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«ГЛОБАЛЬНАЯ ЦИФРОВАЯ ИНТЕГРАЦИЯ: АКТУАЛЬНОСТЬ ОБЕСПЕЧЕНИЯ УСТОЙЧИВОГО МИКРО- И МАКРОЭКОНОМИЧЕСКОГО РОСТА ЧЕРЕЗ РАЗВИТИЕ ТЕХНОЛОГИЧЕСКОЙ И ИНДУСТРИАЛЬНОЙ ПРОМЫШЛЕННОСТИ В ПЕРЕХОДЕ К ЗЕЛЁНОЙ ЭКОНОМИКЕ К 2030 ГОДУ»

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05.01.00 – Axborot texnologiyalari, boshqaruv va kompyuter grafikasi
05.01.01 – Muhandislik geometriyasi va kompyuter grafikasi. Audio va video texnologiyalari
05.01.02 – Tizimli tahlil, boshqaruv va axborotni qayta ishlash
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05.01.04 – Hisoblash mashinalari, majmualari va kompyuter tarmoqlarining matematik va dasturiy ta’minoti
05.01.05 – Axborotlarni himoyalash usullari va tizimlari. Axborot xavfsizligi
05.01.06 – Hisoblash texnikasi va boshqaruv tizimlarining elementlari va qurilmalari
05.01.07 – Matematik modellashtirish
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05.02.00 – Mashinasozlik va mashinashunoslik
05.02.08 – Yer usti majmualari va uchish apparatlari
05.03.02 – Metrologiya va metrologiya ta’minoti
05.04.01 – Telekommunikasiya va kompyuter tizimlari, telekommunikasiya tarmoqlari va qurilmalari. Axborotlarni taqsimlash
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05.08.03 – Temir yo‘l transportini ishlatish
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05.09.04 – Suv ta’minoti. Kanalizatsiya. Suv havzalarini muhofazalovchi qurilish tizimlari
10.00.06 – Qiyosiy adabiyotshunoslik, chog‘ishtirma tilshunoslik va tarjimashunoslik
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08.00.02 – Makroiqtisodiyot
08.00.03 – Sanoat iqtisodiyoti
08.00.04 – Qishloq xo‘jaligi iqtisodiyoti
08.00.05 – Xizmat ko‘rsatish tarmoqlari iqtisodiyoti
08.00.06 – Ekonometrika va statistika
08.00.07 – Moliya, pul muomalasi va kredit
08.00.08 – Buxgalteriya hisobi, iqtisodiy tahlil va audit
08.00.09 – Jahon iqtisodiyoti
08.00.10 – Demografiya. Mehnat iqtisodiyoti
08.00.11 – Marketing
08.00.12 – Mintaqaviy iqtisodiyot
08.00.13 – Menejment
08.00.14 – Iqtisodiyotda axborot tizimlari va texnologiyalari
08.00.15 – Tadbirkorlik va kichik biznes iqtisodiyoti
08.00.16 – Raqamli iqtisodiyot va xalqaro raqamli integratsiya
08.00.17 – Turizm va mehmonxona faoliyati

Ma’lumot uchun, OAK Rayosatining 2024-yil 28-avgustdagi 360/5-son qarori bilan “Dissertatsiyalar asosiy ilmiy natijalarini chop etishga tavsiya etilgan milliy ilmiy nashrlar ro‘yxati”ga texnika va iqtisodiyot fanlari bo‘yicha “Muhandislik va iqtisodiyot” jurnali ro‘yxatga kiritilgan.

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THE IMPACT OF EXTERNAL DEBT, INVESTMENT ACTIVITY, AND CAPITAL FORMATION PROCESSES ON EXPORT VOLUME AND ECONOMIC GROWTH DYNAMICS IN CENTRAL ASIAN COUNTRIES

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Abstract. This study analyzes the impact of external debt, foreign direct investment (FDI), gross fixed capital formation, and debt service on export performance in five Central Asian countries — Uzbekistan, Kazakhstan, the Kyrgyz Republic, Tajikistan, and Turkmenistan — from 1992 to 2023. Using World Bank panel data, it examines both long-run and short-run relationships between these macroeconomic factors and exports as a share of GDP. The findings indicate that investment inflows, debt levels, and capital formation significantly influence export performance, offering policy insights for enhancing competitiveness, attracting investment, and improving debt management to support sustainable economic development in the region.

Keywords: export performance, Central Asia, external debt, FDI, capital formation, panel data, economic development, investment flows, trade potential.

Annotatsiya. Ushbu tadqiqot beshta Markaziy Osiyo mamlakati — O‘zbekiston, Qozog‘iston, Qirg‘iz Respublikasi, Tojikiston va Turkmaniston —da 1992–2023 yillar davomida tashqi qarz, chet el to‘g‘ridan-to‘g‘ri investitsiyalari (FDI), sof asosiy kapital shakllanishi va qarz xizmatlari eksport faoliyatiga ta’sirini tahlil qiladi. Jahon Bankining panel ma’lumotlaridan foydalangan holda, ushbu makroiqtisodiy omillar bilan YAIMdagi eksport ulushi o‘rtasidagi uzoq va qisqa muddatli munosabatlar o‘rganiladi. Natijalar shuni ko‘rsatadiki, investitsiya oqimlari, qarz darajasi va kapital shakllanishi eksport faoliyatiga sezilarli ta’sir ko‘rsatadi, bu esa raqobatbardoshlikni oshirish, investitsiyalarni jalb qilish va qarz boshqaruvini takomillashtirish orqali mintaqada barqaror iqtisodiy rivojlanishni qo‘llab-quvvatlash uchun siyosiy tavsiyalar beradi.

Kalit so‘zlar: eksport faoliyati, Markaziy Osiyo, tashqi qarz, FDI, kapital shakllanishi, panel ma’lumotlar, iqtisodiy rivojlanish, investitsiya oqimlari, savdo salohiyati.

Аннотация. Данное исследование анализирует влияние внешнего долга, прямых иностранных инвестиций (FDI), валового образования основного капитала и обслуживания долга на экспортную деятельность в пяти странах Центральной Азии — Узбекистане, Казахстане, Кыргызской Республике, Таджикистане и Туркменистане — за период с 1992 по 2023 год. Используя панельные данные Всемирного банка, исследование рассматривает долгосрочные и краткосрочные взаимосвязи между этими макроэкономическими факторами и долей экспорта в ВВП. Результаты показывают, что потоки инвестиций, уровень долга и формирование капитала существенно влияют на экспортную деятельность, предоставляя рекомендации по повышению конкурентоспособности, привлечению инвестиций и улучшению управления долгом для поддержки устойчивого экономического развития в регионе.

Ключевые слова: экспортная деятельность, Центральная Азия, внешний долг, FDI, формирование капитала, панельные данные, экономическое развитие, инвестиционные потоки, торговый потенциал.

INTRODUCTION

Export-led growth has been widely recognized in numerous studies as a key driver of economic development in emerging economies. The experiences of East Asian countries, such as South Korea and China, clearly demonstrate that the development of competitive export sectors accelerates industrialization and increases national income. Empirical research has shown that export expansion positively influences GDP growth in developing countries [1,2]. Therefore, the promotion of goods and services exports holds strategic importance for the development of low- and middle-income economies.

In the context of Central Asia, export performance plays a particularly crucial role in sustaining economic growth and ensuring economic diversification. Despite more than three decades since the dissolution of the Soviet Union, Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan continue to face challenges in achieving broad-based export growth based on their natural resource endowments and labor potential. The majority of their exports remain concentrated in raw materials: in 2023, primary commodity exports accounted for approximately 65% or more in Kyrgyzstan, Tajikistan, and Uzbekistan, and more than 90% in Kazakhstan and Turkmenistan [3].

One of the key macroeconomic factors influencing export performance is external debt. While indebtedness can facilitate the financing of export potential, excessive external borrowing may lead to a “debt overhang,” thereby constraining growth and trade expansion [4,5]. Conversely, investments—particularly foreign direct investment (FDI)—serve as an essential catalyst for export expansion. FDI brings in capital, technology, and access to international markets, thus positively contributing to a country’s export capacity [6,7]. Likewise, domestic capital formation—through the development of equipment, factories, and infrastructure—supports export growth and fosters a diversified industrial base [8].

At the same time, scholarly research examining the impact of debt and investment factors on exports in Central Asian countries remains limited. While many existing studies have focused on East Asia or other developing regions, the post-Soviet transition experience and resource-dependent economic structures of Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan necessitate a distinct and in-depth analysis of export and investment dynamics. Although some studies have explored the impact of high trade costs and logistical inefficiencies on exports, comprehensive empirical analyses linking macroeconomic determinants to export performance in the region are still scarce.

RESEARCH OBJECTIVE

The primary objective of this study is to analyze the impact of external debt, debt service payments, foreign direct investment (FDI), and gross capital formation on export growth in Central Asian countries. The research focuses on the export of goods and services in Uzbekistan, Kazakhstan, the Kyrgyz Republic, Tajikistan, and Turkmenistan over the period 1992–2023. Utilizing panel data analysis, the study aims to provide a clearer understanding of how debt burdens and investment inflows have influenced export performance across the region.

The main contributions of the research are as follows: first, it empirically examines the determinants of exports in Central Asian countries, thereby addressing an existing gap in the regional economic literature; second, it offers policy recommendations aimed at promoting export-led economic growth through prudent debt management and the enhancement of investment volume.

RESEARCH METHODOLOGY

This study employs panel data covering the period from 1992 to 2023 for five Central Asian countries — Uzbekistan, Kazakhstan, the Kyrgyz Republic, Tajikistan, and Turkmenistan. This approach allows for controlling cross-country heterogeneity, analyzing temporal variations, and improving the precision of estimation results. Export performance is adopted as the dependent variable, while external debt stock, inflows of foreign direct investment (FDI), gross capital formation, and debt service are included as independent variables. All data were obtained from the World Bank’s World Development Indicators (WDI) database.

To examine the impact of macroeconomic indicators on export performance, the following linear panel regression model was estimated:

$$Exports_{it} = \beta_0 + \beta_1 DebtStock_{it} + \beta_2 FDI_{it} + \beta_3 GFCF_{it} + \beta_4 DebtService_{it} + u_i + \varepsilon_{it}$$

where:
- i represents the country,
- t denotes the time period (year),

− u_i captures unobserved country-specific effects,
− ε_{it} is the random error term.

The study applies both Fixed Effects (FE) and Random Effects (RE) models. The FE model controls for time-invariant country-specific factors by exploiting within-country variations over time, while the RE model assumes that country-specific effects are uncorrelated with the explanatory variables.

ANALYSIS AND RESULTS

Regression Analysis. The conducted regression analysis reveals a significant interrelationship between macroeconomic factors and export performance in Central Asian countries. The model accounts for approximately 24.6% of the variation in the export-to-GDP ratio, indicating that macroeconomic variables exert a statistically significant influence on export activity.

Among the examined variables, foreign direct investment (FDI) emerges as the most influential factor positively affecting export growth. A one-percentage-point increase in FDI inflows is associated with a 1.458-percentage-point rise in the export share, underscoring the crucial role of FDI in capital accumulation, technology transfer, and expanding access to international markets.

Furthermore, external debt also exhibits a positive relationship with exports, with a coefficient of 0.137, suggesting that external borrowing can be beneficial when effectively allocated toward financing infrastructure development and export-oriented sectors.

Table 1. Results of the Linear Regression (Based on the Random Effects Model)

Variable	Coefficient (Coef.)	Standard Error (St. Err.)	t-stat	p-value	95% Confidence Interval [Conf. Interval]	Significance (Sig.)
External Debt (as % of GDP)	0.137	0.039	3.53	0.001	[0.060; 0.213]	***
Foreign Direct Investment (as % of GDP)	1.458	0.31	4.25	0.000	[0.846; 2.070]	***
Gross Capital Formation (as % of GDP)	-0.383	0.14	-2.74	0.007	[-0.659; -0.107]	**
Debt Service (as % of GDP)	-0.156	0.219	-0.71	0.477	[-0.589; 0.277]	—
Constant	33.055	7.78	4.71	0.000	[24.652; 41.459]	***

Table 2. Model Summary Statistics

Mean dependent var	37.045	R-squared	0.246
SD dependent var	15.594	F-test	11.329
Number of obs	144	Prob > F	0.000
Akaike crit. (AIC)	1168.123	Bayesian crit. (BIC)	1182.972

*** p<.01, ** p<.05, * p<.1

At the same time, gross capital formation was found to have a negative relationship with exports. This outcome suggests that investments may have been directed toward low-efficiency sectors or projects that are not primarily export-oriented, thereby limiting their contribution to external trade performance. Although debt service exhibited a negative effect on exports, the relationship was statistically insignificant, indicating that debt repayment obligations did not impose a substantial constraint on foreign trade activity during the analyzed period.

Table 3. Regression Results (Random Effects Model)

Variable	Coefficient	Standard Error	t-statistic	p-value	95% Confidence Interval	Significance
External Debt (% of GDP)	0.137	0.039	4.25	0.001	[0.031 ; 0.219]	***p < 0.01***
Foreign Direct Investment (% of GDP)	1.458	0.310	3.53	0.000	[0.140 ; 0.710]	***p < 0.01***
Investment in Gross Capital Formation (% of GDP)	-0.383	0.219	-2.74	0.006	[-0.710 ; -0.070]	***p < 0.01***
Total External Debt Service (% of GDP)	-0.156	0.476	-0.71	0.476	[-0.650 ; 0.340]	Ahamiyatsiz
Constant	33.055	7.780	4.71	0.000	[24.650 ; 41.460]	p < 0.01

Table 4. Model Summary Statistics

Mean dependent var	37.045	R-squared within	0.200
SD dependent var	15.594	R-squared between	0.629
Number of obs	144	Chi-square	45.318
Overall r-squared	0.246	Prob > chi2	0.000

*** p<.01, ** p<.05, * p<.1

Regression Analysis. The regression results based on the Random Effects model provide substantial evidence regarding the determinants of export performance in Central Asian countries over the period 1992–2023. The dependent variable—exports of goods and services (as a share of GDP)—is significantly influenced by several key macroeconomic indicators.

According to the model, foreign direct investment (FDI) emerges as the most influential determinant of export performance. With a coefficient of 1.458, FDI exerts a positive and statistically significant effect at the 1% level. This implies that a one-percentage-point increase in FDI inflows relative to GDP corresponds, on average, to a 1.458-percentage-point rise in the export share. This strong positive relationship underscores the crucial role of FDI in capital accumulation, technology transfer, management expertise diffusion, and broadening access to international markets.

External debt (as a percentage of GDP) also exhibits a positive and statistically significant effect on exports. With a coefficient of 0.137, a one-percentage-point increase in external debt is associated, on average, with a 0.137-percentage-point increase in export performance. This finding suggests that when external borrowing is efficiently allocated—particularly toward infrastructure development and export-oriented sectors—it can effectively enhance a country's export capacity.

In contrast, gross capital formation (as a percentage of GDP) shows a negative and statistically significant relationship with exports. The coefficient of –0.383 indicates that increases in domestic investment tend to coincide with lower export volumes. This unexpected result suggests inefficiencies in investment allocation, where resources may be channeled into low-productivity sectors, non-tradable activities, or domestically focused projects. Hence, it underscores the need to redirect investment flows toward export-oriented and high-efficiency sectors rather than merely expanding overall investment levels.

Meanwhile, total external debt service (as a percentage of GDP) carries a negative but statistically insignificant coefficient (–0.156). This implies that debt repayment obligations did not exert a substantial constraint on export activity during the analyzed period. Nonetheless, the negative sign aligns with economic expectations, indicating that higher debt servicing could potentially limit financial flexibility and reduce export competitiveness if it increases fiscal pressure.

Overall, the model demonstrates a satisfactory fit, with an overall R^2 of 0.246, meaning that approximately 25% of the variation in exports is explained by the selected macroeconomic variables. Additionally, the between R^2 of 0.629 highlights substantial explanatory power across countries. The Chi-square test ($p < 0.001$) confirms the overall statistical significance of the model (see Table 3).

Table 5. Regression Results (Fixed Effects Model)

Variable	Coefficient (Coef.)	Standard Error (St. Err.)	t-statistic	p-value	95% Confidence Interval	Significance
Exports of Goods and Services (% of GDP) – Constant	26,025	0,363	43,218	0,000	26,025	***
External Debt Share (% of GNI)	0,246	0,059	1,936	0,042	0,042 – 0,65	**
Foreign Direct Investment (FDI, % of GDP))	1,293	0,325	4,347	0,000	0,65 – 1,936	***
Gross Capital Formation (% of GDP)	-0,532	0,15	-3,56	0,001	-0,829 – -0,236	***
Total Debt Service (% of GNI)	-0,629	0,339	-1,85	0,066	-1,3 – -0,236	*

Table 6. Model Summary Statistics

Mean dependent var	37.045	R-squared	0.229
SD dependent var	15.594	F-test	10.042
Number of obs	144	Prob > F	0.000
Akaike crit. (AIC)	1153.537	Bayesian crit. (BIC)	1168.386

*** p<.01, ** p<.05, * p<.1

Fixed Effects Regression Analysis. The Fixed Effects (FE) model accounts for cross-country heterogeneity and controls for within-country variation over time. The results indicate that foreign direct investment (FDI) and external debt stimulate export growth, whereas domestic capital formation and debt service exert a negative impact on export performance.

The FE regression provides important insights into the determinants of export performance in Central Asian countries during 1992–2023. By incorporating country-specific, time-invariant effects, the model controls for structural differences that remain constant over time. The R-squared value of 0.229 suggests that approximately 22.9% of the variation in exports of goods and services (as a share of GDP) is explained by the model. The overall F-test is highly statistically significant ($p < 0.001$), confirming that the included macroeconomic variables collectively explain a substantial portion of export variability.

Foreign direct investment (FDI) demonstrates a positive and statistically significant effect on exports. With a coefficient of 1.293 ($p < 0.01$), a one-percentage-point increase in FDI inflows relative to GDP corresponds, on average, to a 1.293-percentage-point increase in exports. This underscores the pivotal role of FDI in enhancing capital accumulation, facilitating technology transfer, and integrating national economies into global value chains, thereby strengthening export potential.

The share of external debt (as a percentage of GNI) also exhibits a positive and statistically significant relationship with exports. With a coefficient of 0.246 ($p < 0.01$), a one-percentage-point rise in external debt is associated with a 0.246-percentage-point improvement in export performance. This finding implies that well-managed external borrowing, particularly when allocated to infrastructure development and export-oriented sectors, can effectively expand productive capacity and stimulate trade growth.

Conversely, gross capital formation (as a percentage of GDP), which represents domestic investment, shows a negative and statistically significant relationship with exports. The coefficient of –0.532 ($p = 0.001$) indicates that higher domestic investment is associated with a decline in export efficiency. This suggests inefficient allocation of investment resources, with capital possibly being directed toward low-productivity or non-tradable sectors. Therefore, simply increasing the volume of domestic investment is insufficient—investments must be strategically targeted toward trade- and production-oriented activities that enhance competitiveness in global markets.

The coefficient for total debt service (as a percentage of GNI) is –0.629, which is marginally significant at the 10% level ($p = 0.066$). This result implies that debt repayment obligations may constrain financial resources available for export-promoting initiatives, such as infrastructure improvement, logistics, and government export support programs. Although the effect is not statistically significant at the 5% level, the negative sign aligns with theoretical expectations that high debt service burdens can limit export performance by tightening fiscal space.

The constant term is positive and statistically significant, representing the average level of exports when all explanatory variables are zero, though its interpretation is limited in panel data models.

Overall, the Fixed Effects results highlight that external investments—especially FDI—serve as a key driver of export performance in Central Asia. Meanwhile, the efficiency and sectoral targeting of domestic investment require further improvement. External debt can play a supportive role in promoting exports if prudently managed, whereas monitoring debt service obligations remains essential to ensure macroeconomic stability and sustained trade growth.

CONCLUSION

The effectiveness of export-led growth in Central Asia largely depends on the strategic attraction of foreign capital and the efficient allocation of domestic investments. The study demonstrates that foreign direct investment (FDI) and external borrowing, when judiciously utilized for export-promoting and productivity-enhancing projects, can substantially strengthen the region's export potential.

At the same time, effective management of domestic investments and their strategic orientation toward export-oriented sectors are crucial, as merely increasing investment volume does not automatically translate into export growth. Ensuring that domestic capital supports innovation, competitiveness, and production diversification is essential for achieving sustained trade expansion.

Maintaining debt obligations at sustainable levels while aligning investment priorities will be vital for Central Asian economies seeking deeper integration into global markets. The findings emphasize that, for long-term export development, the quality, structure, and allocation of capital are just as important as its quantity.

This research offers practical insights for policymakers, highlighting the importance of leveraging FDI inflows, well-managed external debt, and targeted domestic investment as complementary instruments to boost exports. Together, these factors form the core pillars for developing diversified, resilient, and competitive economic systems across Central Asian countries.

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