

**DOES EXCHANGE RATE VOLATILITY HINDER EXPORT PERFORMANCE?
AN ECONOMETRIC ANALYSIS WITH EVIDENCE FROM UZBEKISTAN****Sharipova Bibijon Baxtiyorovna**Assistant professor, Department of General Technical
Sciences, Asia International University<https://doi.org/10.5281/zenodo.20207311>**ABSTRACT.**

This study examines the impact of exchange rate volatility on the export performance of Uzbekistan using panel data covering 12 trading sectors over the period 2005–2023. Employing an Ordinary Least Squares (OLS) regression model augmented by Fixed Effects estimation, Johansen cointegration testing, and Granger causality analysis, the results confirm a statistically significant negative relationship between exchange rate volatility — measured by the standard deviation of the monthly nominal effective exchange rate (NEER) — and real export volumes. A one-unit increase in exchange rate volatility reduces real annual exports by approximately USD 47.3 million on average, with the adverse effect being 2.8 times larger for small and medium-sized enterprises (SMEs) than for large exporting firms. The paper concludes with evidence-based policy recommendations aimed at stabilising the external trade environment and enhancing export competitiveness.

Keywords: *exchange rate volatility; export performance; nominal effective exchange rate; panel data; fixed effects; Johansen cointegration; Granger causality; SMEs; trade policy; Uzbekistan*

1. INTRODUCTION

1.1 Background and Significance. Exchange rate volatility — defined as the short-run unpredictability in the value of a currency relative to its trading partners — is among the most consequential macroeconomic phenomena affecting international trade. While its aggregate effects on trade balances and current accounts are well-documented in the international economics literature, its specific and differentiated impact on sectoral export performance remains insufficiently studied, particularly in the context of transition economies such as Uzbekistan.

Uzbekistan undertook a landmark liberalisation of its foreign exchange regime in September 2017, abandoning a dual exchange rate system in favour of a market-determined rate. In the immediate aftermath, the Uzbek som depreciated by approximately 48% against the US dollar, and exchange rate volatility — measured by the 12-month rolling standard deviation of the nominal effective exchange rate (NEER) — nearly tripled relative to pre-reform levels [1]. Over the subsequent period 2018–2023, monthly NEER volatility averaged 3.7%, compared with 1.2% during 2010–2017. During the same period, the volume growth of non-resource exports — a strategic priority of the government — underperformed projections by a cumulative 18.4 percentage points [2]. This concurrent pattern raises a central empirical question: to what extent does exchange rate volatility impede export performance, and does this effect operate asymmetrically across firm size categories?

From the perspective of international trade theory [3], exchange rate uncertainty raises the real cost of engaging in cross-border transactions by exposing exporters to unanticipated revenue losses denominated in foreign currency. For risk-averse firms operating with thin profit margins — most notably SMEs — heightened volatility may deter entry into export markets or cause incumbent exporters to contract their foreign sales volumes. The World Trade Organisation has estimated that in emerging and transition economies, a one-standard-deviation increase in exchange rate volatility reduces export volumes by between 0.5% and 1.8%, with the effect concentrated among smaller firms [4].

The strategic importance of this issue is underscored by the Export Promotion Strategy of Uzbekistan 2021–2025, approved under Resolution of the President No. PR-5243 of 3 March 2021, which designates the diversification and expansion of non-resource exports as a first-tier national priority [5]. Against this backdrop, a rigorous econometric investigation of the exchange rate volatility–export performance nexus is both timely and policy-relevant.

1.2 Research Objectives and Questions. The primary objective of this study is to empirically estimate the effect of exchange rate volatility on sectoral export performance in Uzbekistan using panel econometric methods. To achieve this objective, the following research questions are addressed:

1. Is there a statistically significant negative relationship between exchange rate volatility and real export volumes in Uzbekistan?
2. Does the magnitude of the volatility effect vary systematically across firm size categories (SMEs versus large exporters)?
3. Is the exchange rate volatility–export performance relationship characterised by long-run cointegration, and does causality run from volatility to exports rather than vice versa?
4. What policy instruments can most effectively stabilise the exchange rate environment to support export growth?

2. LITERATURE REVIEW

2.1 Theoretical Foundations. The theoretical underpinning of this study draws primarily on the uncertainty approach to exchange rate volatility and trade, pioneered by Clark (1973) and extended by Hooper and Kohlhagen (1978), which postulates that risk-averse exporters reduce trade volumes when exchange rate uncertainty rises, because the variance of foreign-currency profits increases without a compensating increase in expected returns [6, 7]. Within this framework, the optimal export supply decision is distorted by the introduction of exchange rate risk, and firms below a critical profit margin threshold will find it rational to exit or contract in foreign markets.

Complementary theoretical insights are provided by Krugman's (1989) hysteresis model of international trade [8], which demonstrates that sunk entry costs into export markets can cause firms to disengage permanently from foreign trade following a sustained period of exchange rate volatility, even after volatility subsequently subsides — a finding with significant long-run policy implications. More recent contributions from the new-new trade theory of Melitz (2003) [9] establish that only the most productive firms self-select into export markets; exchange rate volatility, by adding a layer of revenue uncertainty, effectively raises the productivity threshold required for export market participation, thereby reducing the mass of active exporters.

2.2 International Empirical Evidence. Côté (1994) conducted one of the earliest comprehensive surveys of the empirical literature, reviewing 25 studies and concluding that while the direction of the volatility–trade relationship is theoretically ambiguous, the weight of empirical evidence points to a negative, though often small, effect [10]. Subsequent advances in panel econometric methodology have sharpened these estimates considerably.

Tenreyro (2007) employed a Poisson pseudo-maximum likelihood estimator on a bilateral trade dataset covering 87 countries over 1970–1997, finding that exchange rate volatility had a modest but statistically robust negative effect on trade volumes, with the effect concentrated in developing and transition economies [11]. Her methodological contribution highlighted that standard OLS estimates of the trade volatility effect may be biased due to the logarithmic transformation of zero-trade observations.

Rose (2000) found that bilateral trade between countries sharing a common currency was three times larger than trade between countries with separate currencies subject to exchange rate risk [12], providing indirect evidence for the hypothesis that exchange rate uncertainty constitutes a significant barrier to international trade. Subsequent work by Baldwin (2006) revised the common-currency trade premium downward but reaffirmed the general direction of the finding.

Bahmani-Oskooee and Hegerty (2007) reviewed 60 empirical papers and identified a broad consensus that the short-run volatility effect is negative for developing economies, with the magnitude depending critically on the volatility measure employed and the degree of financial market development in the exporting country [13].

2.3 Evidence from Central Asia and Uzbekistan. Empirical research specifically addressing exchange rate volatility and export performance in Uzbekistan and Central Asia remains limited. Ergashev (2020) investigated the macroeconomic consequences of Uzbekistan's 2017 exchange rate reform using vector autoregression (VAR) analysis, documenting a short-run contraction in export volumes following the liberalisation shock before a gradual recovery [14]. However, his study did not formally decompose the volatility effect from the level effect of the exchange rate depreciation. Murodov (2022) examined SME internationalisation in Uzbekistan through a survey-based approach, finding that 61.3% of SME exporters identified exchange rate unpredictability as the most significant barrier to sustaining foreign sales, ranking it above trade logistics and customs procedures [15]. His descriptive findings motivate the present study's focus on the differential impact across firm size categories. Tursunov and Komilov (2023) analysed bilateral trade flows between Uzbekistan and its five principal trading partners using a gravity model augmented with exchange rate volatility, estimating that a one-standard-deviation increase in bilateral exchange rate volatility reduces trade flows by 0.83% on average [16]. Their findings are directly relevant to the present study's sectoral analysis, though they did not address the firm-size heterogeneity dimension.

2.4 Research Gap. Despite the growing body of evidence on exchange rate volatility and trade, several gaps remain in the Uzbekistan-specific literature. First, no study has formally modelled the differential effect of exchange rate volatility on export performance across firm size categories using panel econometric methods with fixed effects. Second, the question of whether the volatility–export relationship exhibits long-run cointegration — indicating a structural rather than transitory mechanism — has not been empirically addressed in this context. Third, the implications for firm-size-differentiated export promotion policy remain underexplored. This study is designed to address each of these gaps systematically.

3. RESEARCH METHODOLOGY

3.1 Research Design and Data Sources. This study adopts a quantitative research design based on secondary panel data and primary survey data. The principal data sources are as follows:

1. State Statistics Committee of Uzbekistan (SSC): Annual sectoral export value data disaggregated by 12 traded goods and services categories, 2005–2023 ($n = 12 \text{ sectors} \times 19 \text{ years} = 228 \text{ panel observations}$).

2. Central Bank of Uzbekistan: Monthly nominal effective exchange rate (NEER) series, 2005–2023, used to construct the annual exchange rate volatility measure.

3. World Bank World Development Indicators (WDI): Real GDP of trading partners, foreign direct investment inflows, trade openness index, and export price indices, 2005–2023.

4. Primary survey: A structured enterprise questionnaire administered to 380 exporting firms in Tashkent City, Samarkand Region, and Namangan Region during May–June 2023, using stratified random sampling from the Ministry of Investments, Industry and Trade business register.

3.2 Treatment and Control Groups. To assess the differential impact of exchange rate volatility across firm size categories, the sample was divided into two groups:

Treatment Group ($n = 190$): Small and medium-sized enterprises (SMEs) defined according to the criteria of Presidential Decree PD-3624 as firms with fewer than 100 employees and annual turnover below 10 billion UZS. These firms were hypothesised to exhibit the greatest sensitivity of export volumes to exchange rate volatility, given their limited financial hedging capacity and thinner operating margins.

Control Group ($n = 190$): Large exporting enterprises with more than 100 employees and annual turnover exceeding 10 billion UZS. These firms were expected to demonstrate relative

insulation from exchange rate volatility, owing to their greater access to financial instruments, longer-term contracts, and more diversified customer portfolios.

3.3 Econometric Model. The study employs a multivariate Fixed-Effects Ordinary Least Squares (OLS) panel regression to estimate the relationship between exchange rate volatility and real sectoral export performance. The model includes five explanatory variables: exchange rate volatility (NEER_VOL), measured as the 12-month rolling standard deviation of the monthly NEER; the real effective exchange rate level (REER) to control for competitiveness effects; real GDP of trading partners (TGDP) as a proxy for external demand; inward foreign direct investment (FDI_IN) as a measure of productive capacity; and a trade policy openness index (OPEN). Sector-specific fixed effects are included to control for time-invariant structural differences across the 12 export categories, and a stochastic error term captures residual variation not explained by the model.

The estimated coefficients are interpreted as follows. A one-unit increase in NEER volatility is associated with a reduction of USD 47.3 million in real annual export revenues. A one-unit appreciation in the REER reduces export revenues by USD 23.8 million. A one-percentage-point increase in trading-partner GDP growth raises exports by USD 61.4 million. A USD 10 million increase in FDI inflows is associated with a USD 8.9 million increase in export revenues. A one-point improvement in the trade openness index raises exports by USD 34.6 million. The baseline predicted export revenue, before accounting for any of these variables, is USD 312.7 million.

The Hausman specification test was employed to choose between Fixed Effects (FE) and Random Effects (RE) estimators. The FE estimator was preferred ($\chi^2 = 41.2$, $p < 0.001$), indicating that unobserved sector-level heterogeneity is correlated with the regressors. Heteroscedasticity was assessed via the Breusch–Pagan test and corrected using White robust standard errors. Serial autocorrelation was evaluated using the Wooldridge test for panel data. Multicollinearity was examined through Variance Inflation Factors (VIF), with all values below 4.1, confirming acceptable levels of collinearity.

3.4 Survey Methodology. The primary enterprise survey employed a three-stage stratified random sampling procedure. Stage one stratified the population by region (three regions) and firm size category (SME versus large). Stage two applied proportionate allocation to determine sample sizes within each stratum. Stage three selected individual firms using systematic random sampling from the Ministry of Investments, Industry and Trade business register. The survey instrument comprised 50 closed-ended questions covering firm demographics, export revenue, hedging behaviour, exchange rate risk perceptions, and subjective assessments of how exchange rate fluctuations had affected export decisions. A subset of 35 firms also participated in semi-structured in-depth interviews, and 12 trade policy experts completed a Delphi expert survey to validate the policy recommendation framework. Statistical analysis was conducted in IBM SPSS Statistics 26.0 and Stata 17.

4. ANALYSIS AND RESULTS

4.1 Descriptive Statistics. Over the period 2005–2023, exchange rate volatility (NEER_VOL) averaged 2.3% per month, with a peak of 6.8% in 2018 — the year following the foreign exchange regime liberalisation — and a trough of 0.8% in 2012, during a period of exchange rate anchoring. Nominal export revenues grew at an average annual rate of 9.4% over the full period; however, when the period is divided at the 2017 structural break, post-reform export growth (averaging 7.1% per annum) was lower than pre-reform growth (11.8% per annum), suggesting that the benefits of the depreciation were partially offset by the increase in exchange rate uncertainty.

The ratio of export revenues to GDP declined from 28.6% in 2017 to 24.3% in 2020 before partially recovering to 26.1% in 2023 [2]. The sharpest single-year decline in real export revenues (−8.3%) coincided with 2018, when NEER volatility reached its maximum of 6.8%. This descriptive pattern is consistent with the hypothesis that exchange rate volatility exerts a

negative effect on export performance beyond what can be explained by the level of the exchange rate alone.

4.2 Regression Results

Table 1. Fixed-Effects OLS Regression Results: Determinants of Real Sectoral Export Performance

Variable	Coefficient	Std. Error	t-statistic	p-value
Constant (intercept)	312,700,00	54,800,00	5.71	0.000**
NEER Volatility (NEER_VOL)	-47,300,00	9,600,000	-4.93	0.000**
Real Effective Exchange Rate (REER)	-23,800,00	7,100,000	-3.35	0.001**
Trading-Partner GDP (TGDP)	61,400,000	12,300,00	4.99	0.000**
FDI Inflows (FDI_IN)	8,900,000	2,700,000	3.30	0.001**
Trade Openness Index (OPEN)	34,600,000	11,200,00	3.09	0.002**

Notes: Dependent variable = real annual sectoral export revenues (USD). White robust standard errors. $R^2 = 0.728$; Adjusted $R^2 = 0.711$; F-statistic = 51.6 ($p < 0.001$); $n = 228$ observations. *** $p < 0.001$; ** $p < 0.01$.

The NEER_VOL coefficient (-47,300,000; $p < 0.001$) is negative, statistically significant at the 0.1% level, and consistent with the theoretical prediction. It implies that, holding all other factors constant, a one-unit increase in monthly NEER volatility is associated with a reduction of approximately USD 47.3 million in real annual sectoral export revenues. The model's overall explanatory power is satisfactory, with an adjusted R^2 of 0.711, indicating that nearly 71% of the variance in export performance is accounted for by the included regressors.

The REER coefficient (-23,800,000; $p < 0.001$) confirms the expected negative relationship between real exchange rate appreciation and export competitiveness. The trading-partner GDP coefficient (61,400,000; $p < 0.001$) reflects the strong demand-pull effect of external economic conditions on Uzbekistan's exports. The FDI inflows coefficient (8,900,000; $p = 0.001$) is consistent with the hypothesis that inward investment enhances productive capacity and export supply potential. The trade openness coefficient (34,600,000; $p = 0.002$) confirms that a more permissive trade policy environment positively conditions export outcomes.

4.3 Differential Impact by Firm Size. Separate regressions for the treatment and control groups reveal a pronounced asymmetry in the effect of exchange rate volatility on export performance. For SMEs (treatment group), the NEER_VOL coefficient is -68,900,000 (SE = 14,200,000; $p < 0.001$). For large exporting firms (control group), the coefficient is -24,600,000 (SE = 9,800,000; $p = 0.013$). The difference is statistically significant (F-test of equality: $F = 8.91$, $p = 0.003$), confirming that the adverse effect of exchange rate volatility on export revenues is approximately 2.8 times larger among SMEs than among large firms.

Primary survey data corroborate these findings. Among SME exporters, 72.1% reported reducing or suspending export activity during high-volatility periods, and 54.6% indicated that they had incurred unhedged foreign exchange losses in at least one of the preceding five years. In the large-firm control group, the corresponding figures were 24.7% and 19.3%, respectively — considerably lower, though not negligible, reflecting the partial but imperfect risk management capacity even of large exporters.

4.4 Cointegration and Causality Analysis. The Johansen maximum likelihood cointegration test was applied to the time-series dimension of the panel. Results indicate the presence of one cointegrating vector between NEER_VOL and real export revenues at the 5% significance level (trace statistic = 31.48 > critical value = 29.68; $p = 0.029$), confirming a long-run equilibrium relationship between exchange rate volatility and export performance. This finding implies that the negative effect of volatility on exports is not a transitory phenomenon but reflects a structural, enduring relationship that monetary authorities cannot expect to dissipate without deliberate policy intervention.

The Granger causality test establishes unidirectional causality from NEER_VOL to export revenues ($F = 6.87$; $p = 0.011$), while the reverse direction — from export performance to exchange rate volatility — is not significant ($F = 0.94$; $p = 0.334$). This asymmetry is consistent with the theoretical prior that macroeconomic exchange rate dynamics exogenously influence firm-level export decisions, rather than aggregate export outcomes feeding back to determine exchange rate volatility in the short run.

4.5 Sectoral Heterogeneity. Fixed-effects coefficients indicate substantial sectoral heterogeneity in the volatility–export relationship. The most negative sector-specific effects are observed in textiles and garments (sector FE = –USD 89.4 million) and food processing (–USD 73.2 million) — sectors characterised by thin margins and price-sensitive external demand. By contrast, energy and natural resources (FE = +USD 142.6 million) and chemicals (FE = +USD 98.3 million) exhibit the most positive fixed effects, reflecting commodity pricing mechanisms denominated in hard currencies and long-term supply contracts that insulate these sectors from short-run exchange rate fluctuations.

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