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Economic Freedom and Foreign Direct Investment in Central Asia: Short-Run and Long-Run Evidence

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Abstract
In the context of the transformation of post-socialist economies and increasing global competition for capital, the analysis of institutional factors in attracting foreign direct investment is of particular importance. The aim of the study is to assess the short– and long-term impact of economic freedom on the inflow of foreign direct investment in five Central Asian countries over the period 1998-2024. Using a panel autoregressive distributed lag (ARDL) approach with the Pooled Mean Group (PMG) estimator, the analysis distinguishes between short-run and long-run effects while accounting for cross-sectional dependence and heterogeneity across countries. Panel unit root tests indicate that the variables are integrated of mixed order, justifying the application of the panel ARDL framework. The results showed that there is a stable long-term relationship between economic freedom and investment inflows. The long-term coefficient of economic freedom is 0.095 ($p < 0.01$), which indicates a positive and statistically significant impact of institutional quality on the investment attractiveness of the region. In the extended model specification, this effect persists (0.114; $p < 0.01$). The error correction factor is -0.65 ($p < 0.01$), which indicates a correction of about 65% of short-term deviations from equilibrium during one period. The short-term effects turned out to be statistically insignificant, which confirms the inertial nature of investment decisions. The results have important policy implications, highlighting the need for sustained institutional reforms aimed at improving economic freedom to foster stable and long-term foreign investment inflows

KEYWORDS
Economy, Economic Freedom, Economic Growth, Investment, Foreign Direct Investment, Institutional Quality, Central Asia

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1 | INTRODUCTION

Since the 1980s, the deepening of globalization processes has been accompanied by the structural transformation of national economies and the strengthening of market institutions in ensuring economic growth. In parallel, the neoliberal paradigm, promoted by international financial organizations through structural adjustment mechanisms and credit support instruments, has encouraged developing countries to implement institutional and macroeconomic reforms. These reforms were aimed at trade liberalization, market deregulation, the strengthening of property rights, and fiscal consolidation, which collectively contributed to the expansion of economic freedoms and the integration of countries into the global economic system.

From a theoretical perspective, economic freedom (hereinafter – EF) is regarded as a factor that facilitates increased inflows of foreign direct investment (hereinafter – FDI) by reducing administrative barriers, strengthening the rule of law, enhancing the predictability of the institutional environment, and reinforcing competitive market mechanisms (Hall & Lawson, 2013). Improvements in institutional conditions reduce transaction costs and investment risks, thereby increasing a country's attractiveness to foreign investors. In turn, FDI, by ensuring the inflow of capital, modern technologies, managerial competencies, and integration into global value chains, may contribute to the expansion and increasing complexity of the export structure, the formation of new industries, and the transition toward a more diversified and higher-income development model (Fonchamnyo, 2015; Gamariel et al., 2022). Thus, EF acts as a determinant of FDI inflows, while FDI itself represents one of the key channels for ensuring sustainable economic growth (Azretbergenova et al., 2022; Serikkyzy et al., 2024).

This issue assumes particular research significance in Central Asia, where countries have been undergoing institutional transformation since the dissolution of the Soviet Union in 1991. The transition from a centrally planned to a market-based model was accompanied by the restructuring of state institutions, the reform of property rights systems, the liberalization of foreign economic activity, and the gradual formation of market infrastructure. Under these conditions, the analysis of the relationship between the level of EF and FDI inflows enables empirical assessment of the effectiveness of institutional reforms and their impact on the trajectory of economic development.

The present study aims to identify and quantitatively assess the relationship between EF and FDI in the Central Asian countries, including Kazakhstan, Uzbekistan, Turkmenistan, Kyrgyzstan, and Tajikistan, while accounting for their post-socialist specificity and institutional dynamics. Prior to 1991, the countries of Central Asia operated under conditions of a centralized planned economy and politically authoritarian regimes. Following the dissolution of the Soviet Union, they entered a phase of systemic transformation characterized by the transition from an administrative-command model to a market economy and the gradual institutional restructuring of political systems. However, unlike the countries of Central and Eastern Europe, where transformation processes were relatively rapid and accompanied by accelerated institutional convergence with European standards, the transition in Central Asia was more protracted and heterogeneous. Even more than three decades later, institutional constraints, structural imbalances, and elements of incomplete market transformation persist (Kakizhanova et al., 2025).

In Central Asia, FDI volumes declined by 39 per cent to United States dollars 4 billion (net inflow), while the number of new greenfield projects decreased by 11 per cent, from 158 to 140. According to McKinsey, the structure of global FDI has changed radically over the past five years: whereas capital investments in services and traditional industries previously

accounted for the largest share, since 2022, there has been a shift toward capital-intensive technology sectors (Heritage Foundation, 2025).

Differences in transition trajectories have generated increased scholarly interest in the analysis of post-socialist economies. In recent years, there has been a growing number of empirical studies devoted to the assessment of institutional reforms, investment dynamics, and structural changes in these countries. Nevertheless, the existing literature contains a limited number of studies that consider EF as an independent determinant of FDI inflows, particularly in the context of its influence on structural transformation and export diversification (Ydyrys & Sharhanova, 2022; Pobirchenko & Shutaeva, 2025).

In contrast to previous studies, the present work seeks to provide a comprehensive analysis of the relationship between the level of economic freedom, FDI inflows, and the degree of export diversification in the Central Asian countries. The limited number of empirical studies that integrate these variables into a unified analytical model served as the primary motivation for this research.

The purpose of this study is to assess the short- and long-term effects of EF on FDI inflows in five Central Asian countries–Kazakhstan, Kyrgyzstan, Turkmenistan, Tajikistan, and Uzbekistan–over the period 1998–2024. To achieve this objective, the study conducts a comprehensive statistical analysis of FDI and EF indicators, determines the average EF level in the region, performs panel unit root tests, and examines cross-sectional dependence among the variables. Furthermore, the existence of a long-run equilibrium relationship between EF and FDI is tested using the Doan and Pedroni panel cointegration approaches, while the short- and long-run dynamics are estimated within the PMG Panel ARDL framework. The analysis is based on a balanced panel covering 1998–2024, ensuring data consistency, improving the reliability of econometric estimates, and enhancing the comparability of the empirical results.

2 | LITERATURE REVIEW

The question of the impact of economic freedom, institutional quality, and trade liberalization on FDI inflows constitutes one of the key directions of contemporary empirical literature. Studies demonstrate a stable relationship among the institutional environment, the level of economic openness, and countries' investment attractiveness. However, the results vary by sample of countries, time period, and methodology employed. Early empirical studies focused on the role of trade liberalization and membership in international organizations. For example, Binh and Haughton (2002), based on an analysis of 16 Asian countries for the period 1990–1999 using panel ordinary least squares, demonstrated that trade liberalization and membership in the World Trade Organization contribute to FDI growth, with the effect of World Trade Organization membership strengthening both in the short and long term. This study laid the foundation for subsequent analyses of institutional determinants of investment attractiveness.

Expanding the geographical scope, Quazi and Rashid (2004) used a sample of 67 developing countries for 1995–2000 and found that EF and trade openness exert a statistically significant and positive effect on FDI. Their findings confirm the hypothesis that liberal economic policies create a favorable investment environment. The institutional dimension of the investment climate is examined in greater detail in the study by Dutta and Roy (2009), who employing two-stage least squares and ordered probit models for 115 countries, demonstrated that freedom of the press, democracy, and the level of education positively influence FDI inflows, whereas dependence on natural resources has a negative effect. This indicates the risks associated with the resource curse and underscores the importance of

high-quality institutions.

The relationship between FDI and structural economic transformation is analyzed in the study by Shin (2010) for countries of the Organisation for Economic Co-operation and Development. The author established that FDI contributes to export diversification and mitigates the adverse effects of crises, thereby highlighting the role of foreign investment as a mechanism for enhancing economic resilience. A systematization of accumulated empirical findings is presented in the meta-analysis by Hall and Lawson (2013), encompassing 402 studies. The authors concluded that EF is generally positively associated with economic growth, investment, and welfare levels, which indirectly confirms its significance for attracting FDI. Subsequent studies emphasize the interaction between economic and political freedoms. Sambharya and Rasheed (2015), applying panel generalized least squares to 95 countries, demonstrated that economic and political freedoms stimulate FDI, whereas corruption and excessive government intervention reduce it. Similar conclusions were reached by Ghazalian and Amponsah (2019), where ordinary least squares and generalized method of moments estimations confirmed the central role of the rule of law, market openness, and regulatory freedom.

Regional studies demonstrate heterogeneity of effects. For example, Fonchamnyo (2015), analyzing countries of the Central African Economic and Monetary Community, identified a positive impact of FDI and trade openness on export diversification but noted a negative effect of natural resource rents. In the study by Lee et al. (2015) focusing on Kazakhstan, FDI was shown to stimulate economic growth. However, its contribution to diversification was limited, particularly in the manufacturing sector.

The use of dynamic models has enhanced the empirical robustness of conclusions. Naanwaab and Diarrassouba (2016), employing the generalized method of moments for 137 countries, confirmed the positive influence of EF on FDI but noted that in low-income countries this effect is weaker and significantly dependent on the level of human capital. Similar results are presented in the study by Osakwe et al. (2018), where trade liberalization and institutional quality promote export diversification.

Recent studies have focused on financial factors and macroeconomic stability. Paul and Jadhav (2020) demonstrated that infrastructure and institutional quality increase FDI, whereas corruption and high trade costs reduce it. In the study by Yusuf et al. (2020), using a panel autoregressive distributed lag approach, it was established that in the long term, FDI contributes to economic growth; however, political instability diminishes this positive effect. For African countries, issues of financial development and institutional quality are particularly relevant. Kwablah and Amoah (2022) found that EF strengthens the impact of FDI on growth under conditions of low financial vulnerability. Shikur (2024), employing the system generalized method of moments, confirmed the positive influence of EF and financial development on FDI but emphasized that high tax pressure and weak infrastructure offset this effect. A regional comparative analysis by Singh and Gal (2020) likewise demonstrates that economic and trade freedom positively affect FDI, whereas tax burden and corruption negatively affect it.

In economic literature, the positive impact of EF on attracting FDI is explained by the fact that a liberal institutional environment creates conditions for the more effective integration of foreign investors into the national economy. First, FDI facilitates the transfer of modern technologies to host countries. Second, foreign companies introduce advanced methods of business organization and management under market conditions. Third, high-technology employment opportunities are created, thereby increasing the level of human capital and contributing to the structural modernization of the economy.

Practical confirmation of these propositions can be observed in several countries of Southeast Asia, such as China, Vietnam, Singapore, and Malaysia, which have used FDI as a strategic instrument for technological modernization and the enhancement of international competitiveness. These countries have succeeded in integrating foreign investment into long-term development strategies, thereby ensuring sustainable economic growth and production diversification (Abutalipov & Deger, 2024; Platonova, 2025; Yuan, 2024). A study conducted by Socol and Iuga emphasizes that EF and institutional quality play an important but ambiguous role in shaping the investment and financial environment. Analyzing data for 27 European Union countries for the period 2001–2020 using a dynamic panel GMM approach, the authors show that democracy and high-quality institutions contribute to the stability and efficiency of the financial sector, while EF in developed markets can have a negative impact due to increased competition and risks. These results indicate that the impact of EF on capital inflows depends on the institutional and macroeconomic context (Socol & Iuga, 2025). Similar conclusions were reached in the work of Dang and Anh, which confirms that the effect of EF on the stability of banking systems and the investment attractiveness of countries is conditional and depends significantly on the level of economic policy uncertainty. In conditions of institutional stability, EF contributes to the formation of a favorable investment climate, while in conditions of high political uncertainty, its impact may be neutral or negative (Socol & Iuga, 2025).

Gidage and Bhide (2025) showed that the quality of institutions and EF have a sustained positive impact in the long term, emphasizing the importance of distinguishing between short-term and long-term effects using an ARDL panel model. These findings are consistent with the results of Kunawotor et al. (2025) identified the positive impact of EF and the quality of institutions on economic well-being and emphasize the role of strong institutions in mitigating the negative effects of public policy in developing countries. Toms and Lin (2025) add to this literature by showing that increased EF and financial liberalization without adequate institutional control can lead to systemic risks and a decline in investor confidence. From a theoretical perspective, Fatah et al. (2025) emphasised the limitations of the neoliberal approach and argued that EF must be accompanied by institutional stability and social inclusion to ensure sustainable development. Empirical results from East Asian countries confirm that not all institutional components are equally important for economic growth, with the quality of regulation and control of corruption playing a key role–factors directly related to the investment decisions of foreign investors. Taken together, the existing literature points to the need to analyze the short- and long-term effects of EF on FDI in Central Asian countries (Iskandar et al., 2025).

Despite the extensive empirical literature, the Central Asian countries remain insufficiently studied in the context of the impact of economic freedom on foreign direct investment inflows, given their post-socialist institutional specifics. Most studies do not distinguish between short-term and long-term effects and do not account for cross-country dependence and heterogeneity, which limits the interpretation of the results. Thus, a methodological and regional gap remains, necessitating a dynamic panel analysis of the long- and short-term impacts of economic freedom on investment flows in Central Asia.

3 | RESEARCH METHODS

This study is based on a panel data analysis of five Central Asian countries–Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan–for the period 1998–2024. The selected time span ensures the availability of complete and comparable statistical data for all countries, allowing the construction of a balanced panel dataset. Countries with incomplete or

inconsistent data were excluded to preserve the reliability and consistency of the empirical analysis. The empirical model includes the following variables: FDI, EF, GDP, and Inflation (INF). FDI is measured as net inflows as a percentage of GDP. EF is represented by the overall EF Index score. GDP is measured as annual real GDP growth (percentage), reflecting each country's macroeconomic performance and economic expansion. Inflation is captured using the annual GDP deflator (percentage), which reflects overall price dynamics in the economy (Table 1).

Table 1 Variables used in the study

Abbreviation	Definition	Measurement	Source
FDI	Foreign Direct Investment	Net FDI inflows (% of GDP)	World Bank (2024)
EF	Economic Freedom	Economic Freedom Index (overall score)	The Heritage Foundation (2024)
GDP	Market Size / Economic Development	Real GDP (annual %)	World Bank (2024)
INF	Inflation	GDP deflator (annual %)	World Bank (2024)

Note: compiled by the author

All data was obtained from internationally recognized databases, primarily the World Bank's World Development Indicators and The Heritage Foundation database. The use of harmonized international sources ensures cross-country comparability and consistency over time. The study uses the Index of EF, published annually by the Heritage Foundation, as a key indicator of institutional performance. This index reflects a country's level of EF based on 12 indicators characterizing the rule of law, the size of the state, the effectiveness of regulation, and the openness of markets, and is measured on a scale from 0 to 100. The final value is calculated as a weighted average of these components, with higher index values indicating a more favorable institutional environment for free economic choice and competition, which is theoretically associated with increased investment activity and sustainable long-term economic growth.

The empirical strategy follows a stepwise panel econometric procedure. First, panel unit root tests are conducted to determine the variables' integration properties and confirm that none are integrated of order two. Second, cross-sectional dependence tests are applied to assess potential interdependence among the countries. Third, panel cointegration tests are performed to verify the existence of a long-run equilibrium relationship between EF and FDI. Finally, the long-run and short-run dynamics are estimated using the Pooled Mean Group Panel ARDL estimator, which allows for heterogeneous short-run adjustments across countries while imposing homogeneity on long-run coefficients. Econometric calculations and empirical analysis were conducted using the EViews software package.

4 | RESULTS

Prior to the econometric analysis, a preliminary statistical examination of the variables included in the model is conducted. This analysis provides an overview of the central tendencies, dispersion, and distributional characteristics of the data, allowing for an initial assessment of variability and potential heterogeneity within the panel. Table 2 presents the descriptive statistics for FDI, EF, GDP, and INF for the selected Central Asian countries over the period 1998–2024.

Table 2 Descriptive statistics

Statistic	FDI	EF	GDP	INF
Mean	4.536	52.186	6.310	14.765
Median	3.170	52.200	6.500	11.869
Maximum	22.520	71.100	16.500	87.876
Minimum	−4.850	31.050	−7.150	−5.153
Std. Deviation	4.100	8.311	3.412	13.222
Skewness	1.367	−0.087	−0.332	2.005
Kurtosis	5.497	2.454	4.815	9.826
Jarque–Bera	77.100	1.848	21.014	352.539
Probability	0.000	0.397	0.000	0.000
Observations	135	135	135	135

Note: authors' calculations using EViews

The results indicate that the average EF level is approximately 52 points, reflecting a moderate level of institutional development in the region. The FDI variable exhibits considerable variability, with a relatively high standard deviation and positive skewness, indicating the presence of several periods characterized by substantial investment inflows. GDP shows moderate dispersion and slight negative skewness, suggesting that extremely high-growth episodes were less frequent than moderate growth periods.

INF demonstrates significant variability and pronounced positive skewness, reflecting episodes of high price instability in certain years. The Jarque–Bera statistics indicate that most variables deviate from a normal distribution, particularly FDI and INF, which exhibit higher kurtosis. Overall, the descriptive statistics highlight substantial heterogeneity in macroeconomic and institutional conditions across Central Asian countries during the analyzed period.

Overall, visual analysis indicates a positive correlation, whereby countries with higher EF levels tend to have higher FDI volumes. Figure 1 shows the cross-country relationship between EF levels and FDI in Central Asian countries.

Kazakhstan (KAZ) demonstrates both a high EF and significant FDI, which is consistent with general theoretical expectations. Kyrgyzstan (KGZ) and Tajikistan (TJK) occupy intermediate positions, reflecting moderate values for the indicators analyzed. Uzbekistan (UZB), despite a comparable level of FE, is characterized by relatively lower volumes of FDI. At the same time, Turkmenistan (TKM) is a special case: despite a relatively low EF, the country attracts significant FDI volumes. This discrepancy can be explained by the specific structure of FDI, which is mainly focused on the raw materials and energy sectors and is largely shaped by state and intergovernmental agreements rather than market institutional conditions.

Overall, the descriptive analysis shows a positive relationship between EF and FDI. At the same time, the identified cross-country heterogeneity points to the need for more rigorous panel econometric methods, which justifies the use of PMG-Panel ARDL models to assess short- and long-term effects.

When analyzing the temporal properties of variables in the study, panel tests for unit roots were applied, including Levin–Lin–Chu (LLC), Im–Pesaran–Shin (IPS), ADF-Fisher, and PP-Fisher. The results of the corresponding tests are presented in Table 3.

The results of the panel unit root tests reported in Table 3 provide evidence on the stochastic properties of the variables included in the model. To ensure robustness, four complementary panel unit root tests were applied: Levin–Lin–Chu (LLC), Im–Pesaran–Shin

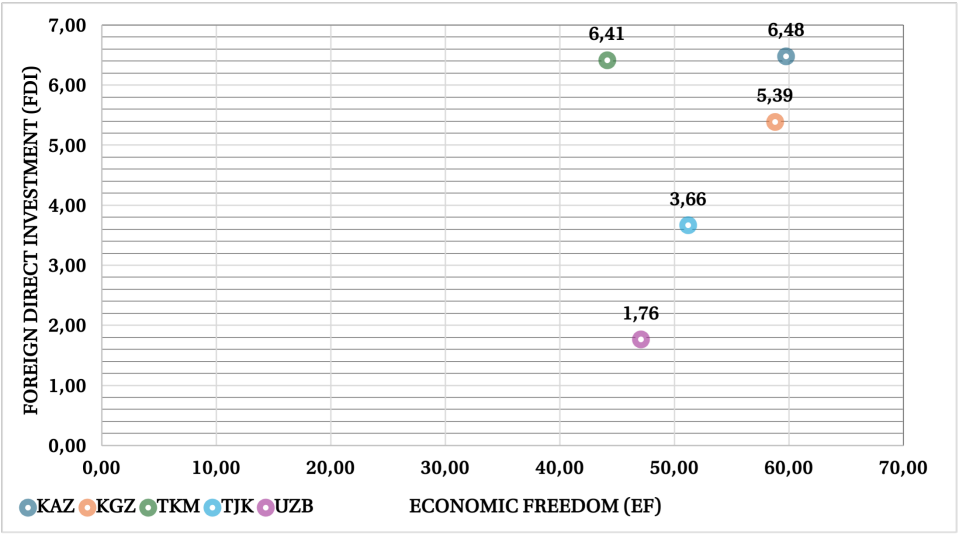


Figure 1 Relationship between Economic Freedom and Foreign Direct Investment in Central Asian Countries

(IPS), ADF-Fisher, and PP-Fisher. The order of integration was determined based on the consistency of results across these tests, following a majority decision rule. The findings indicate that GDP and INF are stationary at levels, as all applied tests consistently reject the null hypothesis of a unit root at the 1% significance level. For EF, most tests also reject the null hypothesis at conventional significance levels, although the statistical evidence is comparatively weaker; therefore, EF can be classified as weakly stationary at level, i.e., I(0).

Table 3 Panel unit root test result

Variable	LLC	IPS	ADF-Fisher	PP-Fisher	Conclusion
EF	−2.28**	−2.01**	19.17**	22.31**	Stationary (weak)
FDI	−1.41*	−1.02	12.15	31.50***	Mixed
GDP	−2.81***	−3.49***	30.51***	43.48***	Stationary
INF	−2.96***	−3.46***	31.29***	54.43***	Stationary
ΔEF	−4.72***	−5.25***	46.00***	73.12***	Stationary
ΔFDI	−7.20***	−8.16***	73.99***	125.04***	Stationary
ΔGDP	−8.04***	−8.03***	72.43***	118.37***	Stationary
ΔINF	−7.80***	−10.03***	92.46***	105.19***	Stationary

*, **, *** denote rejection of the unit root null at 10%, 5%, and 1% significance levels, respectively.

Note: authors' calculations using EViews

In contrast, the evidence for FDI at the level is mixed. While the PP-Fisher statistic suggests stationarity, the LLC and IPS tests do not uniformly reject the null hypothesis of a unit root, preventing a definitive classification of FDI as I(0). However, all panel unit root tests applied to the first-differenced series (ΔFDI) strongly reject the null hypothesis at the 1% level, confirming that FDI becomes stationary after first differencing. Moreover, the

first differences of all variables (ΔEF, ΔFDI, ΔGDP, and ΔINF) are found to be statistically stationary. Accordingly, the variables can be classified as follows: FDI – I(1); EF – I(0) (weakly stationary); GDP – I(0); and INF – I(0).

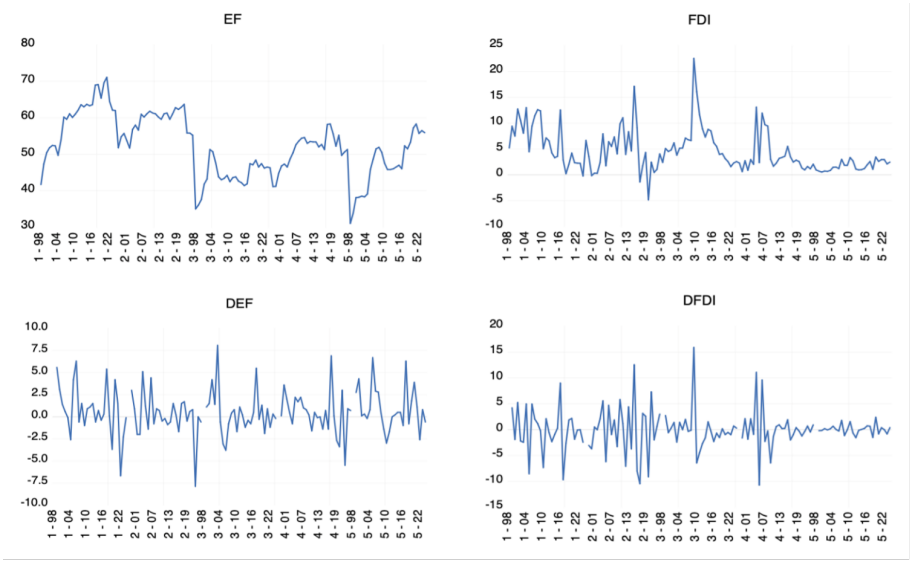


Figure 2 Level and first-difference series of EF and FDI

The results of panel unit root tests show that the first differences of both variables are statistically stationary at the 1% level, as confirmed by all applied tests. The analysis of cross-sectional dependence in panel data is traditionally based on the Breusch–Pagan LM test, which is widely used to identify horizontal dependence. However, the literature notes that this test can yield biased results when the group mean is zero, but the individual means differ significantly from zero.

In this regard, the Pesaran CD test has become widely used, especially in panels with a large number of countries (N) and a relatively short time horizon (T), as it is based on the average pairwise correlation between cross-sections and demonstrates high statistical power under such conditions. In addition, the Pesaran scaled LM test was developed to address the classical LM test's excessive sensitivity and is considered more reliable for both small and large samples.

This study takes a comprehensive approach that considers the historical development and methodological improvements mentioned above, using a set of tests that includes the Breusch–Pagan LM, the Pesaran-scaled LM, and the Pesaran CD. This multifaceted approach enables more reliable and consistent identification of various aspects of horizontal dependence. The hypotheses tested in the horizontal dependence tests are formulated as follows:

H0: There is no cross-sectional dependence

H1: There is cross-sectional dependence

The results of the analysis of cross-sectional dependence on panel data are presented in Table 4.

The results of the cross-sectional dependence tests reported in Table 4 allow us to re-

Table 4 Cross-section dependence and slope heterogeneity test results

Test	EF	FDI	GDP	INF
Breusch–Pagan LM	126.880***	21.421**	35.753***	39.151***
Pesaran scaled LM	26.135***	2.554**	5.759***	6.518***
Bias-corrected scaled LM	26.039***	2.458**	5.662***	6.422***
Pesaran CD	10.856***	2.587***	3.161***	5.665***

***, ** and * denote statistical significance at the 1%, 5%, and 10% levels, respectively.
The null hypothesis for all tests is no cross-sectional dependence.

Note: authors' calculations using EViews

ject the null hypothesis of no cross-sectional dependence for all variables included in the empirical model, namely EF, FDI, GDP, and INF. The Breusch–Pagan LM, Pesaran scaled LM, bias-corrected scaled LM, and Pesaran CD statistics are statistically significant at conventional levels, indicating the presence of horizontal dependence across the panel units. These findings suggest that economic shocks affecting one country are likely to transmit to other countries within the region. Such interdependence may arise from regional economic integration, common external shocks, similar macroeconomic structures, and institutional linkages. The presence of cross-sectional dependence among EF, FDI, GDP, and INF implies that the panel units are not independent, which has important implications for subsequent econometric modelling and supports the use of panel techniques that account for cross-sectional interactions (Table 5).

Table 5 Results of panel cointegration tests (Doan and Pedroni)

Test	Statistic	p-value	Conclusion
Pedroni (within-dimension)			
Panel v-statistic	0.176	0.430	No cointegration
Panel rho-statistic	−4.485	0.000***	Cointegration
Panel PP-statistic	−4.238	0.000***	Cointegration
Panel ADF-statistic	−1.542	0.062*	Cointegration
Pedroni (between-dimension)			
Group rho-statistic	−3.723	0.000***	Cointegration
Group PP-statistic	−5.362	0.000***	Cointegration
Group ADF-statistic	−2.126	0.017**	Cointegration
Kao ADF test	−0.289	0.386	No cointegration

*, **, *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.
The null hypothesis for all tests is no cointegration.

Note: authors' calculations using EViews

The results of the Pedroni (2001) test provide convincing evidence in favor of cointegration, since most of the within-dimension and between-dimension statistics reject the null hypothesis of no long-term relationship. At the same time, the Doan test results do not allow us to reject the null hypothesis. This discrepancy is expected and can be explained by the Kao test's more stringent assumption of homogeneity of cointegration vectors for all cross-sections. Given the identified horizontal (cross-country) dependence and heterogeneity of slope coefficients, priority is given to the Pedroni test, which allows for cross-country

heterogeneity, when interpreting the results. Overall, the results indicate a stable long-term cointegration relationship between EF and FDI.

To examine the relationship between EF and FDI in Central Asian countries, this study employs the Panel Autoregressive Distributed Lag (Panel ARDL) model estimated using the Pooled Mean Group (PMG) estimator developed by Pesaran and Yamagata (2008).

The Panel ARDL framework is justified for several reasons. First, ARDL models allow for the inclusion of variables integrated of order I(0) and I(1), provided that none of the variables is integrated of order I(2). The panel unit root test results indicate a mixed order of integration across variables, making the ARDL approach particularly appropriate. Second, the Panel ARDL specification enables simultaneous estimation of both short-run dynamics and long-run equilibrium relationships within a single framework. Third, it is suitable for panels with relatively small cross-sectional dimensions (N) and moderate time dimensions (T), which corresponds to the structure of the dataset used in this study (N = 5 countries, T = 27 years).

The PMG estimator is selected because it allows for heterogeneity in short-run dynamics, adjustment speeds, and error variances across countries while restricting long-run coefficients to be homogeneous. This assumption is theoretically reasonable, as Central Asian economies share similar structural and institutional characteristics but may differ in their short-term adjustment processes. Compared to alternative estimators such as the Mean Group (MG) or Dynamic Fixed Effects (DFE), PMG provides a balance between efficiency and flexibility when long-run homogeneity is plausible.

As an additional robustness check, a VAR lag-order selection procedure was conducted prior to estimating the dynamic model. The results indicate that the optimal lag length lies between 1 and 2 lags, according to the Akaike Information Criterion (AIC) and the Schwarz Information Criterion (SC). Based on these findings, the maximum lag length in the panel ARDL specification was restricted to 1 or 2 lags to avoid over-parameterisation and ensure model parsimony.

Next, the study conducted a PMG-Panel ARDL assessment. Taking into account the confirmed presence of panel cointegration, the long-term and short-term dynamics of the relationship between EF and FDI are assessed using the PMG-Panel ARDL estimator. This approach allows for heterogeneity in short-term dynamics and adjustment rates between countries, provided that long-term coefficients are homogeneous. The results of the PMG-Panel ARDL assessment are presented in Table 6.

Table 6 PMG-Panel ARDL estimation results

Variable	Coefficient	Std. Error	t-statistic	p-value
Long-run relationship				
EF	0.0951	0.0174	5.464	0.000***
Short-run dynamics				
ΔEF	0.0536	0.0704	0.761	0.448
ECM (COINTEQ)	−0.6467	0.1268	−5.100	0.000***

Note: authors' calculations using EViews

The results of the PMG-Panel ARDL model assessment indicate a stable, statistically significant long-term relationship between the level of EF and FDI inflows in Central Asian countries. The positive sign and high statistical significance of the long-term coefficient for

the EF variable have a stimulating effect on FDI in the long term. Consequently, reducing regulatory restrictions, strengthening property rights protection, and increasing market openness create more favorable conditions for foreign investors and enhance the investment attractiveness of the economy.

The error correction coefficient (ECM) is negative and statistically significant, confirming the existence of a stable long-term equilibrium relationship between EF and FDI. The obtained coefficient value indicates that approximately 65% of short-term deviations from the long-term equilibrium level of FDI are eliminated within one period. This testifies to the high speed of adaptation of investment flows to changes in the institutional environment and indicates a fairly rapid restoration of equilibrium after temporary shocks.

At the same time, the assessment of short-term coefficients shows that changes in the EF level do not have a statistically significant impact on FDI in the short term. This result indicates that foreign investors do not react immediately to institutional changes, reflecting the inertial nature of investment decisions. Thus, the impact of EF on FDI is realized mainly through long-term structural and institutional mechanisms. At the same time, short-term fluctuations in EF do not lead to instantaneous changes in investment flows.

For further verification of the stability of the empirical results, the PMG–Panel ARDL model was re-estimated using an extended specification that includes additional macroeconomic control variables, namely GDP and INF. The results of this alternative specification are presented in Table 7.

Table 7 Robustness check: alternative PMG–Panel ARDL specification

Variable	Coefficient	Std. Error	t-statistic	p-value
Long-run relationship				
EF	0.1136	0.0252	4.501	0.000***
GDP	0.1809	0.0893	2.026	0.045**
INF	0.0298	0.0154	1.937	0.055*
Short-run dynamics				
ΔEF	0.0833	0.0531	1.568	0.120
ΔGDP	−0.0903	0.0908	−0.995	0.322
ΔINF	−0.0102	0.0306	−0.332	0.741
ECM (COINTEQ)	−0.6475	0.1097	−5.905	0.000***

Note: authors' calculations using EViews

The long-run estimates confirm the stability of the main findings. EF retains a positive and statistically significant effect on FDI at the 1% significance level. The magnitude and significance of the EF coefficient remain consistent with the baseline model, indicating the robustness of the positive institutional effect to the inclusion of additional macroeconomic factors. This consistency suggests that the relationship between EF and FDI has a structural foundation rather than being driven by omitted variable bias.

GDP demonstrates a positive, statistically significant long-run impact on FDI, supporting the market size hypothesis and confirming that larger, more economically dynamic economies tend to attract higher levels of FDI. INF shows only weak statistical significance and does not reach the conventional 5% significance level. This indicates that although macroeconomic stability may influence FDI decisions, its impact appears less substantial than that of institutional factors.

The ECM remains negative and statistically significant at the 1% level, confirming the

existence of a stable long-run equilibrium relationship among the variables. The estimated coefficient (approximately -0.65) indicates that around 65% of short-run deviations from the long-run equilibrium level of FDI are corrected within one period. The similarity in the adjustment speed across specifications further supports the stability of the model's dynamic structure.

Consistent with the baseline results, the short-run coefficients remain statistically insignificant, suggesting that FDI does not respond immediately to short-term fluctuations in EF, GDP, or INF. Instead, the effects of EF and macroeconomic fundamentals on FDI are primarily realized through long-run structural channels.

5 | CONCLUSION

This study provides an empirical assessment of the relationship between EF and FDI in five Central Asian countries over the period 1998–2024 using advanced panel econometric techniques. The preliminary analysis revealed significant cross-sectional dependence across countries, indicating a high degree of regional interconnection and justifying the application of panel methods that account for horizontal dependence. The results of the panel unit root tests indicate a mixed order of integration among the variables included in the model. Specifically, EF is found to be weak stationary at level (I(0)), GDP and INF are stationary at level (I(0)), while FDI is integrated of order one (I(1)). The stationarity of the first differences of all variables further confirms these classifications. This mixed integration structure supports the appropriateness of the panel ARDL framework. The results of the Doan and Pedroni (2001) panel cointegration tests confirm the existence of a stable long-run equilibrium relationship between FDI and EF.

The estimates obtained using the PMG–Panel ARDL approach reveal a positive and statistically significant long-run effect of EF on FDI. This finding implies that improvements in institutional quality, reductions in regulatory constraints, and stronger protection of property rights contribute to higher FDI inflows in the region. The robustness analysis, which incorporates GDP and INF as additional control variables, confirms the stability of this long-run institutional effect. GDP demonstrates a positive and significant long-run impact on FDI, supporting the market size hypothesis. In contrast, INF does not exhibit strong statistical significance at the conventional 5% level, suggesting a comparatively weaker role of macroeconomic stability relative to institutional factors.

At the same time, the short-run coefficients remain statistically insignificant, indicating that FDI does not respond immediately to short-term fluctuations in EF, GDP, or INF. This suggests that the influence of institutional and macroeconomic fundamentals on FDI operates primarily through long-term structural channels rather than through short-term adjustments. The negative and statistically significant ECM coefficient confirms the presence of a stable long-run equilibrium and indicates a relatively rapid speed of adjustment toward equilibrium.

The empirical findings of this study are largely consistent with a substantial body of literature emphasizing the positive role of institutional quality and EF in attracting FDI. In particular, the identified long-run positive and statistically significant effect of EF on FDI aligns with the results of Quazi and Rashid (2004), Naanwaab and Diarrassouba (2016), Ghazalian and Amponsah (2019), and Shikur (2024), who document a stable institutional effect on foreign investment inflows across developing economies. The results also support the conclusions of Gidage and Bhide (2025), who highlight the importance of distinguishing between short- and long-term institutional effects using panel ARDL techniques. Furthermore, the positive role of GDP growth is consistent with the market-size and economic

performance hypothesis widely discussed in the literature.

At the same time, the absence of statistically significant short-run effects of EF on FDI is consistent with the contextual and dynamic interpretation proposed by Socol and Iuga (2025) and Dang and Anh (2025), who argue that EF's influence depends on institutional stability and macroeconomic conditions. Unlike some studies that find immediate or strong short-term institutional effects, the present results suggest that in Central Asian countries, the impact of EF materializes primarily through long-term structural channels. Thus, the findings contribute to the literature by providing region-specific evidence that confirms the long-run institutional hypothesis while highlighting the limited short-run responsiveness of FDI to institutional changes.

Overall, the findings demonstrate that EF exerts a positive, economically meaningful impact on FDI, predominantly in the long run, across Central Asian countries. From a policy perspective, the results suggest that reforms aimed at strengthening EF should be accompanied by consistent institutional development and macroeconomic stability to enhance the region's investment attractiveness. The study is limited by the relatively small cross-sectional dimension (five countries) and the set of variables included in the model. Future research could expand coverage to additional countries, incorporate additional institutional and macroeconomic controls, and apply alternative econometric specifications to further assess the robustness of the results.

AUTHOR CONTRIBUTION

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CONFLICT OF INTEREST

No conflict of interest/competing interest is reported by the authors.

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