система IRIS призвана создать в России благоприятную среду для развития устойчивых инфраструктурных проектов, соответствующих высоким стандартам качества, что должно привлечь инвестиции из различных российских и зарубежных источников. Система разработана с учетом передового международного опыта в области оценки качества инфраструктурных объектов с учетом удовлетворения потребительских предпочтений. Благодаря соответствию международным нормам и требованиям российского законодательства, результаты оценки принимаются во внимание международными финансовыми

⁹ Федеральный закон «О внесении изменений в статью 54 Федерального закона» № 333-ФЗ от 14.07.2022 г. URL: https://www.consultant.ru/document/cons_doc_LAW_421918/ (дата обращения: 04.04.2025).

¹⁰ Постановление Правительства Российской Федерации «О совершенствовании порядка мониторинга заключения и реализации заключенных концессионных соглашений и об обеспечении оценки условных и безусловных обязательств бюджетов бюджетной системы Российской Федерации, возникающих при реализации концессионных соглашений № 74 от 28.01.2021 г. URL: <https://base.garant.ru/400263683/> (дата обращения: 26.05.2025).

организациями и инвесторами, что, в свою очередь, стимулирует применение передовых стандартов и практик при реализации инфраструктурных проектов. Методические положения системы IRIIS оценивают проекты по трем ключевым направлениям: экономическая эффективность и управление, качество жизни населения, воздействие на экологию и климат. Каждое направление оценивается по шкале до 1000 баллов. Суммарная оценка определяет уровень сертификации проекта в соответствии с рейтинговой шкалой (табл.).

**Рейтинговая система IRIIS, используемая для сертификации проектов
государственно-частного партнерства**

Уровень	Соответствие критериям, %	Баллы
Рейтинг не присуждается	0...19,9	599 и менее
Бронзовый	20...39,9	от 60 до 1199
Серебряный	40...59,9	от 1200 до 1799
Золотой	60...79,9	от 1800 до 2399
Платиновый	80...94,9	от 2400 до 2849
Бриллиантовый	95...100	от 2850 и более

Источник: составлено Е.С. Богомоловой, В.В. Ламбрехт, Н.В. Никулищевой на основе данных портала IRIIS — сертификация инфраструктурных проектов. URL: <https://hpb-s.com/news/iriis-sertifikacziya-infrastrukturnyh-proektov/> (дата обращения: 26.05.2025).

The IRIIS rating system used for certification of public-private partnership projects

Level	Compliance with criteria, %	Points
No rating is awarded	0–19.9	599 or less
Bronze	20–39.9	from 60 to 1199
Silver	40–59.9	from 1200 to 1799
Gold	60–79.9	from 1800 to 2399
Platinum	80–94.9	from 2400 to 2849
Diamond	95–100	from 2850 and more

Source: compiled by E.S. Bogomolova, V.V. Lambrekht, N.V. Nikulishcheva on the basis of data from the IRIIS — certification of infrastructure projects. Retrieved 26 May 2025, from <https://hpb-s.com/news/iriis-sertifikacziya-infrastrukturnyh-proektov/>

Все участники инфраструктурного рынка могут использовать IRIIS для достижения максимального качества и минимизации расходов¹¹:

¹¹ Система оценки качества и сертификации инфраструктурных проектов. URL: <https://hpb-s.com/news/iriis-sertifikacziya-infrastrukturnyh-proektov/> (дата обращения: 18.04.2025).

- владельцы проектов и инвесторы — для получения независимой оценки и сертификата качества объекта, в т.ч. для привлечения дополнительного финансирования;
- органы власти — для повышения эффективности и оптимизация государственных расходов на создание и реконструкцию региональных и федеральных инфраструктурных объектов;
- финансирующие организации и инвесторы — для получения объективной информации о качестве и устойчивости объекта ко всем видам рисков, целесообразности вложений, а также экологическом и экономическом эффекте;
- квалифицированные эксперты — для участия в проведении оценки и верификации проектов, развития собственных навыков и совершенствования системы.

Применение данной системы для разработки проектов развития ТК и сферы туризма позволяет минимизировать риски и повышать положительные результаты, безопасность объектов и их финансовую устойчивость на всех этапах разработки и внедрения. IRIIS открывает возможности для объективной оценки качества проекта, заблаговременного обнаружения потенциальных проблем, получения доступа к льготным финансовым ресурсам, развития профессиональных навыков разработчиков, а также признания проекта образцовым и включения его в базу лучших российских практик на информационном ресурсе системы.

Заключение

В целом следует отметить положительную динамику роста рынка проектов ГЧП ТК, основанную на его адаптации к изменяющимся внутренним и внешнеэкономическим условиям. Этому способствует широкий перечень мер государственной поддержки и регулирования частных инициатив, направленных на улучшение использования потенциала региональных ТК и предоставленной возможности реализации программных мероприятий развития сферы туризма через ГЧП, что становится паттерном роста экономики Российской Федерации в целом. При этом необходимо учитывать следующие положения, требующие своей реализации в практике дальнейшего развития проектов ГЧП ТК:

- совершенствование качественного обоснования и продвижения региональных проектов ГЧП ТК на основе онлайн-формата в рамках цифрового проектного офиса;
- привлечение для реализации проектов синдиката российских банков и исполнительных органов регионов как активных участников проекта;
- обеспечение получения в долгосрочной перспективе устойчивых доходов от эксплуатации объектов за счет привлечения инвестиций публичного долгового рынка;
- формирование перечня самокупаемых ИП ТК, при реализации которых можно использовать средства Фонда национального достояния на кредитной основе;

- мобилизация ресурсов ИП ГЧП ТК на основе повышения их КРІ, срока окупаемости и активизации всех участников проекта ГЧП;
- расширение использования рейтинговой системы IRIS для сертификации проектов ГЧП в целях обеспечения финансовой устойчивости на всех этапах разработки и внедрения ИП.

Во многом успешное осуществление данных положений развития ТК и сферы туризма за счет финансирования ГЧП возможно благодаря передаче финансовых рисков и риска трафика концеденту, который имеет возможность вносить в законодательство изменения, ускоряющие реализацию туристских объектов ГЧП. В соответствии с этим необходимо рассматривать в практике ГЧП максимально возможный перечень мер государственной поддержки и эффективный механизм финансирования для получения социально-экономических эффектов от реализации инфраструктурных туристских объектов и удовлетворения взаимных интересов всех участников ГЧП.

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