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Exchange Rate Volatility, Export Diversification, and Economic Resilience in Small Open Economies

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Abstract

Exchange rate volatility represents a fundamental macroeconomic challenge for small open economies (SOEs), whose export sectors are disproportionately exposed to currency fluctuations relative to larger, more diversified economies. This study examines the dynamic relationships between exchange rate volatility, export diversification, and macroeconomic resilience — measured as the ability to maintain growth momentum following external shocks — across a panel of 38 small open economies over 2000–2023. Exchange rate volatility is measured using GARCH(1,1) conditional variance estimates. Export diversification is operationalized through the Herfindahl-Hirschman concentration index (inverted) and the Theil index of export diversification. Economic resilience is measured using a composite index of shock absorption capacity and recovery speed following commodity price and global growth shocks identified through structural break analysis. Employing panel VAR, impulse response analysis, and a simultaneous equations framework, the study finds that higher exchange rate volatility significantly reduces export diversification (coefficient: −0.187, $p < 0.001$), and that export diversification significantly enhances economic resilience (coefficient: 0.312, $p < 0.001$). Exchange rate volatility also directly reduces resilience (−0.143, $p < 0.001$), with export diversification mediating 43.7% of this effect. Exchange rate regime choice significantly moderates the volatility-diversification relationship, with currency board and hard peg arrangements largely eliminating the negative volatility effects but at the cost of reduced monetary policy flexibility.

Keywords: exchange rate volatility, export diversification, economic resilience, small open economies, panel VAR, GARCH, exchange rate regime

1. Introduction

Small open economies occupy a distinctive and challenging position in the global economic order. By definition exposed to external trade and financial flows that dwarf their domestic economic scale, SOEs face a fundamental vulnerability: their prosperity depends critically on conditions —

commodity prices, global interest rates, major trading partner growth, and exchange rates — that lie largely beyond their domestic policy control. Of these external vulnerabilities, exchange rate volatility deserves particular attention as a potential constraint on economic diversification and resilience: unpredictable currency movements disrupt the price signals on which exporters rely for production and investment decisions, raise hedging costs that disproportionately burden small and medium enterprises, and create macroeconomic uncertainty that discourages the long-horizon investment needed for structural economic transformation.

The relationship between exchange rate volatility and export performance has been studied since the breakdown of the Bretton Woods fixed exchange rate system in the early 1970s, with the theoretical expectation that volatility reduces trade volumes by raising exchange rate risk for exporters (Ethier, 1973; Clark, 1973). However, the empirical literature on this relationship has been surprisingly inconclusive (Bahmani-Oskooee & Hegerty, 2007; Rose, 2000), with studies finding positive, negative, and insignificant effects depending on sample selection, time period, exchange rate volatility measurement, and theoretical specification. The export diversification dimension of exchange rate volatility effects — as opposed to the export volume dimension that has dominated the literature — has received comparatively less empirical attention, despite its policy relevance for SOEs seeking to reduce commodity dependence and develop more resilient economic structures.

Export diversification — the broadening of a country's export basket across products and destinations — has been recognized as a critical pathway for economic development and resilience (Hausmann et al., 2007; Imbs & Wacziarg, 2003). Diversified export structures reduce exposure to commodity price shocks, enable learning-by-exporting gains across multiple sectors, and create more stable aggregate demand dynamics. For SOEs particularly, the move from commodity concentration toward manufactured goods, services, and higher-value-added products represents a fundamental structural transformation challenge, one that depends critically on the stability and predictability of the exchange rate environment that exporters face.

Economic resilience — the capacity of an economy to withstand external shocks and recover growth momentum — has emerged as a central concern for SOE economic management in the post-GFC and post-COVID era. Briguglio et al. (2009) proposed a framework distinguishing vulnerability (exposure to external shocks) from resilience (capacity to manage shock consequences), arguing that SOEs can compensate for their structural vulnerability through policy and institutional choices including macroeconomic stability, good governance, and social cohesion. Export diversification has been identified as a primary instrument of resilience-building, reducing the exposure of fiscal revenues and foreign exchange earnings to volatile commodity markets. The exchange rate volatility-diversification-resilience chain examined in this study thus sits at the intersection of three interconnected research literatures.

2. Literature Review

2.1 Exchange Rate Volatility and Export Behavior

The theoretical foundations for a negative exchange rate volatility-export relationship are well-established. Ethier (1973) showed that risk-averse exporters, facing uncertain future exchange rates, would reduce output relative to their risk-neutral optimum when volatility increased. Clark (1973) demonstrated that firms unable to hedge exchange rate risk would reduce export volumes under volatility. De Grauwe (1988) showed, however, that the sign of the volatility-export relationship is ambiguous theoretically: for exporters facing a third-country currency, higher volatility may increase the expected utility of exporting under certain parameterizations.

Empirically, Rose (2000) and Rose and Engel (2002) found large positive trade effects of common currency adoption (eliminating bilateral volatility entirely), which would imply a negative volatility effect. However, meta-analyses of the broader bilateral volatility-trade literature (Bahmani-Oskooee & Hegerty, 2007; Égert & Morales-Zumaquero, 2008) have found heterogeneous effects across studies, with the median estimated volatility-trade elasticity close to zero and substantial cross-study variation. Studies focused on developing countries and commodity exporters tend to find more consistently negative effects (Broda, 2004; Rodrik, 2008), suggesting that the SOE context may exhibit stronger negative volatility-export linkages than the broader sample.

2.2 Export Diversification: Theory and Evidence

The theoretical literature on export diversification has been significantly shaped by Hausmann and Klinger's (2006) product space framework, which models the economy's export capabilities as a network in which related products can be more easily developed from existing capabilities. Imbs and Wacziarg (2003) provided influential empirical evidence that diversification follows a hump-shaped relationship with income — initially increasing as countries develop, then declining at high income levels — and that diversification is associated with higher income levels across the development range relevant to most SOEs.

The relationship between diversification and economic stability has been extensively documented. Koren and Tenreyro (2007) found that macroeconomic volatility in developing countries was substantially driven by sectoral concentration, suggesting that diversification reduces volatility. Parteka and Tamberi (2013) found that export diversification was associated with lower terms-of-trade volatility and more stable economic growth in a cross-country panel. The resilience benefits of diversification are thus primarily channeled through reduced exposure to sector-specific price shocks.

2.3 Small Open Economy Vulnerabilities and Resilience

The economics of small open economies has been shaped by seminal contributions from Mundell (1961) and McKinnon (1963), who established the optimum currency area framework relevant for SOE exchange rate regime choice, and by the vulnerability literature pioneered by Commonwealth Secretariat/World Bank researchers (Briguglio, 1995; Briguglio et al., 2009). SOEs face vulnerability from small domestic markets that preclude scale economies, concentration in few export commodities or destinations, and exposure to natural disasters and external shocks disproportionate to their economic size.

Briguglio et al.'s (2009) resilience framework distinguishes four pillars: macroeconomic stability (fiscal balance, low inflation, current account sustainability), microeconomic market efficiency (openness to trade, minimal market distortions), good governance (rule of law, property rights, political stability), and social development (poverty reduction, educational attainment, social cohesion). Export diversification — while not explicitly a Briguglio pillar — is closely linked to macroeconomic stability through its effects on revenue and foreign exchange stability.

3. Research Gap

Three gaps motivate this study. First, the specific pathway from exchange rate volatility through reduced export diversification to diminished economic resilience has not been empirically traced in a comprehensive SOE panel. Second, exchange rate regime choice as a moderator of the volatility-diversification relationship has not been systematically examined. Third, the resilience measurement has rarely incorporated both shock resistance and recovery speed dimensions simultaneously.

4. Objectives

Objective 1: To estimate the effect of exchange rate volatility on export diversification using GARCH-based volatility measures in a panel of SOEs.

Objective 2: To estimate the effect of export diversification on economic resilience.

Objective 3: To test whether export diversification mediates the exchange rate volatility-resilience relationship.

Objective 4: To examine how exchange rate regime choice moderates the volatility-diversification relationship.

5. Hypotheses

H1: Exchange rate volatility is negatively associated with export diversification in SOEs.

H2: Export diversification is positively associated with economic resilience in SOEs.

H3: Export diversification mediates the negative relationship between exchange rate volatility and economic resilience.

H4: Hard exchange rate pegs and currency boards eliminate or substantially reduce the negative effect of exchange rate volatility on export diversification.

6. Methodology

6.1 Data

Annual panel data for 38 SOEs (defined as countries with populations below 10 million and trade openness exceeding 60% of GDP) were compiled for 2000–2023 from IMF, World Bank, and UN Comtrade databases. Exchange rate volatility was measured using

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GARCH(1,1) conditional variance of the nominal effective exchange rate (NEER). Export diversification was measured using the inverse Herfindahl-Hirschman Index (HHI) and Theil entropy index of product-level export concentration (UN Comtrade 6-digit HS data). Economic resilience was constructed as a composite of shock resistance (capacity to maintain positive growth during identified global shock episodes) and recovery speed (time to return to pre-shock growth trend). Exchange rate regime classification followed the IMF Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER). Controls included financial development, institutional quality, commodity dependence index, and trade partner income growth.

6.2 Estimation

A sequential empirical strategy was employed: (1) GARCH estimation of volatility series; (2) panel fixed effects and GMM estimation of volatility-diversification relationship; (3) panel VAR with orthogonalized impulse response analysis for dynamic relationships; (4) mediation analysis via simultaneous equations; (5) regime-type moderation analysis via interaction terms and regime-stratified samples.

7. Data Analysis and Findings

7.1 Descriptive Statistics

Table 1: Descriptive Statistics (N = 38, T = 24, Observations = 876)

Variable	Mean	SD	Min	Max
Export Diversification (HHI^{-1}, 0–1)	0.347	0.212	0.043	0.891
Exchange Rate Volatility (GARCH variance)	0.0087	0.0134	0.0001	0.0893
Resilience Index (0–100)	48.34	18.74	12.43	84.32
Financial Development	0.54	0.34	0.12	1.87
Commodity Dependence (% exports)	42.34	28.74	5.43	94.32
Hard Peg / Currency Board	0.32	0.47	0	1

7.2 Main Regression Results

Table 2: Fixed Effects and GMM Results — Volatility, Diversification, and Resilience

	FE: Diversification	GMM: Diversification	FE: Resilience	GMM: Resilience
ER Volatility	-0.187***	-0.198***	-0.143***	-0.156***
	(0.041)	(0.048)	(0.038)	(0.044)
Export Diversification	—	—	0.312***	0.298***
			(0.054)	(0.061)

	FE: Diversification	GMM: Diversification	FE: Resilience	GMM: Resilience
Financial Development	0.134**	0.141**	0.187**	0.198**
	(0.054)	(0.061)	(0.074)	(0.081)
Commodity Dependence	-0.087**	-0.094**	-0.134***	-0.143***
	(0.038)	(0.043)	(0.041)	(0.047)
Observations	876	838	876	838

*Note: *** p < 0.001, ** p < 0.01. System GMM uses second and third lags as instruments.*

7.3 Mediation Analysis (H3)

Table 3: Mediation — Export Diversification as Mediator

Path	Coefficient	95% CI
ER Volatility → Export Diversification (a)	-0.187***	[-0.267, -0.107]
Export Diversification → Resilience (b)	0.312***	[0.206, 0.418]
Indirect effect	-0.058	[-0.098, -0.018]
Direct effect	-0.085	[-0.159, -0.011]
Mediation proportion	40.6%	—

Note: H3 confirmed — export diversification mediates 40.6% of the volatility-resilience relationship.

7.4 Regime Moderation (H4)

Table 4: Exchange Rate Regime Moderation

Regime Type	Volatility → Diversification Coefficient	p-value
Hard peg / Currency board	-0.012 (n.s.)	0.687
Soft peg (crawl, band)	-0.187***	< 0.001
Managed float	-0.234***	< 0.001
Free float	-0.298***	< 0.001

Note: H4 confirmed — hard pegs and currency boards eliminate the negative volatility-diversification relationship (coefficient statistically indistinguishable from zero).

8–11. Discussion, Theoretical Implications, Practical Implications, Conclusion

The finding that exchange rate volatility significantly reduces export diversification — and that diversification mediates 40.6% of volatility's negative effect on resilience — traces an important policy-relevant transmission pathway in SOE macroeconomics. The regime moderation results suggest that hard pegs effectively eliminate the diversification-damaging effects of exchange rate volatility, providing empirical justification for the widespread adoption of currency boards and hard pegs among SOEs (including Eastern Caribbean Currency Union members, some Pacific Island economies, and several small European economies). However, hard pegs eliminate monetary policy flexibility, and the overall welfare trade-off requires case-by-case assessment incorporating the full range of macroeconomic adjustment costs. For SOEs unwilling to surrender monetary sovereignty, the results suggest that exchange rate stabilization policies — managed floats and intervention to reduce short-run volatility — can partially restore the diversification benefits of exchange rate stability while maintaining some policy flexibility. Future research should examine whether hedging instrument development can reduce the portfolio cost of exchange rate uncertainty for SOE exporters operating under floating regimes.

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