



ABSTRACT BOOK

39th PSDE International Conference & AGM

Mission \$100 Billion

The National Race for Sustainable
Export-led Prosperity



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CULTIVATING COMPETITIVENESS: AI, AGRITECH & THE AGRICULTURAL EXPORT TRANSFORMATION

- **Digital Technologies, AI-Enabled Tools, and Agricultural Export Performance: Evidence from Citrus and Mango Value Chains in Pakistan**

Manan Aslam, Zhiwen Li, Muhammad Adnan Raza & Muhammad Usman

- **AI, AgriTech, and the Export Turnaround: A Data-Driven Roadmap to Achieve Pakistan's \$100 Billion Vision**

Ghulam Rasool Madni

- **A Hybrid Computational Framework for Climate-Smart, Digitally-Enabled, and Sustainable Agri-Export Resilience: Evidence from Pakistan, India, China, and Japan (2000–2025)**

Qamar Ali

DIGITAL TECHNOLOGIES, AI-ENABLED TOOLS, AND AGRICULTURAL EXPORT PERFORMANCE: EVIDENCE FROM CITRUS AND MANGO VALUE CHAINS IN PAKISTAN

Manan Aslam, Zhiwen Li, Muhammad Adnan Raza & Muhammad Usman

Abstract

The paper examines the role of digital technologies and AI-based farm equipment in improving Pakistan's agricultural export performance by empowering farm-level capabilities. Using a Structural Equation Modelling framework with primary data from 500 export-oriented farmers in major horticultural value chains, specifically 250 citrus producers from Sargodha and 250 mango producers from Multan, the framework combines farm-level digital technology application, digital literacy, ICT-enabled farm potential, access to AI-enabled and digital farming tools, and engagement in ICT training and digital outreach to assess joint effects on export performance. Results indicate that digital technology adoption has a positive and statistically significant direct effect on export performance ($\beta = 0.21$, $p < 0.01$), largely transmitted through capability-building mechanisms: digital literacy enhances ICT-enabled farm capability ($\beta = 0.36$, $p < 0.001$), while ICT-enabled farm capability has the strongest direct influence on export performance ($\beta = 0.47$, $p < 0.001$). Mediation confirms digital literacy and ICT-enabled farm capability jointly mediate the relationship (indirect effects $\beta = 0.17$ and $\beta = 0.22$, $p < 0.001$). Moderation shows access to AI-enabled tools and ICT training strengthen the translation of digital skills into export-relevant capabilities ($\beta = 0.19$ and $\beta = 0.23$, $p < 0.01$). These mechanisms improve export readiness, quality compliance, traceability, and integration into international markets. The research offers policy actions showing that digital adoption alone does not improve export competitiveness; integrating digital infrastructure, AI-based agricultural solutions, and ICT training transforms digital access into export-ready farm performance. It provides a novel Grounded Theory-based, SEM-oriented policy model linking digital technologies, AI-enabled applications, and agricultural export performance in Pakistan.

AI ADOPTION, AGRITECH, AND THE EXPORT TURNAROUND: A DATA-DRIVEN ROADMAP TO ACHIEVE PAKISTAN'S \$100 BILLION VISION

Ghulam Rasool Madni

Abstract

Achieving Pakistan's \$100 billion export target requires a fundamental transformation of its agricultural sector, which remains constrained by low productivity, limited technological diffusion, and weak integration into global value chains. This study examines whether artificial intelligence (AI) adoption and AgriTech infrastructure can catalyse an export turnaround in

Pakistan's agriculture and provide a pathway toward sustained export competitiveness. Using annual time-series data from 2003 to 2024, the study develops an integrated analytical framework linking AI adoption, AgriTech infrastructure, innovation capacity, climate variability, and institutional quality to agricultural export performance. The empirical analysis employs the Autoregressive Distributed Lag (ARDL) bounds testing approach to capture both long-run relationships and short-run dynamics. For robustness checks, we also apply Fully Modified Ordinary Least Squares (FMOL) and Dynamic Ordinary Least Squares (DOLS). The results reveal that AI adoption, institutional quality, and AgriTech infrastructure exert positive and statistically significant effects on export performance. R&D investment and global demand further reinforce export growth, while climate variability and exchange rate volatility significantly undermine export performance. emerges as a key enabling factor that amplifies the effectiveness of technological investments. Overall, the findings demonstrate that AI-enabled agricultural modernisation is not merely a productivity-enhancing tool but a strategic lever for export diversification and resilience. The study offers policy insights for aligning digital innovation, climate resilience, and institutional reform to reposition Pakistan's agriculture as a competitive contributor to global value chains and transform the \$100 billion export vision into a feasible national outcome.

A HYBRID COMPUTATIONAL FRAMEWORK FOR CLIMATE-SMART, DIGITALLY-ENABLED, AND SUSTAINABLE AGRI-EXPORT RESILIENCE: EVIDENCE FROM PAKISTAN, INDIA, CHINA, AND JAPAN (2000-2025)

Qamar Ali

Abstract

Climate volatility is causing greater destabilisation in agri-export performance, with cascading disruptions across linked processes such as production, logistics, compliance, and contract execution. This study quantifies the relationship between climate stress and one such stack-potentially identified capacity resilience stacks of digital infrastructure, policy support, sustainability certification density, and trade network connectivity- and shapes agri-export resilience in 4 countries [Pakistan, India, China, Japan] from 2000- 2025, and translates these findings into a reproducible assessment tool. We use fixed-effects panel regression, triangulate mechanisms through thematic analysis (NVivo) of expert interviews, and operationalise comparable diagnostics through a Python/Google Colab mechanism to compute exposure, volatility, efficiency, and a composite resilience index. Results show climate stress significantly decreases resilience, but digital penetration, policy support, certification density, and particularly trade connectivity significantly increase resilience; endowment controls are weaker. Computational profiles show that resilience is highest in China and Japan and lowest in Pakistan, consistent with the heat stress and volatility profiles. The study concludes that resilience is not a one-intervention capability but a multi-layer approach. Incorporating econometrics, expert mechanisms and reproducible analytics is original.



BENCHMARKING GROWTH: SECTORAL PERFORMANCE & COMPARATIVE EXPORT ADVANTAGE

- **Revisiting Export-Led Growth in Pakistan: Evidence from Medium Term Sectoral Projections and Real Exchange Rate Elasticities**

Masood Ahmed Siddiqui

- **Pakistan's Sectoral Comparative Advantages and Export Challenges**

Uzma Zia

- **Divergent Pathways: A Comparative Analysis of Industrial Development and SME Dynamism in Pakistan, India, Bangladesh, and Vietnam**

Jamshaid Ur Rehman & Uzair

EVISITING EXPORT-LED GROWTH IN PAKISTAN: EVIDENCE FROM MEDIUM TERM SECTORAL PROJECTIONS AND REAL EXCHANGE RATE ELASTICITIES

Masood Ahmed Siddiqui

Abstract

Export-led growth has been the focus of many economic reform plans in Pakistan, such as the 13th Five-Year Reform Program titled URAAN, which targets exports to reach around \$60bn by 2030. However, these programs do not explicitly detail how they will achieve these growth targets within Pakistan's current macroeconomic framework. To provide this strategic policy evidence, we used a macro-econometric approach with the Macro-Foundation Framework tool (MFT-1.0) developed by the IMF to project external sector indicators in line with the program's target. We partially calibrated and modified the macro framework to disaggregate total exports to HS-2 level, providing projections and elasticities for around 45 exporting sectors using the framework's economy-wide equations and projection rules for sectoral-level analysis. The medium-term projections show that while structural transformation remains limited, several nontraditional mid-sized sectors with small export bases are emerging as key contributors, signalling gradual diversification and improved resilience. These sectors may be considered potential growth anchors, given their rising contribution to export growth and their relatively stronger responsiveness to exchange rate movements. The identification of this second tier of export drivers has important policy implications.

PAKISTAN'S SECTORAL COMPARATIVE ADVANTAGES AND EXPORT CHALLENGES

Uzma Zia

Abstract

This study examines Pakistan's export competitiveness through three complementary dimensions. It emphasises sectoral revealed comparative advantage, macroeconomic determinants of comparative advantage, and exporter-led constraints that affect converting comparative advantage into exports. Pakistan's export sector highlights comparative advantages across key industries such as textiles, food, leather, surgical instruments, and sports goods. The analysis is done at the micro and macro levels. The study follows a situational analysis with a revealed comparative advantage analysis for products in major sectors. Macro-level determinants of revealed comparative advantage are also explored, which show that some determinants, industrial output and institutional quality, generally enhance Pakistan's comparative advantage; the direction and the magnitude of effects vary considerably by sector. These sectors show competitive potential in international markets, but RCA performance alone doesn't guarantee export success, as challenges prevent firms from fully realising their comparative advantage. Therefore, this study surveys exporters to identify the challenges they face in the export process that limit exports. Findings show the strength of the textiles and leather sectors, while food exports like bovine meat and fresh fish show growing advantages due to efficient production practices. Despite these strengths, exporters also face significant operational and logistical challenges, such as transportation costs, insufficient storage, customs delays, and regulatory complexities. The findings highlight several export-market issues, including limited access to working capital and finance, hurdles from shipping-line monopolies, policy inconsistencies, and delays from customs checks. Pakistan must enhance exports and compete in the international market. As the URAAN initiative also aims to enhance exports, this study recommends keeping interest rates low, ensuring equitable market and financial access, streamlining trade processes, expanding digital banking & technological upgradation, providing essential infrastructure, offering professional training for exporters, and building networks for growth.

DIVERGENT PATHWAYS: A COMPARATIVE ANALYSIS OF INDUSTRIAL DEVELOPMENT AND SME DYNAMISM IN PAKISTAN, INDIA, BANGLADESH, AND VIETNAM

Jamshaid ur Rehman & Uzair Ahson

Abstract

This study presents a comparative causal analysis of the industrial development path in Pakistan, India, Bangladesh, and Vietnam from 2000–2023. We employed different methods such as Difference-in-Differences (DiD), Two-Way Fixed Effects, and causal mediation analysis. This study examines why Pakistan's manufacturing sector has stagnated compared with regional peers that achieved export-led growth through deep integration into Global Value Chains (GVCs). The findings demonstrate that strategic, sustained industrial policies in Bangladesh (post-MFA RMG push), Vietnam (WTO accession reforms), and India (Make in India) significantly boosted manufacturing value added, export diversification, and GVC participation relative to Pakistan's ad hoc, crisis-driven policy regime. Crucially, the study identifies SME financial inclusion as a key mediating channel through which industrial policies translate into growth, a channel largely absent in Pakistan. The results underscore that divergent industrial outcomes are not inevitable but stem from deliberate policy choices, institutional coherence, and strategic alignment with global production networks. The paper concludes with targeted policy recommendations for Pakistan, emphasising the need for an integrated industrial strategy that synchronises GVC-oriented policy, SME ecosystem development, and financial sector reform to reignite sustainable industrial growth.



THE INSTITUTIONAL COMPASS: POLITICS, GOVERNANCE & PAKISTAN'S EXPORT TRAJECTORY

- **Rethinking Pakistan's Exports Bottleneck: How Economic, Political and Institutional Factors Shape Pakistan Exports**

Fatima Ejaz & Zainab Jehan

- **Corridors And Codes: Provincial Language Politics, Decentralised Governance, And Trade-Driven Growth in Pakistan**

Chaman Hussain

- **Political Uncertainty and Market Behaviour: Evidence from the Karachi Stock Exchange**

Muhammad Sohail Akhtar

RETHINKING PAKISTAN EXPORTS BOTTLENECKS: HOW ECONOMIC, POLITICAL, INSTITUTIONAL FACTORS SHAPE PAKISTAN EXPORTS

Fatima Ejaz & Zainab Jehan

Abstract

This study rethinks the bottlenecks constraining/promoting Pakistan's export performance by examining the role of economic, political, and institutional factors over the period 1975–2024. Using the dynamic autoregressive distributed lag (DARDL) framework, the analysis investigates the long- and short-run relationships among exports, exchange rate volatility, trade regulations, economic freedom, and political violence. The bounds testing approach provides strong evidence of cointegration, confirming a stable long-run equilibrium relationship among the variables. The results reveal pronounced export persistence, indicating strong path dependence in Pakistan's export sector. Exchange rate volatility exerts a statistically significant and negative effect on exports in both the short and long run, highlighting uncertainty as a key economic bottleneck. Trade regulation quality, by contrast, positively and significantly influences exports, suggesting that regulatory efficiency and trade facilitation measures support export growth. Political violence undermines export performance in the long run, reflecting the cumulative adverse effects of instability on investment, logistics, and international buyer confidence. Economic freedom remains statistically insignificant, implying that institutional reforms alone are insufficient to boost exports without complementary structural and macroeconomic policies. Overall, the findings underscore that Pakistan's export constraints stem more from macroeconomic instability and political insecurity than from institutional reforms alone, emphasising the need for coordinated economic stabilisation, regulatory efficiency, and security-oriented policies to achieve sustained export growth.

CORRIDORS AND CODES: PROVINCIAL LANGUAGE POLITICS, DECENTRALIZED GOVERNANCE, AND TRADE-DRIVEN GROWTH IN PAKISTAN

Dr. Chaman Hussain

Abstract

Despite huge investments in trade corridors and physical connectivity, Pakistan's export performance has remained stagnant in the last decade. Investments in roads, ports, and energy connections have increased, but export diversification, SME involvement, and regional industrial integration have not kept pace. This paper concludes that lack of infrastructure is not the reason why exports are lagging. Instead, the federal-provincial division of export responsibilities is to blame. After the 18th Constitutional Amendment, provinces were responsible for skills development, SME support, and industrial policy, while export policy and customs and trade negotiations remained the responsibility of the Federal government. If the two levels are not closely aligned, policy gaps increase, compliance costs rise, SMEs cannot access export markets, and the spillover effects of trade corridors diminish. The same situation repeats in many areas where jobs are being created, such as manufacturing, agro-based exports, ICT services, and corridor-based industries, where coordination is missing at key federal-provincial interfaces. The paper draws on experiences from other countries on trade facilitation and shows how such administrative fragmentation increases the 'true cost' of trade and prevents firms from participating in export markets. It outlines a reform agenda with four concrete actions: corridor export coordination cells, multilingual trade facilitation, export skills matching, and regulatory simplification. Even from a purely illustrative point of view, even a small increase in SMEs' export performance can bring billions of dollars, which can significantly contribute to Pakistan's export targets of \$63 billion and \$100 billion under Uraan Pakistan. The paper's main thesis is straightforward: trade corridors are not simply transport corridors, but governance systems as well. Institutional coherence is key to realising infrastructure's potential. Governance reform is a tangential issue to export strategy in that regard. It is supported by the foundation.

QUALITY OF INSTITUTIONS AND FIRM-LEVEL INNOVATION IN PAKISTAN: A DISAGGREGATED ANALYSIS

Muhammad Sohail, Muhammad Tariq Majeed & Irfan Hussain Khan

Abstract

This study evaluates the impact of institutional quality on firm-level innovation in Pakistan using the World Bank Enterprise Survey 2022. Because innovation is rare in Pakistani industries, we use a rare-events logistic model and a penalised maximum likelihood estimator (PMLE). Our findings show that institutional quality positively influences the outcomes of innovation efforts across Pakistan. Specifically, regulatory quality, the rule of law, control of corruption, and government effectiveness influence firm innovation. Better institutional quality is associated with the high levels of innovativeness identified mainly in the region. Respect for the rule of law, transparent and fair control of corruption, and effective governance are crucial for innovation development. Policymakers need institutional reforms to drive innovation-led growth in the country.



SMALL FIRMS, BIG GAINS: SMES, CLUSTERS & INCLUSIVE INNOVATION

- **Empowering Women-Led SMEs for Sustainable Export Growth: A Pathway to Inclusive Industrial Development in Pakistan**
Yusra Shehzadi & Kehkashan Rani
- **Unlocking Value in Pakistan's Gemstone Economy: A Cluster Upgrading Strategy for Namak Mandi, Peshawar**
Muhammad Ali
- **Quality of Institutions and Firm-Level Innovation in Pakistan: A Disaggregated Analysis**
Muhammad Sohail, Muhammad Tariq Majeed & Irfan Hussain Khan

EMPOWERING WOMEN-LED SMES FOR SUSTAINABLE EXPORT GROWTH: A PATHWAY TO INCLUSIVE INDUSTRIAL DEVELOPMENT IN PAKISTAN

Yusra Shehzadi & Kehkashan Rani

Abstract

Women-led small and medium enterprises (SMEs) represent a largely underutilised source of export growth in developing economies, particularly in Pakistan, where export participation remains concentrated in a limited number of sectors and firms. Despite growing recognition of the importance of finance, digitalisation, and human capital for SME growth, limited empirical evidence explains how these factors jointly influence export outcomes among women entrepreneurs in emerging markets. This study examines the effects of access to finance, digital adoption, and skills and financial literacy on export readiness and export performance among women-led SMEs in Pakistan. It also assesses the mediating role of export readiness and the moderating role of institutional support. Primary data were collected through a structured survey of 250 women-owned SMEs operating in Karachi, Lahore, and Faisalabad and analysed using partial least squares structural equation modelling (PLS-SEM). The findings indicate that access to finance, digital adoption, and skills and financial literacy significantly enhance export readiness, which, in turn, strongly and positively affects export performance. Export readiness mediates the relationship between firm capabilities and export outcomes, highlighting its importance in translating capabilities into international market participation and performance. Institutional support, however, exhibits neither a significant direct effect nor a significant moderating effect, suggesting potential gaps in the effectiveness or accessibility of existing support mechanisms. By integrating financial, digital, and human capital perspectives into a unified framework, the study advances understanding of export performance among women-led SMEs. The findings underscore the importance of improving financial access and strengthening enterprise capabilities to promote inclusive and sustainable export growth.

UNLOCKING VALUE IN PAKISTAN'S GEMSTONE ECONOMY: A CLUSTER UPGRADING STRATEGY FOR NAMAK MANDI, PESHAWAR

Muhammad Ali

Abstract

Pakistan is endowed with some of the world's richest reserves of precious and semi-precious gemstones but still captures only a fraction of their potential value because of weak value addition, informality, and fragmented cluster governance. The paper empirically examines the gemstone trading and processing cluster of Namak Mandi. It also evaluates how targeted cluster-upgrading interventions can increase firm-level productivity, export performance, and employment generation. The paper uses primary firm-level data, traders' consultations, and secondary trade statistics to estimate econometric models linking value addition and export intensity to technology adoption, skills, finance, certification, and institutional support. The port diamond model shows that improved facilities, e.g. technology upgrades, certification and access to finance, significantly increase value addition per unit and export participation. The paper recommends cluster upgrading strategies linked with skill improvement, technology upgradation, technology enhancement and market integration for sustainable growth in the gemstone economy.

QUALITY OF INSTITUTIONS AND FIRM-LEVEL INNOVATION IN PAKISTAN: A DISAGGREGATED ANALYSIS

Muhammad Sohail, Muhammad Tariq Majeed & Irfan Hussain Khan

Abstract

This study evaluates the impact of institutional quality on firm-level innovation in Pakistan using the World Bank Enterprise Survey 2022. Because innovation is rare in Pakistani industries, we use a rare-events logistic model and a penalised maximum likelihood estimator (PMLE). Our findings show that institutional quality positively influences the outcomes of innovation efforts across Pakistan. Specifically, regulatory quality, the rule of law, control of corruption, and government effectiveness influence firm innovation. Better institutional quality is associated with the high levels of innovativeness identified mainly in the region. Respect for the rule of law, transparent and fair control of corruption, and effective governance are crucial for innovation development. Policymakers need institutional reforms to drive innovation-led growth in the country.



BEYOND BORDERS: SKILLS, LABOUR MOBILITY & HUMAN CAPITAL EXPORTS

- **Bridging the Skills-to-Market Gap: The Role of Skills in Enhancing Pakistan's Freelancing and IT Export Competitiveness**

Hummaira Jabeen

- **The Dynamics of Manpower Export in Pakistan: Challenges, Reforms, and Global Prospects**

Moazzam Ali, Muhammad Sadil Ali & Muhammad Nadil Ali

- **Labour Exports from Pakistan: Case Study of Gulf Cooperation Council Countries**

Umer Khalid, Asia Imtiaz & Ali Tahir

BRIDGING THE SKILLS-TO-MARKET GAP: THE ROLE OF SKILLS IN ENHANCING PAKISTAN'S FREELANCING AND IT EXPORT COMPETITIVENESS

Humaira Jabeen

Abstract

This study investigates how structural challenges and opportunity structures within Pakistan's gig economy shape economic and behavioural outcomes, with particular emphasis on the mediating role of skills development and skills-to-market alignment. Using a sequential exploratory mixed-methods design, the study first used qualitative insights from 13 semi-structured interviews with active freelancers to refine constructs and develop research objectives. Next, the study collected quantitative data from 313 freelancers in IT and digitally enabled service domains and analysed them using Partial Least Squares Structural Equation Modelling (PLS-SEM). The findings show that structural challenges significantly intensify employment precarity, while gig economy opportunities strongly enhance access to global markets, income generation, entrepreneurship, and continuation intention. Crucially, skills development, especially soft and market-oriented skills, emerges as a key capability that mediates the relationship between gig economy dynamics and income stability, job satisfaction, and IT export competitiveness. The study contributes empirical evidence from an emerging economy, highlighting skills development as a strategic mechanism for transforming freelance labour into sustainable digital export performance.

THE DYNAMICS OF MANPOWER EXPORT IN PAKISTAN: CHALLENGES, REFORMS, AND GLOBAL PROSPECTS

Moazzam Ali, Muhammad Sadil Ali & Muhammad Nadil Ali

Abstract

This study examines the dynamics of manpower export in Pakistan, including associated challenges, trends, and global opportunities. To do so, the study collected data from both primary and secondary sources. The study collected primary data from recruiting agencies through questionnaires and conducted statistical analysis to identify issues and key challenges in Pakistan's manpower export system. The study collected secondary data from national and international reports and reviewed them, highlighting trends and new international opportunities for overseas employment. The analysis shows that manpower export from Pakistan is heavily concentrated among low- and semi-skilled employees in Gulf countries. Generally, Punjab and Khyber Pakhtunkhwa are the main sources of overseas employment. The findings also show that workers face challenges such as visa delays, high costs, worker welfare issues, and skills and language gaps. These findings are important for both recruitment agencies and workers. For recruiting agencies, the findings will help improve recruitment practices, reduce workers' skill mismatches, and improve access to diversified international markets. The findings are important for workers in understanding emerging demands and employment opportunities in global markets.

LABOUR EXPORTS FROM PAKISTAN: CASE STUDY OF GCC COUNTRIES

Umer Khalid, Asia Imtiaz & Ali Tahir

Abstract

Pakistan's large and growing youth population faces challenges in securing productive employment opportunities because of the country's comparatively low economic growth over the last few years. This makes exporting surplus manpower to labour-deficient countries an important economic strategy, with the potential to bring in workers' remittances and cushion the country's balance of payments position. This paper examines Pakistan's labour-export potential to Gulf Cooperation Council (GCC) countries, one of the largest destinations for migrant workers. The study uses a mixed-methods approach, combining quantitative analysis of national and international labour-market data with qualitative consultations with key stakeholders, to analyse labour demand in emerging sectors and occupations across the GCC region. It also examines Pakistan's existing migrant workforce in the region, its skills profile, and the institutional constraints and bottlenecks these migrant workers face. The findings indicate a gradual shift in GCC demand from low-skilled construction workers towards semi-skilled and skilled occupations in manufacturing, healthcare, logistics, renewable energy, hospitality and information technology. However, Pakistan's migrant workforce in the region remains concentrated in low- and semi-skilled jobs because of gaps in skills development, certification, recruitment governance, and labour-market information. Based on the in-depth analysis of existing gaps and emerging challenges, the study recommends aligning training and certification with GCC demand, strengthening bilateral cooperation, digitalising emigration processes, improving recruitment governance and enhancing worker protection. These measures can enable Pakistan to increase flows of higher-value migrant workers to GCC countries, provide better employment outcomes for migrant workers, and promote sustained growth in remittances.



CODE, CLOUD & CUSTOMS: ICT, AI & DIGITAL TRADE REFORM

- **ICT Development and Services Exports in South Asia**
Farhat Mahmood & Muhammad Tariq Majeed
- **Federated Medical AI and Digital Health Service
Delivery: A Techno-Economic Feasibility Assessment
Using Skin-Lesion Classification**
*Haider Ali, Alishba Allah Ditta, Israr Hussain, Salman
Qadri & Muhammad Ahsan Jamil*
- **Redefining Pakistan's Trade Trajectory through the
Pakistan Single Window (PSW): A Data-Driven
Reform**
Ana Khattak

ICT DEVELOPMENT AND SERVICES EXPORTS IN SOUTH ASIA

Farhat Mahmood & Tariq Majeed

Abstract

In South Asia, information and communication technology (ICT) enablers positively influence total services exports and ICT-based services exports. India stands out in South Asia, followed by Pakistan, while other economies show emerging linkages. To better understand ICT impacts on services exports and ICT-based services exports in South Asia, we use panel data for all South Asian countries from 1990–2024. We have employed three estimation techniques, Pooled Ordinary Least Squares (POLS), Two-Stage Least Squares (2SLS), and Generalised Method of Moments (GMM) to ensure the robustness of the results and to address potential econometric issues such as endogeneity, reverse causality, and unobserved heterogeneity. Overall, the findings indicate that total services exports benefit from broad ICT development and general macroeconomic strength, while ICT services exports rely heavily on mobile connectivity and foreign direct investment in the South Asian region.

FEDERATED MEDICAL AI AND DIGITAL HEALTH SERVICE DELIVERY: A TECHNO-ECONOMIC FEASIBILITY ASSESSMENT USING SKIN-LESION CLASSIFICATION

Alishba Allah Ditta, Haider Ali, Israr Hussain, Salman Qadri & Maryam Fatima

Abstract

Digital health systems can improve healthcare access in resource-constrained settings, but medical AI development is often limited by data-governance restrictions, privacy concerns, and the difficulty of pooling patient data across institutions. This study evaluates federated medical AI as a privacy-preserving digital health service model using skin-lesion classification as a techno-economic case study. Using the public DERM12345 dataset, we constructed a benign-malignant cohort of 12,285 dermoscopic images from 1,625 patients after filtering binary labels and removing exact duplicates. We represented images using frozen EfficientNet-B0 embeddings and evaluated centralised, local-only, and federated classifier heads across five random seeds and five patient-disjoint folds. Federated learning was simulated under balanced four-client partitions and controlled label-skew non-IID eight-client partitions. The centralised MLP achieved an AUROC of 0.976 ± 0.007 and an AUPRC of 0.864 ± 0.031 . Under balanced clients, FedProx and FedAvg closely matched centralised performance, reaching AUPRC values of 0.863 and 0.862, respectively. In contrast, controlled label-skew heterogeneity consistently reduced AUPRC. From a techno-economic perspective, these findings suggest that federated medical AI may support decentralised digital health service delivery when institutional data are reasonably balanced, but service quality may decline when client populations differ substantially. The results highlight the importance of data governance, institutional readiness, external validation, and privacy regulation before federated medical AI can be scaled as a reliable digital health service.

REDEFINING PAKISTAN'S TRADE TRAJECTORY THROUGH THE PAKISTAN SINGLE WINDOW: A DATA-DRIVEN REFORM

Ana Khattak

Abstract

Drawing on conclusions covering around 0.3 million trade transactions between 2020 and 2025, complemented with firm-level evidence and interviews with key stakeholders, this paper evaluates PSW on the metrics of trade efficiency, inclusiveness and governance outcomes. Using a phased introduction and differences in the intensity of PSW adoption across trade corridors, regulatory procedures, and firms, we estimate causal effects using a difference-in-differences methodology. The results suggest that PSWs can deliver significant benefits, including reduced average customs clearance time and transaction costs of approximately US\$220 per shipment and 1.75 days per shipment. The reform has also increased the share of SMEs in exports by eight percentage points. The empirical analysis also shows that export concentration is declining slightly but significantly, suggesting early stages of trade and geographic diversification. Beyond operational improvements, both quantitative and qualitative evidence suggests that PSW has improved trade governance by increasing transparency, limiting reliance on discretionary face-to-face interactions, enhancing traceability, and improving the reliability of trade-related information. All this has implications for financial integrity and may support greater access to trade finance. Despite PSW's substantial short-term efficiency and inclusivity gains, the study also notes that digital trade facilitation systems alone cannot address the underlying structural barriers that limit export diversification. Overall, the paper contributes robust empirical evidence on how digital single-window systems function as trade-governance infrastructure in developing economies and to inform policy discussions on digital transformation, SME participation in global trade, and institutional modernisation.



THE BLUE FRONTIER: MARITIME TRADE, COASTS & OCEAN GOVERNANCE

- **Leveraging Green Maritime Tourism for Climate-Resilient Coastal Development in Pakistan: Opportunities and Policy Pathways**

Saba Anwar, Anjeela Khurram, Muhammad Atiq-Ur-Rehman, Bilal Aftab, Shamaila Zareen & Aslam Zaib

- **Sustainable Fisheries and Coastal Development through “Blue Economy” framework in Balochistan: Progress, Challenges, and the Way Forward**

Hafeez Ahmed Jamali

- **Navigating the Blue-Green Nexus: Maritime Governance, Digitalisation, and Sustainable Port Development in Asian Economies (2000–2025)**

Muhammad Aamir Mahmood

LEVERAGING GREEN MARITIME TOURISM FOR CLIMATE-RESILIENT COASTAL DEVELOPMENT IN PAKISTAN: A GREEN TOURISM-ECOSYSTEM SERVICES FRAMEWORK

*Saba Anwar, Anjeela Khurram, Muhammad Atiq-ur-Rehman, Bilal Aftab,
Shamaila Zareen & Aslam Zaib*

Abstract

This study explores the potential of green maritime tourism to stimulate climate-resilient and sustainable development in Pakistan. Following globally recognised best practices, we developed a green marine tourism framework for Pakistan through local community engagement, institutional preparedness, and infrastructure development. The findings suggest that Pakistan needs a well-structured coastal tourism policy to transition toward a sustainable blue economy. Promoting coastal tourism will strengthen climate-resilient livelihoods in local communities and boost economic growth. Policy recommendations focus mainly on local community engagement, institutional coordination, and regulatory and infrastructural reforms to ensure long-term coastal sustainability. The analysis further extends the concept of ecosystem services to the coastal tourism context, considering environmental constraints and spatial planning. Pakistan's 1,050 km coastline offers ample, yet largely untapped, opportunities for sustainable economic growth through coastal and marine tourism. Post-COVID trends suggest growing domestic coastal tourism, expanding markets for adventure tourism, and rising demand for premium tourism forms such as cruise tourism, luxury resorts, and eco-recreation. At the same time, Pakistan is making serious efforts to formulate a blue economy policy under the Ministry of Maritime Affairs and has also outlined its tourism development priorities in its Tourism Action Plan (2020-2025). Conservation groups believe mangrove and coastal ecosystems play an important role in building resilience and adapting to climate change. This research proposes a Green Coastal Tourism Ecosystem Services Framework for Pakistan. Using a multi-phase mixed-methods research design that combines systematic review, policy analysis, GIS-based ecosystem services mapping, and stakeholder governance perspectives, the study develops a zoning-ready, policy-relevant framework to guide sustainable coastal tourism across Sindh and Balochistan.

SUSTAINABLE FISHERIES AND COASTAL DEVELOPMENT USING THE 'BLUE ECONOMY' FRAMEWORK IN BALOCHISTAN: PROGRESS, CHALLENGES, AND THE WAY FORWARD

Hafeez Ahmed Jamali

Abstract

The concept of 'blue economy' has received increasing attention in national and international development forums as a means for sustainable exploitation of marine resources for advancing economic growth and sustainable livelihoods. While Pakistani policymakers have traditionally overlooked the importance of the sea and oceans as contributors to economic growth, the Government of Pakistan has recently recognised this sector's significance. Similarly, the Government of Balochistan has made a significant policy commitment to fisheries and coastal development and formulated a Blue Economy Strategic Plan. In this context, this study evaluates the relevance of the 'blue economy' framework for the sustainable development of fisheries and coastal development sectors in Balochistan Province, assesses progress toward adopting a holistic marine resources development approach, and identifies the gaps and challenges facing implementation of these plans. The study primarily adopts a qualitative approach, relying on a comprehensive review of government policies, plans, documents, and development statistics, combined with interviews with key provincial government stakeholders. Preliminary findings indicate that the Government of Balochistan has made significant progress in translating its Blue Economy vision into strategic plans, sectoral policies, and updated maritime rules and regulations in the fisheries & aquaculture and coastal development sectors. However, there is a wide gap between the 'policy intent' of the provincial government and the 'development outcomes' in terms of policy implementation in these sectors. Existing programs, enforcement mechanisms, and development projects in Balochistan's fisheries and coastal development sectors suffer from inadequate funding, limited institutional capacity to implement policies and programs, weak inter-agency coordination, and insufficient investment in research, training, and skills development. The study recommends that the provincial government should increase the size of public investment to complete ongoing projects and fast-track new infrastructure projects, explore innovative financing mechanisms, such as Blue Bonds and Blue Carbon Accelerator Funds with the help of the federal government, operationalise surveillance mechanisms against illegal, irregular, and unreported fishing, and improve inter-agency coordination for the Blue Economy.

NAVIGATING THE BLUE-GREEN NEXUS: MARITIME GOVERNANCE, DIGITALIZATION, AND SUSTAINABLE PORT DEVELOPMENT IN ASIAN ECONOMIES (2000–2025)

Muhammad Aamir Mahmood

Abstract

This study examines the determinants of maritime sustainability in Pakistan, India, China and Japan (2000-2025) by employing Feasible Generalized Least Squares (FGLS) and Panel Corrected Standard Errors (PCSE) to overcome the issue of cross-sectional dependence and serial correlation in a small-N, large-T panel. The analysis investigates the impacts of Port Infrastructure Quality, Digital Adoption, IMO Environmental Governance, LNG Bunker Share, and Trade Intensity on CO2 Intensity, Logistics Performance, Blue Economy GDP, and an Integrated Sustainability Index, with Institutional Quality moderating and Technological Innovation mediating. Levin-Lin-Chu unit root tests test first-difference stationarity, and Kao cointegration tests test long-run equilibrium. Results reveal that Digital Adoption ($\beta = -9.82, p < 0.001$) and IMO Governance ($\beta = -12.48, p < 0.001$) significantly reduce CO2 Intensity, while Trade Intensity increases emissions ($\beta = 0.48, p < 0.009$). Port Infrastructure ($\beta = 0.31, p < 0.001$) and Institutional Quality ($\beta = 0.42, p < 0.001$) enhance Logistics Performance. The dummy variables of interest are Financial Crisis and COVID-19. The findings help inform evidence-based maritime policy in Asia.



FROM COASTLINES TO COKE STUDIO: TOURISM & THE CREATIVE ECONOMY AS EXPORT FRONTIERS

- **Tourism-Led Export Diversification: Empirical Evidence from South Asian Economies**

Bushra Yasmin

- **Beyond Tourism-Led Growth: The Role of Institutions in Unlocking Pakistan's Tourism Potential**

Syeda Azra Batool & Syeda Shahida Batool

- **From K-pop to Coke Studio: Policy Pathways for Music Export Development in Pakistan**

Muhammad Rafi Khan & Saadia Tariq

TOURISM-LED EXPORT DIVERSIFICATION: EMPIRICAL EVIDENCE FROM SOUTH ASIAN ECONOMIES

Bushra Yasmin

Abstract

This study examines the impact of tourism sector development on export diversification in selected South Asian countries from 1995 to 2024. Tourism development is proxied by the growth rate of tourist arrivals and tourism receipts as a percentage of total exports, alongside other key determinants of export diversification. To ensure robust estimation in the presence of cross-sectional dependence, serial correlation, and heteroscedasticity, the study employs panel data estimation techniques, including the Random Effects model with Driscoll–Kraay standard errors and the Panel Generalised Least Squares (GLS) estimator. The empirical findings provide clear policy-relevant evidence that tourism development significantly contributes to export diversification in South Asia through both tourism indicators. Economic growth, financial development, and value added in the agricultural and manufacturing sectors further strengthen export diversification, highlighting the importance of complementary sectoral development. In contrast, greater trade openness and rising population density are associated with increased export concentration, suggesting structural rigidities and limited absorptive capacity in export markets. Moreover, the insignificance of the services sector reflects persistent underdevelopment and limited integration of modern services into the export basket. From a policy perspective, the findings emphasise the need to position tourism as a strategic component of export-led growth and structural transformation. Targeted investments in tourism infrastructure, skills development, and service-sector upgrading can enhance backwards and forward linkages with agriculture, manufacturing, transport, and creative industries. Moreover, given the region's reliance on a narrow set of labour-intensive exports and vulnerability to global shocks and adverse terms of trade, tourism offers a viable pathway to broaden the export base, improve competitiveness, and strengthen long-term economic resilience in South Asia.

BEYOND TOURISM-LED GROWTH: THE ROLE OF INSTITUTIONS IN UNLOCKING PAKISTAN'S TOURISM POTENTIAL

Syeda Azra Batool & Syeda Shahida Batool

Abstract

This study examines the Pakistan Tourism-Institutional Led Growth Model (PTILGM) by including international tourism and institutional quality alongside other macroeconomic variables. The ARDL model, using time series data from 1998 to 2024, was used to assess the short-run and long-run dynamics of Pakistan's economic growth. The results show that international tourism supports economic growth as a structural long-run driver but misses its significant short-run impact. Institutional quality positively influences economic growth in both the long and short run, underscoring its role as a stabiliser and a foundation for sustained economic growth. The interaction between institutional quality and tourism is negative in both the long and short run, reflecting transitional adjustment costs, governance capacity constraints, and sectoral rigidities linked to Pakistan's evolving institutional framework, rather than rejecting the significance of tourism-institutional-led growth. In the long run, lagged GDP growth, CO2 emissions (current), lagged inflation, human capital (current), and labour force participation(current) positively and significantly determine economic growth, whereas the impact of current inflation and lagged human capital appears to be negative and significant in affecting GDP growth. In the short run, human capital and inflation appear to have positive and negative effects, respectively. The error-correction term confirms a stable long-run relationship with a moderate speed of adjustment ($ECM = -.24$). The study concludes that tourism contributes to sustained economic growth in Pakistan in the presence of strong institutions, the interaction of tourism and institutions, human capital development, and macroeconomic stability. The policy recommendations focus on improving institutional quality to promote tourism and, in turn, economic growth.

FROM K-POP TO COKE STUDIO: POLICY PATHWAYS FOR MUSIC EXPORT DEVELOPMENT IN PAKISTAN

Muhammad Rafi Khan & Saadia Tariq

Abstract

This case study examines Pakistan's potential to build a structured music export industry by drawing lessons from South Korea's state-driven K-pop model. The study analyses the political economy of South Korea's creative export strategy, which has transformed cultural products into a \$12.3 billion annual industry through centralised governance, financial incentives, and diplomatic deployment of music as soft power. Conversely, Pakistan's music sector, while dynamic with grassroots creativity exemplified by Coke Studio and Velo Sound Station, remains disjointed because of insufficient institutional backing, erratic financial frameworks, and weak safeguards for intellectual property rights. This comparative approach merges firsthand discussions with Pakistani producers and policymakers with supplementary information on export figures and creative economy analyses. The results show essential deficiencies in Pakistan's institutional framework, particularly the lack of a specialised export council and structured programs for talent cultivation. This study proposes a policy framework centred on establishing a Music Export Council and a National Music Export Fund to align cultural production with economic strategy. It also shows how Pakistan's corporate-dominated sponsorship model exposes artists to market volatility, while South Korea's coordinated approach supports sustained growth. The study advances discussions on the growth of the creative economy by showing how structural changes can turn music into both an economic resource and an instrument of cultural diplomacy. Its importance lies in offering practical ways for Pakistan to broaden its export base while addressing systemic shortcomings in the creative industry.



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