

# **Bridging Bytes and Borders: Transformation of Trade in CAREC Countries**

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# Study Focus

- Objective: To Examine how digitalization enhances bilateral trade flows in CAREC (1990–2023).
- Approach: Augmented Gravity Model & Machine Learning (Random Forest).
- Combines econometric and AI models for deeper insights.

# Key Finding

Digital trade is reshaping regional integration,  
but uneven readiness and fragmented regulation  
limit its impact.

How we find it?

# CAREC Digital Context

- CAREC Digital Strategy 2030 offers regional framework for digital cooperation.
- Implementation rate: 69% (UN 2023) – near Asia-Pacific average.
- Key Insight and GAP: Strong progress, but digital divide persists that effect the trade and integration efforts of CAREC, need to be analyzed the reasons.

# Rationale for Digital Trade

- Reduces trade costs and delays
- Improves transparency
- Enables MSME participation

Paperless systems enhance inclusivity and efficiency.

# Conceptual Framework

## Traditional Drivers

- GDP, population, distance, openness

## Digital Drivers

Internet, broadband, mobile, ICT exports

Traditional Drivers ensures trade growth and

Digitalization reduces trade frictions.

# Literature Insights

- Internet use boosts trade (Freund & Weinhold 2004)
- Digital divide hinders integration (Babajanova 2021)
- FTAs with digital provisions strengthen trade (Kwak 2022).
- Data-flow agreements/clear rules can boost bilateral trade( Spiezia & Tscheke ,2020) / OECD (2020)
- Broadband diffusion materially increases trade-to-GDP ratios(Riker ,2014)
- Distance continues to matter even for digital goods in certain contexts(Blum & Goldfarb ,2006)

# Research Model

- Augmented Gravity Model + Random Forest
- $\text{Trade} = f(\text{GDP, Population, Distance, FTA, Stability, Digital Variables})$

Blends interpretability and predictive accuracy.



# Data Overview

Period: 1990–2023

11 CAREC countries

- Sources: World Bank, ITU, UN Comtrade, IMF

Panel /Long term data ensures robust results.

# Digital Divide Snapshot

Top performers

Kazakhstan, Azerbaijan, Uzbekistan

Lagging

Afghanistan & Pakistan (<30%)

Bridging digital divide is key for trade inclusion.

# ICT Service Exports Snapshot

Leaders

Pakistan & China

Fastest growth

Uzbekistan (24% CAGR)

ICT exports indicate digital trade maturity.

# FTA and Political Stability

- FTAs boost trade, though impacts fluctuate.
- Political stability consistently supports trade.

Governance quality underpins trade confidence not  
simple Free Trade Agreements only

# Empirical Findings (Gravity Model)

- GDP, population, and Trade openness dominate.

Traditional drivers remain strongest, digital adds have only incremental power.

# Machine Learning Insights

- Feature Importance
  - 1. Trade openness (importer)
  - 2. GDP (importer/exporter)
  - 3. Political stability (importer)

Confirms emerging digital influence.

# Digitalization's Trade Effect

- Internet & broadband positive but inconsistent.
- Mobile weakly related.

Connectivity needs complementary policy support.

# Interaction Effects

- Digital  $\times$  FTA / Political Stability  $\rightarrow$  insignificant.

The analysis reveals that digitalization and institutional policy improvements in CAREC economies operate in parallel rather than synergistic pathways, implying that each contributes independently to trade performance. This result is consistent with Spiezia and Tscheke (2020) and Meng et al. (2024), who find that digital infrastructure and policy coherence enhance trade outcomes separately but fail to generate multiplicative gains in the absence of integrated digital governance frameworks.



# Policy Implications

- 1. Expand broadband infrastructure
- 2. Add digital chapters to FTAs
- 3. Harmonize digital regulations
- 4. Build skills & cyber trust.

# Regional Cooperation Agenda

- Shared data centers & cloud services
- Common technical standards
- PPPs for fiber networks

Regional integration enhances competitiveness.

# Theoretical & Policy Contributions

- Theoretical
- Extends gravity model with digital & AI elements.
  - Policy
- Blueprint for CAREC digital trade strategy.

# Conclusion

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- Digital trade potential in CAREC
- large but uneven.
- Need holistic strategy
- Infrastructure + Policy + Skills + Cooperation.
- Final Message

Regional collaboration is key to sustainable connectivity and to utilize trade potentials.