

CENTRAL BANK DIGITAL CURRENCY, FINANCIAL COMPETITION, AND GROWTH: IDENTIFYING CHALLENGES, OPPORTUNITIES, AND APPLICATIONS

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ABSTRACT

Central banks worldwide are actively pursuing the successful implementation of Central Bank Digital Currency (CBDC) with perceived benefits such as enhanced financial inclusion, a more efficient and secure payment system, increased transaction transparency, stable prices, and a robust framework for effective monetary policy. This report aims to achieve five objectives encompassing the global and national dimensions related to CBDC, employing qualitative and quantitative methodologies. First, the study plans to conduct a comprehensive literature review on CBDC using systematic review, bibliographic mapping techniques, and synthesis analysis. Second, it intends to investigate the macroeconomic, financial, technological, and other factors influencing the adoption and implementation of CBDC across the globe, where the countries are classified based on CBDC development stages, income groups, and geographical regions. Third, the study aims to compare Pakistan's financial ecosystem and macroeconomic environment with the countries at the research stage of CBDC. Fourth, the study also critically assesses the compatibility of the existing regulatory framework of Pakistan to launch and implement CBDC. Lastly, the study aims to assess the level of awareness, readiness, acceptability, and perception about the benefits, challenges, opportunities, and implications of CBDC at all tiers of the financial ecosystem in Pakistan comprising financial institutions, merchants, and the general public using primary data. The report revealed that Pakistan's economic and technological indicators are comparable with those of countries at the advanced stages of CBDC exploration. Moreover, Pakistan's adoption of digital payment systems positions it favorably for CBDC implementation. Regional competitors like India and China are progressing rapidly, reinforcing the urgency for Pakistan to act. Based on the primary data, it is revealed that digital illiteracy, particularly among women, is perceived as a significant barrier to CBDC adoption and the risk of excluding marginalized groups unless targeted interventions are implemented. Financial institutions reported inadequate communication and lack of coordination regarding CBDC awareness, highlighting the need for improved stakeholder engagement. Trust in digital ecosystems and concerns about data privacy are significant barriers. The report emphasized that addressing these issues is vital to fostering public confidence in digital currencies. Investments in cybersecurity measures and public education on safe digital practices are perceived as prerequisites for realizing the professed benefits of CBDC. CBDC presents a transformative opportunity for Pakistan to modernize its financial system, enhance financial and digital inclusion, and foster economic growth. However, realizing this potential requires addressing critical gaps in literacy, infrastructure, and trust. With strategic investments, stakeholder engagement, and alignment with global practices, Pakistan can position itself as a leader in digital financial innovation.

PREFACE

The global financial landscape is undergoing a profound transformation, driven by rapid advancements in digital technologies and the increasing integration of financial innovations into everyday life. Central Bank Digital Currency (CBDC) represents a significant evolution in this transformation, potentially redefining how economies function, how monetary policies are implemented, and how financial inclusion is achieved. As nations worldwide explore the opportunities and challenges of adopting CBDC, examining the feasibility and implications of their introduction within specific national contexts is imperative.

This report assesses the prospects of CBDC adoption in Pakistan, a country at the intersection of emerging technological advancements and persistent developmental challenges. With a predominantly young population, increasing digital literacy, and a rapidly evolving financial ecosystem, Pakistan holds immense potential for harnessing the benefits of CBDC. However, the nation also faces substantial hurdles, including limited trust in financial institutions, high reliance on cash transactions, and infrastructural inadequacies that may impede the successful implementation of this innovative currency.

Recognizing these complexities, the report aims to provide a comprehensive understanding of the macroeconomic, financial, and technological factors influencing CBDC adoption in Pakistan. It also seeks to address critical questions regarding regulatory readiness, public perception, and stakeholder preparedness for this transformative shift in the financial ecosystem. By leveraging a systematic and analytical approach, this study identifies gaps in the existing literature, evaluates global experiences, and offers actionable insights for policymakers and financial institutions.

This report is intended for a diverse audience, including academics, researchers, policymakers, financial regulators, and other stakeholders interested in understanding and shaping the future of digital finance in Pakistan. Through an in-depth analysis of global and national trends, it aims to contribute to the growing body of knowledge on CBDCs and provide a roadmap for their effective implementation.

The exploration of CBDC is not just a technological endeavor but a profound socio-economic transformation that demands the involvement of all stakeholders, alignment with global practices, and strategic planning. It is hoped that this report will serve as a valuable resource in navigating this transformative path, fostering informed decision-making, and catalyzing a robust dialogue on the future of digital currencies in Pakistan.

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ABBREVIATIONS

CBDC	Central Bank Digital Currency
Fintech	Financial technologies
AE	Advanced Economies
AML	Anti-Money Laundering
ATM	Automated Teller Machine
Bigtech	Big technologies
BIS	Bank of International Settlements
CPI	Consumer price index
CPMI-MC	Committee on Payments and Market Infrastructures - Markets Committee
DeFi	Decentralized finance
DLT	Distributed ledger technology
ECB	European Central Bank
EMDEs	Emerging market and developing economies
EME	Emerging Market Economies
IMF	International Monetary Fund
PCI	Per capita income
SBP	State Bank of Pakistan
SLR	Systematic Literature Review
UN	United Nations

INTRODUCTION

1.1. Background

The contemporary era of digitalization characterized by rapid advancements in big technologies (BigTech) and financial technologies (FinTech) is reshaping our perception and management of currency. The paradigm shift in financial payment systems is inextricably linked to the emergence of the internet, digitalization, and Fintech. Indeed, internet banking, a gateway to digital innovations, provides a convenient alternative to traditional banking by enabling individual and corporate clients to manage their finances and other financial transactions remotely and more effectively. The advent of plastic money enhanced transaction convenience while also improving payment security, records, and fraud protection. As technology advanced, mobile wallets and payment apps became the forefront of digital finance. These apps leverage smartphone capabilities for contactless payments, streamlining transactions, and enhancing security through features like biometric authentication and tokenization (Uwaleke, 2022). The emergence of decentralized finance (DeFi) based on blockchain technology, exemplified by cryptocurrencies like Bitcoin and Ethereum, has brought to the forefront the challenges and risks associated with digital currencies. Nevertheless, central banks and financial institutions all over the world are grappling with challenges such as regulatory concerns, price volatility, and security issues, among others, associated with this innovative form of money. A vast range of policies have been implemented by the central banks of different countries to guarantee that individuals and businesses continue to have access to more secure and efficient payment systems. Several central banks are considering central bank digital currencies (CBDCs) as a regulated and secure alternative to DeFi with perceived benefits including but not limited to financial inclusion, efficient and secure payment system, transparency in transactions, price stability, and effective monetary policy.

1.2. Features and Models of CBDC

The 2018 report by the Committee on Payments and Market Infrastructures - Markets Committee (CPMI-MC) defines CBDC as a new form of central bank money, distinct from physical cash or central bank reserve/settlement accounts. The classification of CBDCs into different types is based on factors such as intended users, use cases (Retail and Wholesale CBDC), technical implementations, and issuance methods (account based and token based CBDC). A concise summary of differences in different types of CBDCs is presented in Figure 1.

Figure 1: a) Retail vs wholesale CBDC; b) Account vs Token Based CBDC

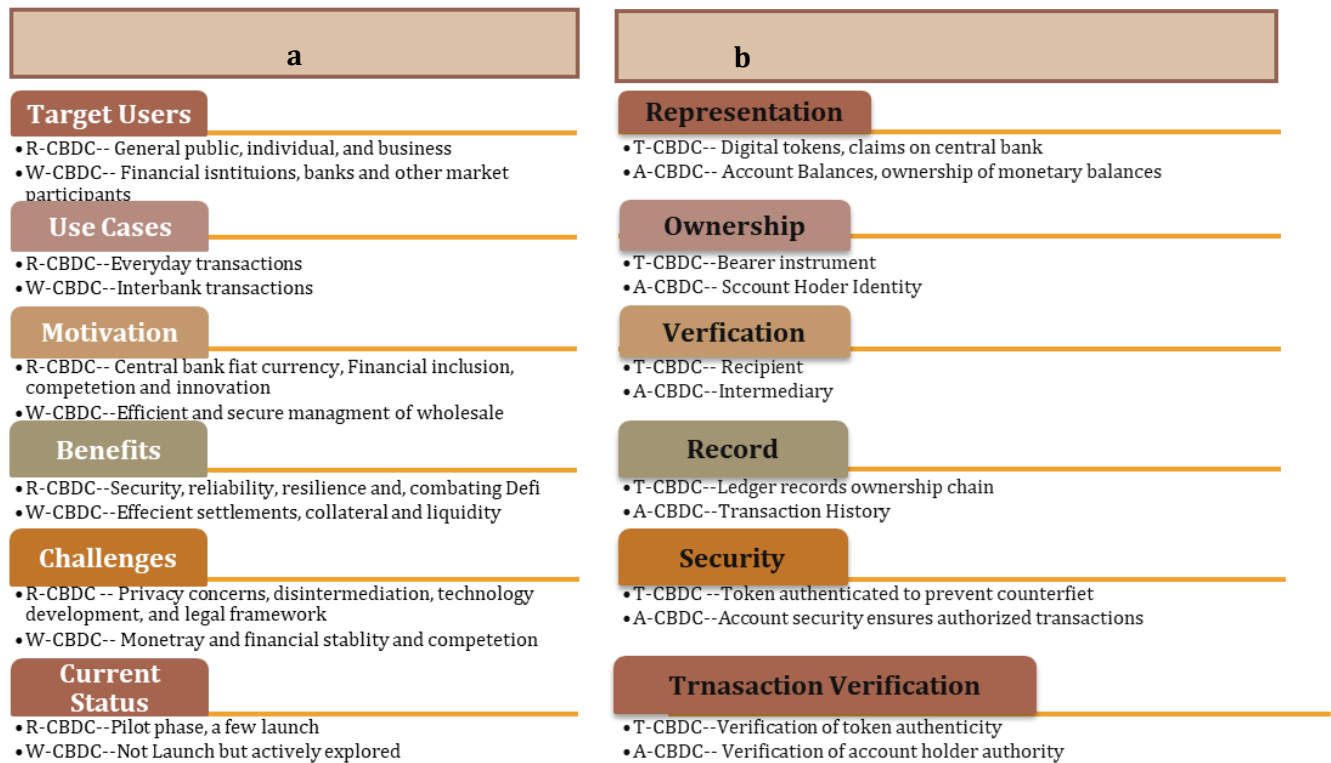
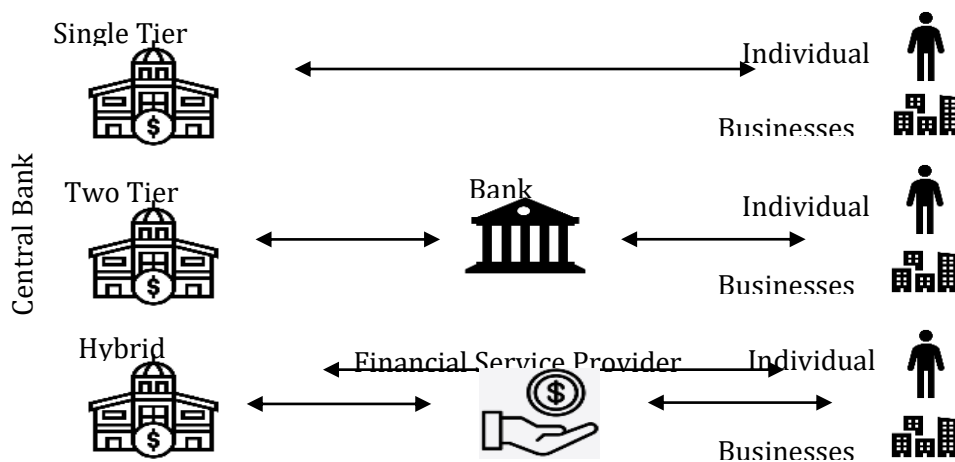


Figure 2: Modes of CBDC



There are three distinct modes for the issuance and administration of CBDCs (See Figure 2). These are single-tier, two-tier, and hybrid modes. For single-tier or direct mode, the central bank assumes full responsibility for overseeing all aspects of the CBDC framework, including issuance, account management, and transaction validation. On the other hand, the two-tier or indirect mode involves a collaborative approach where central banks manage CBDC through financial intermediaries. In the hybrid mode, intermediaries deliver retail services to end users, while the central bank maintains a record of retail transactions (Chortareas et al., 2024).

1.3. Central Bank Digital Currency: Global Facts

A total of, approximately, 134 countries and currency unions, representing 88% of global GDP, are currently exploring CBDCs. Currently, about 68 countries are in advanced stages of exploration, including development, pilot testing, or launch. However, it is also shown that the CBDC exploration phase of 134 countries of the world with most countries in the research phase of CBDC development.

Along with a significant increase in the number of countries piloting and developing CBDC projects, some countries have also canceled CBDC after its launch or have disabled it for the time being. For instance, both Ecuador and Senegal have permanently terminated their retail CBDC project after the launch. The Ecuadorian Central Bank launched its digital currency but due to low level of trust in the central bank, the project was eventually canceled. In November 2016, a regional Senegalese Bank, Banque Régionale de Marchés (BRM), announced the launch of a digital currency called the eCFA. Importantly, the eCFA in Senegal was not declared legal tender, but an experiment that the central bank could observe and learn from. However, the eCFA was soon criticized due to a lack of compliance with e-money regulations and hence was canceled instantly.

The number of countries where CBDC became inactive after initial initiatives has also increased over time. Currently, 17 countries have disabled their CBDC projects. A noteworthy case is Kuwait, which has shown no progress since its first announcement in 2018. Last year, Kuwait's capital market authority banned all crypto and virtual transactions and the Central Bank of Kuwait introduced a new interbank payment system. Similarly, the Central Bank of Uruguay successfully completed a retail and intermediated digital currency pilot program. The pilot ended in 2018 and has been at a standstill since then.

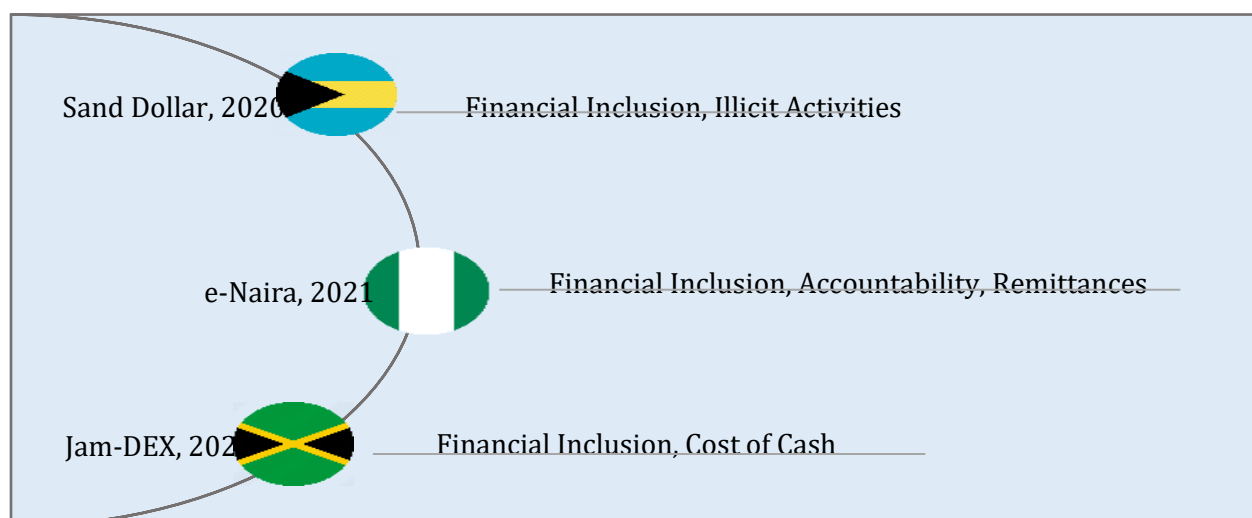
About 60% of countries are running retail-CBDC development projects. The highest percentage is contributed by those projects that are at the pilot testing phase of CBDC development. Almost 44 countries are actively pursuing the exploration of wholesale CBDC. Countries like India, China, Russia, Australia, and Brazil, among others, are exploring both types of CBDC. Similarly, North American countries along with the UK, Norway, and a few Southeast Asian Countries, which are largely at the development stage of CBDC projects, have declared both types of CBDC to be launched. Another important feature, which is unanimous in all the countries mentioned, is that their CBDC is planned to be a two-tier CBDC.

The data from Atlantic Council reports also highlights the motivation to launch CBDC. Figure 3 depicts financial inclusion as a uniform motivation of countries where CBDC is fully operative. The Central Bank of Nigeria claimed that e-Naira can increase financial inclusion from 85% which

currently stands at 60%. It is also expected that a well-managed eNaira could add twenty-nine billion dollars to the GDP of the country over the next ten years. JAM-DEX is projected to save about seven million US dollars per year, which Jamaica currently spends on replacing, storing, and handling cash.

Advanced economies such as the USA, Canada, and Norway are primarily researching cross-border operable CBDCs. In contrast, Asian countries like Indonesia, the Philippines, Taiwan, and South American Countries like Columbia are exploring the potential benefits of retail or wholesale CBDCs, focusing on financial inclusion, reduction in tax evasion, and payment efficiency. Some South American nations such as Peru, view the launch of a CBDC essential for fiscal and monetary stability. In contrast, Argentina, do not see an urgent need to issue a CBDC and are focusing on improving their current payment systems. European countries such as Hungary and the Czech Republic have also stated that they are not considering the launch of a CBDC shortly. African countries have recently begun researching CBDCs, with African central states exploring the possibility of a common CBDC for member states. South Asia experiences a similar situation; Bangladesh is cautiously exploring the feasibility of a CBDC, influenced by unsuccessful examples of other countries and widespread digital illiteracy. The progress of research on CBDCs in Pakistan and Nepal is also negligible.

Figure 3: CBDC Status-Launched



1.4. CBDC in Pakistan: Gap identification and Problem Statement

Pakistan's plans for a CBDC trace back to 2018, when SBP proposed a bill to the legislature, setting the groundwork for the development of a CBDC. During this period, the central bank's objective was to launch a digital form of the national currency to address the proliferation of unregulated digital currencies and counter the perceived threat of dollarization in the economy. The former governor of the SBP elucidated that the primary motives behind the potential issuance of CBDC are to enhance financial inclusion and to strengthen efforts in combating money laundering, countering the financing of terrorism, and bringing the vast informal economy into a formal setup.

According to one strand of views, Pakistan is already transitioning to a digital payment system, and hence, prospects for CBDC to achieve its primary objectives are very hopeful. Given the rising levels of technological literacy and the demographic composition, where the youth constitute a substantial majority of the population, there is an immense potential for digitalization. It is also manifested in the impressive growth of digital transactions as compared to cash transactions, specifically, in recent years. According to some statistics, there is a massive increase of 100-150% in digital transactions in 2020. Moreover, while addressing the Pakistan Fintech Forum (2022), the governor of the SBP mentioned that the SBP has issued a licensing and regulatory framework for the establishment of digital banks in Pakistan which depicts the country's preparedness to adopt the technology. The successful launch of RAAST Bulk Payment and RAAST Person to Person (RAASTP2P), and RAAST Person to Merchants (RAASTP2M) by the SBP has added further confidence about the successful launch of CBDC in Pakistan.

An alternative perspective raises concerns regarding the usefulness of CBDC in Pakistan. For instance, while digital transactions in Pakistan are on the rise, over 80% of payments are still paper-based. Though, the rise of e-banking is considered as an improvement in the digital payments landscape, yet, within e-banking, over 70% of the transactions included are also paper-based. Similarly, while Real Time Online Branches (RTOB), are by definition online, they include transactions that occur between branches where cash is either deposited, withdrawn, or transferred between the same bank branches. A survey by Standard Chartered of emerging affluent Pakistanis showed that 50% of the total population saves money by storing cash at home. In other surveyed countries, the highest ratio was in India where only 15% of the population saved by storing cash at home. This reflects a lack of trust in financial institutions in Pakistan along with the motive to avoid coming under the tax net. Additionally, high costs and poor end-user experience in digital services have made cash a natural means of payments and savings. The resistance may be exacerbated given the religious sentiments of the Pakistani populace regarding the sharia legitimacy of financial services in Pakistan.

Moreover, the role of CBDC in the effectiveness of monetary policy transmission and its strength to achieve mandated macroeconomic objectives (e.g. price and financial stability, sustainable economic growth, and stable exchange rates) is still ambiguous. Interest rate pass-through is found to be very weak in Pakistan undermining the SBP's effort to achieve price stability and other monetary policy objectives (Madiha et al., 2023). With increased bank competition, if CBDC is implemented appropriately, the interest rate margins may reduce and the interest rate channel for monetary transmission may become more potent (Drechsler, Savov, and Schnabl 2017). Moreover, the bank lending channel may become strong with an increase in wholesale funding and the asset price channel may become effective with more financial inclusion.

As per CBDC Dashboard (2023), Pakistan is positioned among the countries that have conducted initial explanatory research on CBDC. However, beyond SBP's former Governors' speeches and interviews, and only a handful of newspaper articles and blog content, there is a lack of publicly available information regarding the explanatory research conducted by the SBP on the issue of CBDC.

Also, there is dearth of institution and academic research on Pakistan regarding the need assessment, potential benefits, and challenges associated with the launch and implementation of CBDC. Moreover, the evaluation and assessment of the existing legal framework of State Bank of Pakistan has not yet been conducted to understand its compatibility for the launch and management of CBDC and mechanism for redressal of issues related to its monitoring and accountability. Furthermore, we do not find any comprehensive study to identify the macroeconomic, financial, and technological factors that are considered a prerequisite for successful launch of CBDC. Finally, we know less about the opinion of key stakeholders including general public, financial institutions, and merchants about the preparedness for the adoption of CBDC, leveraging the benefits of CBDC and addressing the challenges associated with it. Given these vacuums in existing literature regarding Pakistan, the objective of this research is to discern the opportunities and challenges in launching CBDC in Pakistan.

1.5. Objectives and Research Questions

This study has the following objectives.

- To conduct a comprehensive literature review on CBDC using systematic review, bibliographic mapping techniques, and synthesis analysis.
- To identify the macroeconomic, financial, technological, and other factors influencing the adoption and implementation of CBDCs in various countries classified based on CBDC development stages, income groups, and geographical regions.
- To compare financial ecosystem and macroeconomic environment of Pakistan with countries with different stages of CBDC development.
- To critically assess the compatibility of existing regulatory framework to launch and implement CBDC.
- To assess the level of awareness, readiness, acceptability, and perception about the benefits, challenges, opportunities, and implications of CBDC at all tiers of financial ecosystem comprising financial institutions, merchants and general public.

Pertaining to the objectives of the study, the following research questions are expected to be addressed.

- What are the predominant themes and trends in the existing literature on CBDC and how has the body of research on CBDCs evolved over time and across different regions?
- How do macroeconomic conditions, financial developments, and technological setup vary in countries at different stages of CBDC development, income groups, and regional characteristics?
- Are amendments in regulatory framework of SBP required for the launch and effective implementation, and monitoring of CBDC?
- What are the perceptions of financial institutions regarding the preparedness of financial ecosystem and challenges for the adoption of CBDC in Pakistan, and benefits and

opportunities associated with it?

- What opinions commercial and personal users hold regarding the perceived advantages and risk exposures in the adoption of CBDC in Pakistan?
- What strategies can the SBP adopt to effectively address the challenges and leverage the opportunities associated with CBDCs?

The report is structured as follows. Chapter 1 contains background, motivations, gap identification, research objectives, and research questions. The methodology and research design are presented in Chapter 2. Chapter 3 consists of literature review based on synthesis analysis, bibliographic mapping and systematic review. Chapter 4 critically evaluates the existing regulatory framework of SBP, identifies the similarities and differences with the neighboring countries namely India and China regarding CBDC. Chapter 5 of the report presents distribution analysis and critical and analytical discussion of stylized national, regional, and global facts. Chapter 6 presents the detailed analysis of the survey from key stakeholders. Finally, Chapter 7 presents some key conclusions, policy implications, and way forward for the successful launch and implementation of CBDC in Pakistan.

METHODOLOGY

The chapter presents various methodologies adopted to achieve the above stated objectives of the research.

2.1. Methodology: Objective 1

Regarding the first objective, an extensive literature review is conducted using various conventional and advanced techniques.

2.1.1. Conventional Literature Review

For the conventional literature review, the existing literature is divided into three overlapping groups:

- Issuance and adoption of CBDC
- The potential and realized benefits of CBDC
- Implications of CBDC

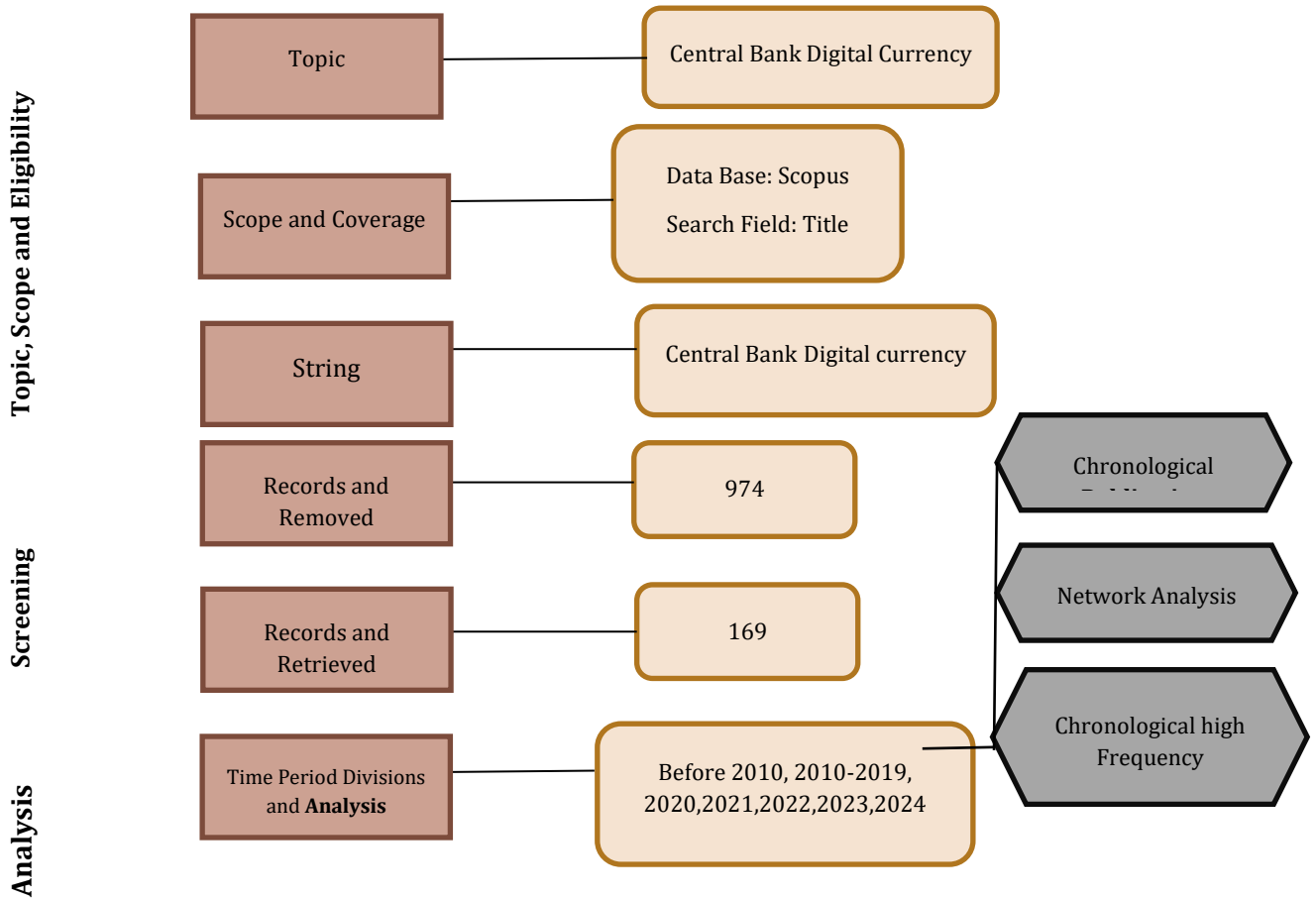
We further categorize the literature based on institutional and academic research. Institutional research includes reports and working papers published by different organizations such as the International Monetary Fund (IMF), Bank of International Settlement (BIS), and central banks from various countries. Academic research, on the other hand, focuses on scientific research published in well-reputable journals. We also identify key aspects within each category and present their occurrence percentages using treemaps.

2.1.2. Bibliographic Mapping

We employed bibliographic mapping techniques. Our search began with targeted keywords—specifically, ‘Central Bank Digital Currency’ or ‘CBDC’—within the Scopus database. We chose Scopus due to its extensive coverage of scholarly articles across diverse disciplines, ensuring a comprehensive collection of relevant literature.

The initial search yielded 874 documents, including articles, book chapters, conference papers, reviews, books, short surveys, and notes. To refine this database, we implemented a rigorous selection process. We restricted our review to articles published in English to ensure linguistic consistency and the accessibility of findings to the international research community. We selected 805 articles, which were then sorted into different time periods. All articles published before 2010 were grouped together, and the second group ranges from 2011 to 2018. After 2018, the analysis was conducted on an annual basis till 2024. For the analysis of the selected articles, we employed a combination of software tools, including Vosviewer and Excel. These tools provided a versatile and powerful framework for data organization, analysis and visualization. We analyzed the publication trend, network analysis, and keyword frequency analysis to delve deeper understanding of the issue. Figure 4 contains the strategy for conducting bibliographic mapping.

Figure 4: Data Collection Strategy for Bibliographic Mapping



2.1.3. Systematic Literature Review

The study was further extended to include a systematic literature review (SLR). For this, 100 working papers and reports were sourced from the IMF, BIS, and central banks of various countries. 200 hundred academic research articles retrieved from Scopus were also utilized. Nvivo software was employed to create a word cloud highlighting the most frequently used terms in literature related to CBDC. Additionally, the information was organized into treemaps and mind maps to identify areas rich or lacking in literature. Figure 5 contains the strategy for SLR.

2.2. Methodology: Objective 2-3

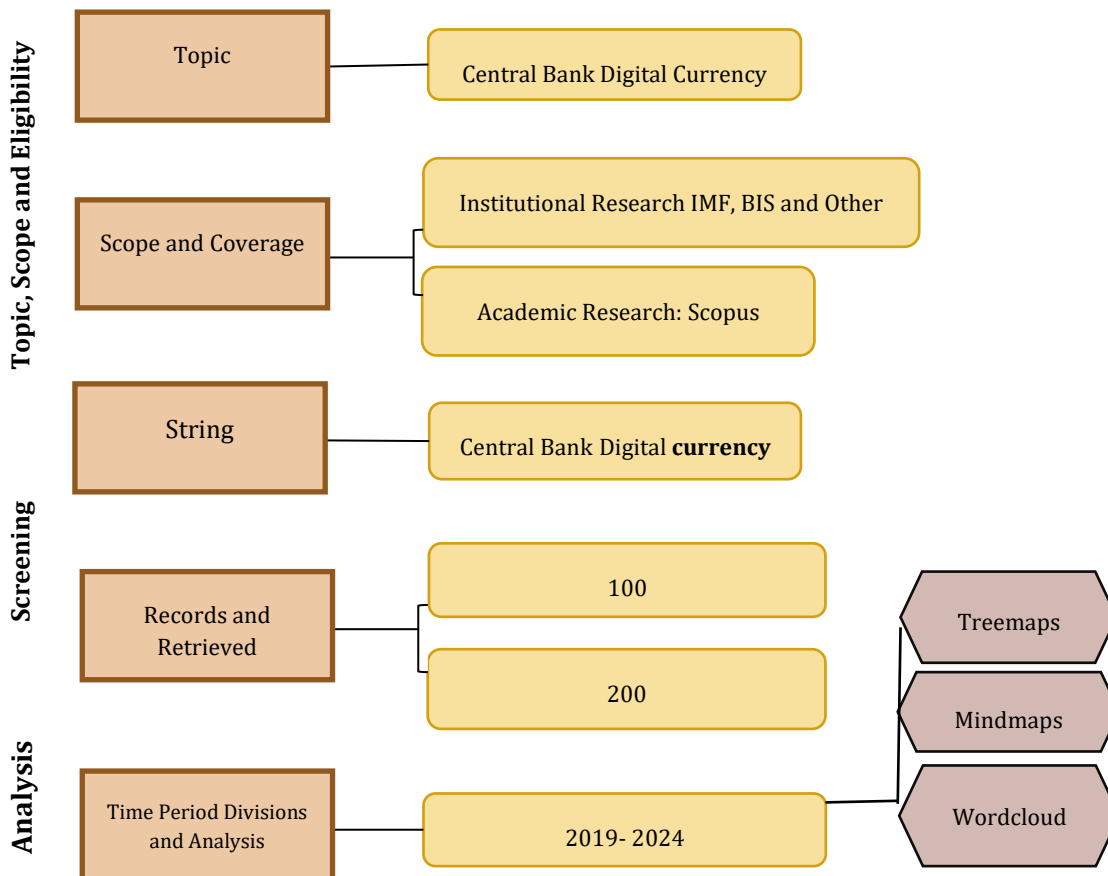
2.2.1. Distribution Analysis:

Many macroeconomic variables are explored for their potential connection with the development of CBDC. Variables are classified into five categories:

- Monetary policy indicators
- Financial sector indicators

- Technological adequacy indicators
- Macroeconomic indicators
- Cybersecurity and Illicit flows indicators

Figure 5: Data Collection Strategy for SLR



Source: Authors' Construction.

The research utilizes choropleth mapping to assess countries concerning above-mentioned variables in three categories.

- Stages of CBDC development
- Income groups
- Regional groups

2.3. Methodology: Objective 4

Another objective of the study is to examine the readiness of financial architecture and regulatory framework for CBDC launch and intermediation in Pakistan. We employed a comprehensive, evidence-based approach. This involved data from secondary sources, including academic research and institutional reports, and analyzing international case studies such as those of China and India.

2.4. Methodology: Objectives 5

For objective 5, a comprehensive survey analysis is conducted. The survey is structured around three main stakeholders in twin cities of Pakistan;

- General Public
- Merchants
- Financial Institutions

These three pillars collectively provided an all-inclusive view of CBDC readiness and awareness across different sectors of society, laying the groundwork for analyzing the diverse factors that influence the adoption and implementation of digital currency in Pakistan.

2.4.1. Questionnaire Design

For **General Public**, the questionnaire aimed to assess their awareness and potential acceptance of CBDC.

The questionnaire for **Merchants** was structured to understand their readiness to adopt CBDC in business operations.

Both questionnaires included the following sections adopting the technology adoption model.

1. *Demographics*
2. *Awareness/Knowledge about CBDC*
3. *Relative Advantages (only for merchants)*
4. *Perceived Usefulness*
5. *Perceived Ease of Use/Benefits of CBDC*
6. *Challenges,*
7. *Compatibility*
8. *Personal Innovativeness with Digital Technology and CBDC*
9. *Future Considerations*

For **Financial Institutions**, the questionnaire was designed to capture the strategic and operational perspectives of banks and fintech companies. It included the following sections

1. *Bank/Institution Profile*
2. *Demographic Profile of Respondent*
3. *Perception of FinTech and CBDC*

4. *Potential Financial and Economic Benefits of CBDC.*
5. *Potential Financial and Economic Costs/Risks*
6. *Technical Adequacy*
7. *Public Perception and Acceptance*
8. *Challenges and Remedies*
9. *Design of CBDC*

2.4.2. Area of Study

The study was conducted in Islamabad and Rawalpindi, chosen for their diverse and dynamic population, as well as the concentration of business and financial activities.

2.4.3. Sampling Frame

The sampling frame was determined based on the availability and accessibility of respondents within the selected areas. The study included 270 respondents from the general public, 200 merchants from various business sectors, and 50 representatives from financial institutions, such as banks and fintech companies.

2.4.4. Training of Enumerators

A two-day training was organized for enumerators to ensure quality and reliability of data collected. During the training, enumerators were briefed on specific terminologies and concepts used in each questionnaire, as well as the importance of understanding the context of CBDC. They were also instructed on the sensitivity of certain questions, how to handle them appropriately, and the protocols for maintaining respondent confidentiality and data integrity. The training emphasized the ethical and professional standards required for conducting the survey, ensuring that enumerators were well-prepared to engage with participants respectfully and effectively.

2.4.5. Ethical Considerations

The study followed the ethical guidelines established by the International Islamic University Islamabad (IIUI). All ethical considerations, including informed consent, voluntary participation, confidentiality, and the right to withdraw from the survey at any time, were strictly observed. Participants were assured that their responses would be kept anonymous and used solely for research purposes, in line with IIUI's ethical standards and research protocols.

2.4.6. Data Analysis

The data is analyzed using stacked bar graphs for each item. Moreover, the comprehensive indices for each aspect of CBDC are also constructed and presented in the form of bar charts.

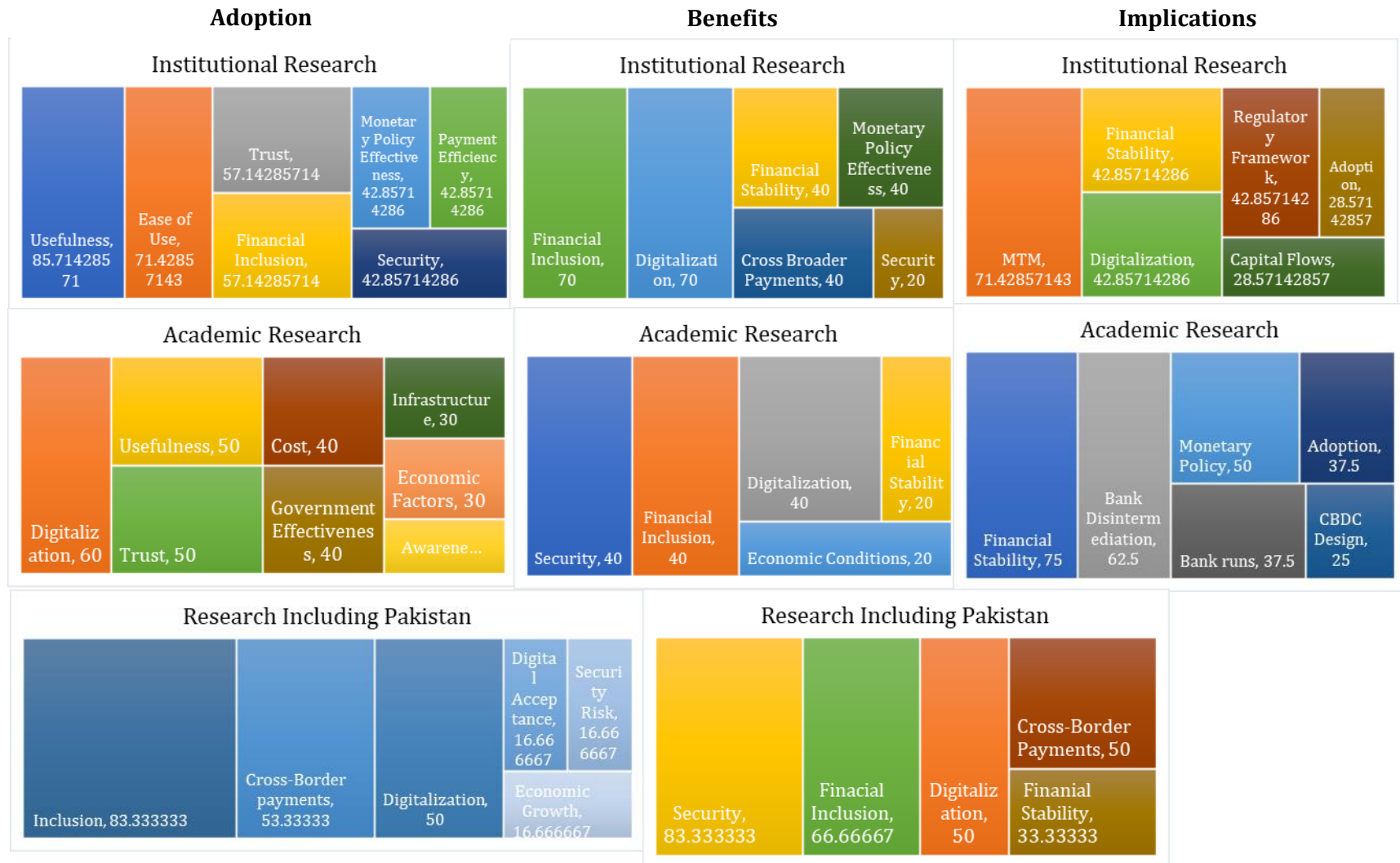
LITERATURE REVIEW

3.1. Literature Review and Synthesis Analysis

This section reviews institutional and academic research regarding factors determining the adoption, implications, benefits, and challenges of CBDC. The concise summary of the literature review regarding each dimension specified is presented in respective tables. The synthesis analysis is also presented in the form of treemaps with each dimension of the literature reviewed. Tables 1 - 13 contain the summary of institutional, academic and research including Pakistan undertaken to examine the factors affecting the adoption, cost/benefits and implications of CBDC.

Overall, the research highlighted the usefulness as the most important factor in the adoption of CBDC followed by ease of use. Academic research also places ease of use and the level of digitalization encompassing digital literacy as the important factors of CBDC adoption all over the world. Trust on existing financial system and security concerns are also important factors in inducing or hindering the adoption of CBDC. The literature review also highlighted that improvement in digitalization and financial inclusion, increase in payment efficiency, and effectiveness of monetary policy are the most frequently reported benefits of CBDC. Research including Pakistan has also reported enhanced security as one of the most prominent benefits of CBDC. Moreover, CBDC has substantial implications for the monetary transmission mechanism. The synthesis analysis for all the above-mentioned dimensions is presented in Figure 6.

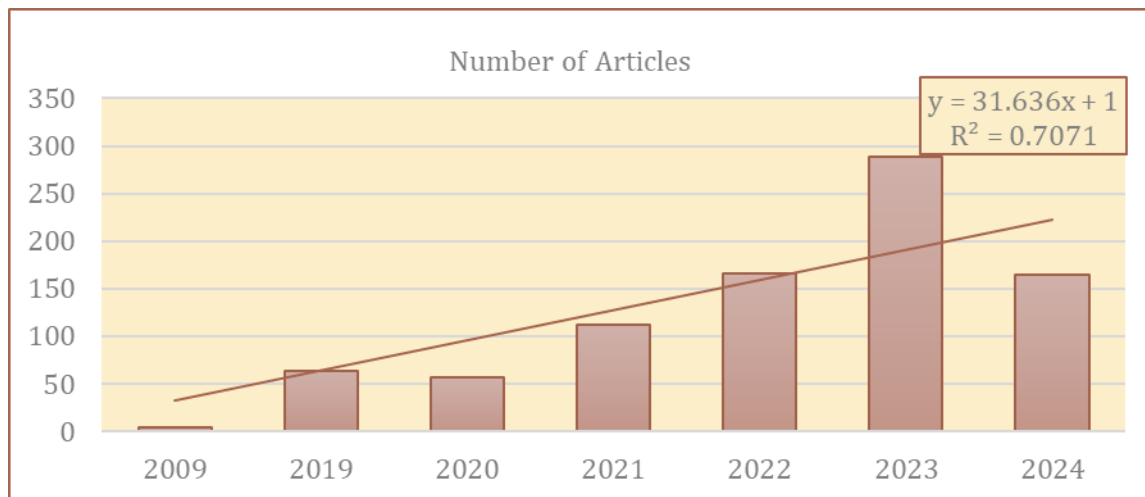
Figure 6: Synthesis Analysis



3.2. Bibliographic Mapping

The study employed bibliometric and content analysis to examine the landscape of existing knowledge related to CBDC by using Scopus database and organizing it into periods. Figure 7 depicts the number of articles published over time. All relevant articles published before 2010 are grouped and presented for the year 2018. Articles published between 2010 and 2019 are compiled and shown for the year 2019. After 2019, the trend is displayed on an annual basis. A trend line is fitted, and the R-squared value is reported to determine the significance of the trend over time. The estimated value indicated that there is about a 71 % increase in publications each year.

Figure 7: Publication Trend



Source: Authors' construction based on Scopus data.

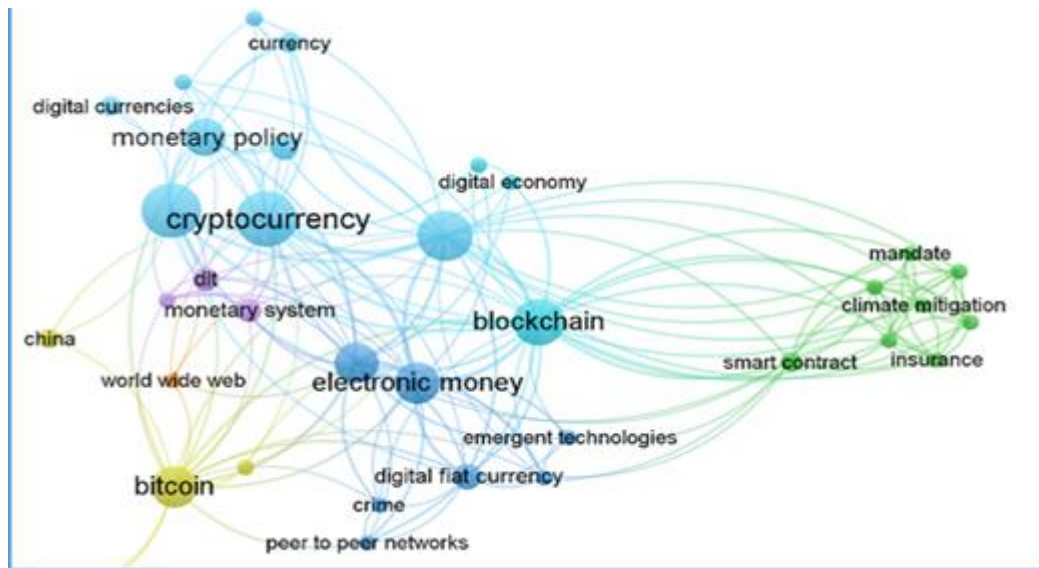
For content analysis, this research adopts a narrative synthesis approach, where the actual content of each research study is used for literature classification. Network analysis is employed as a reference to provide an in-depth explanation of research themes within the CBDC. Several frequently occurring keywords in research on CBDC are grouped into clusters. The analysis is presented for 2010- 2018 and most recent years only.

The extent of research is depicted in Figure 8 for the period 2010-2018¹. CBDC, cryptocurrency, digital currency, and monetary policy are the keywords with substantial strength manifesting the evolution and direction of research undertaken in the field. Similarly, a cursory look at the clusters depicts that the research is not only expanding to examine the technological feasibilities of private and fiat digital currencies and examination of DLT but also the implication of these digital currencies on a multitude of economic factors like financial stability, systemic risk, and monetary

¹ Figure 8 is constructed by using Vosviewer, by using the data as mentioned in methodology figures 4 and 5. The figures are saved as PNG file by default.

policy, among others. Moreover, the discussion on use cases and design aspects of CBDC was also initiated during the same period.

Figure 8: Network Analysis, 2019

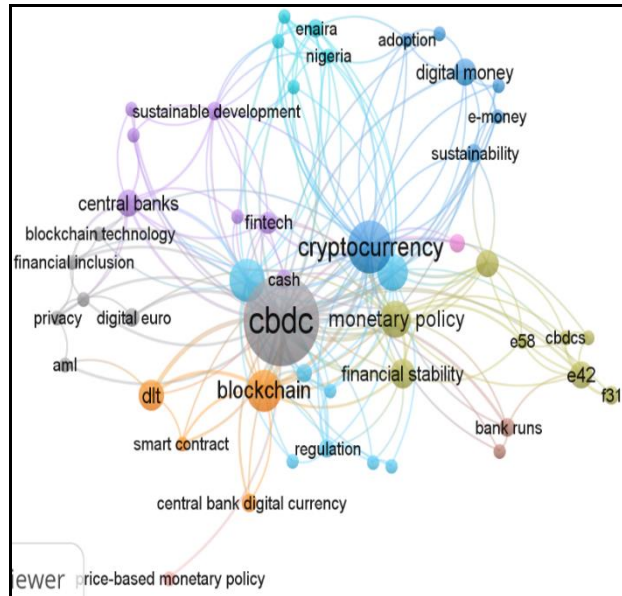


Source: Authors' construction based on Scopus data.

Data provides evidence that in 2024 countries reached the advanced phases of exploration (launch, pilot, or development). As of May 2024, functioning CBDCs exist in the Bahamas, Jamaica, and Nigeria. Nevertheless, several countries have pilots, and eight G20 nations are developing CBDC programs. The European Central Bank (ECB) announced a “preparation phase” for a digital euro. This critical phase, starting in November 2023, lays the groundwork for a digital euro, focusing on rulebook finalization, infrastructure development, and extensive testing. Prior research has explored various dimensions, emphasizing the impact of CBDCs on financial stability and effectiveness monetary policy (Figures 9 and 10)².

² These Figures are constructed by using Vosviewer, by using the data as mentioned in methodology figures 2.1 and 2.2. The figures are saved as PNG file by default.

Figure 10: Network Analysis, 2024



3.3. Systematic Literature Review

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3.3.1. Word Cloud

Institutional Research

The word cloud highlights the most frequently used keywords in banks'/institutional research. The first one is "CBDC". Other words are 'cross-border' 'payments', 'digital' and 'currency', underlining the importance of international transactions, and digital financial systems. The phrases 'central', 'bank', and 'payments' emphasize the role of central banks in CBDC development and execution. Additional prominent terms include interoperability, wholesale, retail, and ledger, which indicate a broad spectrum of uses and considerations in the practical application of digital currencies, from retail transactions to large-scale wholesale activities. The word cloud additionally emphasizes efficiency, settlement, and technology, implying that CBDCs are being investigated for their potential to simplify financial operations and improve technological integration in the banking sector.

Academic Research

The word cloud represents the theme of central bank digital currency, with largest and most prominent terms such as "CBDC", "central", "bank", "financial", "payments", and "cross border", highlights the fundamental premise of central bank-issued digital currencies and their main function in allowing payments.

The terms *digital, infrastructure, services and system*, represent CBDC scientific and service-oriented qualities, implying their capacity to upgrade the financial system and deliver digital financial services. The phrases *inclusion and efficiency* refer to the advantages of CBDC in terms of payment efficiency and financial inclusion, whereas *market, policy, and legal* words refer to the regulatory and policy concerns involved in adopting CBDC (Figures 11 and 12)³.

³ These figures are constructed by using NVivo 14, by using the data as mentioned in methodology figures 4 and 5. The figures are saved as PNG file by default.

A word cloud visualization of terms related to digital currencies and blockchain technology. The most prominent words are 'border', 'cross', 'payments', 'digital', 'central', 'currency', 'token', 'settlement', 'financial', 'transaction', 'system', 'ledger', 'retail', 'private', 'stablecoin', 'monetary', 'network', 'different', 'project', 'improve', 'interbank', 'piore', 'initiate', 'systems', 'initiate', 'arrangements', 'transaction', 'financial', 'settlement', 'token', 'stablecoins', 'economies', 'currencies', 'account', 'platform', 'facilitate', 'substitution', 'banks', 'distributed', 'entire', 'monetary', 'institutions', 'backed', 'versus', 'trade', 'volume', 'identity', 'wallet', 'multi', 'design', 'tokenization', 'called', 'project', 'different', 'network', 'monetary', 'stablecoin', 'increase', 'potential', 'model', 'transfer', 'domestic', 'balance', 'survey', 'capabilities', 'investments', 'market', 'risks', 'three', 'foreign', 'monetary', 'technology', 'tokens', 'monetary', 'development', 'interoperability', 'efficiency', 'research', 'advanced', 'public', 'source', 'blockchain', 'sovereign', 'natural', 'wholesale', 'payment', 'based'.

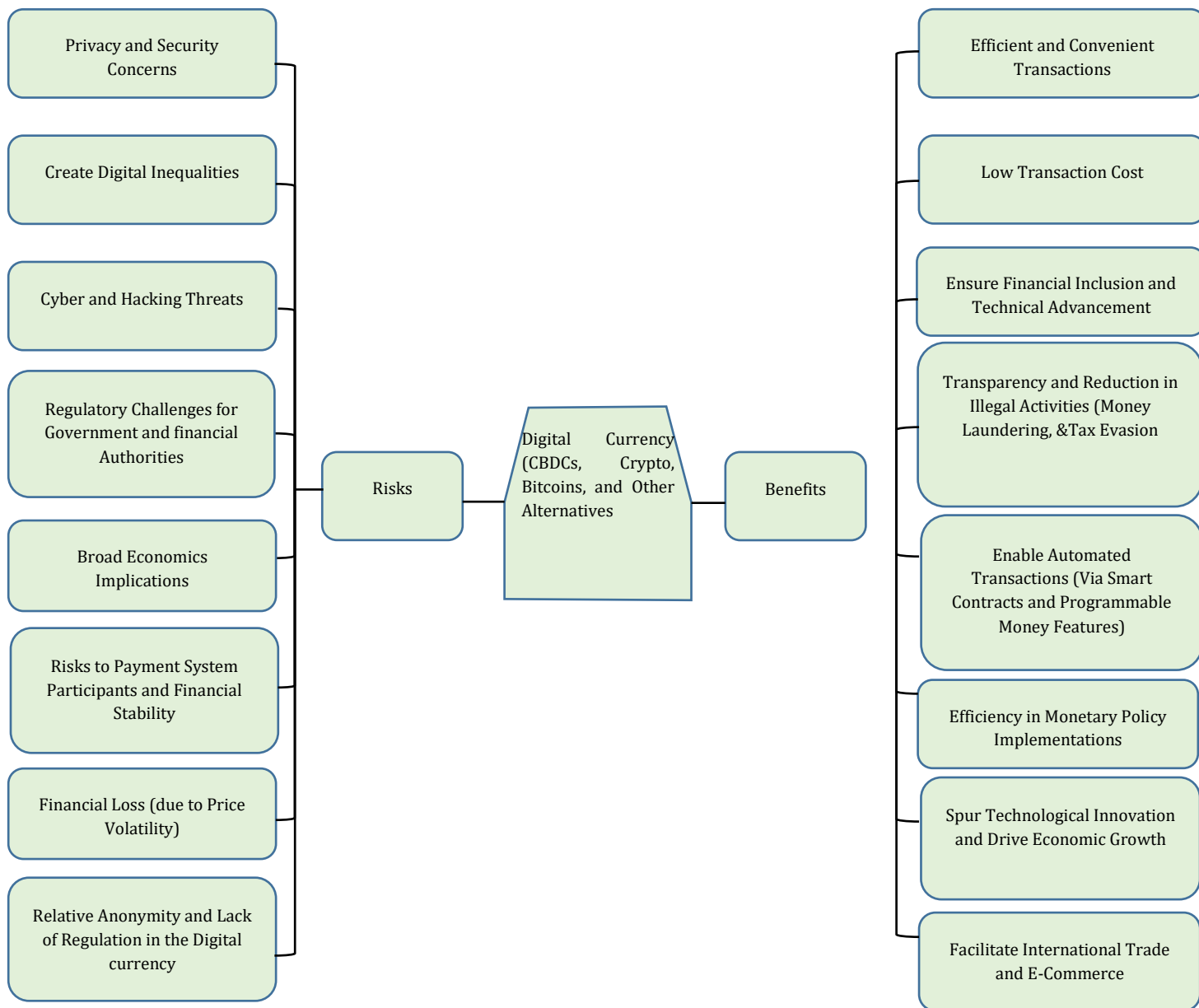
Figure 12: Word Cloud of Academic Research



Mind Map

Figure 13 presents the mind map of digital currency, which is divided into CBDCs and cryptocurrencies, along with their respective risks/challenges and benefits/opportunities. The CBDCs exhibit several benefits, including enhanced payment efficiency and monetary policy implementations, increased financial inclusion, innovation and financial stability, reduced transactions and third-party costs, enhanced risk mitigation mechanism and accurate measurements of economic activities, the ability to counteract private cryptocurrency, and account the monetary as well as fiscal sovereignty. The CBDCs also have some risks and challenges such as financial disintermediation of incumbents, technical and security risks, create potential disruption to banking sectors, risks of legal legitimacy, and supervision, and the possibility of centralized control.

Figure 13: Mind Map of Digital Currency (2023-2024)



REGULATORY FRAMEWORK OF PAKISTAN

Following the global trend, SBP seeks to develop a digital currency with the aim of improving financial inclusion, lower transaction costs, and offering a more effective and safe payment system by learning from the experiences of other nations. The SBP has stated its intention to create a thorough legal and regulatory framework for CBDCs (SBP 2022). The existing regulatory framework and amendments required in the framework to launch and manage CBDC are explained in this chapter.

4.1. Existing Regulatory Framework of Pakistan

The regulatory framework of the SBP acts as the foundation for retaining financial stability, supporting economic growth, and safeguarding the integrity of Pakistan's banking and financial sectors. It covers rules and regulations on topics including capital adequacy, risk management, anti-money laundering (AML), and consumer protection.

The launch of a CBDC in Pakistan requires careful consideration of the SBP's existing legal framework. The State Bank of Pakistan Act, 1856 grants SBP the authority to issue and regulate physical currency, but this legal framework may not encompass digital forms of currency like CBDCs. According to a comparative analysis by Jagtiani and Jayakumar (2020), most countries pursuing CBDC have had to amend their central banking laws to account for the unique characteristics of digital currencies. Similarly, Pakistan may need to amend its definition of "currency" to explicitly include digital forms, as current laws primarily focus on physical currency.

Pakistan's existing laws only recognize cash and bank deposits as legal tender, therefore, Legal tender status for CBDC in Pakistan would also necessitate amendments, as noted in various international studies on CBDC frameworks. For instance, Allen, Gu, and Jagtiani (2022) emphasize that legal recognition of a CBDC as tender is crucial to ensure its universal acceptance for transactions. In addition, while the SBP regulates electronic payment systems under laws like the Payment Systems and Electronic Fund Transfers Act, 2007, this does not fully cover the specific dynamics of CBDCs. As explained by Bech and Garratt (2017), regulating CBDCs would require new frameworks that address unique concerns such as distribution, control, and integration with monetary policy (Bech & Garratt, 2017).

Moreover, CBDCs could influence monetary policy and financial stability. Studies by Auer and Böhme (2021) highlight how CBDCs could alter monetary transmission mechanisms, necessitating revisions to central banks' tools for managing interest rates and money supply.

Finally, aligning with international best practices is critical. Countries like China and Sweden have either amended their legal structures or are in the process of doing so to remove legal ambiguities.

4.2. Routes to Amend Regulatory Framework

There are two possible routes that SBP may adopt to pursue two routes for amending its regulatory framework to introduce a CBDC. The legislative route, involving amendments to the SBP Act, 1856, would ensure comprehensive legal backing and avoid potential challenges, as suggested by De Gregorio (2021). Alternatively, the ordinance route could be pursued for faster enactment, though it would still require eventual parliamentary approval (De Gregorio, 2021). These legal adjustments

are critical for providing the SBP with the legal authority to issue and regulate a CBDC, ensuring stability in the financial system, and resilience in the face of digital currency adoption.

4.3. Key Regulatory Authorities for CBDC Conversion in Pakistan

The launch and management of CBDC require coordination between different regulatory authorities.

- State Bank of Pakistan
- Ministry of Finance.
- Securities and Exchange Commission of Pakistan (SECP)
- Federal Board of Revenue (FBR)
- National Assembly
- Financial Monitoring Unit (FMU)
- Pakistan Telecommunication Authority (PTA)
- Anti-Corruption Authorities
- International Institutions (IMF, World Bank)

These entities would ensure the legal, economic, technological, and operational aspects of currency conversion are managed in compliance with national and global standards. Countries have approached the regulatory framework in various ways; some have adapted existing laws, while others have introduced new regulations to accommodate the digital currency.

4.4. Lessons from Other Countries

4.4.1. China (Digital Yuan - e-CNY)

- **CBDC Status:** Pilot stage, with extensive trials in multiple cities and for various use cases, including retail transactions and cross-border payments.
- **Regulatory Mechanism:**
 - **Existing Framework Adaptation:** China has used its existing legal framework to support the initial launch and trials of the Digital Yuan. The People's Bank of China (PBoC) has issued guidelines and regulations under its authority to manage and supervise the e-CNY.
 - **New Regulations:** The PBoC has also proposed amendments to the People's Bank of China Law to include digital currency as part of the official monetary system, thereby formalizing its status as legal tender (Xu & J, 2022).

4.4.2. India (Digital Rupee)

- **CBDC Status:** The Reserve Bank of India (RBI) has launched pilot projects for the digital rupee in both wholesale and retail segments.
- **Regulatory Mechanism:**

- **Existing Framework:** The RBI has managed the initial stages of CBDC implementation under its existing regulatory powers. For wholesale CBDC transactions, the regulatory framework applicable to securities and government bonds has been extended.
- **Planned Amendments:** India is considering amendments to the Reserve Bank of India Act, 1934 to formally recognize digital currency issuance and regulation. Additionally, discussions on amendments to the Foreign Exchange Management Act (FEMA) and Information Technology Act are ongoing to address issues specific to CBDCs, Sehgal et al. (2024).

Table 14 outlining the similarities and differences between the regulatory frameworks of the central banks of India, China, and Pakistan with respect to CBDCs is given in Appendix.

CBDC AND MACRO-FINANCIAL-TECHNOLOGICAL FACTORS-GLOBAL ANALYSIS AND PAKISTAN'S POSITION

The chapter presents the results of the first two objectives of the study and provides a qualitative and quantitative scoping review of the global state of CBDC development. The study evaluates the role of various monetary, financial, stock market, banking, technological, macroeconomic, and security-related indicators in influencing the operationalization of CBDCs around geographic regions as the UN classification income groups by the World Bank. In this regard, the choropleth mapping technique has been employed to examine the progression of CBDCs across four stages—fully launched, pilot testing, proof of concept, and research over the period from 2000-2022⁴. The section incorporates different geographic regions using UN classification and income groups.

5.1. Monetary Indicators and CBDC: Global Analysis

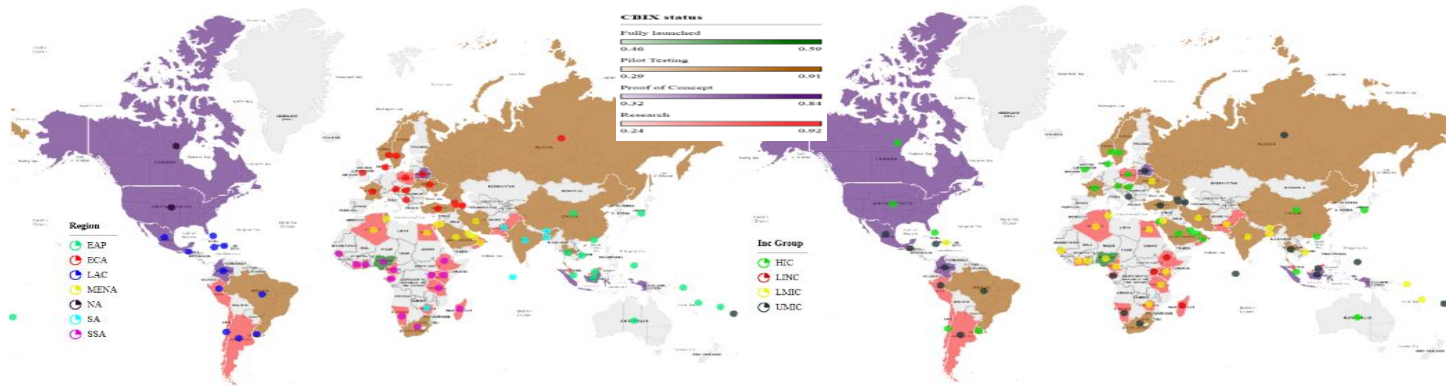
The analysis appraises the status of various monetary indicators encompassing central bank independence (CBI), monetary policy independence (MPI), exchange rate stability (ERS), and money supply (M2). Figure 14 (panels A and B) demonstrates that countries that have fully launched CBDCs primarily lie in Sub-Saharan Africa and belong to low and middle-income regions. It includes countries like Nigeria, Bahamas, and Jamaica, and exhibits a moderate level of CBI (0.46-0.58). In contrast, majority of the countries from Europe, Central Asia, and Latin America, which are in the pilot testing stage, show a broader CBI range (0.28-0.81). Those in the proof-of-concept stage, predominantly from North America and Latin America have moderate CBI scores (0.52 and 0.58). Lastly, the research stage countries display the highest variation in CBI score (0.24-0.82). What's striking is that countries with fully launched CBDCs have the lowest MPI, yet their CBI score remains moderate. Countries in the pilot testing and research stage have higher CBI, while proof-of-concept exhibits the highest MPI. Overall, the mapping depicts that all groups maintain an average MPI below 0.50, indicating limited monetary policy independence across different CBDC stages. The mapping illustrates that higher CBI (MPI) does not forecast the CBDC adoption, as countries with elevated scores remain in the research or proof-of-concept stages. CBDCs may enhance MPI but could also reduce reliance on commercial banks to improve transmission effectiveness. However, CBDCs may temper the MPI and sovereignty of the central bank if they lead to dollarization, causing unwanted exchange rate fluctuations.

Panel C of Figure 14 reveals that ERS may be an important predictor of CBDC adoption. It illustrates that countries with fully launched CBDCs exhibit moderate to high ERS (0.52-0.87). In contrast, countries from the proof-of-concept, research, and pilot testing stages show a wide variation in ERS with values ranging between 0.05 to 1.00. Additionally, countries with fully launched CBDCs have the lowest M2/GDP, while countries from the research stage have the highest value showing CBDCs may affect M2 through various channels like digital currency substitution and cross-border payments.

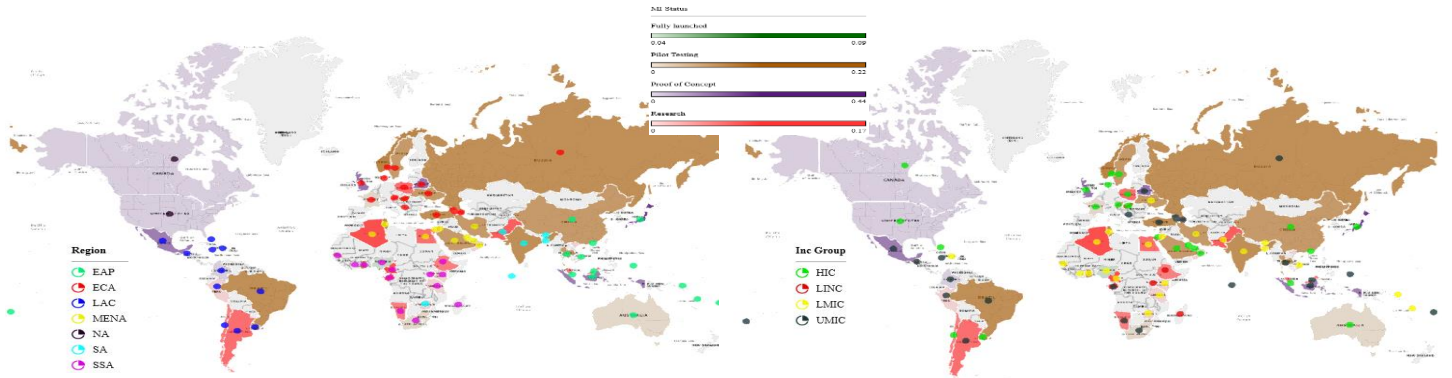
⁴ All the maps are drawn by the authors in MS Excel by using the relevant data of these variables. The maps are saved as PNG.file by default.

Figure 14: Monetary Indicators

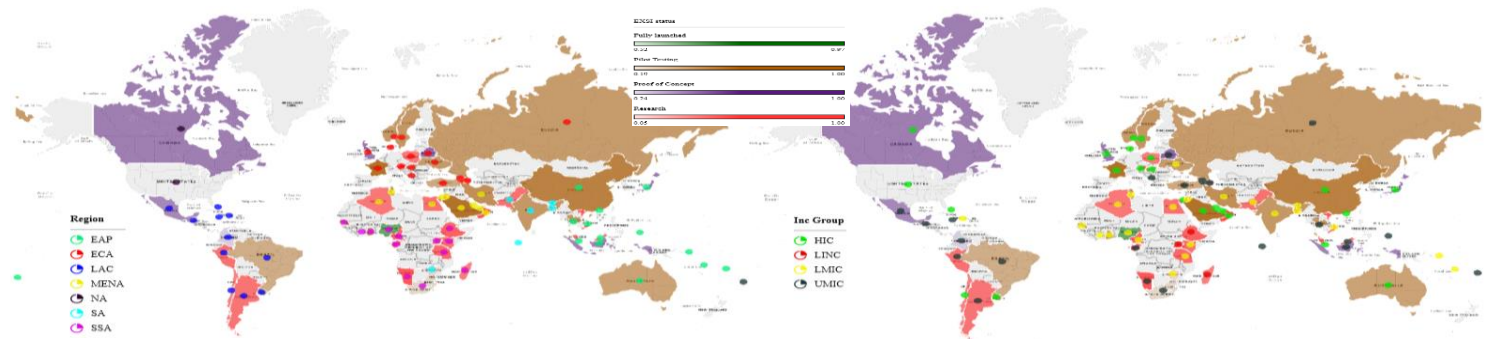
Panel A: Central Bank Independence



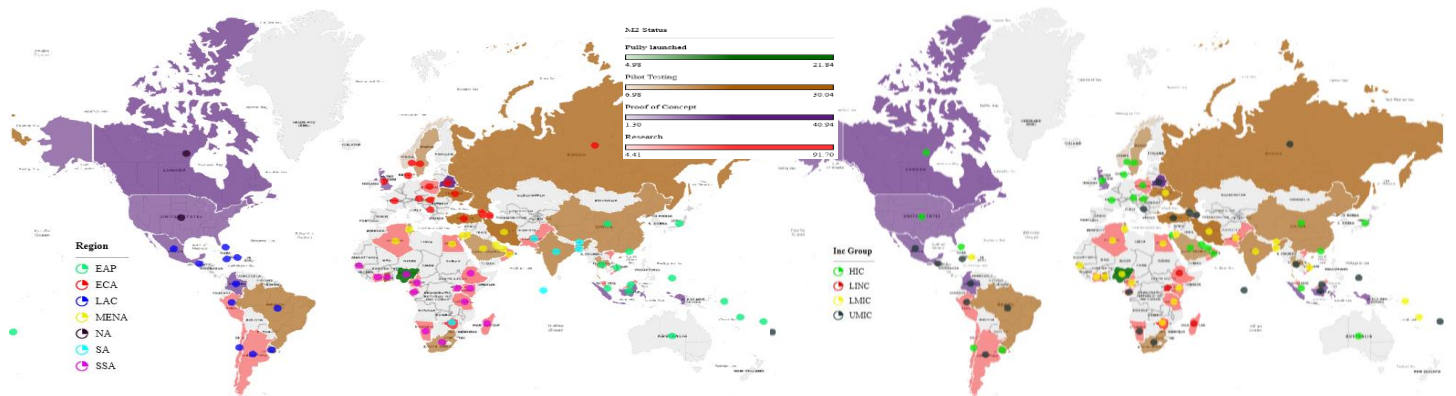
Panel B: Monetary Policy Independence



Panel C: Exchange Rate Stability Index



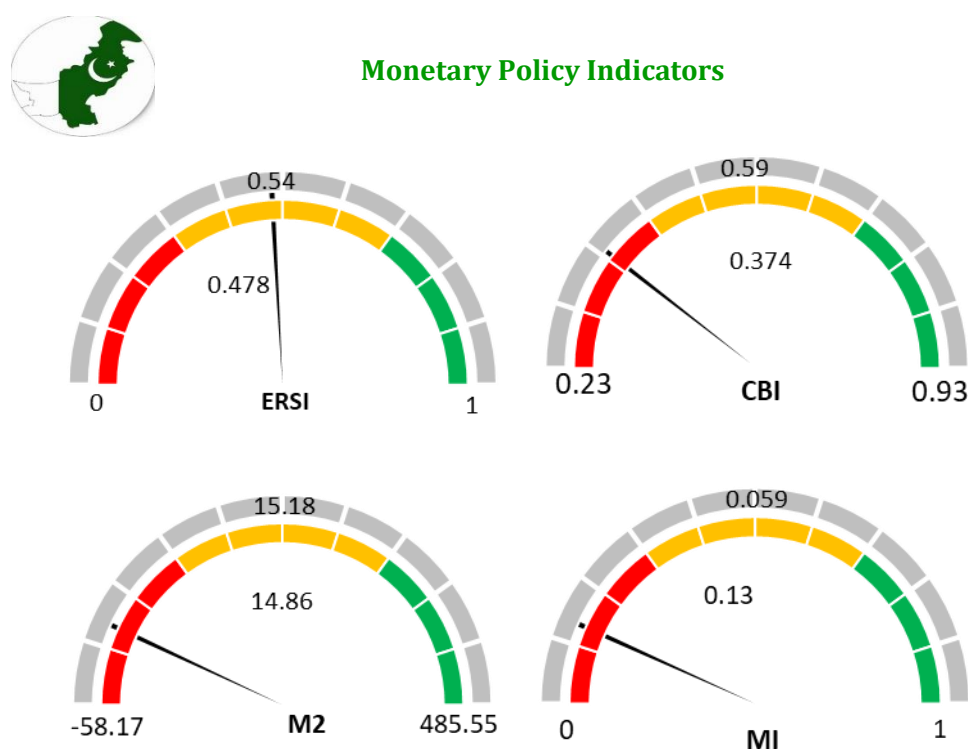
Panel D: M2/GDP



5.1.1 Monetary Indicators and CBDC: Case of Pakistan

As per the CBDC Atlantic trace, Pakistan's goal of issuing a CBDC would be to promote financial inclusion and reduce corruption and inefficiency. Pakistan stands in the research stage of CBDC development. Figure 15 explains that for CBI and MPI, Pakistan stands at 0.37 and 0.13, respectively. It is pertinent to note that for CBI, the average score of Pakistan is higher than the minimum average score of countries falling in the proof of concept and pilot testing stage. Similarly, the average values of M2 (14.8) and the ERS index (0.48), stand almost near the research group average score of these indicators. Hence, Pakistan's performance in the monetary indicators is quite moderate and satisfactory.

Figure 15: Monetary Indicators in Pakistan



5.2. Financial Indicators and CBDC: Global Analysis

Financial variables, for the analysis, embodies financial markets (FM) and financial institutions (FI)' access, depth, efficiency, financial openness index, and financial development index.

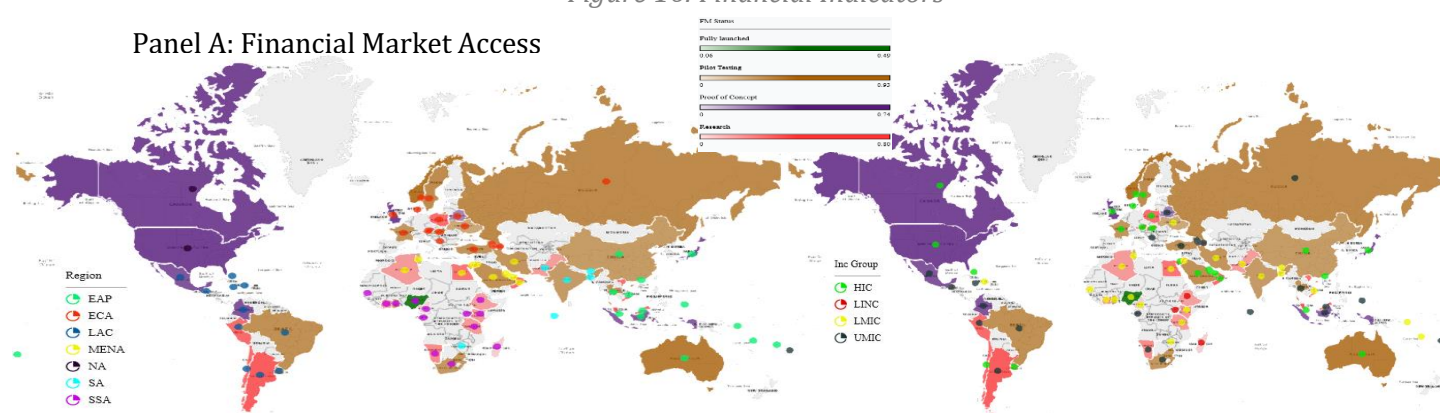
Countries with fully launched CBDCs show a wide variation in financial market access (efficiency) 0.06-0.48. The highest score of FM and FI's depth is showcased by proof-of-concept and pilot-

testing countries with notable variations due to diverse income levels. Financial openness stays moderate for fully launched CBDC countries. The financial development index of fully launched group appear the lowest scores, less than 50% followed by the research group. Notably, the research group attains scores above 50% despite comprising low and middle-income countries. However, countries in proof-of-concept and pilot testing illustrate the strongest financial sectors with index values crossing 80%.

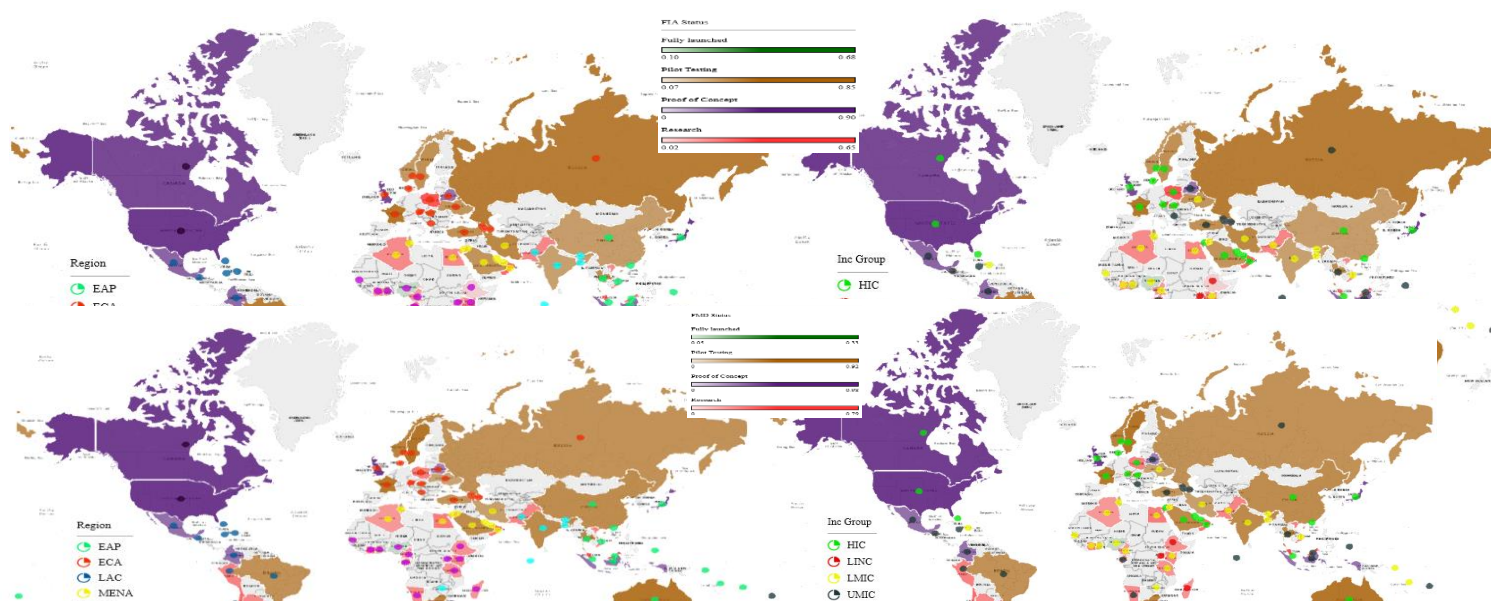
These observations indicate that the countries with higher/improved financial sector performance in terms of efficiency, access, depth and openness are still working on the CBDC. On the other hand, the countries where financial sector is yet to mature have launched CBDC. They do so to harvest the benefits associated with CBDC. One of the reasons might be the lower income group of these countries which requires the immense need of improvement in their respective financial sectors. When the motivation for launch of CBDC for these countries is consulted, it can be clearly observed that these countries launched CBDC with an aim to improve financial sector performance such as increases in financial inclusion, financial market efficiency, and financial access through CBDC. It can again be inferred that the financial sector performance may be considered a motivation as well as a goal of central banks to achieve through CBDC and it is not a determining factor to launch CBDC.

Figure 16: Financial Indicators

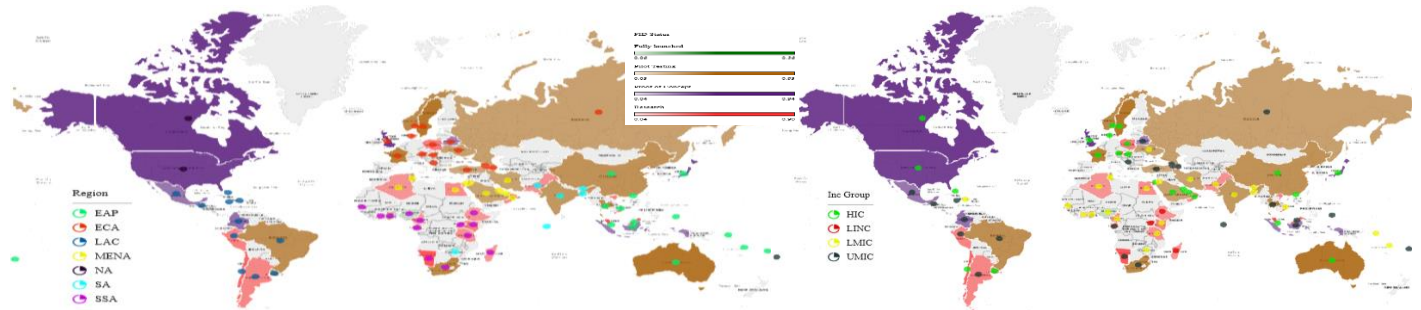
Panel A: Financial Market Access



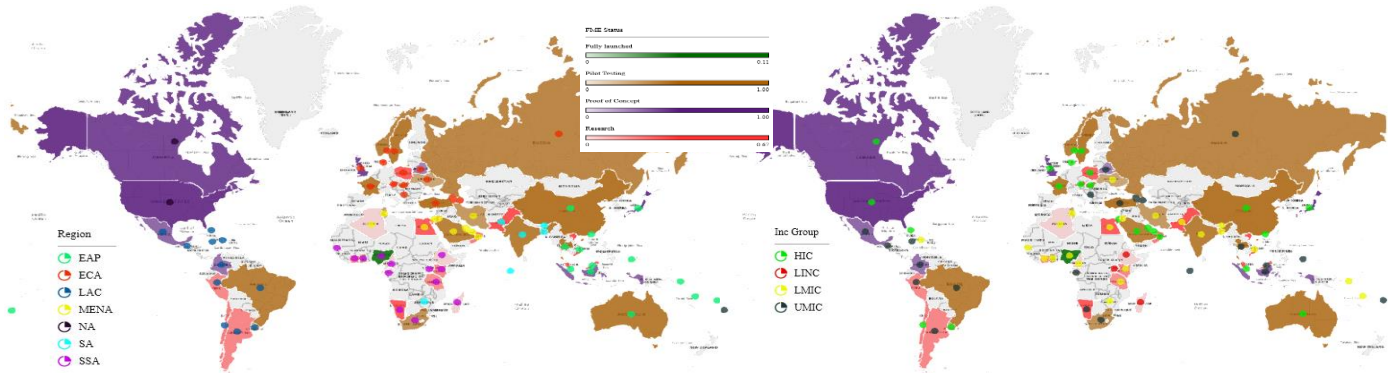
Panel B: Financial Institution Access



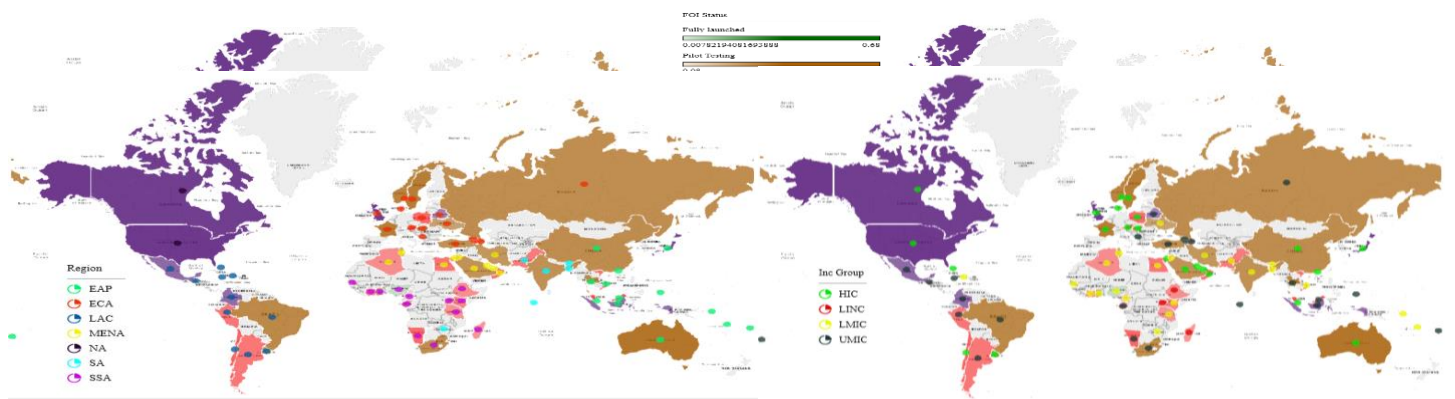
Panel D: Financial Institution Depth



Panel E: Financial Market Efficiency



Panel F: Financial Openness Index

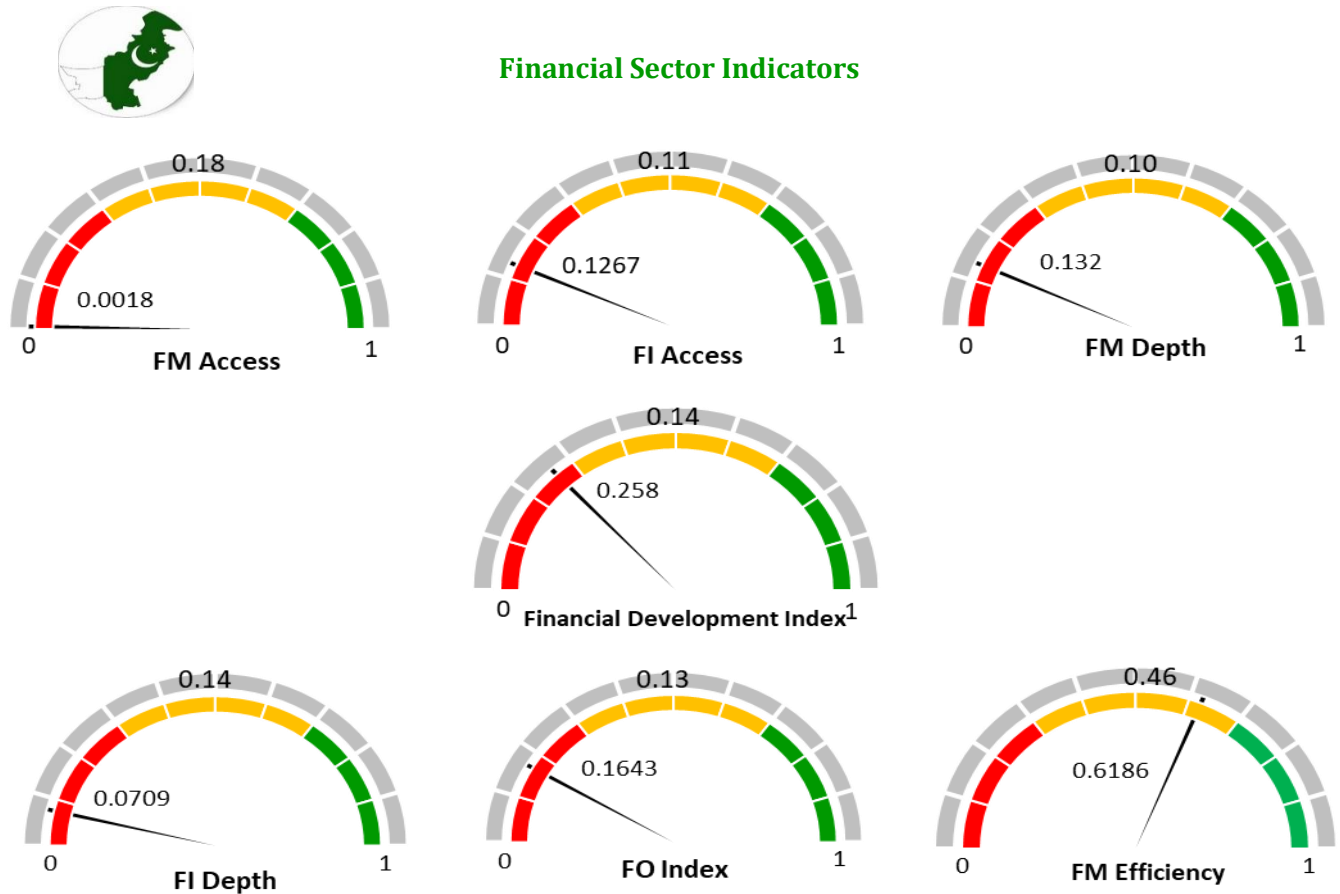


Panel G: Financial Development Index

5.2.1 Financial Indicators and CBDC: Case of Pakistan

As far as the financial sector indicators are concerned (Figure 17) with respect to financial market and institution access, Pakistan's performance is relatively better in terms of institutions. In terms of depth, FMs are performing relatively better than FIs. Specifically, financial market efficiency appears quite optimistic with an average score of 0.62. Similarly, Financial Development Index (FDI) stands at 0.26. The financial sector of Pakistan among the research group of CBDC is lying in the low performing countries as indicated by its average values except the FM efficiency. Hence, we may infer that CBDC presents an opportunity for Pakistan to bring further improvements in financial infrastructure and architecture, enhance financial inclusion, and improve financial sector efficiency. Notably, Pakistan has already initiated digital transaction system since 2018 and provided basic infrastructure for digital transactions and online payments, which may serve as a platform for the launch of CBDC. These facilities include 1LINK switch, RAAST payment system, and Roshan Pakistan. However, still the number of such transactions are quite low as compared to other countries but showing an increasing trend. Although, Deputy Director, SBP has announced launch of Sandbox, Pakistan digital currency, in 2025, the development of CBDC will be assessed based on regulation, stability, and innovations of the financial sector of Pakistan.

Figure 17: Financial Sector in Pakistan

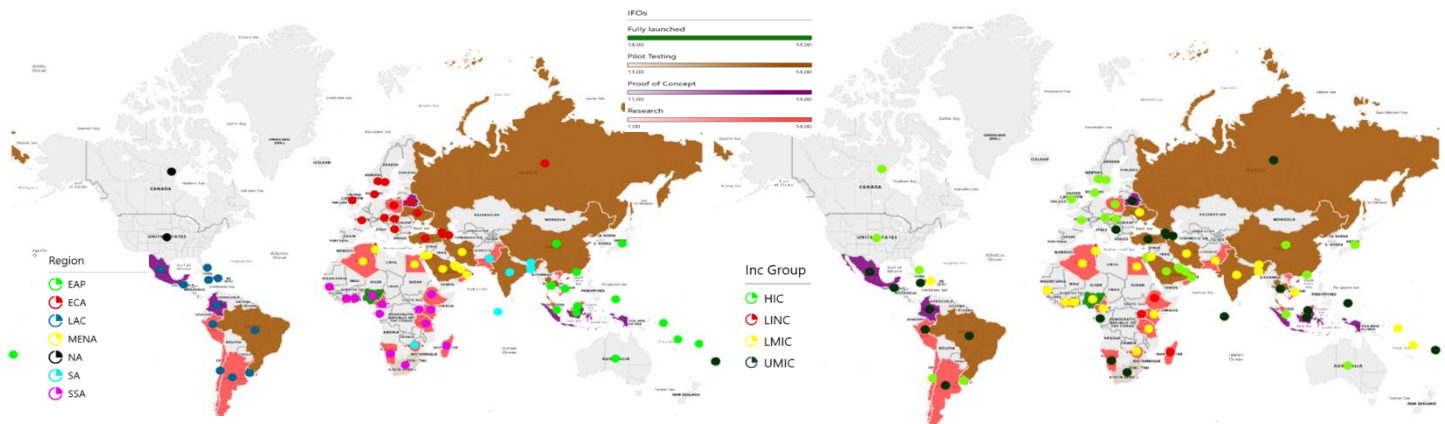


5.3. Illicit Financial Outflows, Cyber Security, and CBDC: Global Analysis

Countries with fully launched CBDCs face the lowest illicit financial flows while countries in the research stage encounter the highest illicit flows highlighting the benefits attached to CBDCs. Moreover, Pilot-testing countries show the highest security levels while fully launched have the lowest. Research group shows relatively better cyber security. Due to the sensitivity of CBDCs to cyber threats, central banks must address infrastructural operational, and user privacy challenges for a smooth adoption of CBDCs.

Figure 18: Illicit Financial Outflows and Cyber Security

Panel A. Illicit Financial Flows



Panel B. Cyber Security

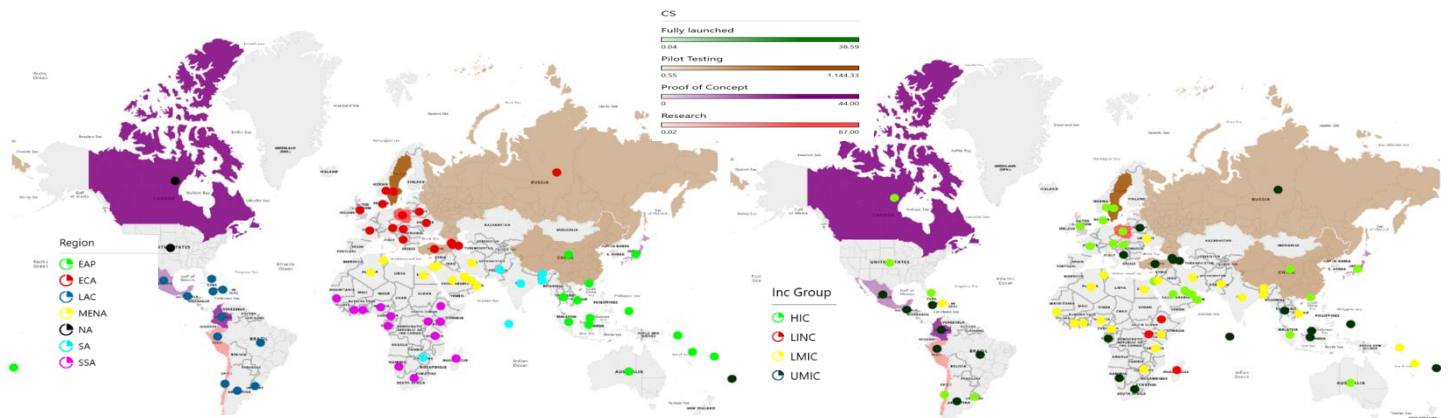
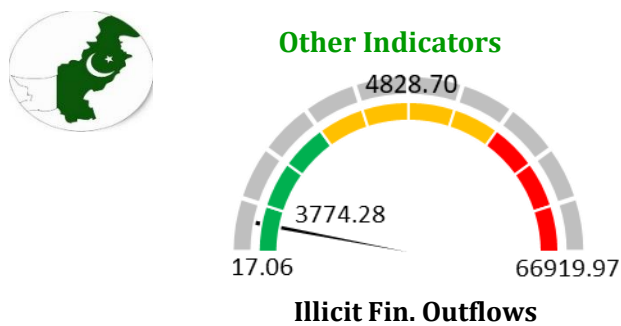


Figure 19: Illicit Financial Flows in Pakistan

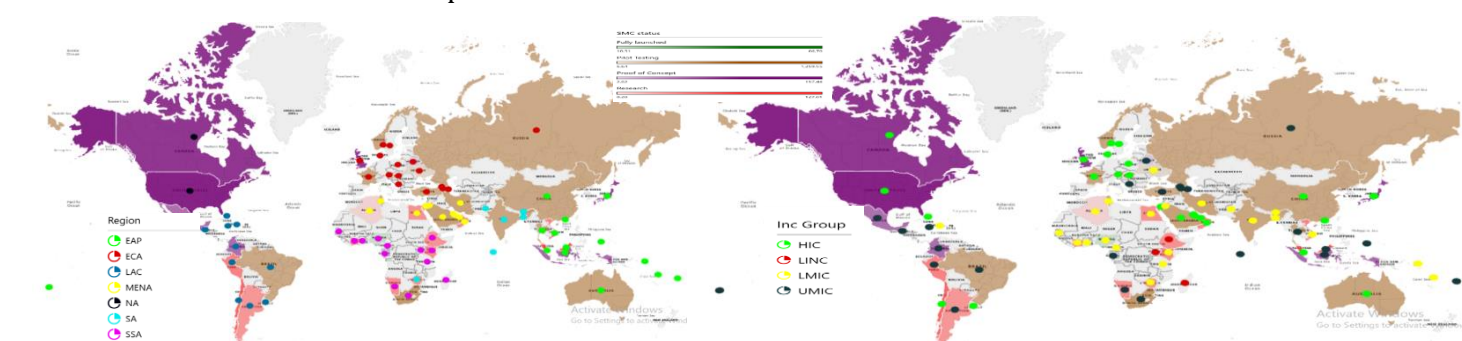


5.4. Stock Market Indicators and CBDC: Global Analysis

To capture stock market performance, the study has used two indicators; stock market capitalization (SMC) index and stock returns. SMC index exhibits that countries in the pilot testing stage maintain the highest performance of the stock market followed by proof-of- concept group, whereas the lowest performing stock markets are in the launched group of CBDC followed by the research group. In low- middle-income countries, CBDC can provide opportunities for efficient transfer of funds, diversification of investment portfolio, and stock market stability, however, conditional on the regulatory framework, financial structure and adoption behavior of investors.

Figure 20: Stock Market Indicators

Panel A: Stock Market Capitalization Index



Panel B: Stock Returns

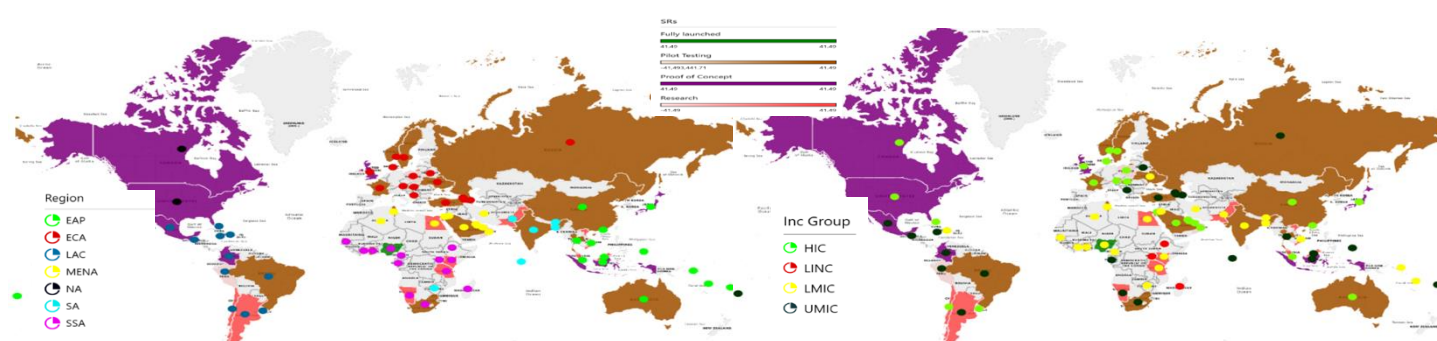
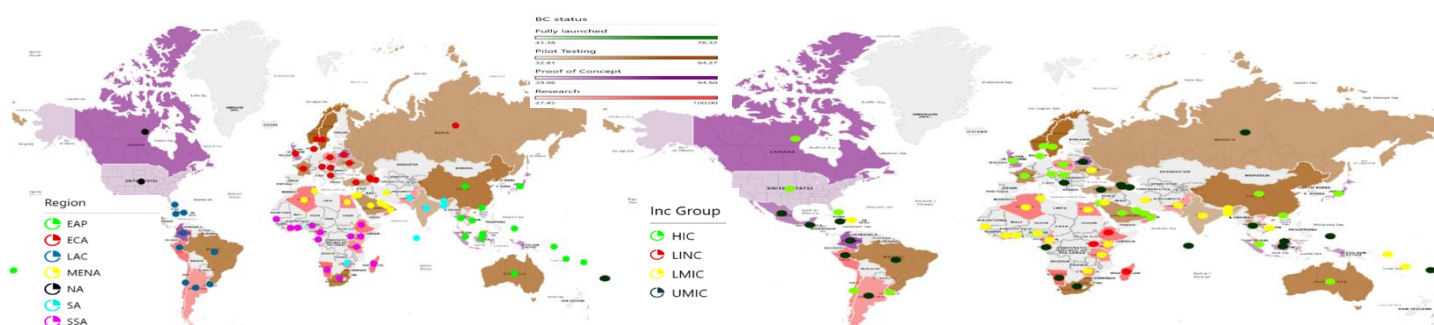


Figure 21: Banking Sector Indicators

Panel A: Bank Concentration Index



Panel B: Bank assets to GDP ratio

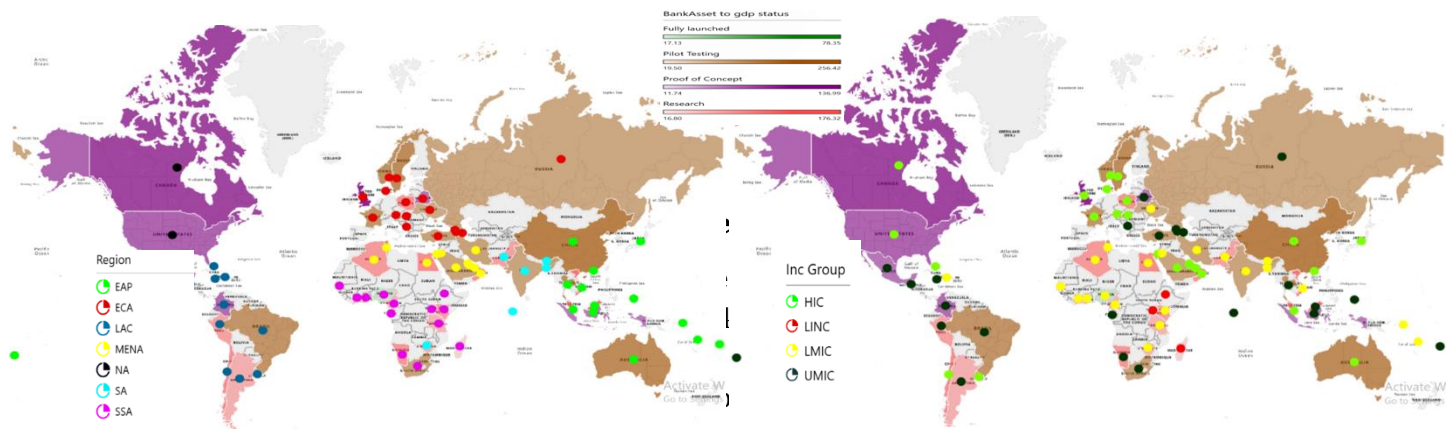
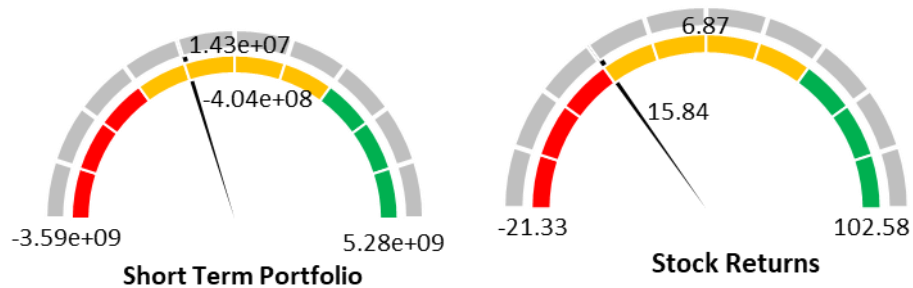


Figure 22: Stock Market Indicators



Stock Market Indicators

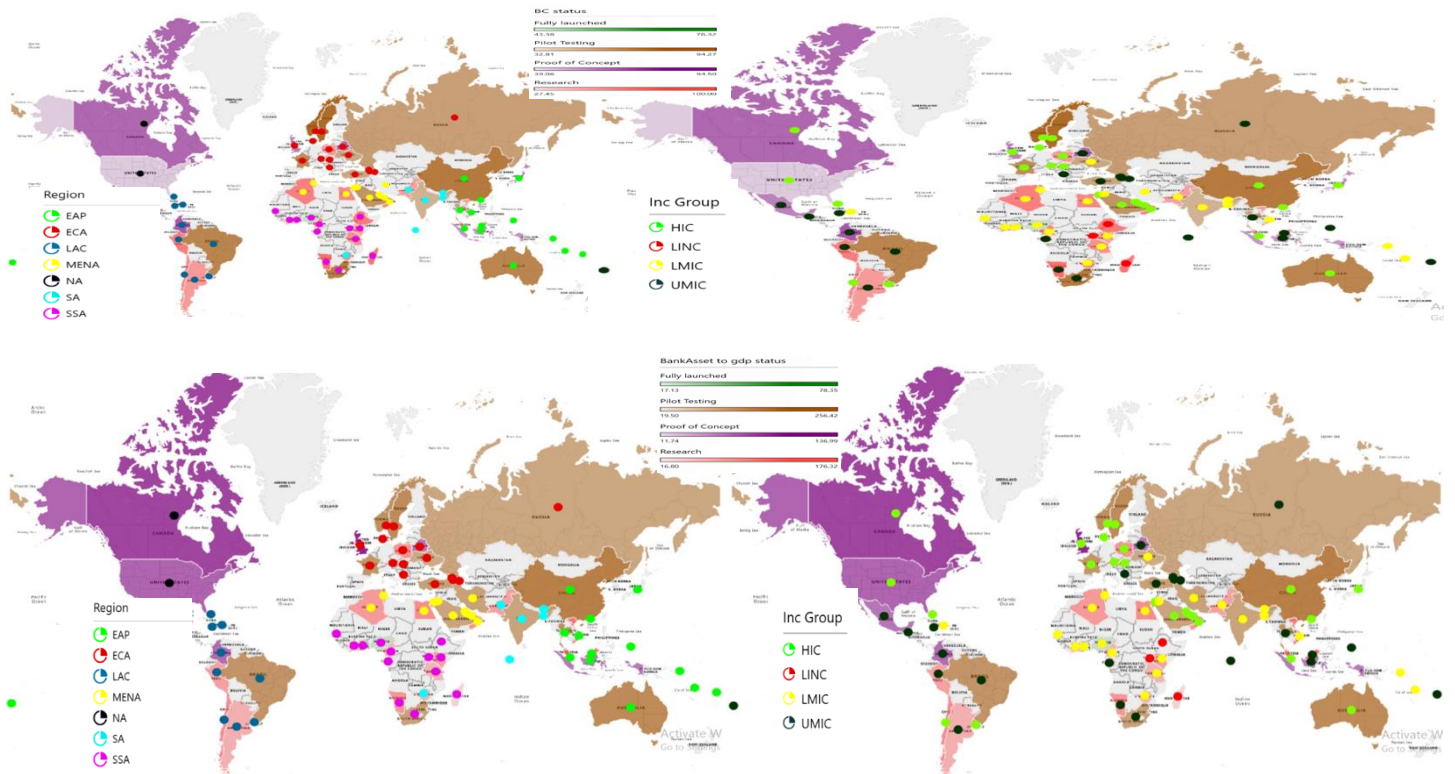


5.5. Banking Sector Indicators: Global Analysis

By looking at figure 23, the Bank concentration index is highest in the research stage and lowest in the fully launched stage. Pilot testing and proof of concept groups show similar results. It can be observed that there are majority of countries lying at the lower end of the bank assets as show in the lighter shade of the area. The Bank ratio is lowest in fully launched while highest among pilot testing countries. CBDC may influence the banking sector in different ways. It may adversely affect the deposit base by introducing an alternate to physical currency and through currency substitution.

Figure 23: Banking Sector indicators

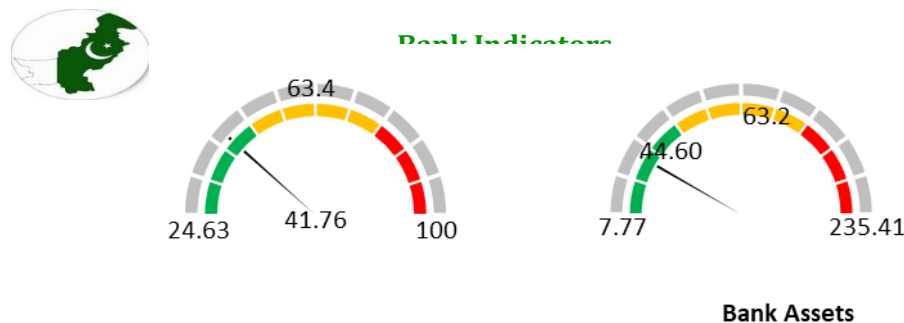
Panel A. Bank Concentration Index



5.5.1 Banking Sector Indicators and CBDC: Case of Pakistan

The statistics indicate that Pakistan performance in the banking sector is quite lower than the average of the research group. Specifically, the situation in the bank assets is quite dismal. Hence, CBDC may provide an opportunity for Pakistan to improve banking sector performance.

Figure 24: Banking Sector Indicators



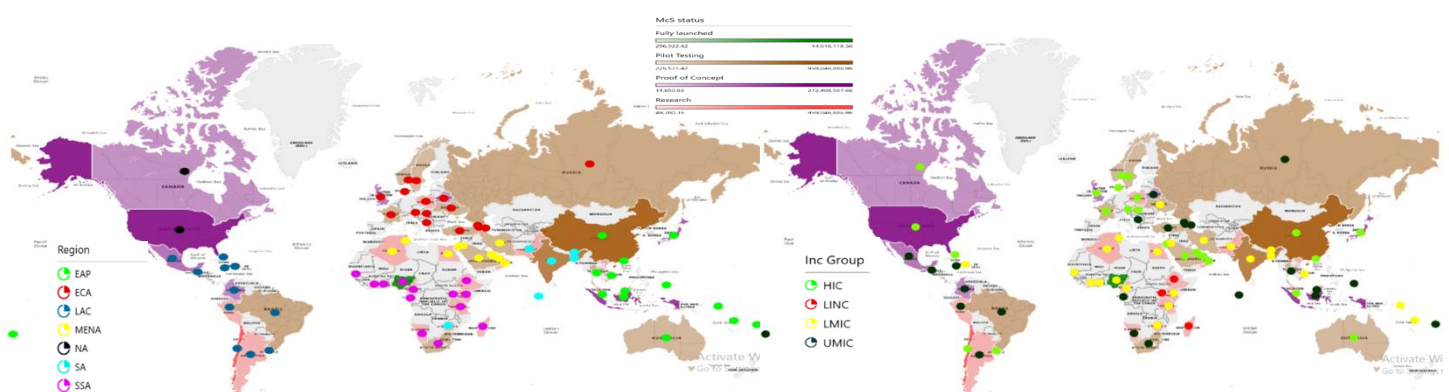
5.6. Technology Indicator and CBDC: Global Analysis

Digital infrastructure including mobile cellular subscriptions, fixed broadband subscriptions, mobile services, debit cards, and ATMs greatly influences the launch and adoption of CBDCs. Mobile phone subscriptions are seen to be highest in the pilot testing stage followed by research and proof of concept groups while the launched stage has the lowest. A consistent pattern is seen for fixed broadband and mobile service subscriptions. It reflects having a greater number of mobile users may help in the introduction of digital transaction systems but it's not essential for the CBDC launch.

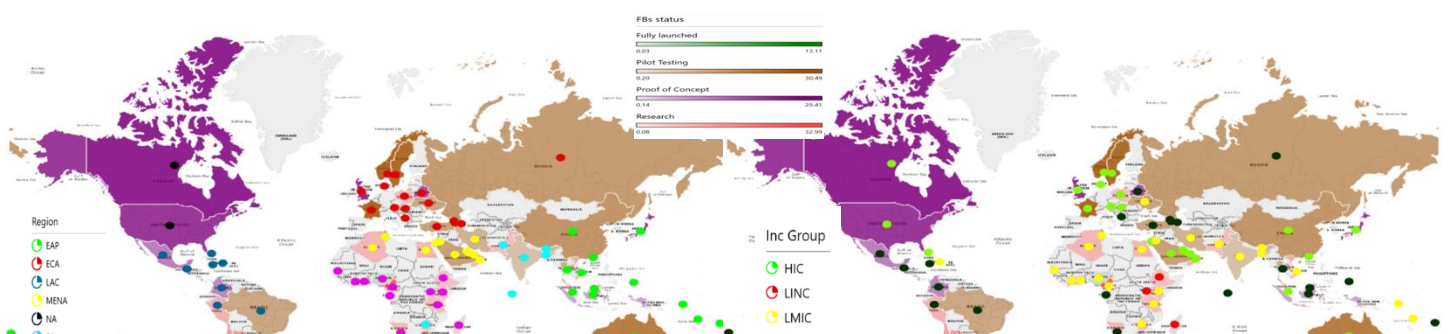
The pilot testing stage has the highest number of debit cards while most ATM machines are seen to be available in the research stage.

Figure 25: Technology Indicators

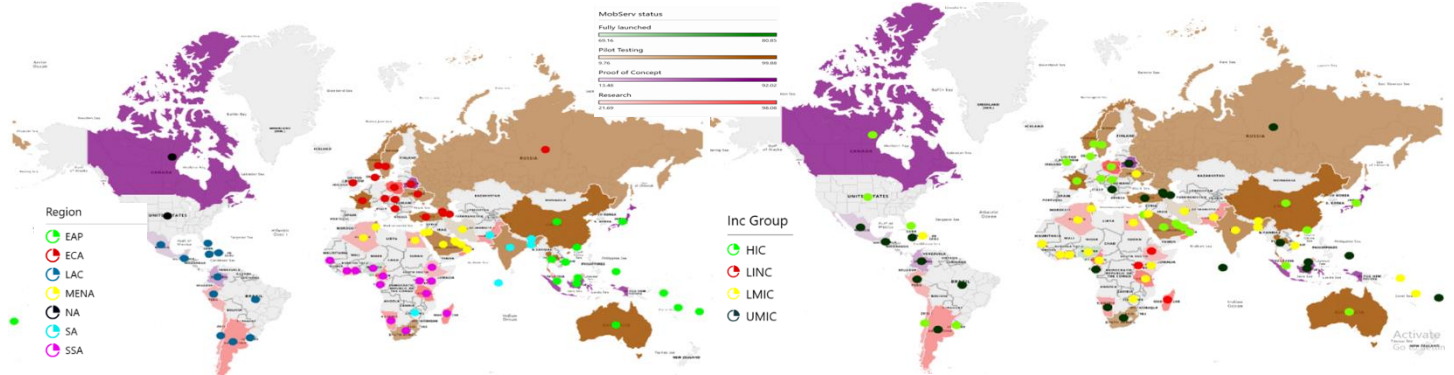
Panel A: Mobile Cellular Subscriptions



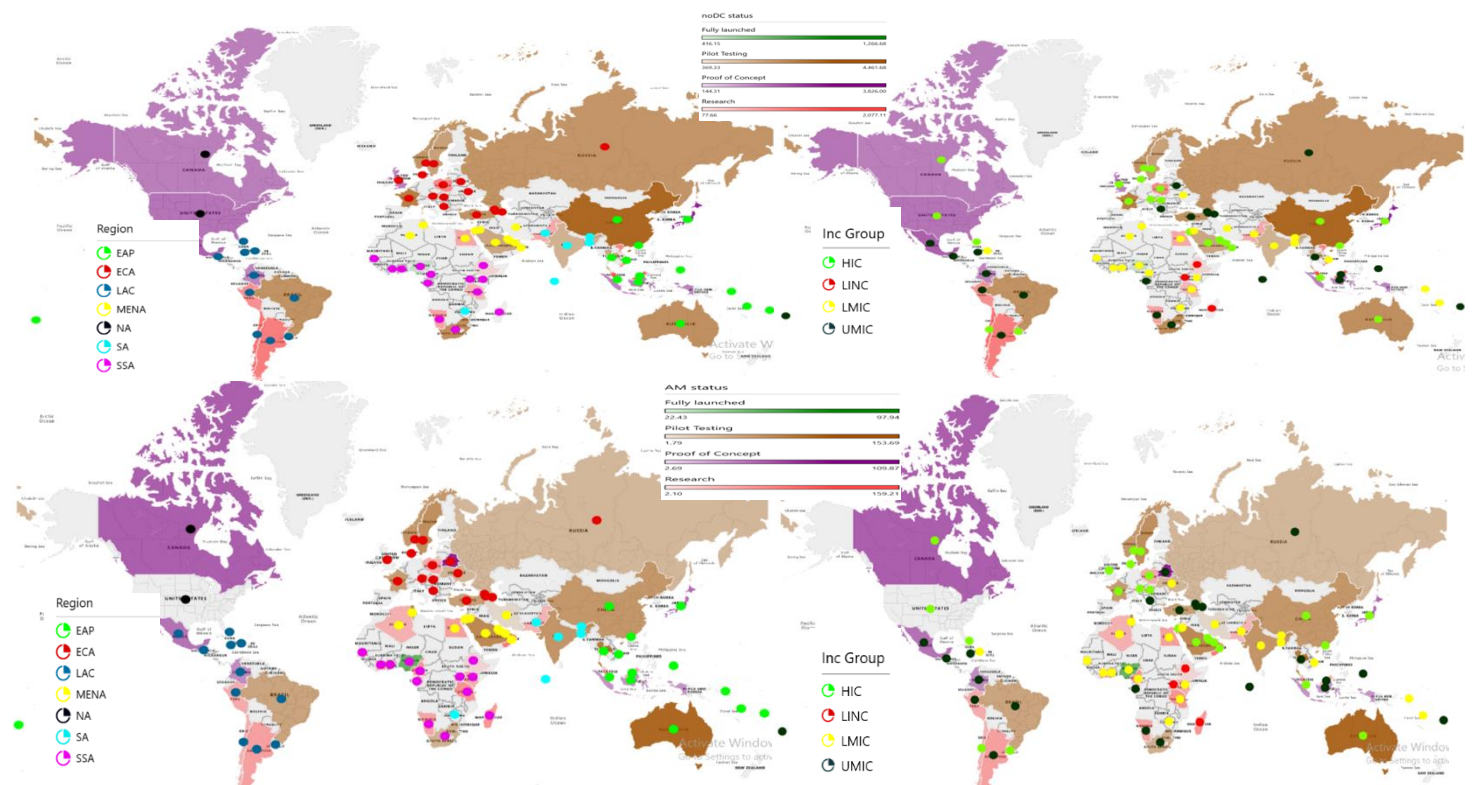
Panel B: Fixed Broadband Subscriptions



Panel C. Mobile Service Use



Panel D. No. of Debit Cards



5.6.1. Technology Indicators: Case of Pakistan

Figure 26 explains that Pakistan is performing reasonably well in terms of mobile subscriptions and mobile services, where the average values of former crosses the average of the research group and equal to the pilot testing group and later is almost equal to the research group average. The average value of the number of debit cards is quite below the average of the research group, however, quite above the minimum value of the group. The least performing areas are the number of ATMs and broadband subscriptions.

5.7. Macroeconomic Indicators and CBDC: Global Analysis

Macroeconomic indicators are categorized into internal and external sectors (see Figure 26). The internal sector consists of the consumer price index (CPI), government expenditures, informal economy size, per capita income (PCI), ease of doing business (EODB), human capital, and literacy rate. Mapping reveals that the research group has the highest PCI growth but shows a notable decline in this growth. However, the launched group has the lowest PCI growth and inflation rates. Government expenditures and EoDB are highest in the pilot testing group, followed by research, proof of concept and launched stage. Human capital is highest in the proof-of-concept group with the launched stage having the lowest levels. EODB is the lowest in the fully launched group. The informal economy is seen to be highest in pilot testing countries and smallest in the proof-of-concept stage. There is an unclear relationship between internal sector indicators and CBDC.

External sector indicators reflect trade openness, foreign direct investment (FDI), and exchange rate stability. Choropleth mapping reveals that the value of FDI and trade openness is highest among pilot testing followed by the research group, proof-of-concept group, and lastly the launched group. External sector performance could be enhanced using CBDCs through more transparent cross-border payments.

Figure 26: Technology Indictors

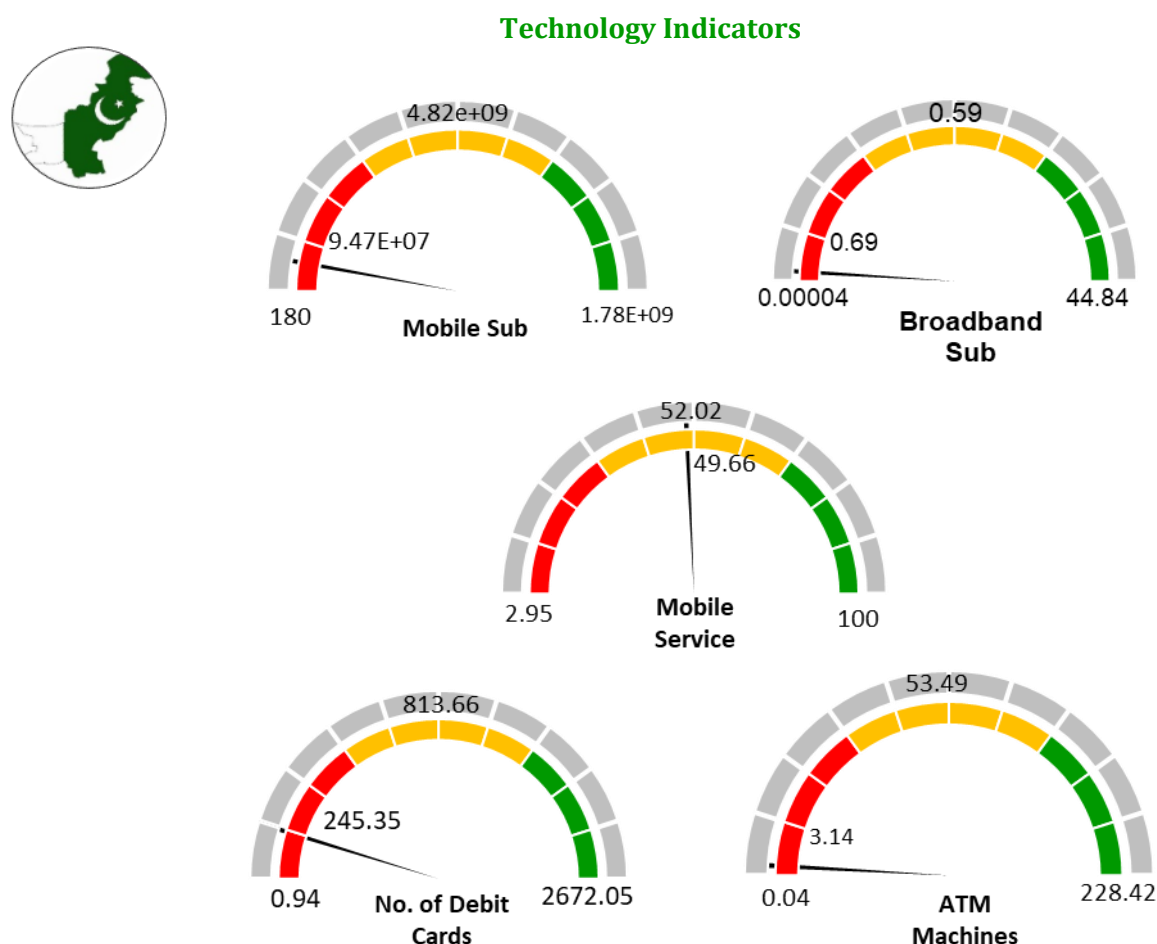
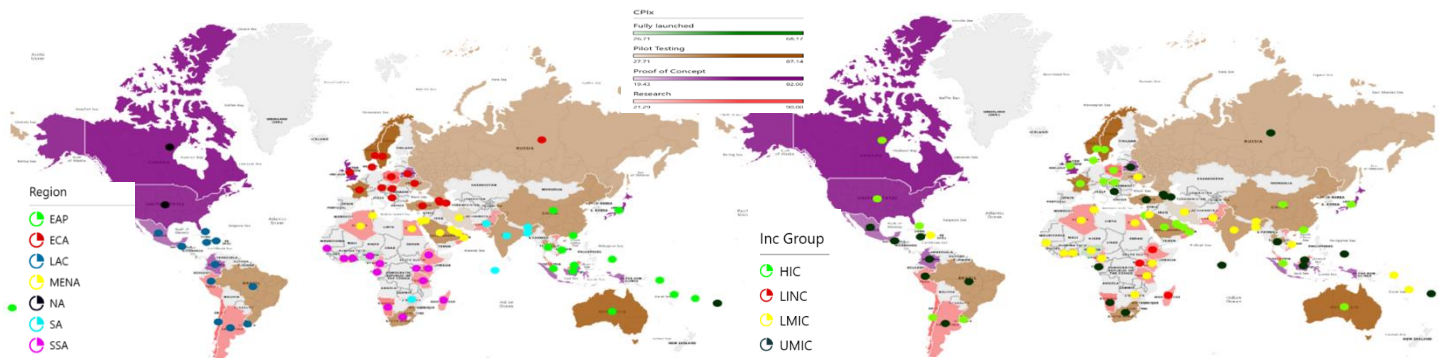
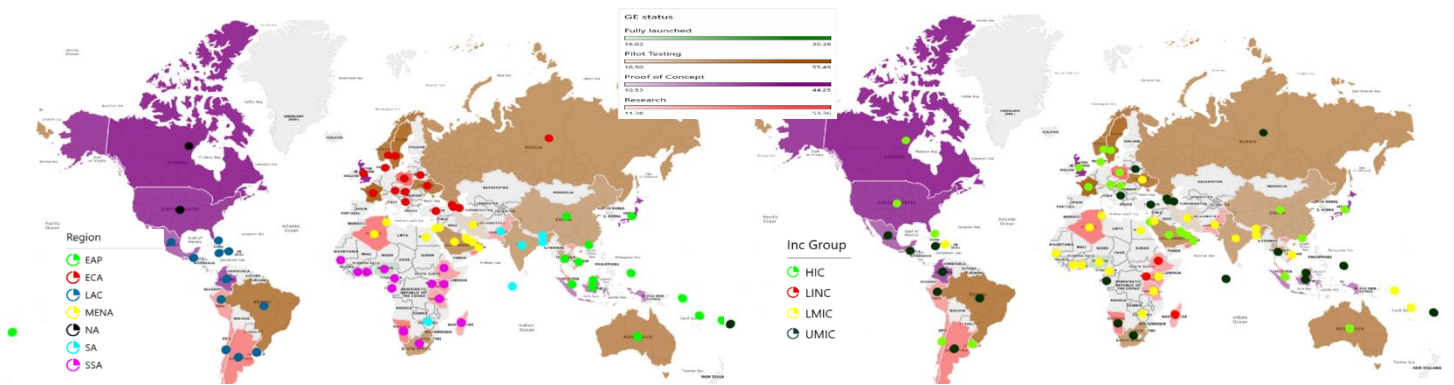


Figure 27: Macroeconomic Indicators

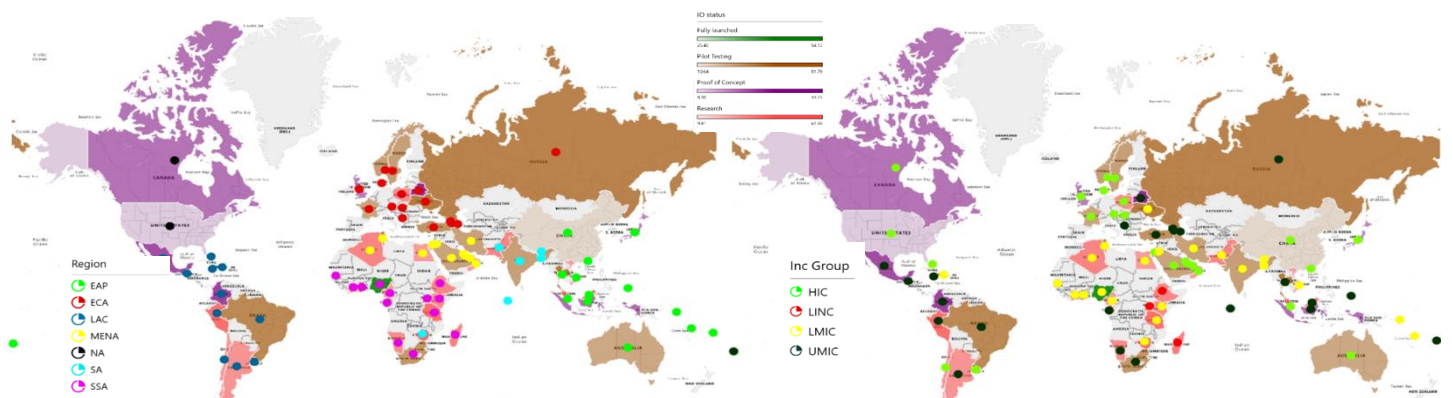
Panel A. Consumer Price Index (CPI)



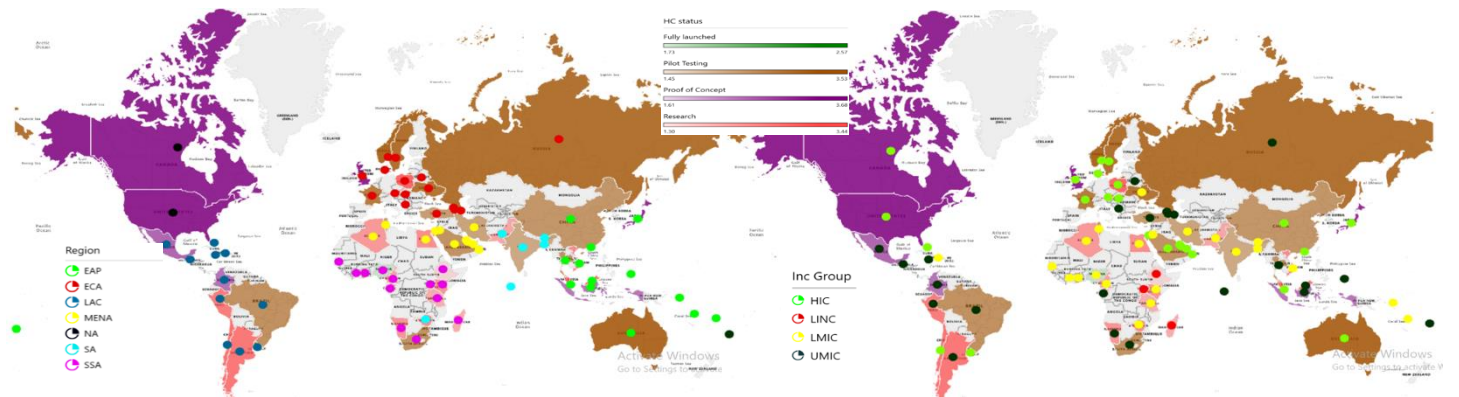
Panel B. Government Expenditures



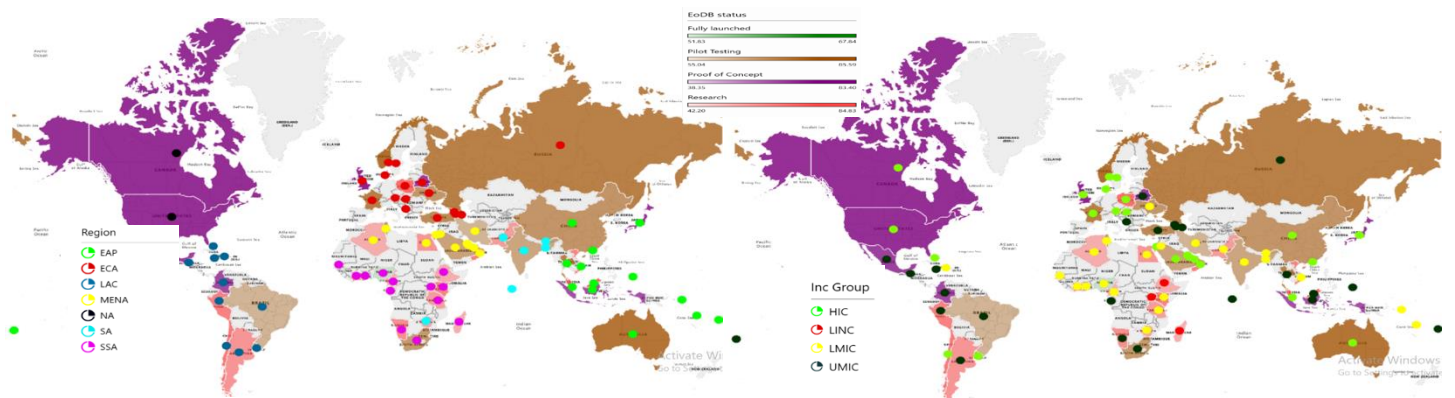
Panel C. Informal Output



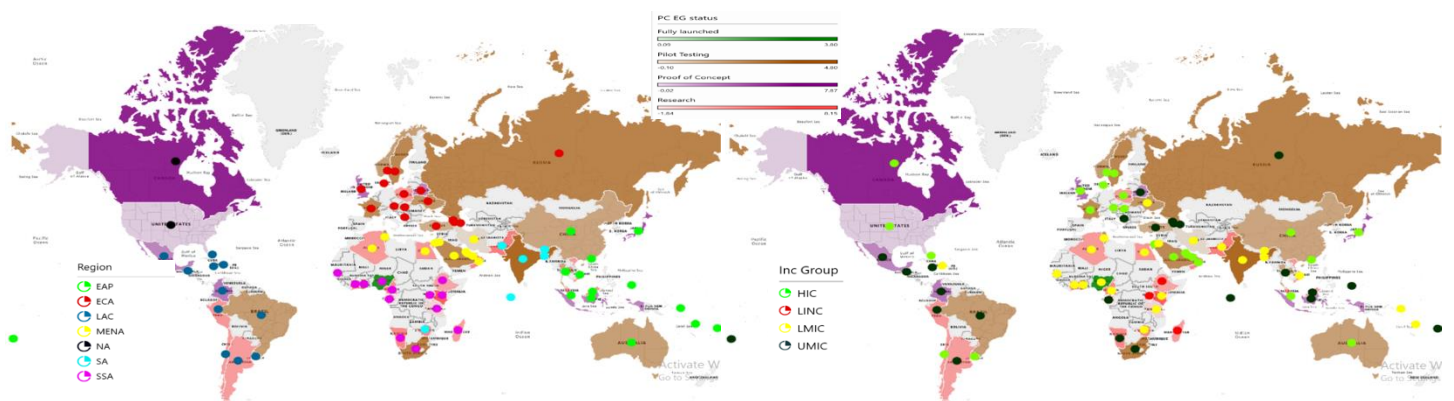
Panel D. Human Capital (HC)



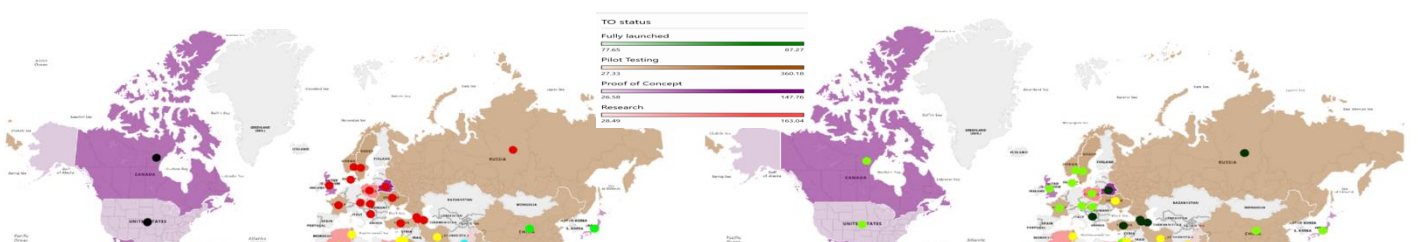
Panel E. Ease of Doing Business



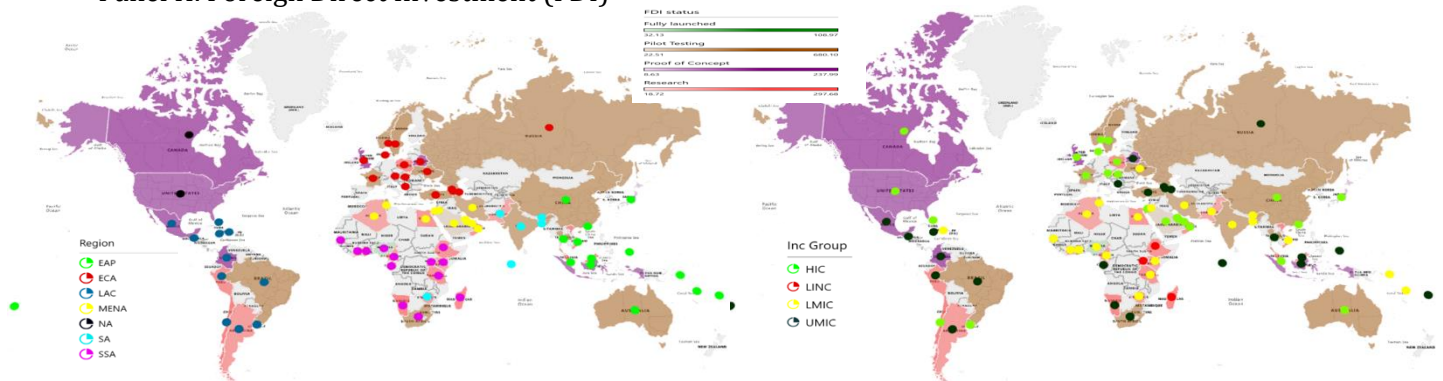
Panel F. Per capital Income Growth



Panel G. Trade Openness (TO)



Panel H. Foreign Direct Investment (FDI)



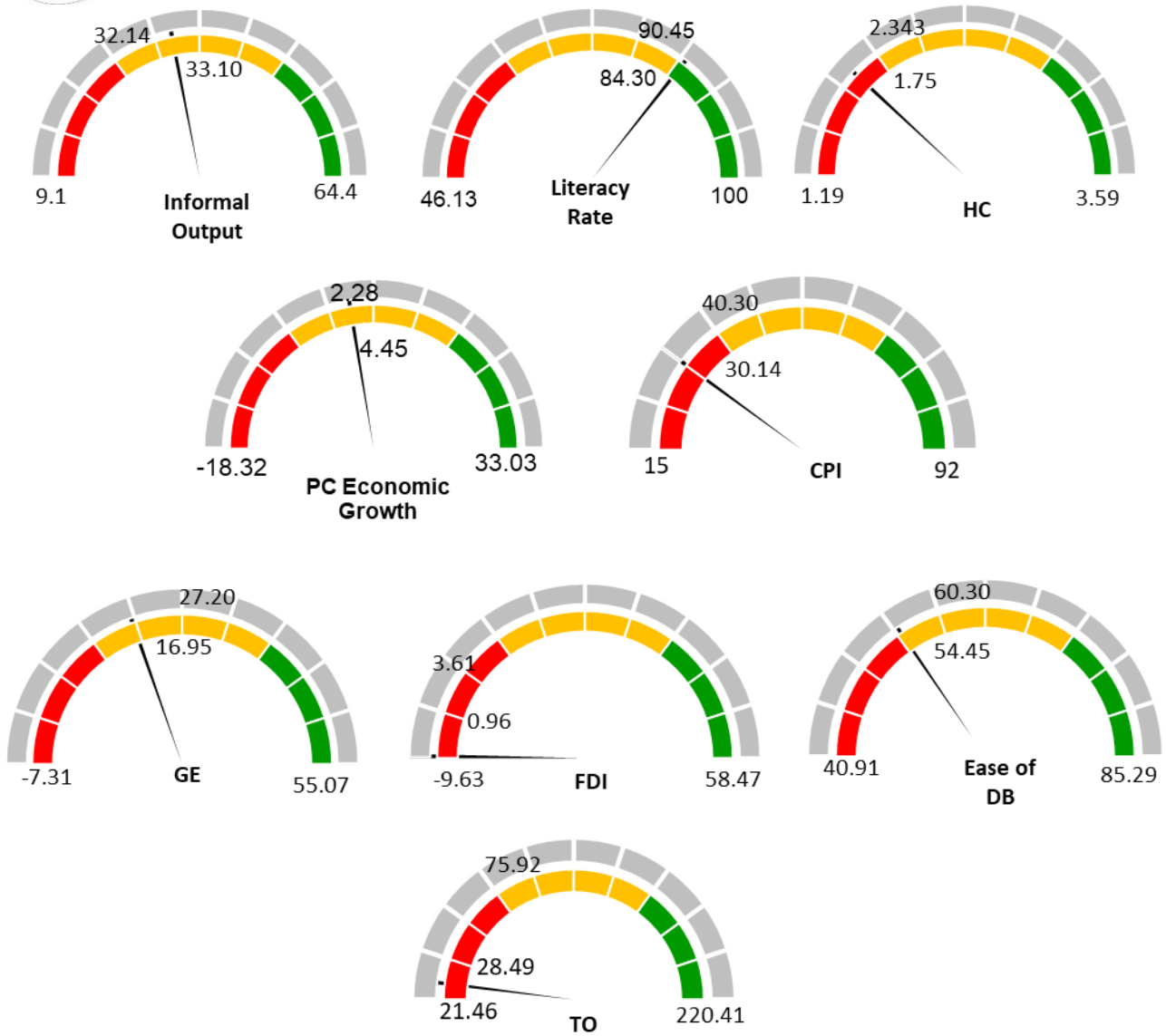
5.7.1. Macroeconomic Indicators: Pakistan Vs Research Group

The macroeconomic conditions of Pakistan present a mixed picture. As some of the indicators show a promising picture, whereas, in other areas there is a dire need for huge improvement. For instance, literacy rate, informal output growth, and per capita income growth are lying near the research group average. Notably, ease of doing business in Pakistan appears near the group average. The average performance of Pakistan in terms of human capital, GE, FDI, and TO appear quite below the research group with TO appear the least performing indicator as compared to the whole group.

Figure 28: Macroeconomic Indicators and CBDC: Case of Pakistan



Macroeconomics Indicators



RESULTS AND DISCUSSIONS: ANALYSIS OF SURVEY DATA

6.1. Analyses from the Survey of General Public

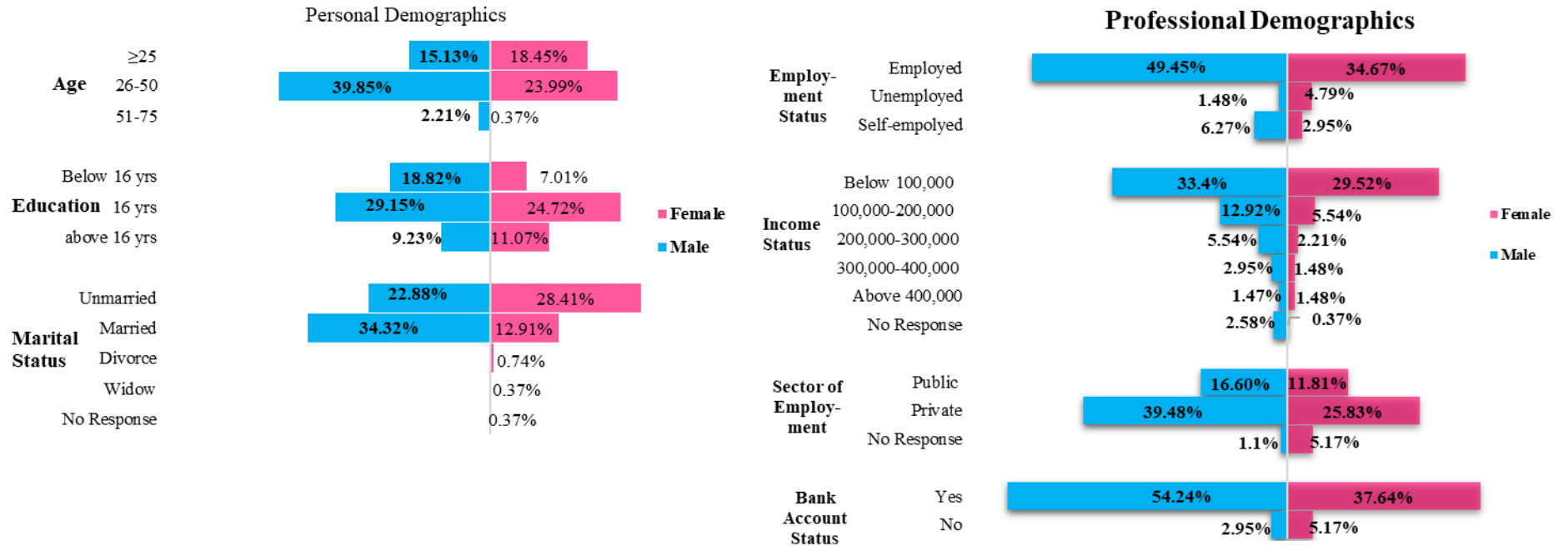
6.1.1 Introduction

This section presents the analysis and findings from the survey data of 271 general public respondents (comprising 155 males and 116 females) from the twin cities of Rawalpindi and Islamabad. The primary objective was to assess the preparedness and acceptability of the general public towards the expected implementation of CBDC in Pakistan. The results are presented based on six different dimensions including (a) perceived benefits, (b) perceived ease of usefulness, (c) challenges and compatibility, (d) the personal innovativeness of the individuals, (e) trust level in the central bank or other banks, and (f) the future considerations of the digital currency.

6.1.2 Demographic Profile of Participants

The demographic profile of the respondents is presented in Figure 29. The data showed that the 26-50 age group represents the largest share for both males (38.85%) and females (23.88%) and males with higher educational attainment. The sample comprised a higher percentage of males employed (48.45%) compared to females (34.67%) and they fall in higher income brackets. Majority of participants (62.82%) had an income below PKR100,000, and the majority were employed in the private sector while 28.41% were employed in the public sector. A higher percentage of males had a bank account as compared to females.

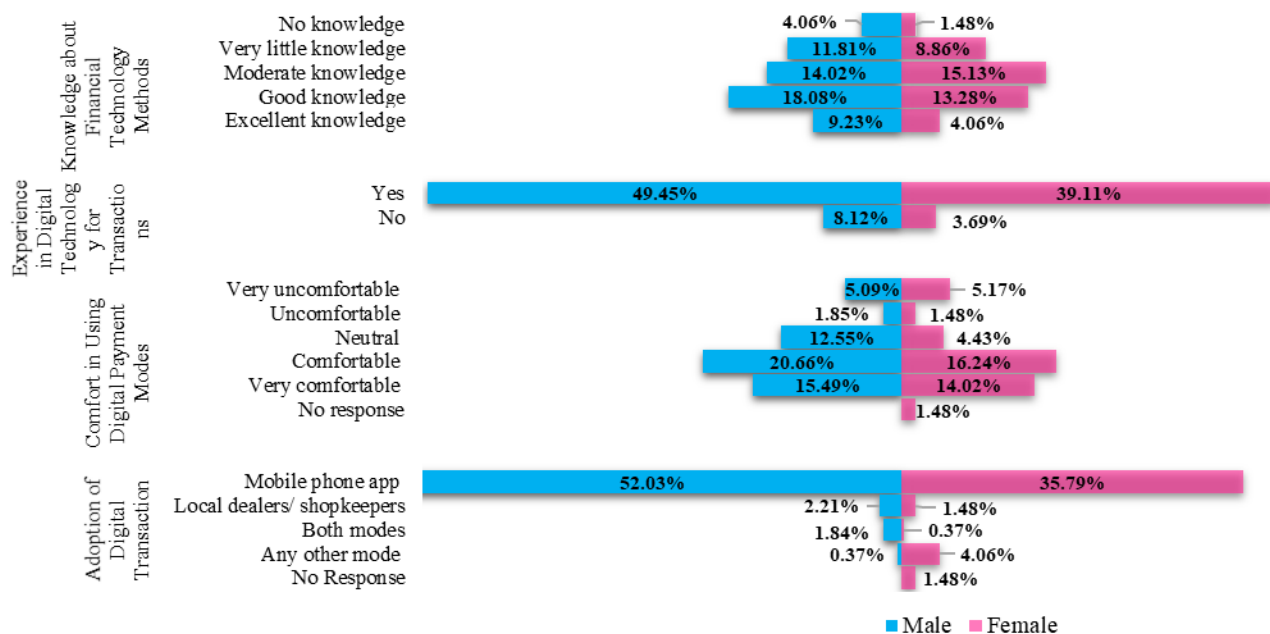
Figure 29: Respondents' Demographics



6.1.3. Knowledge of Digital and Financial Technology

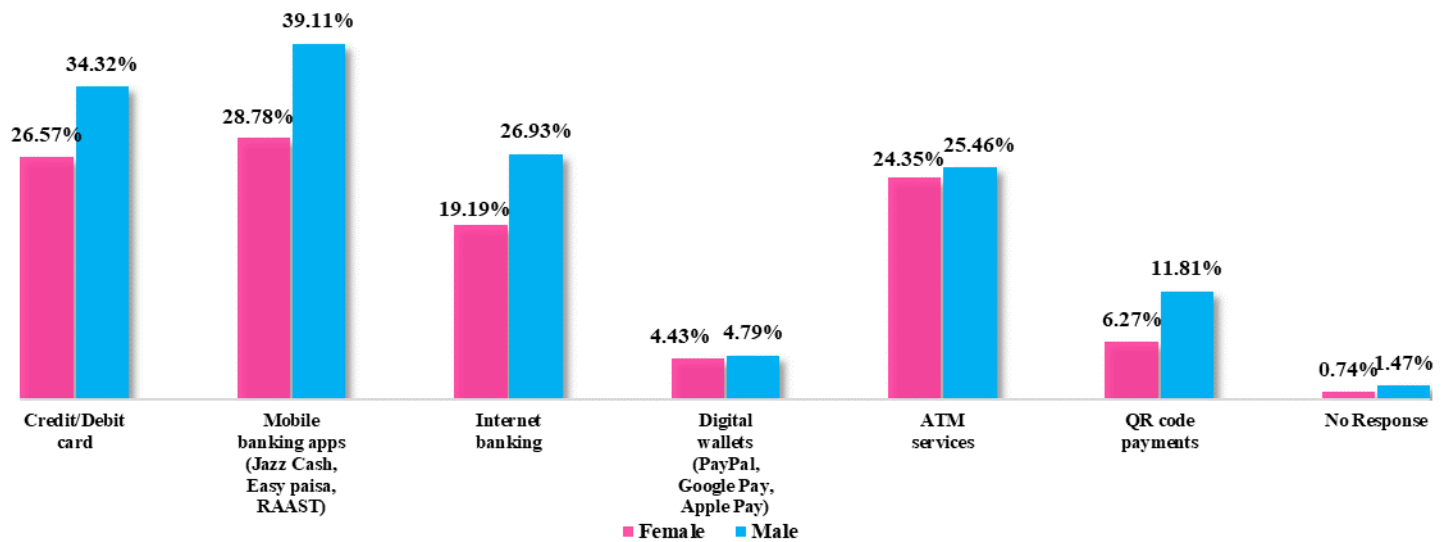
The data on digital knowledge and transaction behaviors among respondents by gender reveals significant disparities in financial technology usage. A greater percentage of males demonstrate superior knowledge of financial technology, with 35.46% having moderate –to good knowledge, compared to 26.73% of females. Additionally, 48.64% (30.11) of males (females) report prior digital transaction experience, suggesting that gender differences in digital literacy and access to financial services may hinder women's engagement in formal financial systems.

Figure 30: Digital and Fintech Knowledge



A higher percentage of males (36.0 %) exhibit greater comfort with digital payment methods as compared to females (30.0%), which likely influences their adoption of various digital transaction tools. Specifically, among various types of digital payment modes, the male showed a higher proportion usage as compared to their female counterparts. Notably, the gender gap is widest for the use of mobile banking apps, digital wallets (such as PayPal, Google Pay, and Apple Pay), followed by credit/debit cards and internet banking while the narrowest in digital payments and ATM services.

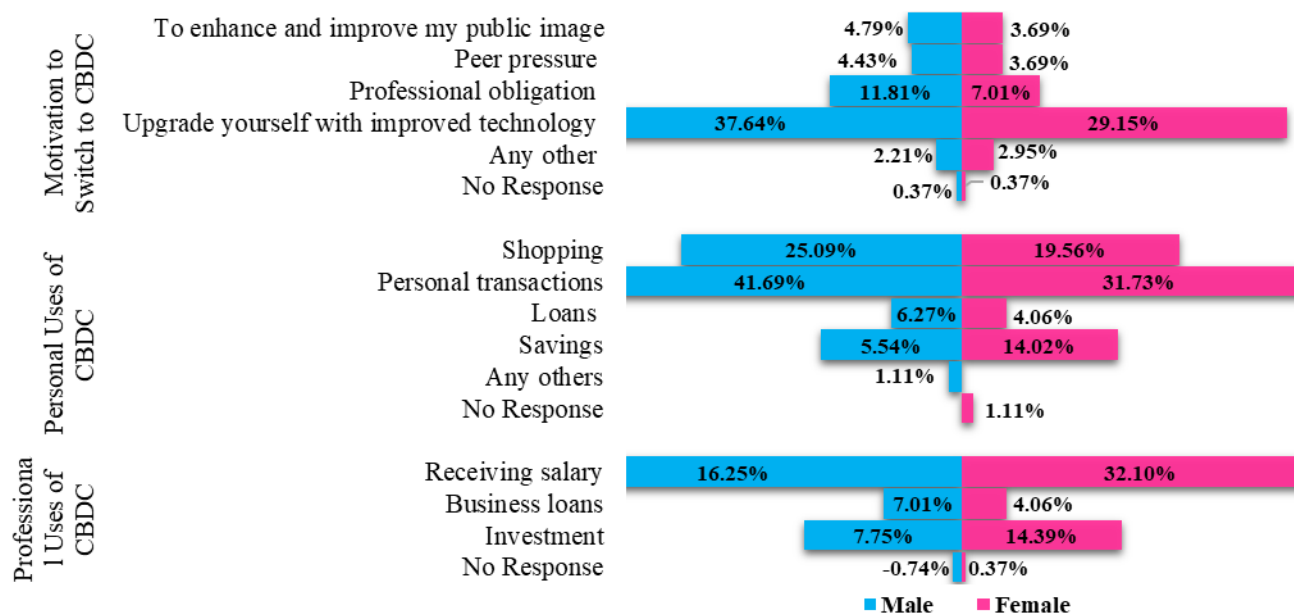
Figure 31: Current Mode of Financial Transactions



6.1.4 Awareness/Knowledge about CBDC

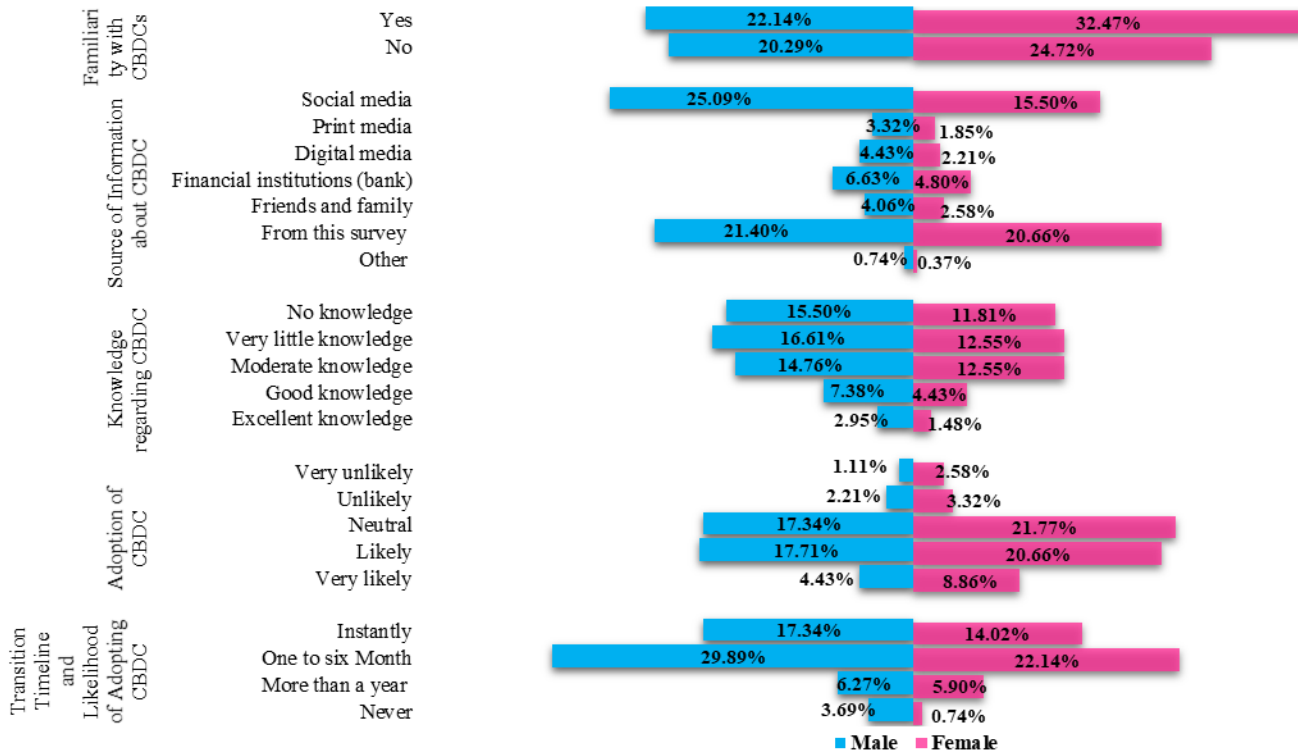
Figure 32 provides the extent of awareness, knowledge, and readiness to adopt CBDC across gender. A higher percentage of male (32.47) showed familiarity with CBDC as compared to their female counterparts. Both genders primarily turn to social media as their main source of information regarding CBDC, although men show slightly more interaction with financial institutions, such as banks, for obtaining CBDC knowledge. Both genders showed equal likelihood of adopting the CBDC.

Figure 32: Adoption of CBDC



In terms of motivation, both genders stated that they would shift to adopt CBDC to upgrade to improved technology. In terms of personal usage, both males and females (41.68% and 31.73%) prefer CBDC for personal transactions, although females (14.02%) are more inclined to use it for savings than males (5.54%). For professional use, both genders have a comparable interest in receiving a salary through CBDC. Males, however, are more likely than females to use CBDC for business loans (5.27%) and investments (7.57%).

Figure 33: Knowledge of CBDC



6.1.5. Relative Advantages and Perceived Usefulness

Figure 34 depicts that at the individual level, the respondents have shown agreement that CBDC will accrue a range of economic and social benefits. Specifically, at the individual level, the highest percentage of respondents (71%) agreed that CBDC will enhance accuracy of financial transactions and digital literacy. At the economy level (Figure 35), efficiency in the transaction of credit, green banking, and avoidance of tax are the most alleged benefits of CBDC by the general public. Notably, a reduction in cybercrimes, security, and corruption was considered the least expected advantages of CBDC in Pakistan.

Figure 34: Benefits and Usefulness of CBDC at Economy Level

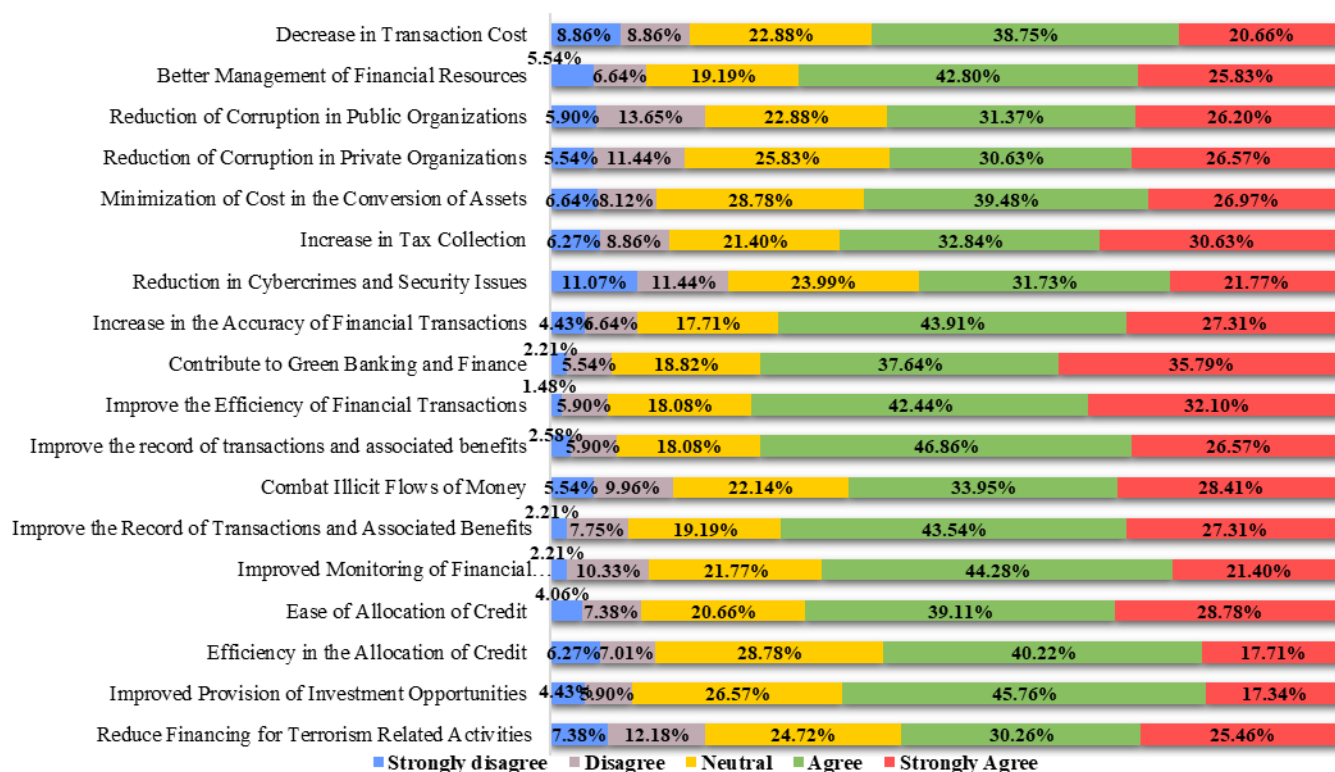
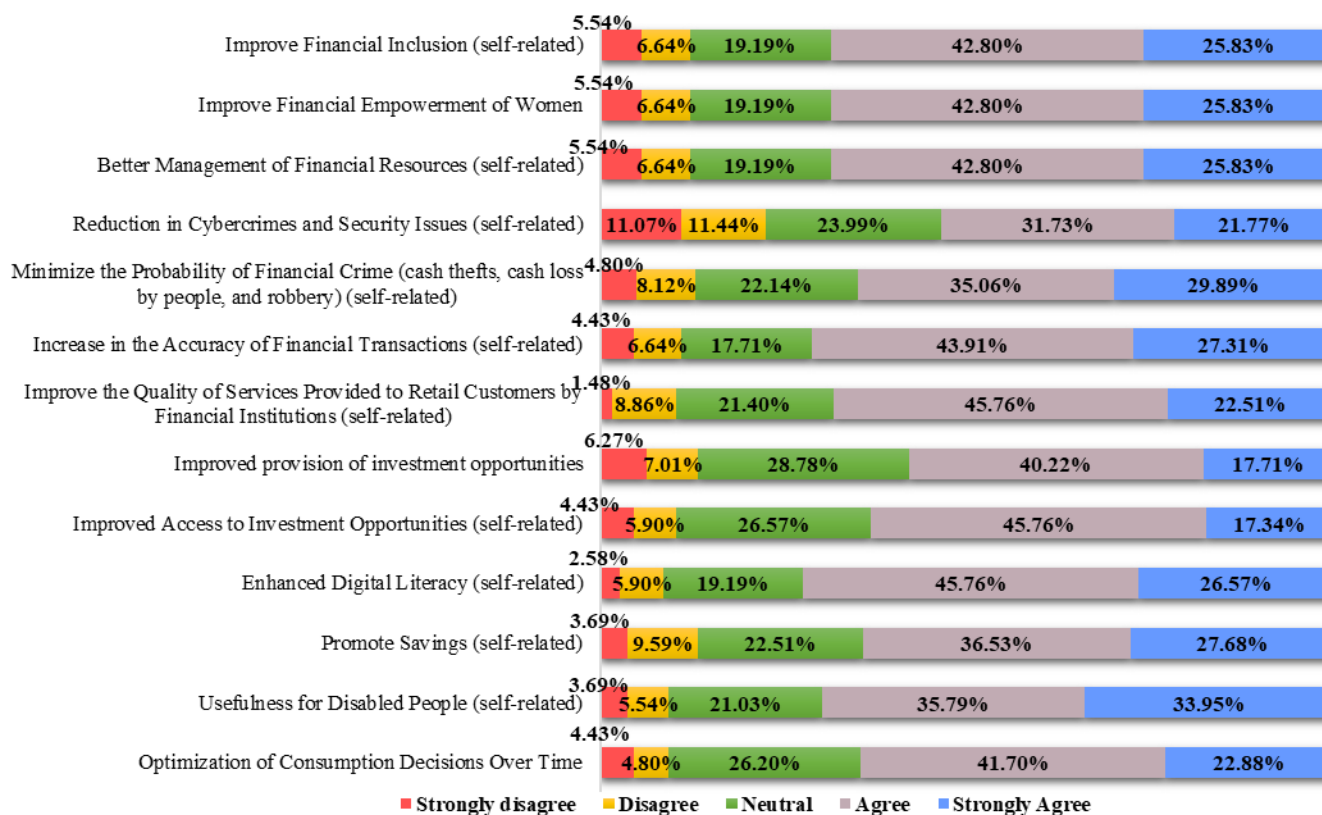


Figure 35: Benefits and Usefulness of CBDC at Individual Level



6.1.6 Perceived Ease of Use

Figures 36 and 37, respectively, represent the perceived ease of use of CBDC at individual and economy levels. At both individual and economy levels, there is a high perception of respondents (74%) that CBDC will simplify and improve the ease of financial transactions. Similarly, there is a high agreement that CBDC would potentially reduce travel costs and save time (81%). At the individual level, there is a high agreement regarding the simplicity of the payment process (77%, by combining agree and strongly agree). The lowest-ranked use of CBDC is customer support for troubleshooting as reported by majority of the respondents from general public.

Figure 36: Perceived Ease of Use at Individual Level

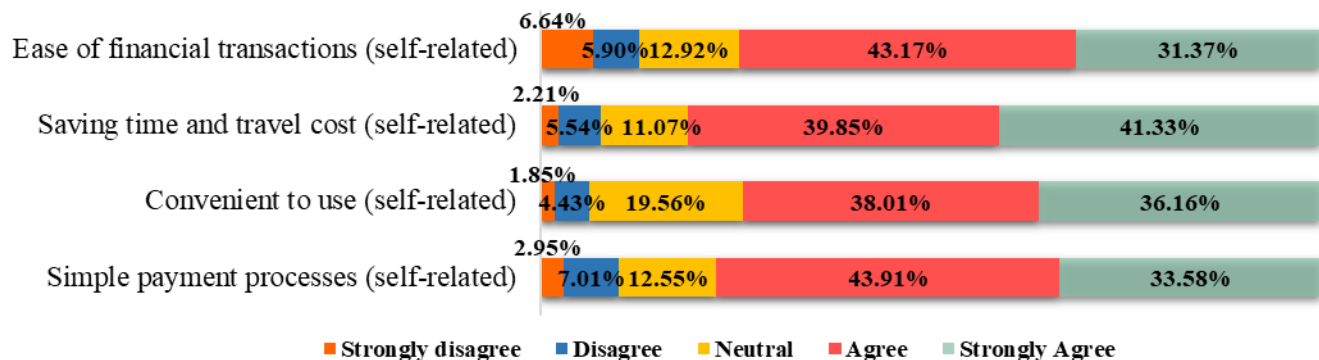
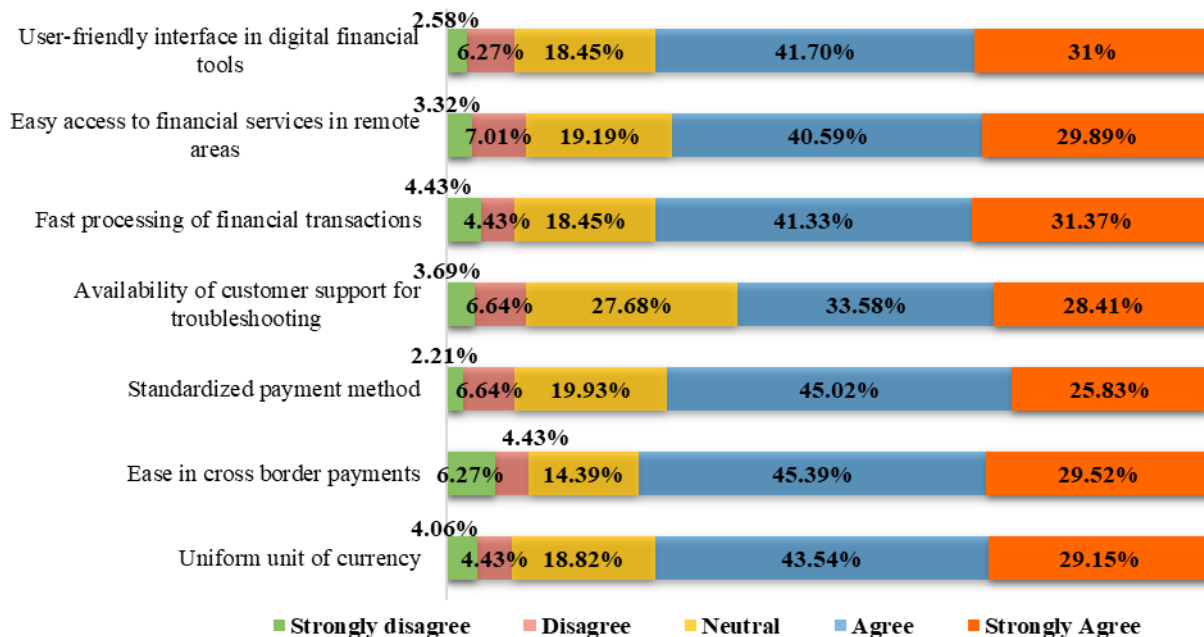


Figure 37: Perceived Ease of Use at Economy Level



6.1.7 Challenges/ Complexity

This section offers insights related to the perceived challenges regarding the adoption of CBDC. Figures 38 and 39 present the perceived challenges regarding the use of CBDC, at individual and economy levels. At the individual level, the population with low literacy, lack of digital literacy, and affordability of smartphones pose serious challenges in the implementation of CBDC in Pakistan. At the economic level, lack of awareness and communication between the central bank and the general public, lack of regulatory framework, and data privacy issues appear as serious obstacles in implementing CBDC in Pakistan. Notably, respondents do not see financial exclusion, political will, and Shariah compliance as serious challenges for the implementation of CBDC, in Pakistan.

Figure 38: Perceived Challenges of CBDC at Individual Level

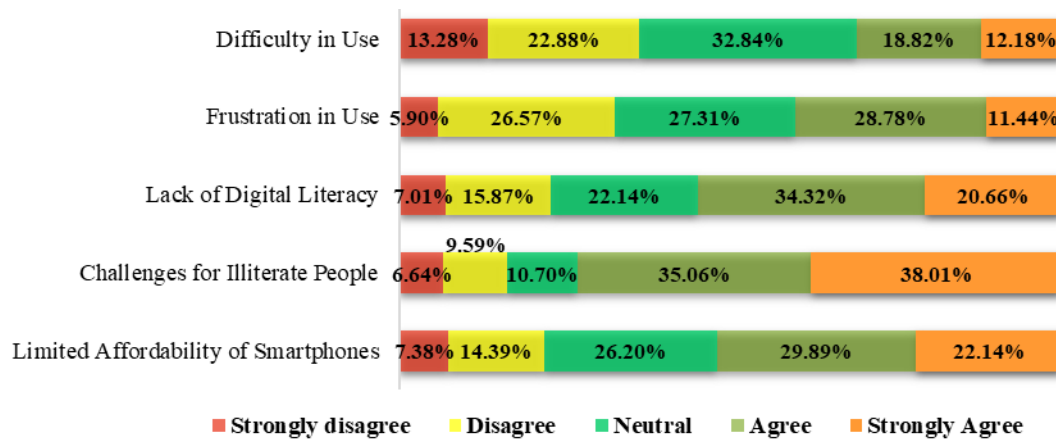
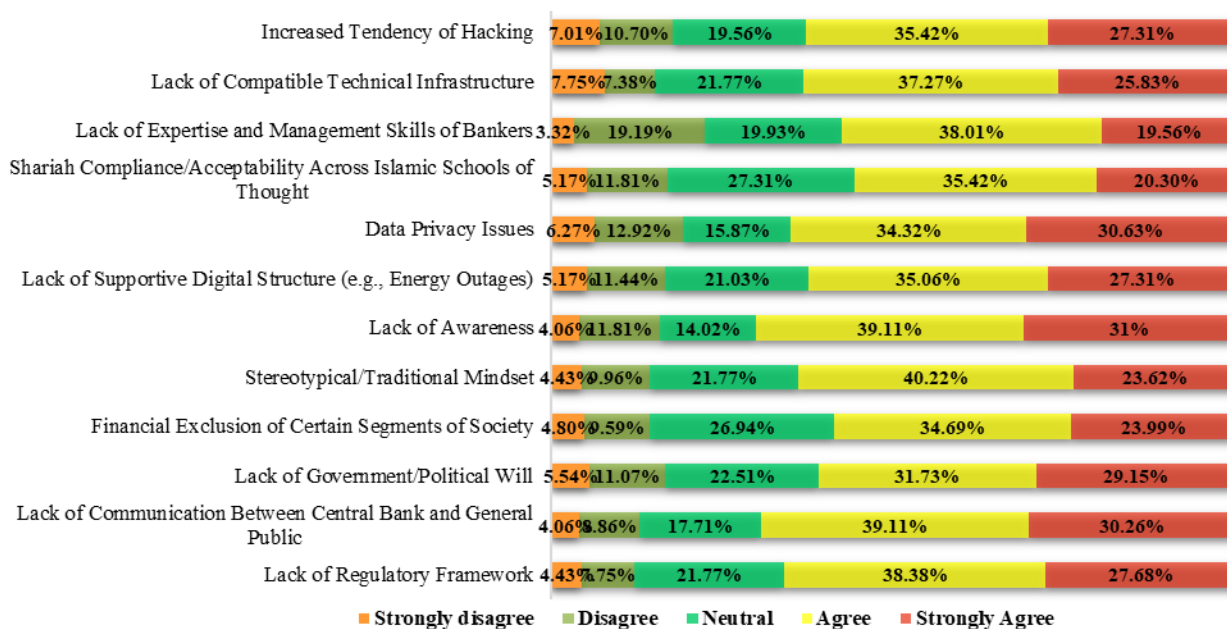


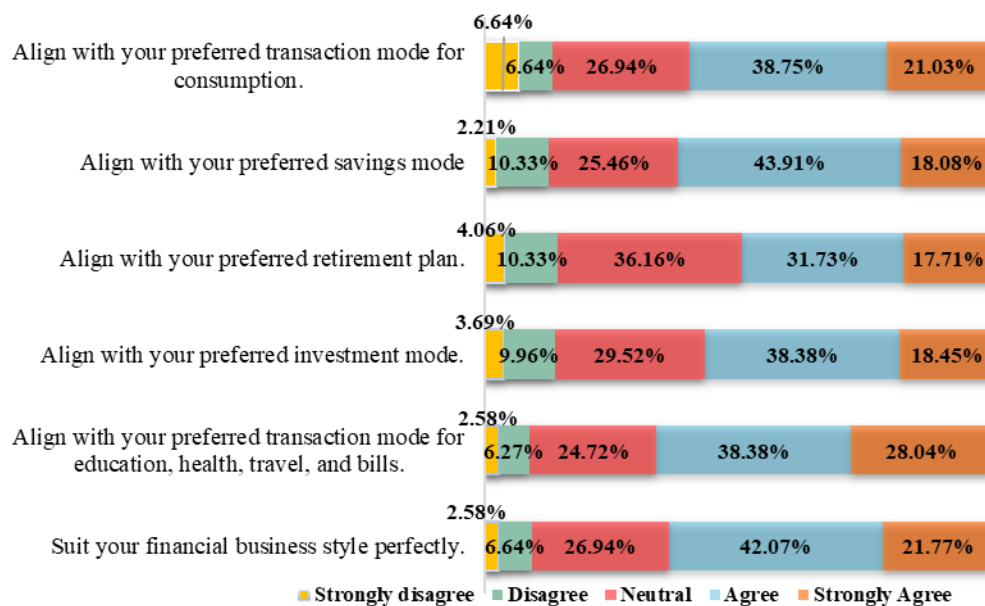
Figure 39: Perceived Challenges of CBDC at the Economy Level



6.1.8 Compatibility

This section provides how well CBDC aligns with the existing financial management practices and preferences across various aspects. Figure 40 presents the compatibility of CBDC with the existing financial modes of transactions. The majority of the respondents believe that CBDC is highly compatible with their preferred mode of transaction used for education, health, and travel-related payments. Similarly, they also agree that CBDC is compatible with their current business styles and mode of savings. However, respondents disagree that CBDC would align with their preferred retirement plans.

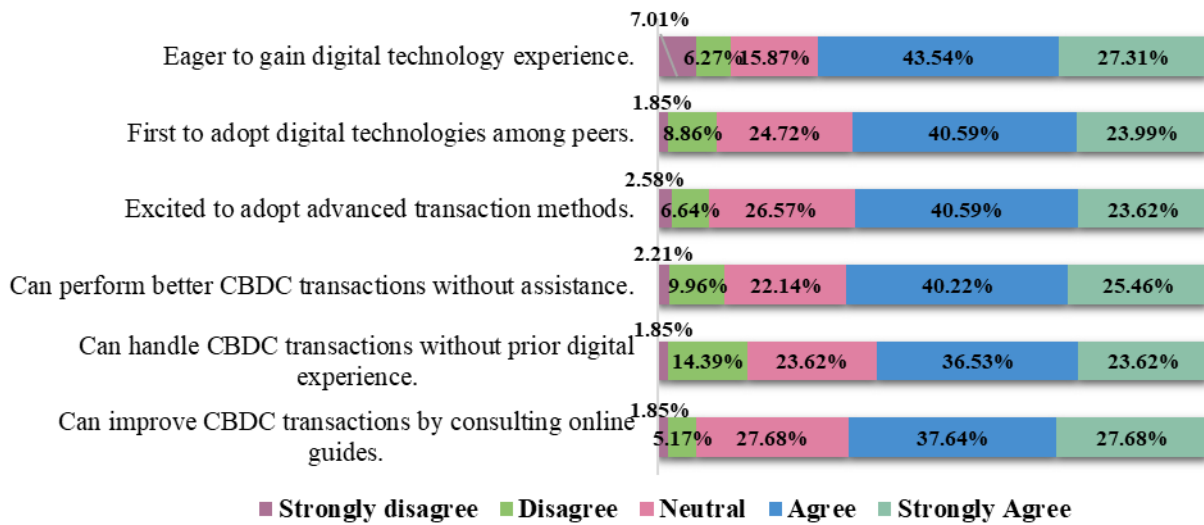
Figure 40: Compatibility of CBDC



6.1.9 Personal Innovativeness with digital technology and Digital Self-Efficacy

Figure 41 displays the respondent's innovativeness role in the adoption of CBDC. About 70% of respondents agreed that they are willing to adopt CBDC because they are eager to gain digital technology experience. They also believed that they could master CBDC-based transactions only by consulting online guides without any further assistance. However, people also showed their concern that the adoption of CBDC would not be easy without any prior digital experience.

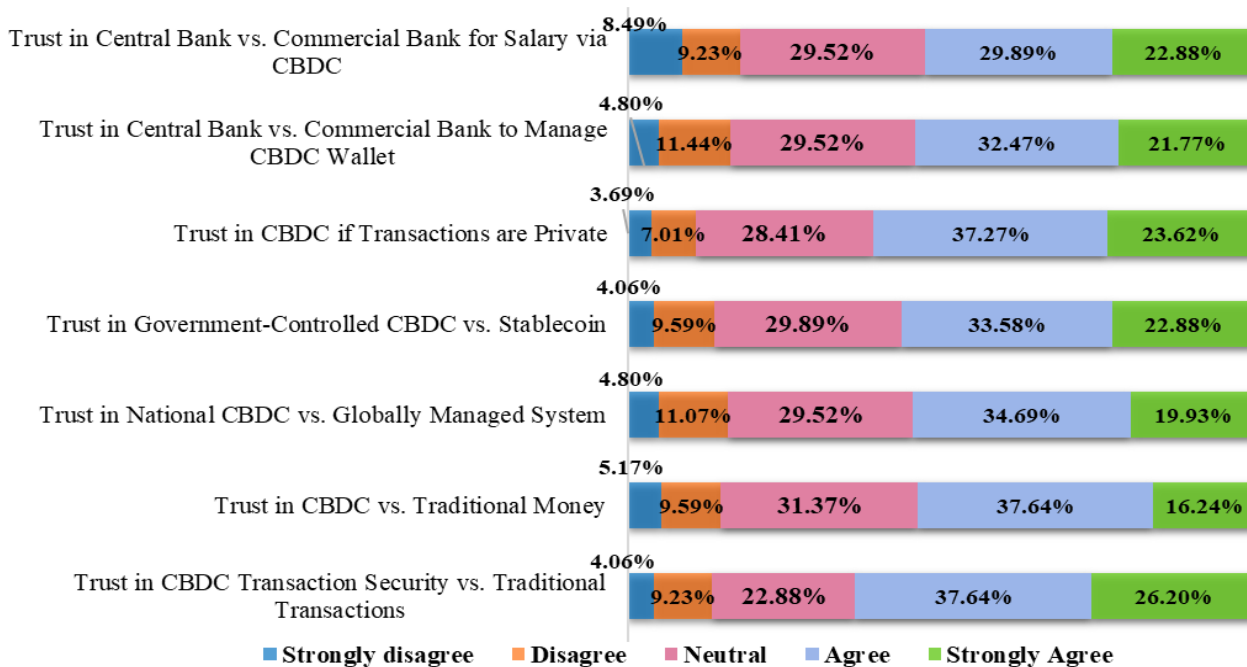
Figure 41: Personal Innovativeness



6.1.10 Level of Trust in CBDC

Figure 42 illustrates various dimensions of trust in CBDC compared to traditional financial systems, institutions, and transactions. It is observed that perceived trust of the general public is high if CBDC offers high transaction security (64%) and privacy (61%) as compared to traditional modes. However, 54% of respondents stated that they are still ambiguous about their trust in CBDC compared to traditional money. Further, this ambiguity also lies in the responses for trust in central bank Vs commercial banks for salary advancements and managing digital wallets.

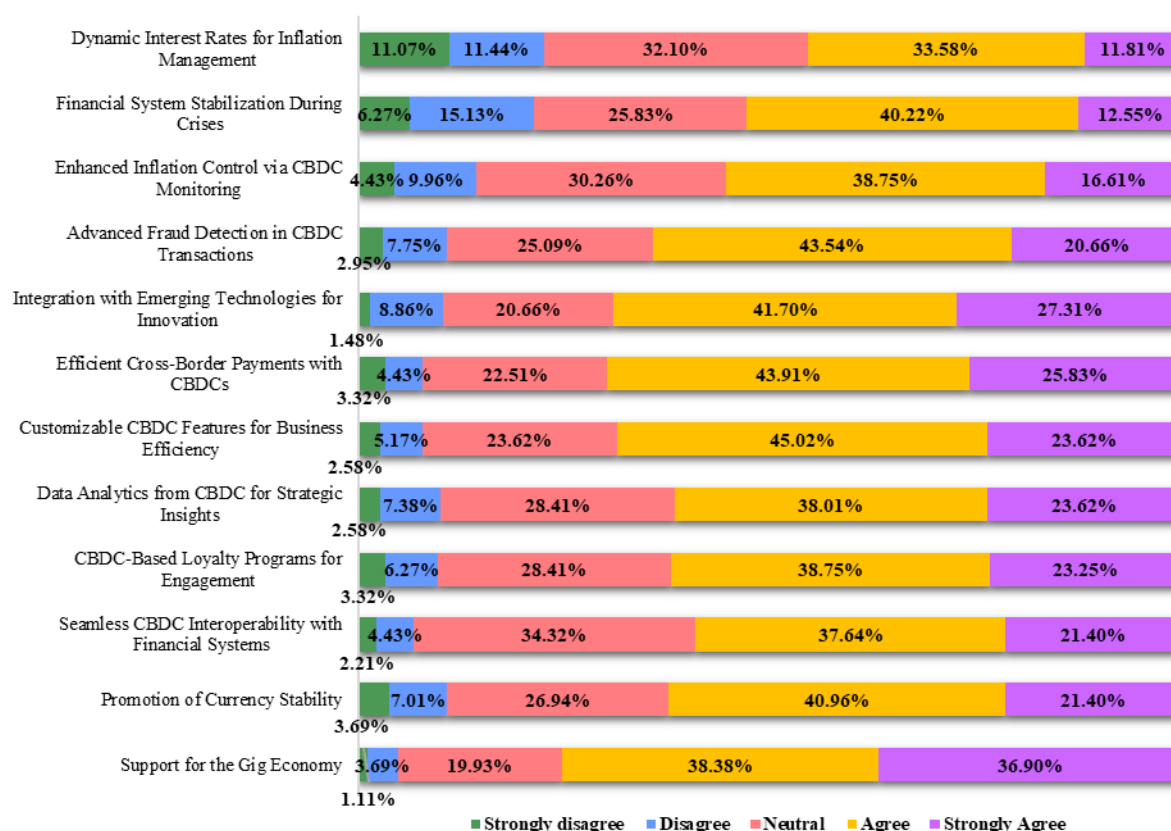
Figure 42: Trust Level



6.1.11 Future Considerations

This section provides insights into the potential of CBDC in enhancing financial system efficiency, security, and scalability, as depicted in Figure 43. 75% of respondents agree that CBDC would promote the Gig economy in the future. Similarly, the majority of the respondents agree that CBDC would facilitate cross-border payments, will increase business efficiency, and will also promote technological innovations. However, most of the respondents (54%) disagree that CBDC can be used as a monetary policy tool for inflation management.

Figure 43: Future Considerations regarding CBDC

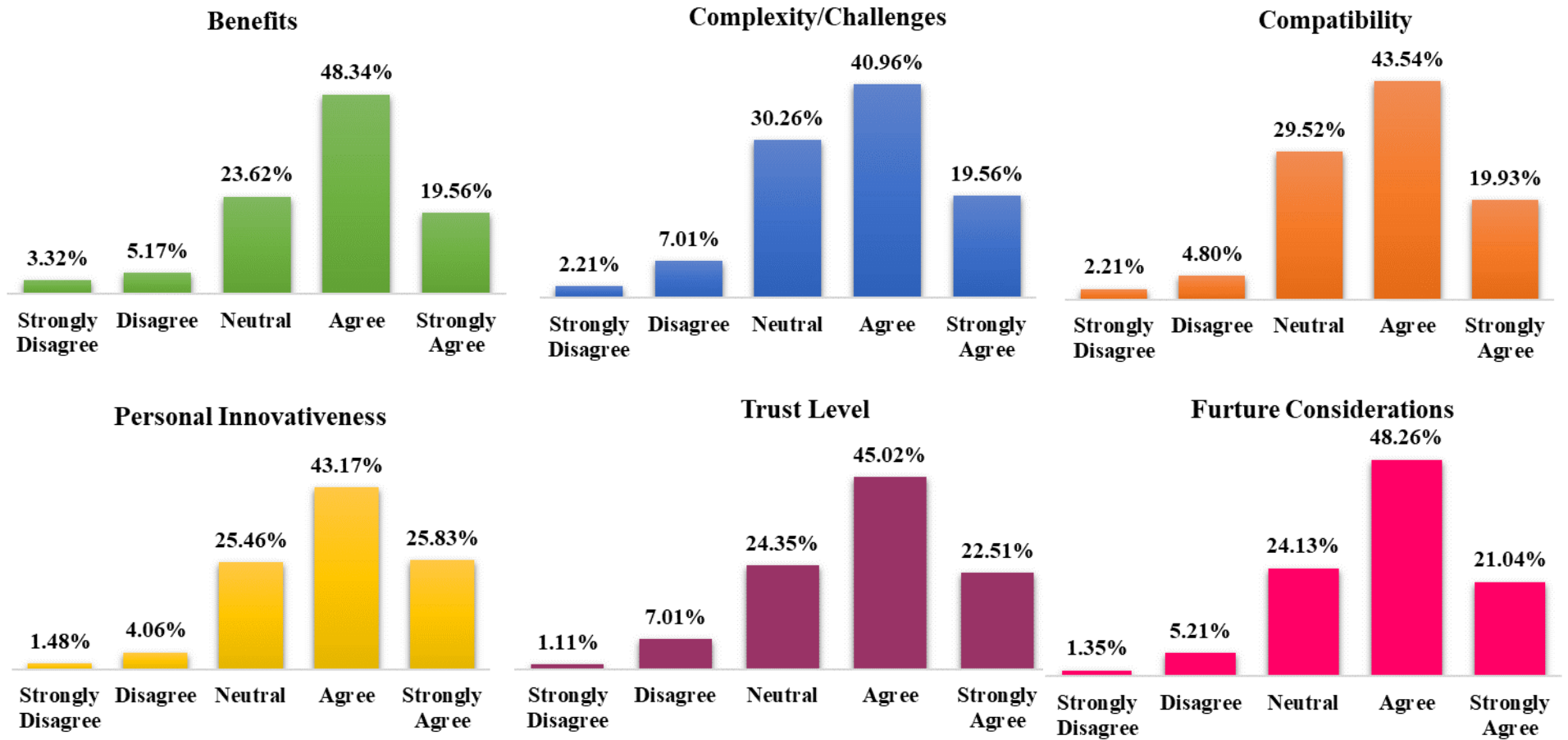


6.1.12 Summary of Findings from General Public: Average Response

To capture the above-stated dimension, an index of each dimension has been constructed to gauge the holistic picture of each Figure 44 presents the indices based on the responses from the general public. The composite index of Benefits shows that many respondents recognize significant economic advantages of CBDC, particularly in financial inclusion, transaction efficiency, and reduced cross-border payment costs, indicating a generally positive economic attitude. However, the index of Complexity/Challenges reflects a more dispersed response, with some participants acknowledging the complexities involved in CBDC adoption, likely due to infrastructure demands and adaptation costs, suggesting the need for investments and policy adjustments. Regarding Compatibility, most respondents believe CBDC would integrate well with existing financial systems,

implying minimal disruption to current banking structures. For personal innovativeness, a positive bias indicates that many individuals are open to embracing digital financial solutions, reinforcing the potential for demand-driven innovation in financial services. The Trust Level Index reveals that most respondents have confidence in CBDC, associating them with economic stability and security, strengthening the public case for their adoption. Finally, the index capturing the future considerations suggests a forward-looking view, with participants perceiving long-term benefits from CBDC, such as operational ease and enhanced digital financial services. Overall, the benefits category shows the strongest support, highlighting that public backing for CBDC is primarily driven by expectations of economic efficiency and cost reduction.

Figure 44: Average Response regarding CBDC: General Public



6.2. Analyses from Survey Data of Merchants/Businesses

6.2.1. Introduction

This section presents the findings and insights derived from data collected from businesses and merchants to evaluate their preparedness and acceptance of CBDC. The results are organized around six key themes: (i) benefits of CBDC, (ii) perceived ease of use and utility, (iii) challenges and compatibility with existing practices, (iv) merchants' innovativeness, (v) trust in the central bank and other financial institutions, and (vi) future outlook on digital currency.

The analysis is based on the survey of 142 merchants in Rawalpindi and Islamabad. These merchants are categorized into four groups: wholesalers, retailers, service providers, and manufacturers.

6.2.2. Demographic Profile of Merchants

Figures 45 and 46 present the demographic profile of merchants. The data showed that the 26-50 age group represents the largest proportion of merchants for both males (88.73%) and females (11.26%). Notably, 52% of the merchants had 16 years of education and/or above. The majority of merchants have been doing business for over 10 years, retail business owners dominate the market (44.36%), and about 15% of the merchants are also involved in international dealings. About 61% of the merchants operate under sole proprietorships, while a small proportion (8%) run the corporations. Most of the businesses are registered (84.51%) and 86.62% of merchants are tax filers. Regarding current payment modes that merchants use themselves, ATMs are the most utilized, with 76.80% of merchants, indicating familiarity with digital tools, and also depicting strong inclusion in the financial sector.

In terms of fintech knowledge, most of the respondents (58%) rate themselves as having good-to-excellent knowledge. 83.66% of merchants have prior experience of dealing in digital transactions. Moreover, 70% of the respondents demonstrated comfort in using digital technology. 76% showed reliance on the traditional mode of payments i.e. cash/physical currency. Nonetheless, more than 65% are also using mobile banking apps and internet banking for financial transactions. As far as the current mode of payment for personal transactions is concerned, merchants rely mostly on ATMs (76.8%) and mobile banking apps (78.2%). 32% of the merchants have already shifted 40-60% of their transactions to online modes. As far as the adoption of CBDC for business transactions is concerned, almost 50% of merchants found it very likely to happen. About 60% of the respondents had little or no knowledge of CBDC. For the rest, the main source of information on CBDC remains the social media. The primary motivation to adopt CBDC is to reduce the cost of cash handling followed by the desire to satisfy tax-savvy customers, lower transaction fees, and to maintain competitiveness. About 42% of the merchants showed willingness to adopt CBDC within 1-6 months while others may take more than one year. Notably 18.31% intended to shift to CBDC instantly. The majority of the respondents (78.40 %) preference is non-interest bearing CBDC and 50% would like to use CBDC for online and physical shopping.

Figure 45: Respondents' Demographics and Digital Information

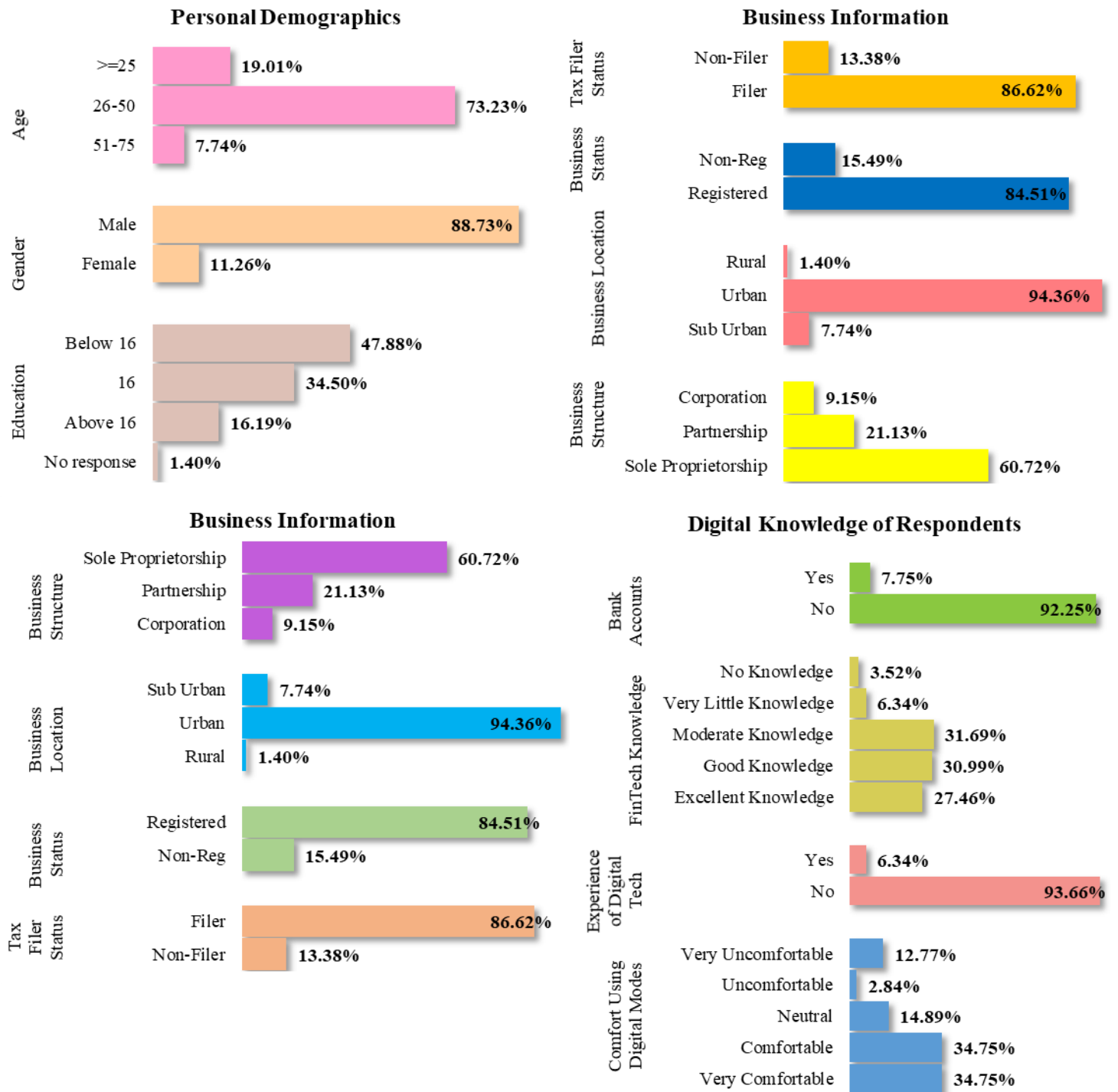
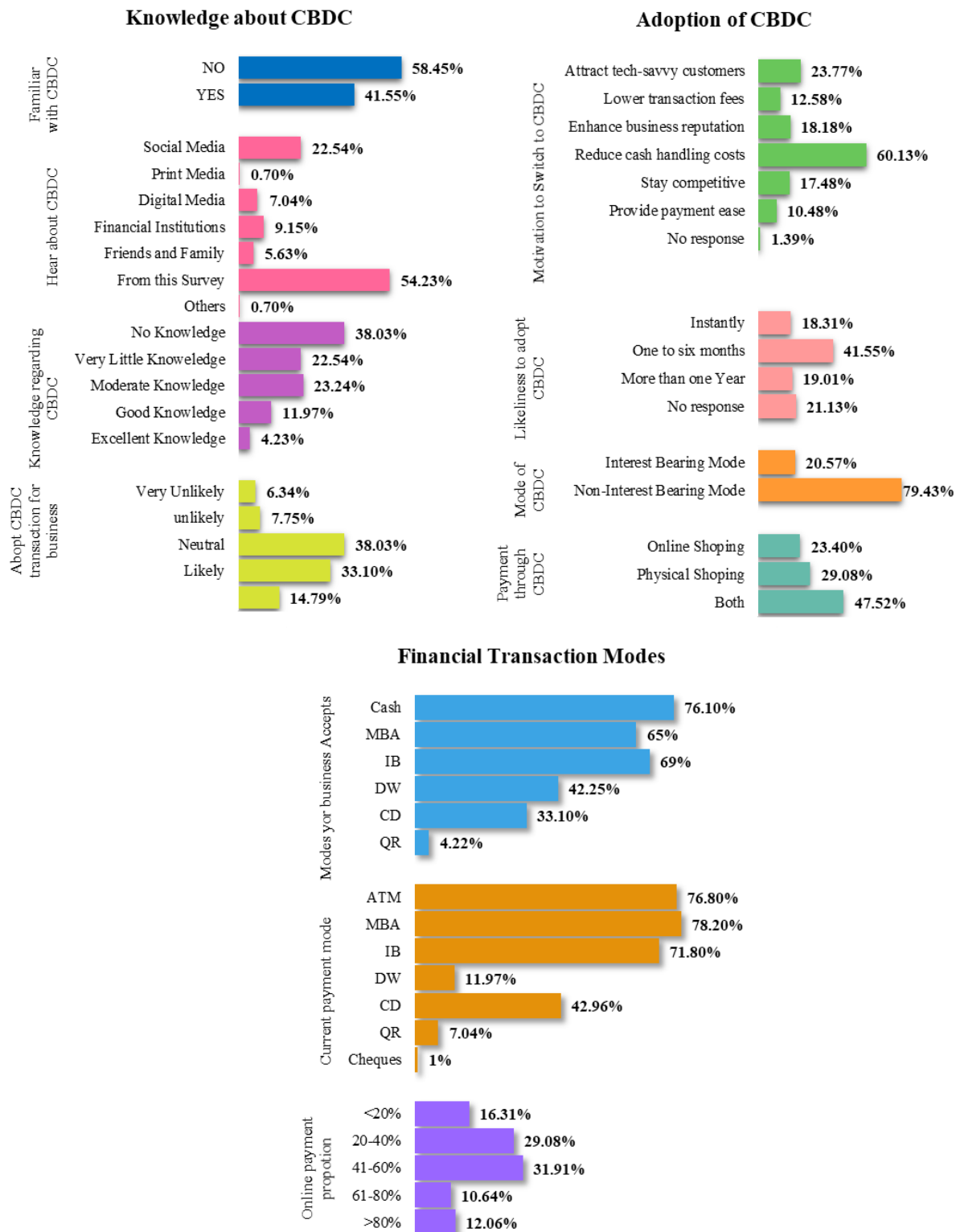


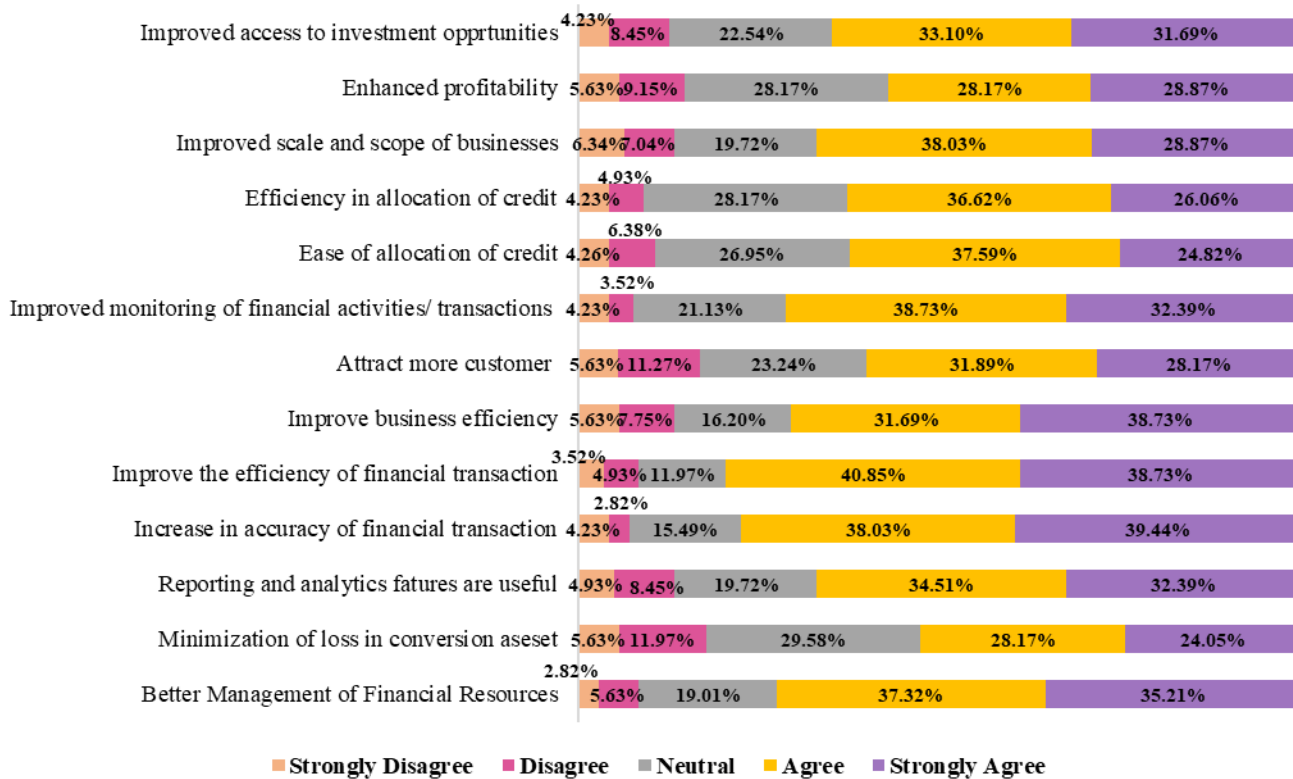
Figure 46: CBDC Knowledge, Adoption and Modes of Financial Transactions



6.2.3. Relative Advantages and Perceived Usefulness

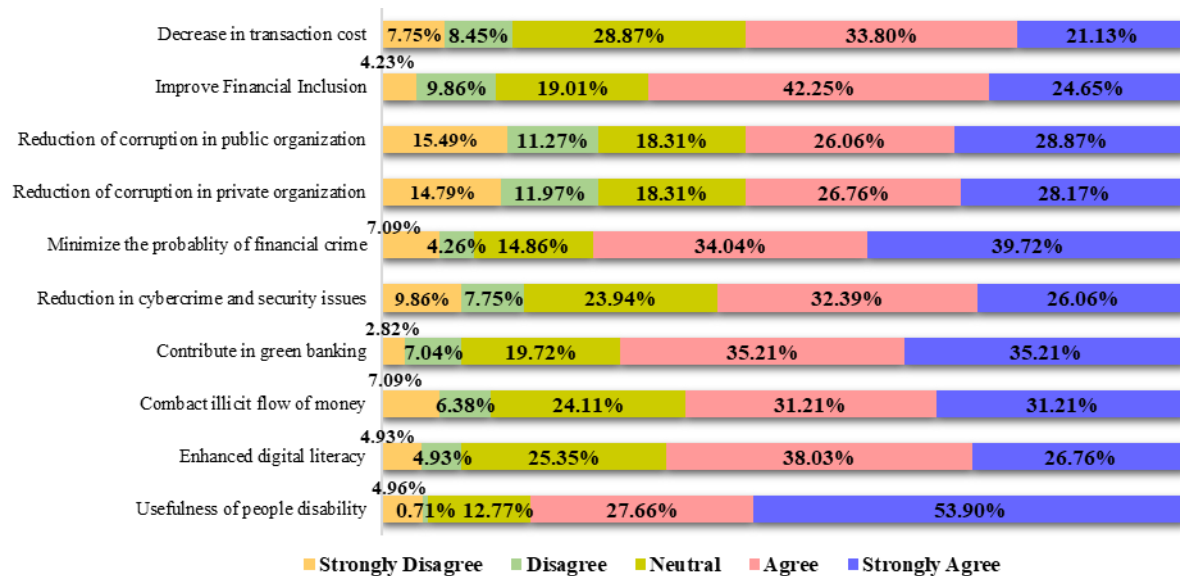
Figure 47 explains the perception of merchants on the potential advantages of CBDC over traditional banking systems. The analysis of relative advantages has further been broken down into two dimensions: benefits at the economy level and benefits at the business level. Accuracy and efficiency of financial transactions along with better management of financial resources appeared the most promising benefits of CBDC. However, respondents did not consider CBDC useful for the minimization of loss in asset conversion, attracting more customers, and increasing profitability of the business as potential benefits of CBDC.

Figure 47: Benefits and Usefulness of CBDC at Business Level



At economy level, minimizing the probability of financial crimes, improving financial inclusion, and green banking happened to attain greater agreement to be the potential benefits. On the other hand, merchants did not consider CBDC to be useful for people with disabilities. Moreover, a decrease in transaction costs and, a reduction in corruption in public and private organizations could not earn substantial agreement from the merchants.

Figure 48: Benefits and Usefulness of CBDC at Economy Level



6.2.4. Perceived Ease of Use

Figure 49 provides a breakdown of respondents' opinions on the perceived ease of use of CBDC at individual and at macro levels.

At both individual and economy levels, approximately 82% of merchants agree that CBDC will save time and reduce travel costs due to the ease of remote digital transactions. Moreover, CBDC is also perceived to create ease in cross-border payment as well by a substantial number of merchants (74%). At the economy level, ease in financial transactions (78%), user-friendly interface (77%), and fast processing (72%) in financial transactions, standardized payment methods (71.8%) are recorded as the most agreed ease of use of CBDC.

Figure 49: Perceived Ease of Use at Individual Level

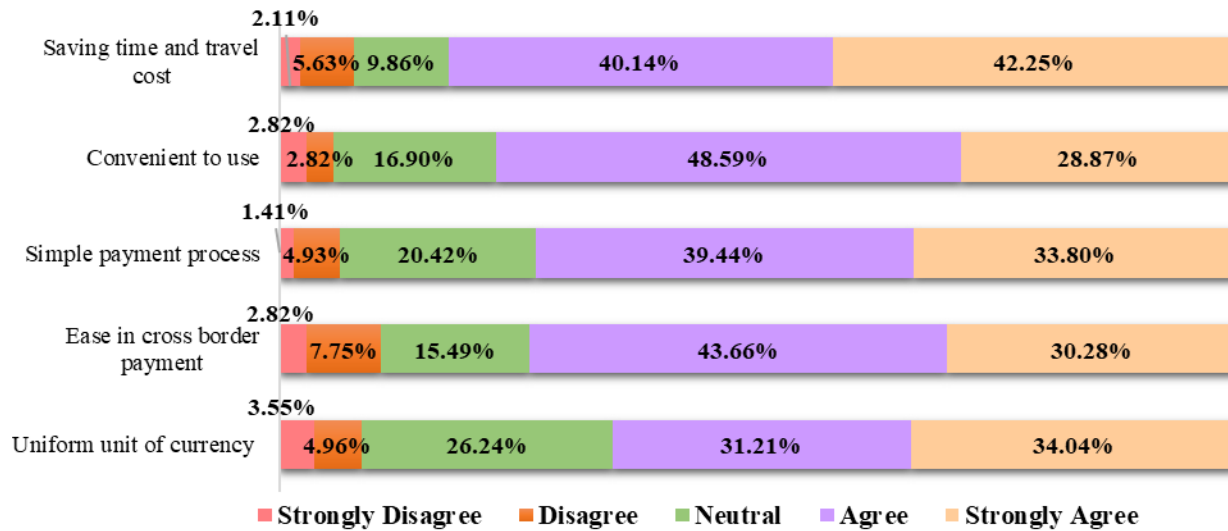
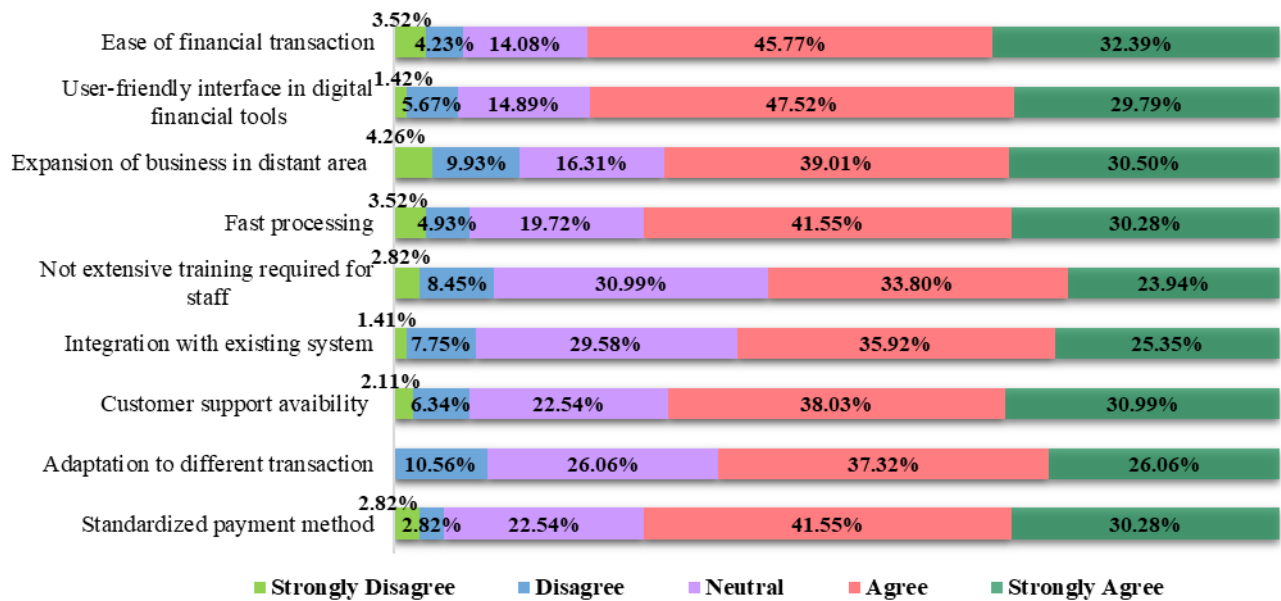


Figure 50: Perceived Ease of Use at Economy Level



6.2.5. Challenges/Complexity

Figures 51 and 52 present insights related to the perceived challenges regarding the adoption of CBDC in Pakistan. At the individual level, lack of literate people (77%), traditional mindset (64%), lack of awareness (63%), lack of expertise and management skills (63%), lack of awareness (63%), appeared important factors that can pose a challenge in the implementation of CBDC. At economy level, the risk of fraud (66%), compatibility of the payment system (65%), and risk of hacking (64%), appeared as crucial factors to pose challenges in the implementation of CBDC.

Figure 51: Challenges of CBDC at the Individual Level

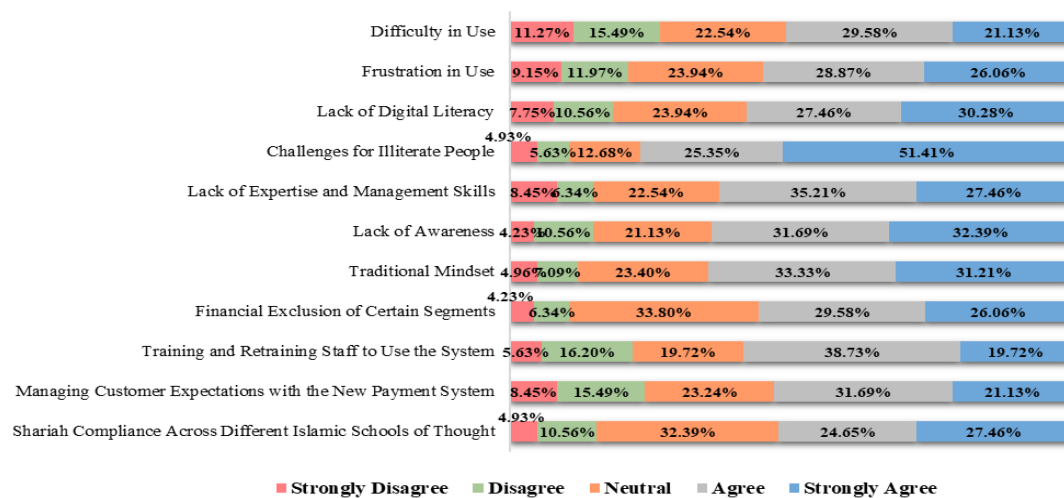
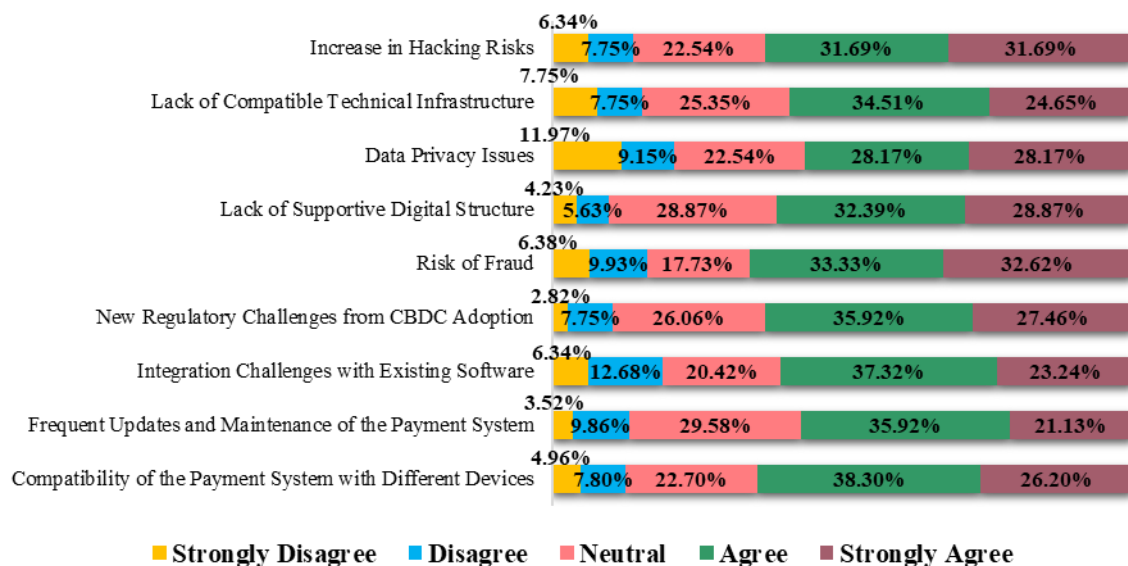


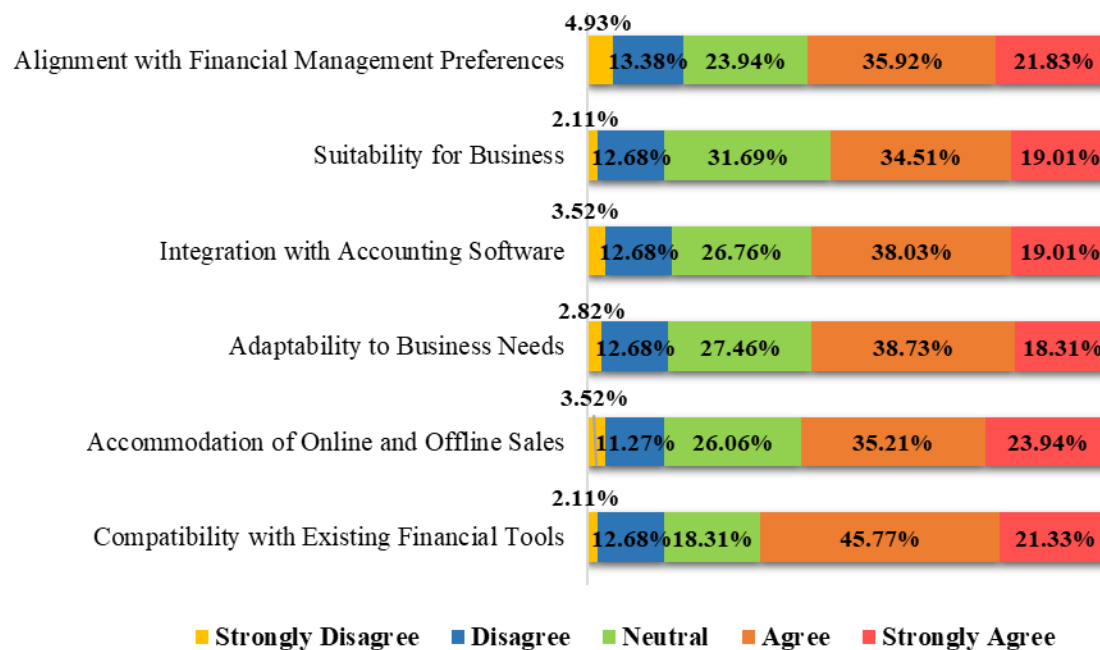
Figure 52: Challenges of CBDC at the Economy Level



6.2.6. Compatibility

Figure 53 explains merchants' perspective on the compatibility of CBDC in businesses in Pakistan. About 67% of merchants perceived CBDC as compatible with existing financial tools. They also see CBDC as well aligned with financial management preferences, and highly adaptable to business needs. Merchants also reported that CBDC can accommodate both online and offline sales and can be integrated with existing accounting software.

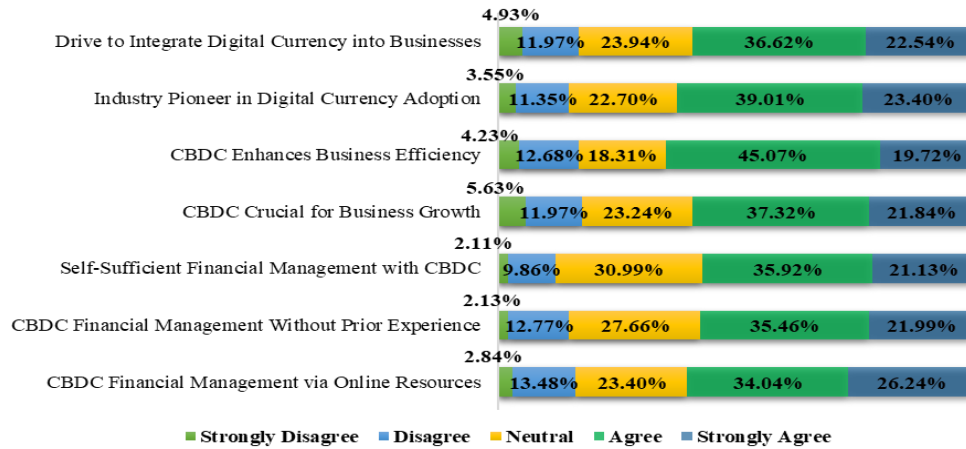
Figure 53: Compatibility of CBDC



6.2.7. Personal Innovativeness with Digital Technology and Digital Self-Efficacy

Figure 54 exhibits the role of personal innovativeness in the adoption of CBDC. Approximately 65% of merchants expressed their belief that CBDC enhances business efficiency, and 61% of the merchants showed interest in the adoption of CBC to become pioneers in the use of digital currency. CBDC's financial management for online resources and drive to integrate digital currency into businesses also appeared as highly agreed factors.

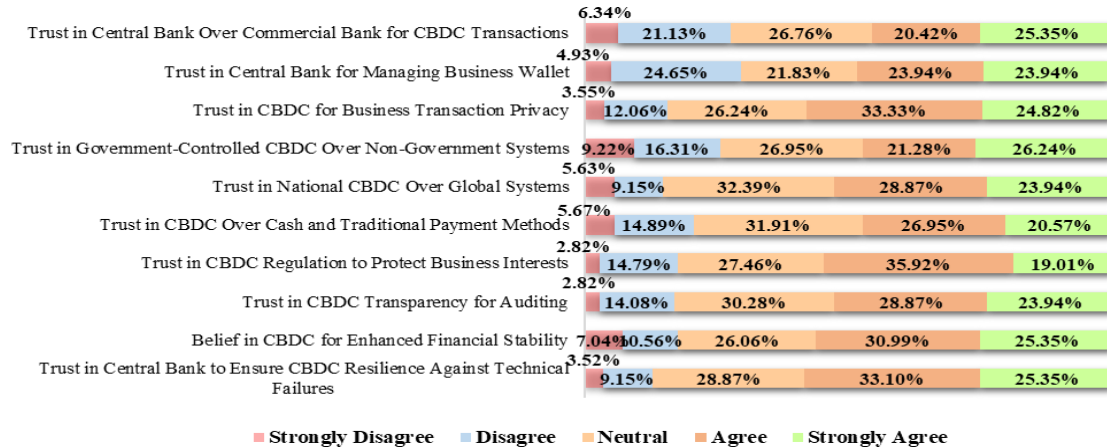
Figure 54: Personal Innovativeness of CBDC at Businesses



6.2.8. Level of Trust in CBDC

Figure 55 expresses the trust of merchants in the management and operation of CBDC. Business transaction privacy as well as trust in the central bank to ensure CBDC resilience towards technical failure are viewed as the most important trust factors. However, people did not show their trust in government-controlled CBDC over non-government systems, nor did they show substantial trust on CBDC over cash and traditional payment methods.

Figure 55: Trust Level on Banks regarding CBDC

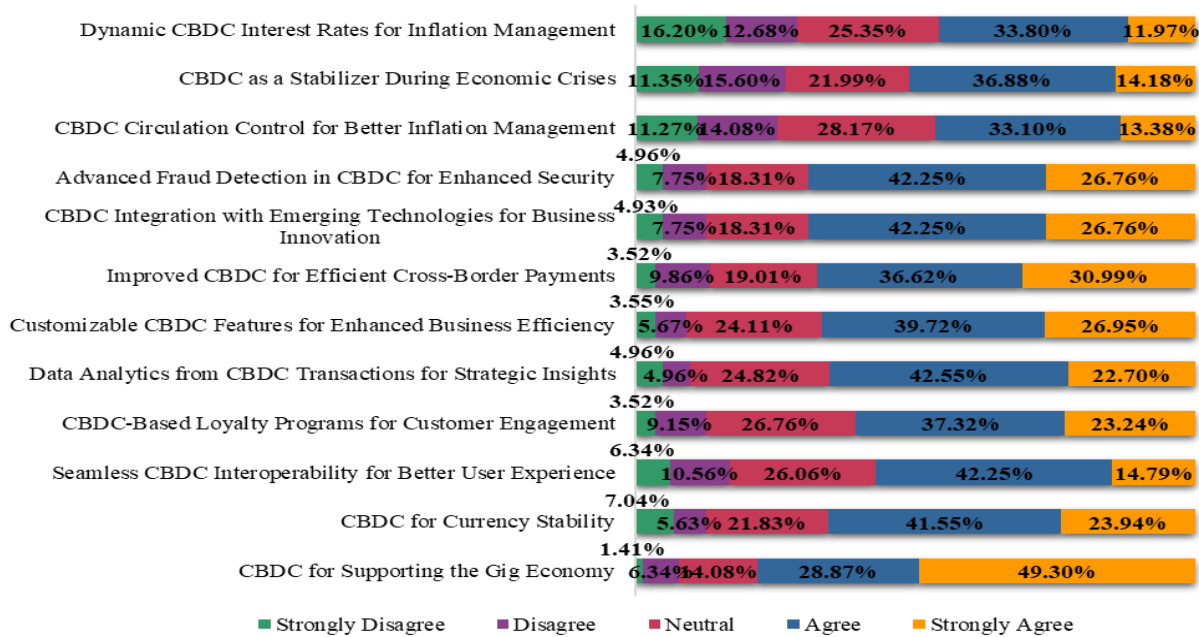


6.2.9. Future Considerations

This section highlights the potential of CBDC to improve financial stability, price stability, business innovation, and the gig economy from the perspective of merchants. Figure 6.24 exhibits the potential future impact of CBDC. Approximately 88% of the merchants viewed CBDC as pivotal for supporting the gig economy. For the effectiveness of CBDC in countering fraud and enhancing security, promoting emerging technologies for business innovations, increasing efficiency of cross-

border payments, increasing business efficiency, and maintaining currency stability in the future, a reasonably higher percentage of merchants agreed on the role of CBDC. Merchants, however, disagreed that CBDC could be used for better inflation management.

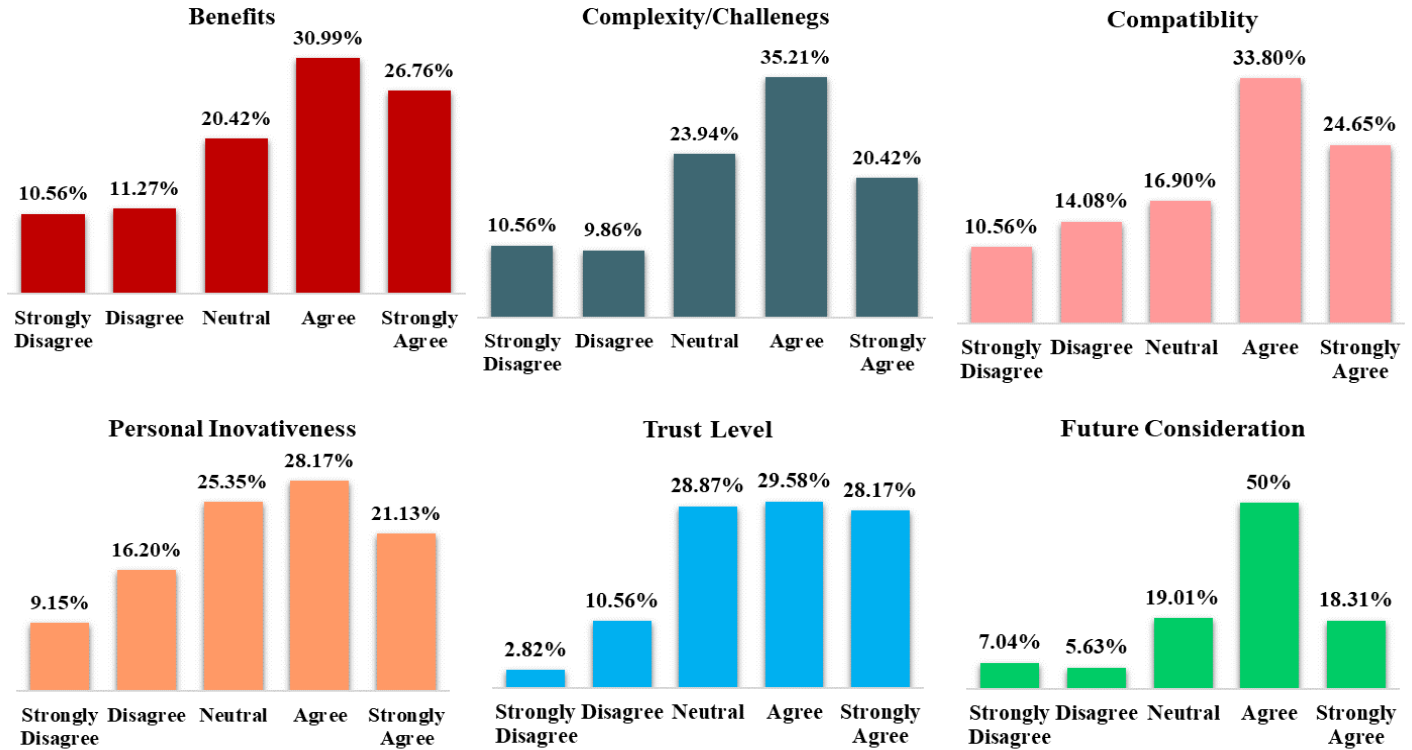
Figure 56: Future Considerations of CBDC



6.2.10. Summary of Findings: Average Response from the Merchants

Figure 57 explains the consolidated response from merchants on various aspects of CBDC. The Responses across the index of benefits are distributed towards agreement indicating that majority of merchants recognized the benefits of CBDC. Similarly, the complexity/challenges regarding the adoption of CBDC are also highlighted as majority of participants believe that challenges would occur in the adoption of CBDC. In addition, majority of merchants expressed that CBDC would be compatible with existing modes of the financial system in Pakistan. Moreover, majority of respondents believe that personal innovativeness would be a primary motive to adopt CBDC and majority of participants hold a strong trust in CBDC and believe that CBDC has important future considerations. It is pertinent to note that future consideration of CBDC has scored the highest agreement as compared to the other dimensions of CBDC among merchants.

Figure 57: Average Response regarding CBDC: Merchants



6.3. Analysis of Survey Data from Financial Institution

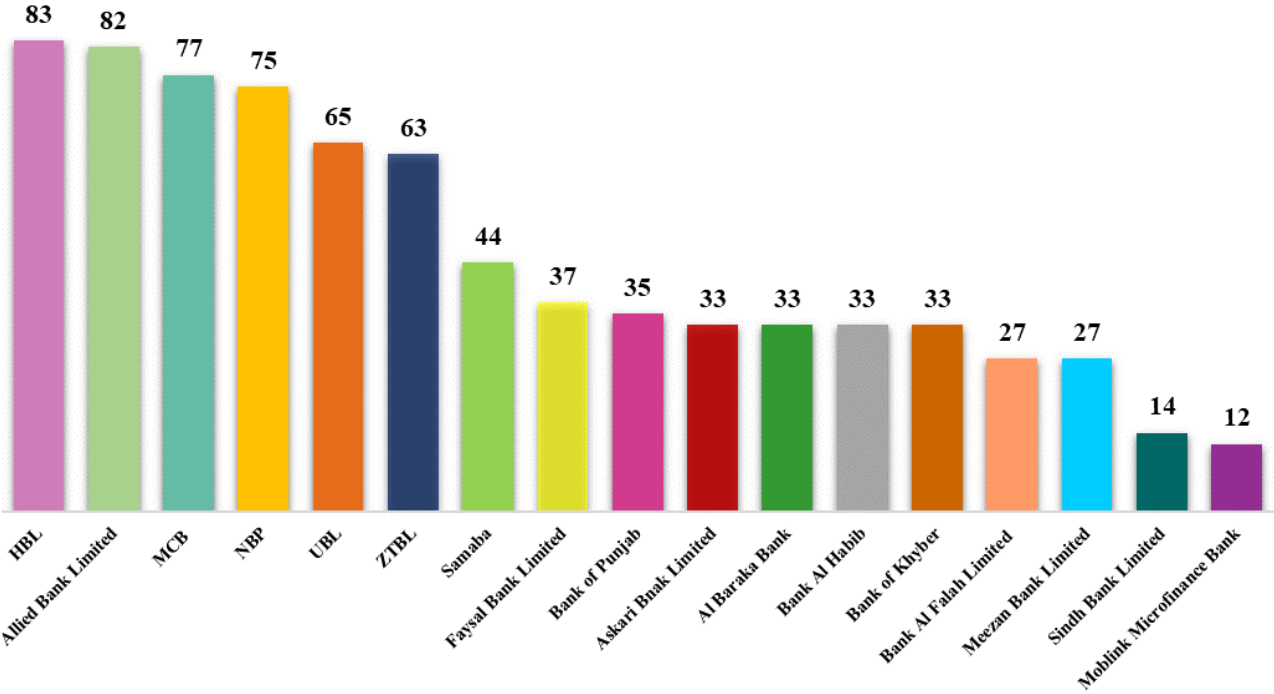
6.3.1. Introduction

The survey was conducted across 38 bank and non-bank financial institutions in Rawalpindi and Islamabad to gain insights on the level of experience in the digital finance sector, as the State Bank of Pakistan moves towards the introduction of CBDC.

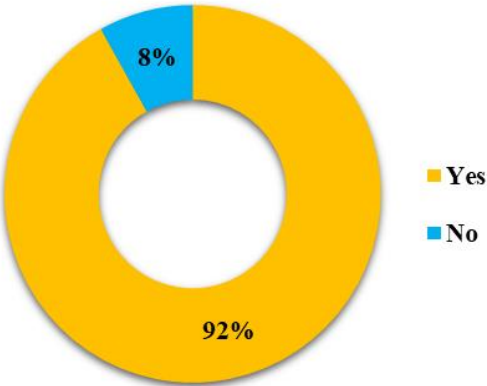
6.3.2. Profile of Financial Institutions

Figure 58 - 60 explains the profile of financial institutions (FI). Out of the total 38 financial institutions, the oldest financial institutions are HBL and Allied Bank Limited whereas Mobilink individual finance bank appeared as the youngest with 12 years of existence. 82% of these FIs are RAAST partners and 78% operate in both conventional and Islamic modes. Under both modes, conventional FI provides a diverse range of digital products including mobile and internet banking, credit/debit cards, ATMs, digital wallets and other apps, etc. 32% of FIs reported receiving training on digital financial services, and only 27% have attended seminars conducted by SBP, and 32% of FIs had the experience of dealing in digital currency.

Figure 58: Age of Financial Institutions



Raast Partner



Islamic Window

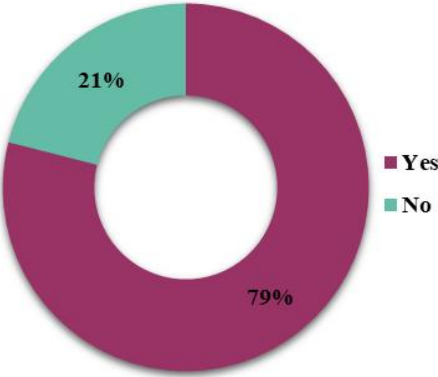
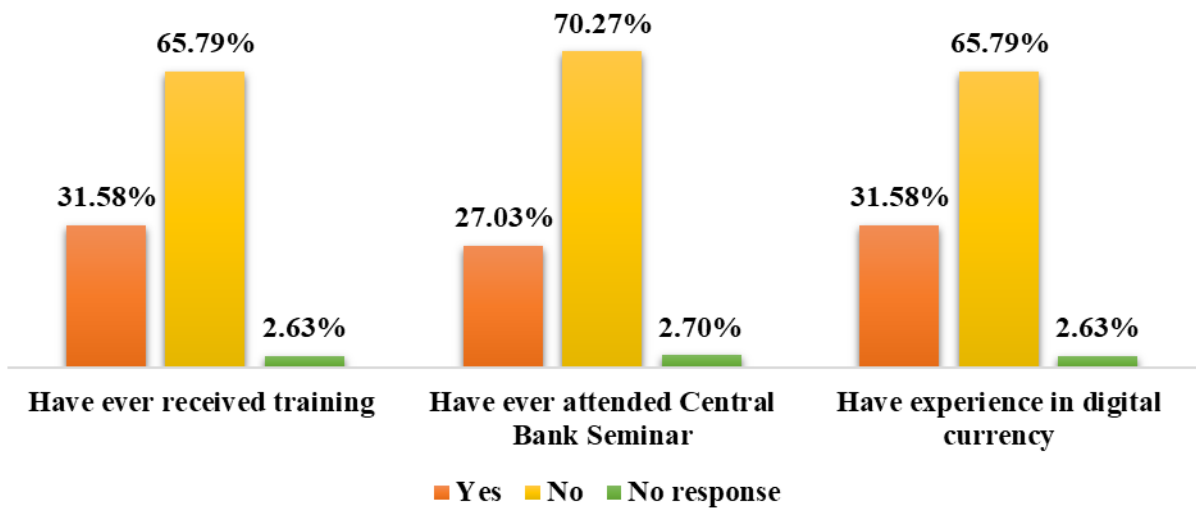


Figure 59: Digital Products and Services of Banks



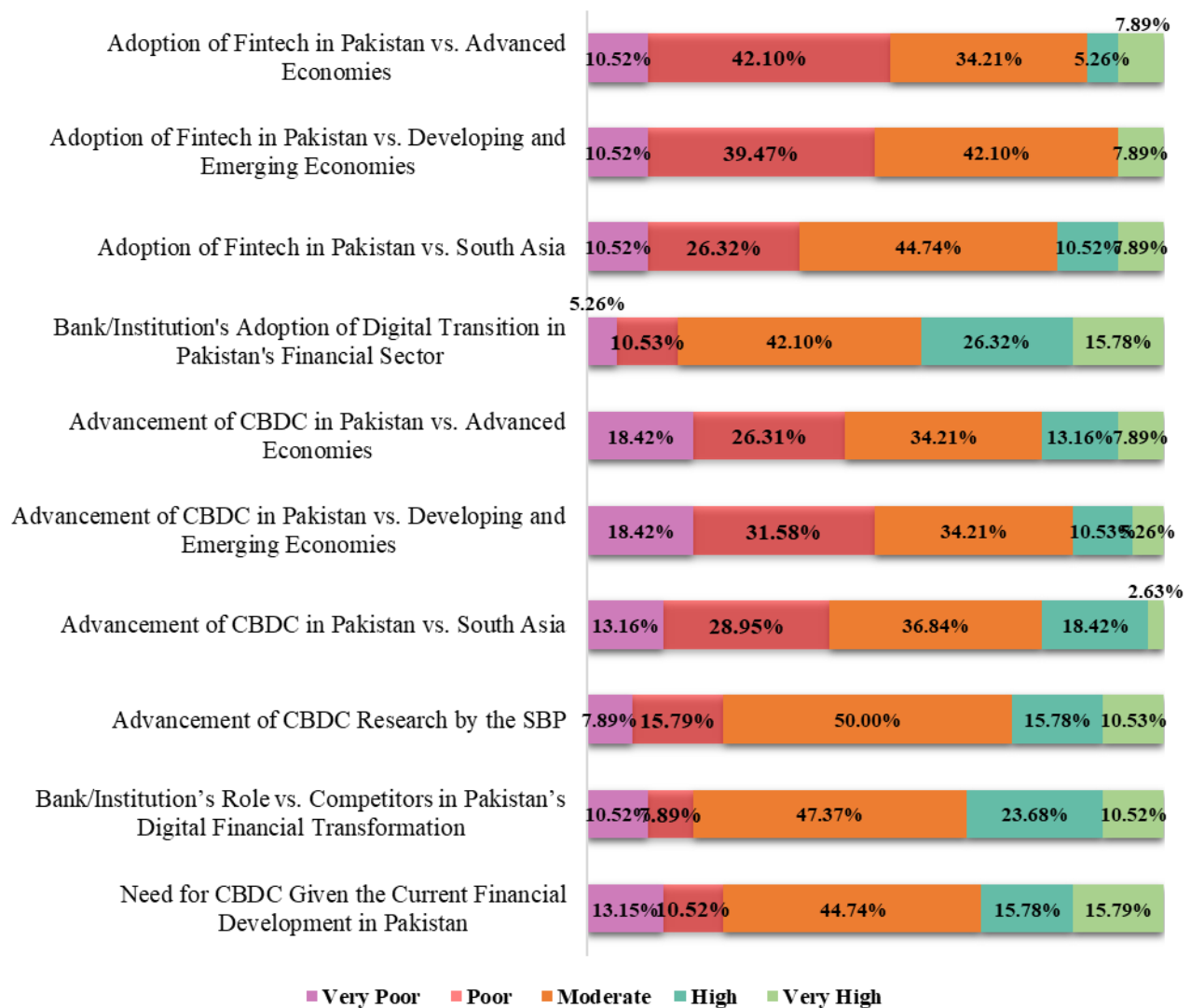
Figure 60: Bank's Experiences Regarding Digital/Financial Technology



6.2.3. Perception of Fintech and CBDC

Figure 61 presents the perception of financial institutions about financial technology. About 14% (8%) of the respondents considered the adoption of Fintech in Pakistan comparable to other advanced (emerging economies) of the globe. Most of the responses in this regard revealed moderate adoption of Fintech in Pakistan. Similarly, the advancement of CBDC in Pakistan compared to other countries specifically South Asian countries is significantly low (20%) according to responses. Only a small proportion of the respondents (26%) considered a moderate level of research by SBP on the Advancement of CBDC. Similarly, 32% of the respondents viewed that CBDC is essential for financial development.

Figure 61: Respondents' Perceptions of Fintech and CBDC



6.3.4. Potential Benefits of CBDC

Figure 62 displays the potential benefits of CBDC at the bank level, from a financial institution's perspective. Majority of the respondents (more than 50%) considered CBDC as an effective tool for countering illicit financial flows, increasing bank competition and discipline, enhancing monitoring and accountability of financial transactions, reducing tax avoidance, and increasing digital literacy. Nonetheless, recovery of bad debt, improving financial stability, improvement in investment and funds allocation, profitability, and stability of banking sectors are not viewed as potential benefits of CBDC by the majority.

At economy level (Figure 63), reducing the monetary cost of financial transactions and improving the compatibility of Pakistan's financial sector with the global economy attained majority of responses. A vast majority (60%) believed that CBDC does not have the potential to increase the efficacy of monetary policy, nor can it be a significant driver of economic growth and development.

Figure 62: Potential Benefits of CBDC at Financial Institutions Level

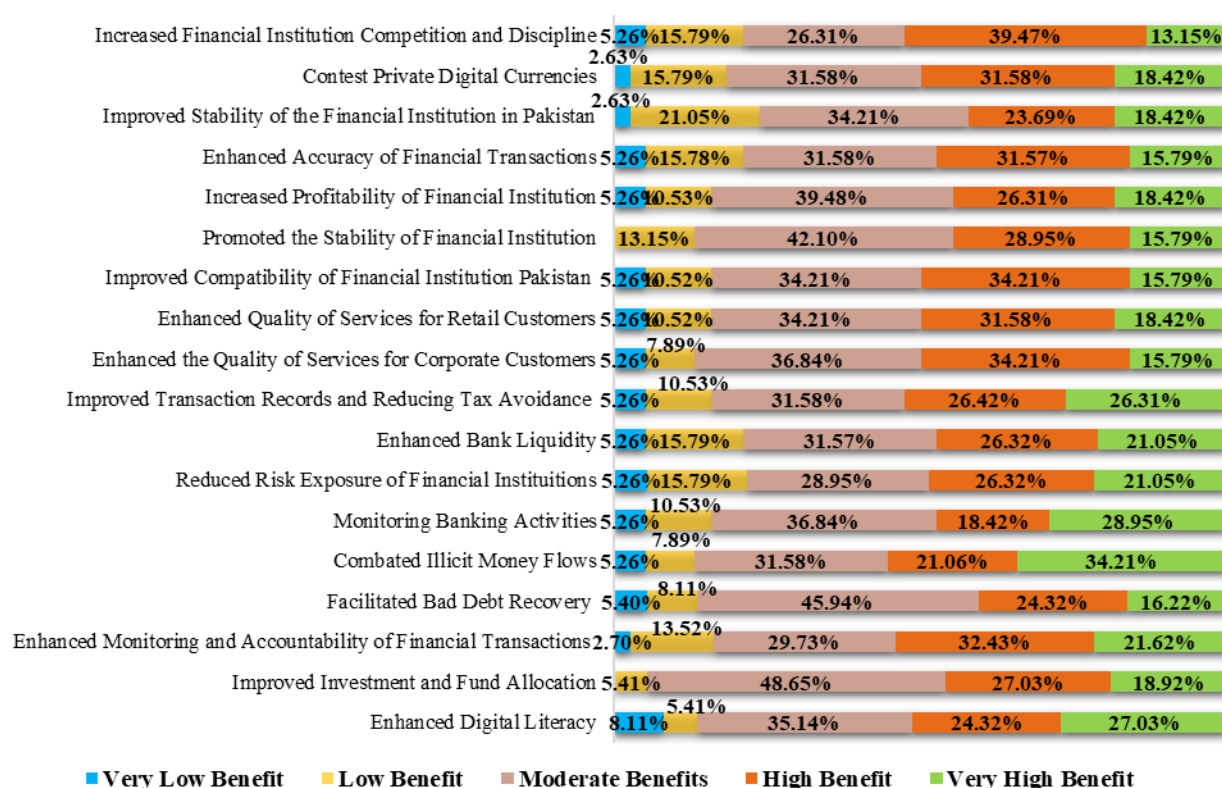
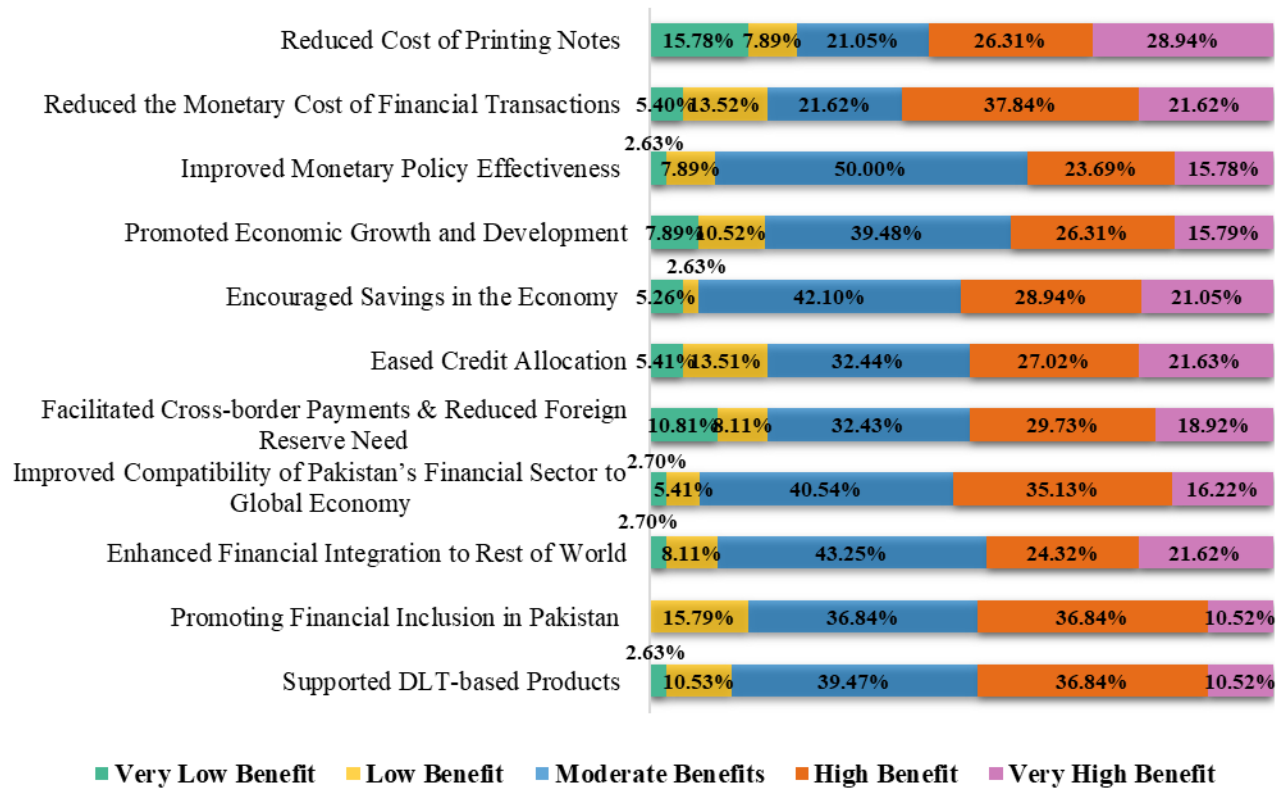


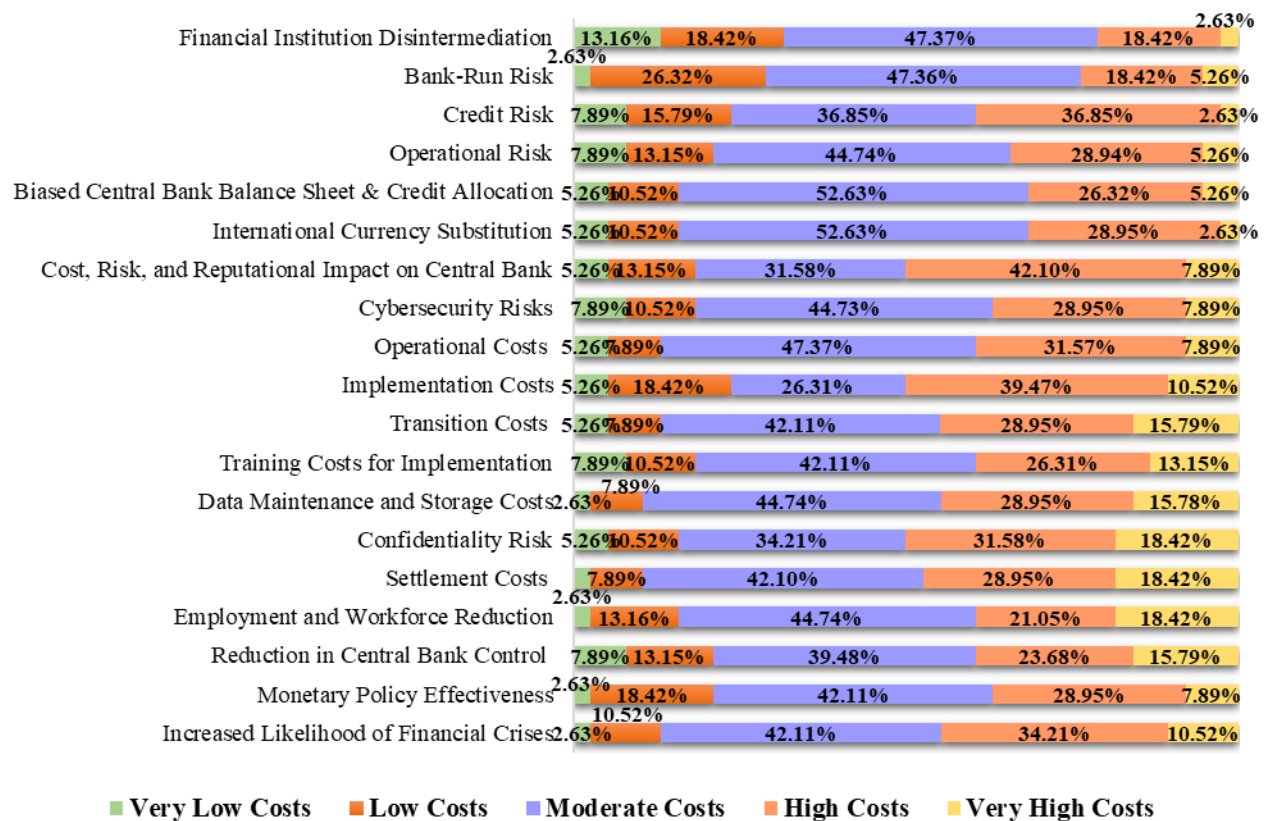
Figure 63: Potential Benefits of CBDC at Economy Level



6.3.5. Potential Financial and Economic Costs/Risks

Figure 64 explains the financial and economic costs of CBDC. The most important cost of CBDC appeared as the implementation cost, and risk and reputational impact of CBDC, confidentiality risk, increase in the likelihood of financial crisis. On the other hand, respondents are of the view that bank disintermediation and bank run risk may not appear as adverse implications of CBDC.

Figure 64: Potential Costs and Risks Associated with CBDC

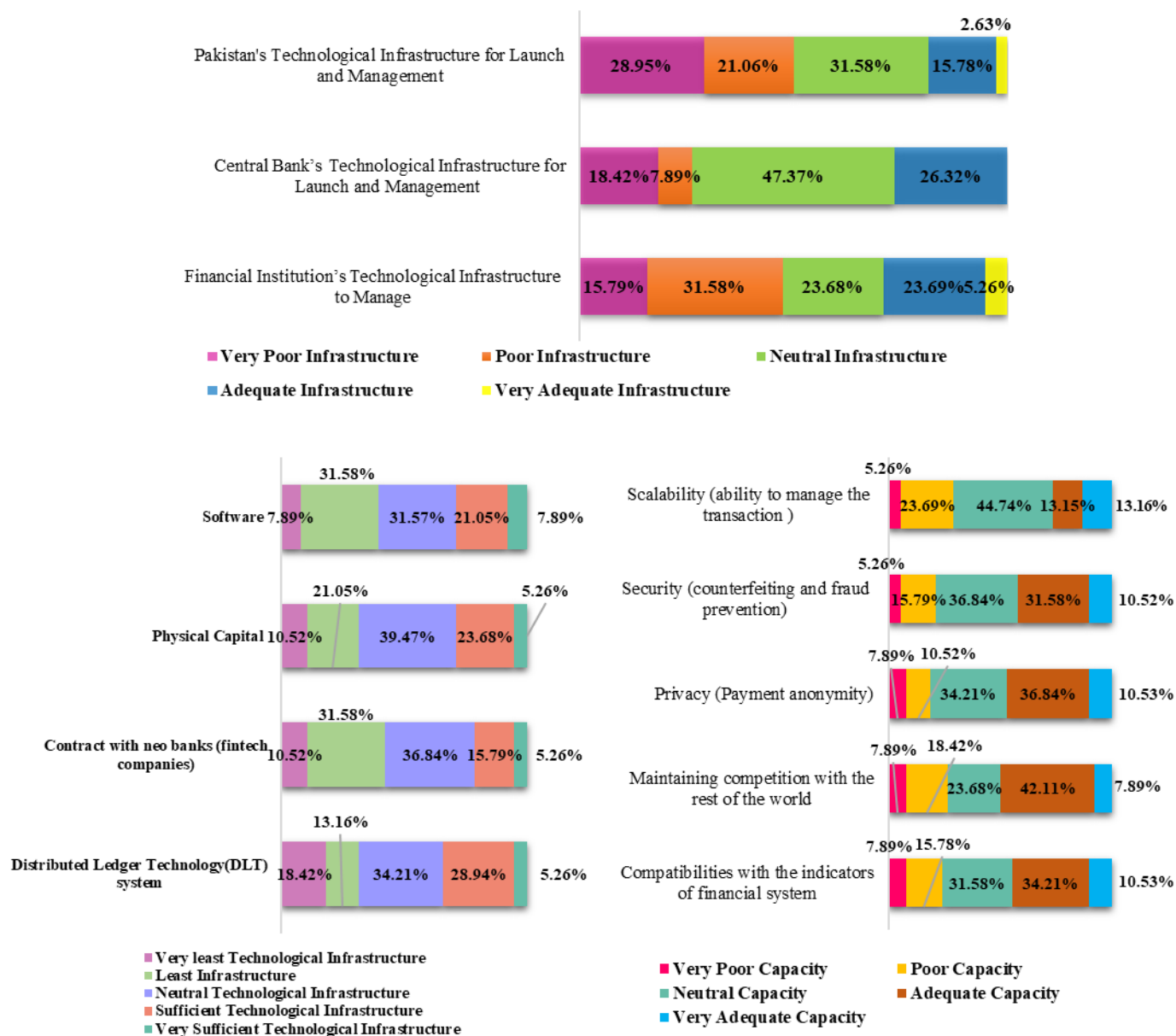


6.3.6. Technical Adequacy

Figure 65 represents the opinion of the representative of financial institutions about technical adequacy of financial institutions. Approximately 26.32% of the respondents considered the technological infrastructure of Pakistan as adequate for the launch and management of CBDC, only about 16% viewed the State Bank of Pakistan's infrastructure as suitable for CBDC and 23% agreed that their particular financial institution as ready for the management and launch of CBDC, technologically.

Figure 66 also describes the scaling of banks and non-bank financial institutions on various aspects of technological infrastructure and their capacity building. On software capabilities, responses exhibit moderate confidence at 31.57%; on physical capital, it is 38.47%; overall, these results suggest that steady improvement is ongoing but not adequate for modernization due to the inadequacy of infrastructure. For instance, DLT evaluation, size-ability challenges (the highest being at 44.74%), and security for prevention of fraud. Furthermore, privacy remains a concern and implies that payment anonymity must be improved by the banks. In conclusion, a huge amount of investment both in the hardware and software, ensuring security is required for the successful implementation of CBDC in Pakistan.

Figure 65: Technical Adequacy and Implementation Concerns regarding CBDC



6.3.7. Preparedness and Acceptance of CBDC from the Financial Institutions Perspective

Figures 67 and 68 present the preparedness and acceptance of CBDC, by financial institutions. Approximately, 44% of participants think that SBP is prepared to launch CBDC, Similarly, banks 40% of the respondents opined that banks, and non-bank financial institutions along with Islamic branches are ready for the CBDC in Pakistan. Preparedness and acceptance of Government and non-bank Islamic financial institutions, and the Ministry of Finance is reported as low.

Figure 66: Readiness of the Financial Institutions/Stakeholders/Public/Government

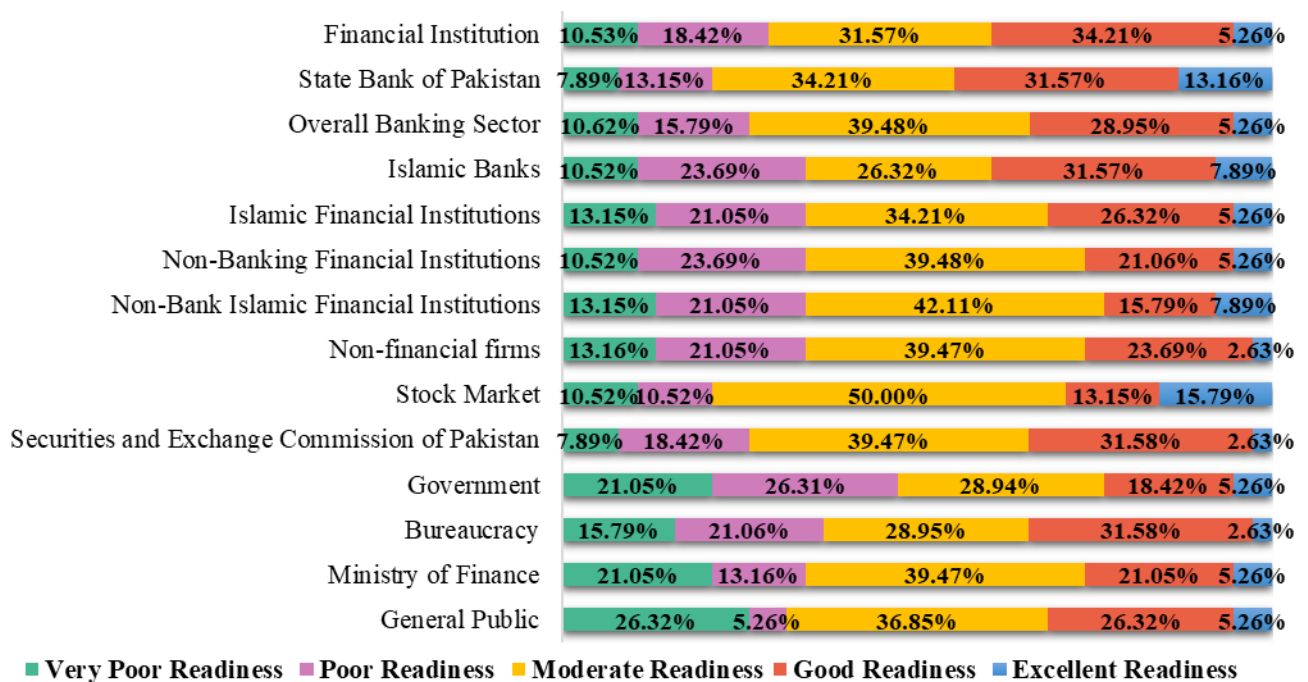
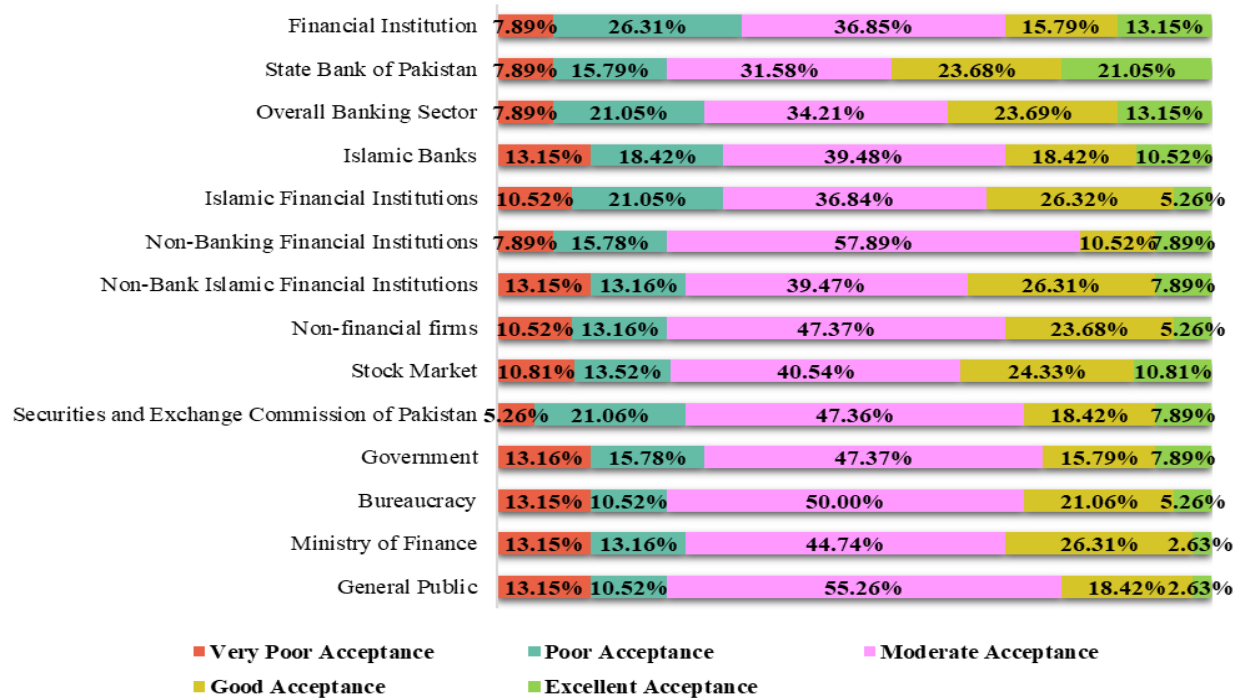


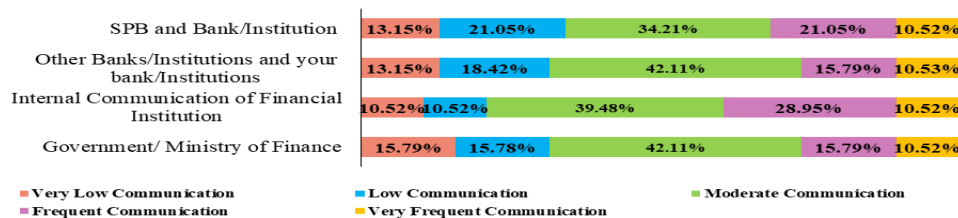
Figure 67: Acceptance of CBDC



6.3.8. Frequency of Communication regarding CBDC

Figure 68 describes the frequency of communication regarding CBDC among different stakeholders. Only 31% of the respondents reported that SBP and their respective institutions have a high level of communication regarding the CBDC. Similarly, quite a low percentage of respondents reported a high frequency of communication amongst different banks and within/between MoF and the government. Similarly, the frequency of training held by different FIs regarding FinTech got a relatively higher score i.e. 31%.

Figure 68: Communication Frequency regarding CBDC

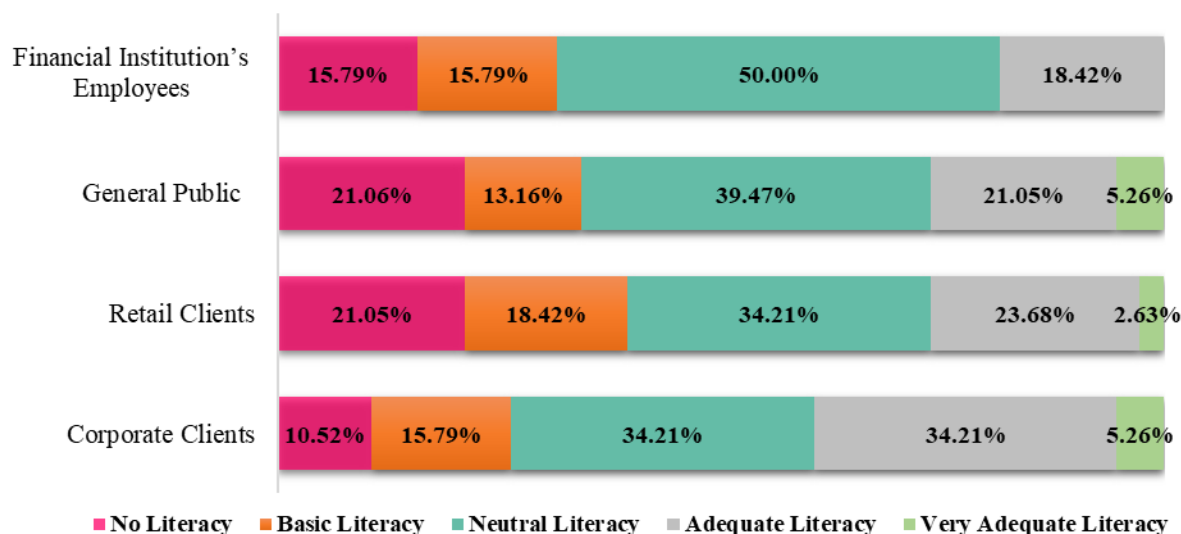


6.3.9. Digital and Fintech Literacy regarding CBDC

Figure 69 describes the level of Digital and Fintech literacy of different stakeholders as perceived by the representatives of financial institutions. Almost 40% of the respondents agreed that corporate clients possess a higher level of digital and Fintech literacy while employees of FIs got the lowest score on digital and Fintech literacy even lower than the general public and retail clients.

Figure 69: Digital and FinTech Literacy of the Respondents regarding CBDC

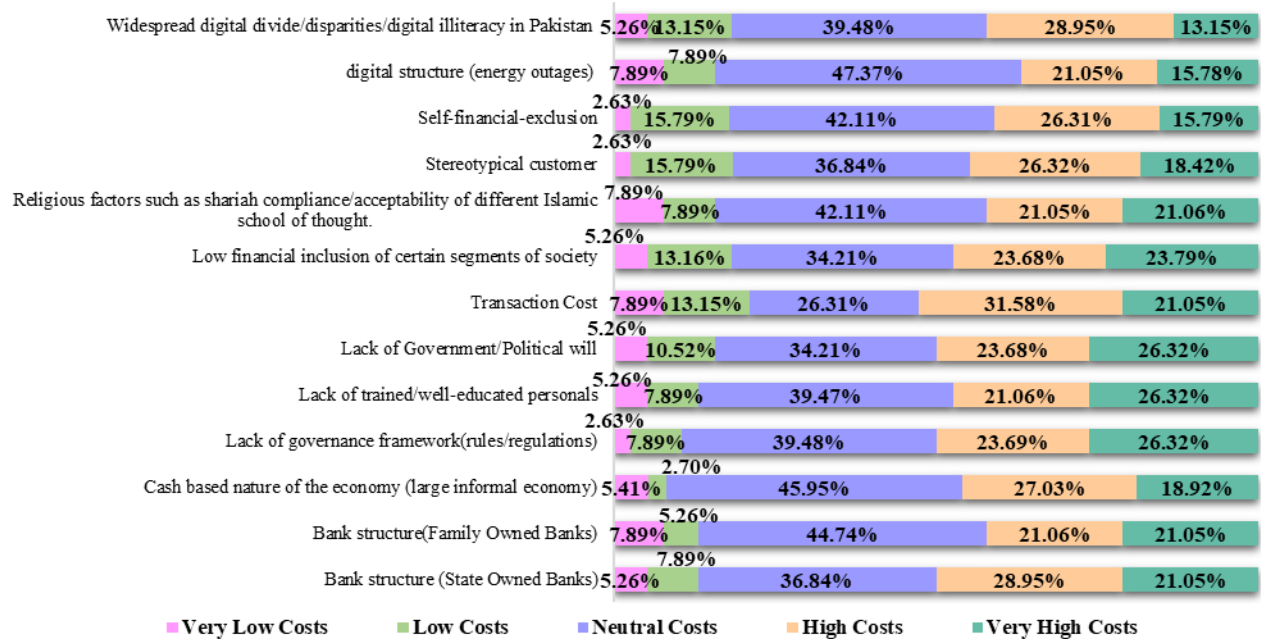
Figure 6.36: Digital and FinTech Literacy of the Respondents regarding CBDC



6.3.10. Potential Challenges for CBDC

Figure 670 describes several challenges regarding the implementation of CBDC in Pakistan. 52% of the respondents considered the transaction cost as the most pressing challenge associated with CBDC, lack of political will, regulatory framework, and state-owned structure of banks are also considered critical factors by the majority of the respondents. However, energy outages family-owned bank structures, and Shariah compatibility are viewed as relatively less critical challenges.

Figure 70: Potential Challenges related to the CBDC



6.3.11. SBP and Financial Institutions Strategies to Enhance CBDC

Figure 71 explains the strategies devised by SBP to enhance CBDC awareness, preparedness, and acceptance across various sectors. 45% of respondents considered that SBP is taking effective strategies to enhance CBDC preparedness, acceptance, and awareness for banks and non-bank financial institutions, governmental institutions, and the general public. However, for retail clients, SBP's strategies are less effective regarding CBDC awareness, preparedness, and acceptance.

Figure 71: SBP's Strategies to Enhance CBDC Awareness, Preparedness, and Acceptance

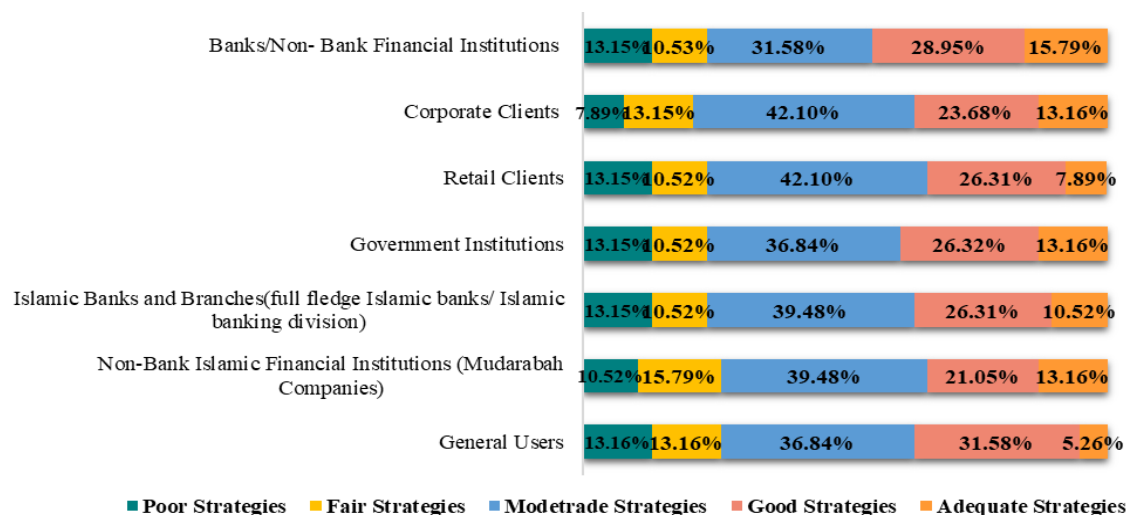


Figure 6.39 presents the strategies of banks and non-bank financial institutions to enhance CBDC awareness, preparedness, and acceptance across various sectors. A very small percentage of respondents agree that banks and non-bank FIs are taking effective measures to create CBDC awareness, preparedness, and acceptance among their employees, management, and the general public.

Figure 72: Financial Institutions Strategies to enhance CBDC Awareness, Preparedness, and Acceptance

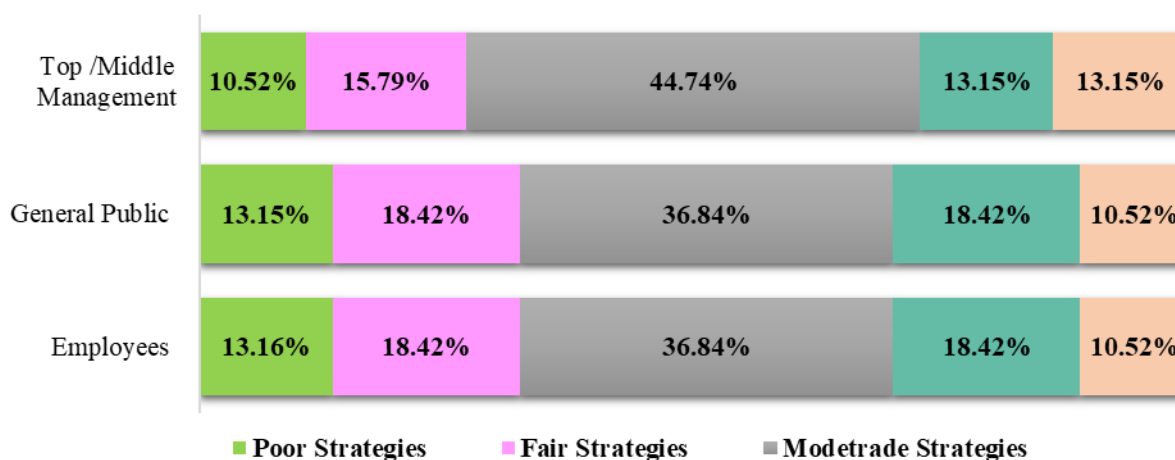
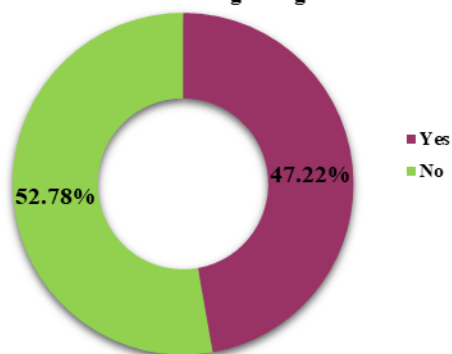


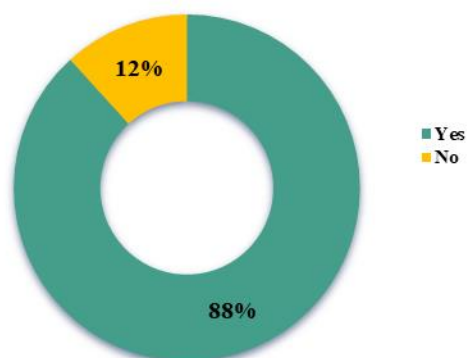
Figure 6.40 shows that 47.22% of banks actively organize conferences, seminars, or campaigns to promote awareness about financial technology, but a noticeable proportion remains inactive, suggesting an opportunity for further spread of FinTech knowledge. It also shows that 88.24% of respondents feel a governance structure is required for the introduction of CBDC in Pakistan. Most financial institutions (62%) have held five or more FinTech training sessions, reflecting a significant focus on staff's skill development.

Figure 73: Bank's Strategies to Raise Awareness, Need of Governance, and Frequency of Trainings

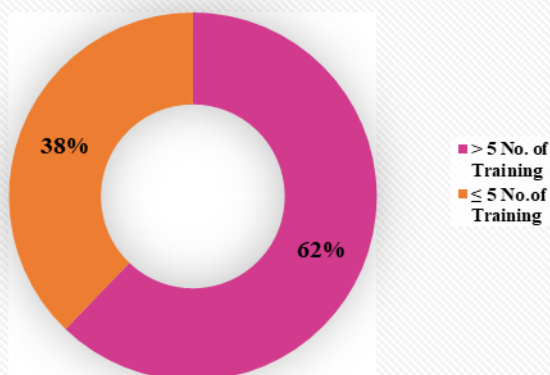
Has Your Bank Organized Any Conference, Symposium, Seminar, Exhibition, Digital Advertisements, or Workshop to Raise Awareness regarding FinTech?



Is a Governance Framework Needed for CBDC Launch?



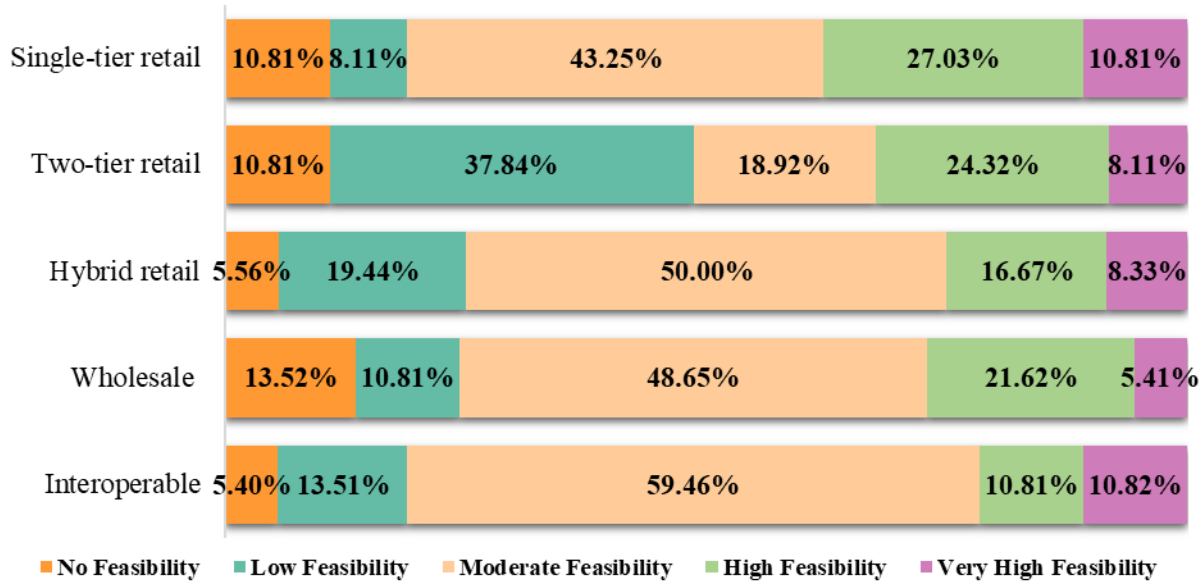
Frequency of Trainings Held by Financial Institutions regarding FinTech



6.3.12. Designs of CBDC

Figure 6.41 explains the opinions of respondents regarding the feasible design of CBDC in Pakistan. The assessment of various CBDC designs in Pakistan shows that, while responses across all models are predominantly neutral, the Single-tier retail CBDC stands out with the highest proportion of agreement at 37.84%, compared to other modes.

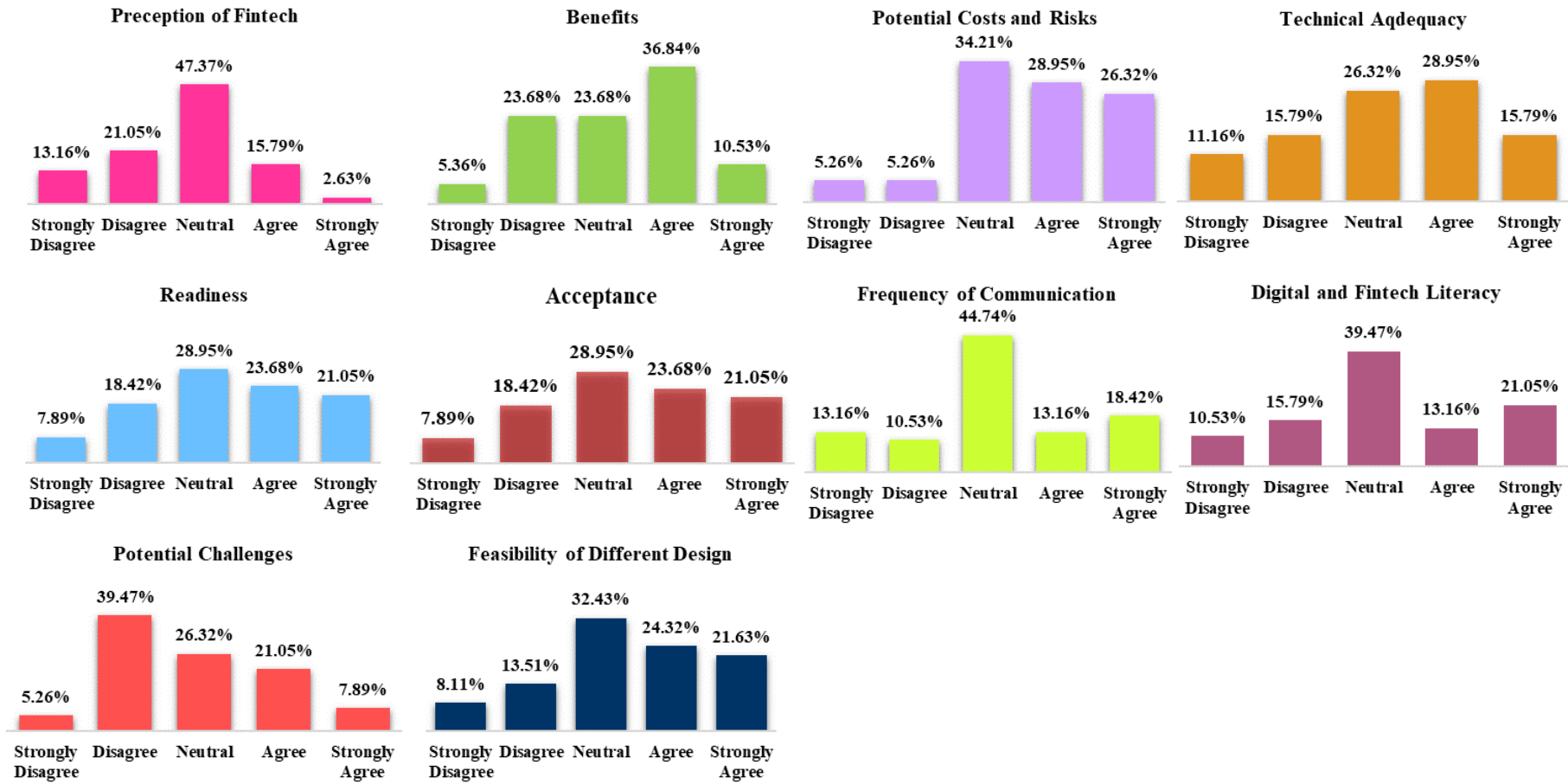
Figure 74: Feasibility of Different Design of CBDC



6.3.13. Summary of Findings: Average Response of Financial Institutions

Figure 6.42 presents indices of diverse aspects of CBDC based on responses from financial institutes. The highest agreement is seen in the potential cost and risks category, with 55.27% (combining agree and strongly agree responses) of respondents overwhelmingly acknowledge and accept the risks associated with CBDC. Another striking result is the highest disagreement in the category of potential challenges, with 44.73% relative to the other categories. This suggests that respondents have significant concerns or skepticism about the challenges involved in implementing the CBDC. In the perception of Fintech and CBDC, a significant concentration of responses is seen in the neutral and disagree categories. This suggests that many banks and financial institutions may still be undecided or cautious in their outlook toward Fintech and CBDC, possibly due to limited exposure or ongoing uncertainties. Similarly, in the benefits and potential costs and risk category, the responses vary, with a large portion being neutral but also notable percentages agreeing, suggesting a considerable awareness of risks among participants but also recognizing the potential benefits. In the digital and Fintech literacy category, there are higher responses to uncertainty. Notably, the frequency of communication regarding CBDC shows the highest concentration in the neutral category (44.74%), possibly reflecting limited active discussions about CBDC within institutions.

Figure 75: Average Responses of Financial Institutions Level regarding different aspects of CBDC



CONCLUSIONS AND RECOMMENDATIONS

7.1. Introduction

This chapter is organized to draw conclusions, propose recommendations, and propose a way forward to relevant stakeholders and policy makers specifically state bank of Pakistan. In doing so, insights are taken from the findings drawn from the extensive secondary sources covering the state of CBDC at global level and also from the field survey conducted to gauge the understanding, perception, challenges and opportunities of CBDC in Pakistan from the lens of general public, businesses, and financial institutions.

7.2. Application of CBDC

The situation analysis of countries at different stages of CBDC development and the review of the vast body of the literature offer multifaceted implications for Pakistan. These implications are related to the appropriate design, user cases, and types and modes of CBDC regarding implementation and issuance. Moreover, implications are also offered on the various aspects of issuance, adoption, risk management, perceptions, opportunities, and challenges associated with CBDC.

7.2.1. Need of CBDC in Pakistan

- The first implication relates to the necessity of CBDC in Pakistan. Countries in the research phase of CBDCs can be broadly divided into two groups. The first group includes countries that have conducted extensive research, surveys, and experiments on the necessity of CBDCs and have concluded that there is no urgent need of CBDC for them, In the other category, several countries in the research group have begun feasibility experiments to transition to the advanced stage of CBDC development.
- Based on the comparison of economic, monetary, and financial indicators of Pakistan with the research group, it is found that Pakistan's performance in these indicators provide supporting evidence for the need of CBDC.
- Majority of the general public and merchants are using a variety of digital payment modes and consider financial technology useful for their financial transactions. They also consider themselves confident for adopting any technological and financial innovation comprising superior features than the existing ones, hence highlighting the need to launch CBDC in Pakistan.
- It is also highlighted by the representatives of financial institutions that CBDC is essential for financial development and Pakistan is already lagging as far as adoption of advanced financial technology is concerned. Hence to be at Par with other advanced/emerging economies, CBDC may be considered a viable option.

Recommendations:

- SBP may consider conducting extensive research, surveys, and feasibility studies to understand the necessity of CBDCs unique to the country by taking into consideration different stakeholders in the economy.
- A full-fledged policy framework and implementation procedure should be designed to effectively launch the CBDC.

- To maintain financial and trade competitiveness and better integration of the financial and economic system of Pakistan with the neighboring countries, and rest of the world, it is necessary to adopt most sophisticated and advanced financial system.
- Given the need for CBDC, the gaps between the existing and required financial and technological architecture shall be identified and abridged.

7.2.2. Design and Architecture of CBDC suitable for Pakistan

- Approximately 60 percent of countries are focusing on retail CBDC projects. Nonetheless, it is observed that many other countries are also exploring wholesale CBDC, which has the potential to facilitate cross-border payments.
- Almost all CBDC projects at the advanced stage of CBDC development have defined intermediated/hybrid CBDC as CBDC architecture. This evidence suggests that by involving both the central bank and private sector intermediaries, a hybrid model can enhance the resilience and security of the payment system.
- There is a lack of conclusive evidence from other countries' practices about the functioning and efficiency of account-based and token-based CBDCs.
- There is no consensus on the anticipated benefits associated with interest bearing and non-interest bearing CBDCs.

Recommendations:

- Pakistan may consider retail CBDC to align its payment system with rest of the world. This recommendation can also be justified as retail CBDCs are designed for use of the general public and can enhance financial inclusion, reduce transaction costs, and provide a secure and efficient payment system.
- SBP may simultaneously explore wholesale CBDC to facilitate cross border payment. This may facilitate Pakistan's international trade with rest of the world.
- Implementing a hybrid CBDC can be more technologically feasible for Pakistan, as it can be built on existing financial infrastructure and leverage the expertise of private sector intermediaries.
- Given the current levels of digital literacy, overall education, and demographic profile, transitioning to an entirely new system of financial payments and transactions may face significant resistance. Therefore, based on our analysis, we suggest that an account-based CBDC is a more feasible option.
- SBP may conduct target-oriented training and workshops for financial institutions to educate them about CBDC designs, and the implications and benefits associated with each.
- Given the conventional and Islamic window operations of financial institutions in Pakistan, SBP should consider the compatibility of the CBDC with the Shariah legitimacy.

7.3. Regulatory Framework

- Many countries pursuing CBDC have had to amend their central banking laws to account for the unique characteristics of digital currencies.

- Regulating CBDCs would require new frameworks that address unique concerns such as distribution, control, and integration with monetary policy.
- It is also documented that CBDCs could influence monetary policy and financial stability and alter monetary transmission mechanisms, necessitating revisions to central banks' tools for managing interest rates and money supply.
- Aligning with the best international practices is essential. Countries like China and Sweden, which have progressed in their CBDC journeys, have either amended their legal structures or are in the process of doing so to remove legal ambiguities.
- The findings from the survey of FIs highlighted the pressing need of establishing a sound governance framework setting the rules for the launch, implementation and management of CBDC.

Recommendations:

- Pakistan may need to amend its definition of "currency" to explicitly include digital forms, as current laws primarily focus on physical currency.
- Pakistan's existing laws only recognize cash and bank deposits as legal tender, so amendments would be required to ensure CBDC is treated equally.
- While the SBP regulates electronic payment systems under laws like the Payment Systems and Electronic Fund Transfers Act, 2007, this does not fully cover the specific dynamics of CBDC. Therefore, the SBP's mandate under its current legal structure might need to be expanded to accommodate these changes.
- SBP may amend the SBP Act, 1956 to ensure comprehensive legal backing and avoid potential challenges. However, it is pertinent to mention that SBP should first implement a pilot program to evaluate operational and regulatory aspects of CBDC before proposing the final amendments in its Act.
- SBP and Government of Pakistan should ensure that its legal structure for CBDC is aligned with global and regional standards to integrate financial and economic institutions with rest of the world.
- To oversee the matters related to CBDC, SBP should establish a division designated for CBDC.

7.4. Challenges of CBDC

- Our findings highlighted the usefulness as the most important factor in the adoption of CBDC followed by ease of use.
- The level of digitalization encompassing digital literacy is found to be an important factor in CBDC adoption all over the world.
- CBDC and digital literacy are inextricably linked with each other. Digital literacy is necessary for successful launch, acceptance and adoption of CBDC in Pakistan.
- Female lacks more in digital and financial literacy as compared to male. This reflects the risk of female financial exclusion even after the launch of CBDC and may hinder achieving

the objectives of CBDC launch.

- The survey also reported lack of communication, data privacy, lack of political will, insufficiency/inadequacy of physical and technological infrastructures at both SBP and financial institutions level are important challenges.
- This finding highlights the need to improve SBP communication with stakeholders (Financial institutions) about its programs /initiatives regarding CBDC and its implications.
- Investments on Infrastructural development (physical, technological, hardware, software) are required before the launch of CBDC.
- Trust in the existing financial system and security concerns are also important factors in inducing or hindering the adoption of CBDC.
- The data theft, information privacy, and security protocols are found to be some of the biggest challenges posed by CBDC.

Recommendations:

- SBP should prioritize creating a simple and intuitive user interface for CBDC transactions. This includes ensuring digital wallets and payment platforms that are easy to navigate, even for those with limited technological knowledge and experience.
- There should be specific initiatives to improve digital literacy across the country. This could involve educational campaigns and training programs to help people understand and use digital financial services effectively, specifically female.
- SBP should conduct a comprehensive cost-benefit analysis on the prioritize design of CBDC.
- To address the financial and technical constraints for launching and implementing CBDC, SBP may partner with private sector such as Fintech companies.
- SBP needs to build and maintain trust with different stakeholders by ensuring transparency in the development and implementation of the CBDC.
- SBP may invest in robust cybersecurity measures to protect the CBDC infrastructure. This includes regular security audits, implementing advanced encryption technologies, and establishing a rapid response system for any security breaches.
- A careful and wholistic assessment of CBDC for monetary policy transmission is required from SBP.
- The SBP can leverage CBDCs to gain more precise control over monetary policy, improving its ability to manage inflation, interest rates, and overall economic stability. SBP may update its underlying models to include CBDC and other forms of digital money for a more realistic monetary policy framework.
- The SBP is also required to initiate a designated platform for institutional and academic research to evaluate the implications of CBDC for monetary policy functioning and effectiveness.

7.5. Prospects /Opportunities

- Improvement in digitalization and financial inclusion, increase in payment efficiency, and effectiveness of monetary policy are the most frequently reported benefits of CBDC. Research including Pakistan has also reported enhanced security as one of the most prominent benefits of CBDC.
- Pakistan performance in the monetary sector is better than average score of other countries in the proof of concept and pilot testing group. This implies that the satisfactory performance of Pakistan in the monetary sector provides an opportunity to launch CBDC.
- Pakistan has already initiated digital transaction system since 2018 and provided basic infrastructure for digital transactions and online payments, which may serve as a platform for the launch of CBDC. These facilities include 1LINK switch, RAAST payment system, Roshan Pakistan, and Person to Person (P2P), RAAST-P2M. Hence, the availability of digital payment system can be capitalized to launch CBDC if, and when the need arises.
- Majority of Financial institutions reported reduction in illicit financial flows and tax avoidance, increase in bank competition, and monitoring and accountability of financial transaction, and compatibility of Pakistan's financial system with global economy as significant benefits of CBDC.
- According to merchants, accuracy and efficiency of financial transaction, better management of financial resources are pertinent opportunities that CBDC may offer in Pakistan. Similarly, efficiency in financial transactions, and green banking are viewed as important benefits of CBDC in Pakistan.
- Regarding Compatibility, most respondents from general public believe CBDC would integrate well with existing financial systems, implying minimal disruption to current banking structures.

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APPENDIX

Table 1: Summary Statistics and Data Sources of Variables

Variables	Variable Descriptions / Measurements	Data Source
<i>Monetary Policy Indicators</i>		
Exchange Rate Stability Index	Measured as the annual standard deviations of the monthly exchange rate between home and base country	Portland State University (Constructed by Aizenman, Chinn, and Ito, 2010)
Central Bank Independence	a de jure index that expands and enhances previous indices by incorporating new information on central bank financial independence	CBI Data & Legislation (Constructed by Romellie 2022, 2024)
M2	Broad Money Growth measured in Annual Percentage	World Development Indicators, World Bank
Monetary Independence (MI)	The reciprocal of annual relationship between monthly interest rates of home and base country	Portland State University (Constructed by Aizenman, Chinn, and Ito, 2010)
<i>Financial Sector Indicators</i>		
Financial Development Index	Relative ranking of the depth, access, and efficiency of financial markets and institutions	International Financial Statistics (IFS)
Financial Openness Index	Index of Capital account openness or KAOPEN, by Chinn and Ito (2006, 2008)	Portland State University (Constructed by Aizenman, Chinn, and Ito, 2010)
Financial Access	Compile data on market capitalization	International Financial Statistics (IFS)
Financial Depth	Compile data on stock market capitalization, stock traded, international and total debt securities of government and financial authorities	International Financial Statistics (IFS)
Financial Efficiency	Compile data on stock market turnover ratio	International Financial Statistics (IFS)
Financial Access	Compile data on bank branches and ATMs	International Financial Statistics (IFS)
Financial Depth	Compile data on bank credits to private sector in percent of GDP	International Financial Statistics (IFS)
<i>Stock Market Indicators</i>		
Stock Market Capitalization SMC	Total value of all listed shares in a stock market as a Percentage of GDP.	World Development Indicators, World Bank
Short term Portfolio	Portfolio Investment, net (BoP, current US\$)	World Development Indicators, World Bank
Stock Returns	Stock market return (% , year-on-year) is the growth rate of annual average stock market index.	World Development Indicators, World Bank
<i>Macroeconomic Indicators</i>		
Informal Output (% of official GDP)	Dynamic general equilibrium model-based (DGE) estimates of informal output (% of official GDP)	World Development Indicators, World Bank
Human Capital	Human capital index, based on years of schooling and returns to education	Penn World Table, version 10.0
Ease of DB	Ease of doing business score (0 = lowest performance to 100 = best performance)	World Development Indicators, World Bank
Per capita income growth	Gross Domestic Product Per Capita	World Development Indicators, World Bank
Consumer Price Index	Consumer Price Index	World Development Indicators, World Bank
Trade Openness	Trade (% of GDP)	World Development Indicators, World Bank

FDI	Foreign direct investment, net inflows (% of GDP)	World Development Indicators, World Bank
GE	Government expenditure, (% of GDP)	Public Finances in Modern History (IMF)
<i>Technology Indicators</i>		
Mobile cellular Sub	Mobile Cellular Subscriptions refer to subscriptions to a public mobile telephone service that provide access to the PSTN using cellular technology	World Development Indicators, World Bank
Fixed Broadband sub	Fixed broadband subscriptions refer to fixed subscriptions to high-speed access to the public Internet	World Development Indicators, World Bank
Mobile service Use		
No. of Debit Cards	Debit cards per 1,000 adults	World Development Indicators, World Bank
ATM Machines	Automated teller machines (ATMs) (per 100,000 adults)	World Development Indicators, World Bank
<i>Bank Indicators</i>		
Bank Concentration Index	Bank Concentration (% GDP) refers to assets of three largest commercial banks as a share of total commercial banking assets.	World Development Indicators, World Bank
Banks assets to GDP ratio	Deposit money banks' assets to GDP (%) refers to total assets held by deposit money banks as a share of GDP	World Development Indicators, World Bank
<i>Other Indicators</i>		
Illicit financial outflows	Millions of US dollar	The United Nations Office on Drugs and Crime (UNODC)
Cyber security	Fraud cybersecurity rate per 100,000 population	The United Nations Office on Drugs and Crime (UNODC)

Table 2: Institutional Research on Adoption of CBDC

Authors	Title	Sample	Technique	Study Type	Key words
Brandon Tan (2023)	Central Bank Digital Currency Adoption: A Two-Sided Model	Heterogeneous households and merchants/firms	Simulation	Empirical	card payment, CBDC payment, CBDC issuance, government payment, CBDC adoption
Das et al., (2023)	Implications of Central Bank Digital Currencies for Monetary Policy Transmission	Global	Survey	Theoretical	monetary transmission, baseline policy CBDC design, unremunerated CBDC, CBDC adoption, remunerated CBDCs, Central Bank digital currencies
BIS (2018)	Fintech for the people	Africa	Conference	Theoretical	fintech's potential, innovative solutions, financial inclusion, adoption,
Maryaningsih et al., (2022)	Central bank digital currency: what factors determine its adoption?	Emerging and advanced countries (a cross-country dataset)	Ordered Probit model	Empirical	Central bank digital currency; Financial development; Financial inclusion; Technology adoption
BIS (2022)	CBDCs in emerging market economies – a short note by Bank Indonesia	Indonesia	Report	Theoretical	digital banking, CBDC, inclusion, innovation, adoption, acceptance efficient payment solutions,
Kiff et al. (2020)-IMF	A Survey of Research on Retail Central Bank Digital Currency	Global	Comprehensive survey of Published research	Theoretical	money, CBDCs, monetary policy, issuance of CBDC
Lukonga (2023)	Monetary Policy Implications of Central Bank Digital Currencies	CBDC launched Countries	Conceptual analysis	Theoretical	CBDC, Issuance of CBDC, speed of adoption, monetary policy, financial systems, conventional and Islamic banking
Source: Authors' tabulation					

Table 3: Academic Research on Adoption of CBDC

Authors	Title	Sample	Technique	Study Type	Keywords
Ogunmola & Das (2024)	Analyzing consumer perceptions and adoption intentions of central bank digital currency: a case of the digital rupee	Primary data India	SEM	Empirical	Digital rupee, CBDC, Digital currency, RBI, Technology acceptance model (TAM), Adoption intentions
Alfar et al. (2023)	The determinants of issuing central bank digital currencies	All countries involved in the advanced stage of CBDC (2014-2021)	Pooled OLS Probit Logit	Empirical	Money supply, Central banks and their policies, financial system, CBDCs, CBDC issuance
Mohammed, DE-Pablos-Herero & Botella (2023)	Exploring the Factors Affecting Countries' Adoption of Blockchain-Enabled Central Bank Digital Currencies	67 countries	Non-linear partial least square	Empirical	CBDC, fintech, blockchain technology, macro-level adoption, SEM analysis
Alora, Sahoo & Sasidharan (2024)	Central bank digital currency adoption challenges- The case of an emerging nation	Primary Data India	Analytical Hierarchical Process & Analytic Network Process	Empirical	CBDC, AHP, ANP, CBDC adoption issues, technical, and financial hurdles
Soilen & Benhayoun (2021)	Household acceptance of central bank digital currency: the role of institutional trust	Primary Data	PLS-SEM		Ease of Use, Usefulness, Digital literacy
Ngo et al. (2023)	Governance and monetary policy impacts on public acceptance of CBDC adoption	Facebook data from May 2012 to April 2022	deep learning algorithms for text mining	Empirical	Public sentiment, Central bank digital currency, Text mining, Governmental factors, Financial market conditions, Monetary policy
Abass (2022)	A Study on Public Perception on the Adoption of Central Bank Digital Currency (CBDC) in Ireland	Survey	Unified Theory of Acceptance and Use of Technology model	Empirical	public perception and adoption of CBDCs, financial freedom and privacy, economic benefits
Bijlsma et al. (2023)	What Triggers Consumer Adoption of Central Bank Digital Currency?	Primary data, Netherlands	7-point Likert scale	Empirical	CBDC, Consumers, Public money, Private money, Bank accounts, Trust
Jamader et al. (2022)	An Analysis of Consumers Acceptance towards Usage of Digital Payment System, Fintech and CBDC	Survey (India)	experimental method, Structural equation model	Empirical	Digital Payment system, consumer's acceptance, Structural equation model, apparent effectiveness, portable payment method
Wannaswang & Kraiwanit (2023)	An Adoption of Digital Currency of Central Bank of Thailand	online questionnaire via Google Forms (511 responses)	the binary logistic regression analysis model	Empirical	Digital Currency of Central Bank of Thailand, Bank of Thailand, Electronic Wallet, Digital Money, Behavior of Electronic Money Service Usage

Source: Authors' tabulation

Table 4: Research regarding Adoption in Pakistan

Authors & Year	Title	Sample	Technique	Study Type	Keywords
Sadiq et al. (2023)	Digital currency and blockchain security in accelerating financial stability: A mediating role of credit supply	survey-based questionnaire from Pakistan, Punjab, and five industrial zones	structural equation modeling (SEM)	Empirical	Blockchain, Central bank Credit supply, Digital currency, financial stability
BIS publication (2018)	Fintech for the people	Africa	Conference	Theoretical	fintech's potential, innovative solutions, financial inclusion, adoption,
Maryaningsih et al. (2022)	Central bank digital currency: what factors determine its adoption?	emerging and advanced countries (a cross-country dataset)	ordered probit model	Empirical	Central bank digital currency; Financial development; Financial inclusion; Technology adoption
BIS papers (2022)	CBDCs in emerging market economies – a short note by Bank Indonesia	Indonesia	Report	Theoretical	digital banking, CBDC, inclusion, innovation, adoption, acceptance efficient payment solutions,
Bouza et al. (2024)	Central Bank Digital Currencies in the Middle East and Central Asia	ME&CA, MENA and MENAP (IMF survey)	Comprehensive analysis	Theoretical	CBDCs, financial inclusion, cross-border payment services, Energy sustainability
Chen et al. (2021)	CBDCs in emerging market economies	emerging market economies' banks	Survey	Theoretical	CBDC issuance, GDP growth, financial inclusion, benefits and costs, security risks, cross-border spillovers

Source: Authors' tabulation

Table 5 contains the summary of academic research conducted on exploring the potential benefits of CBDC. Table 3.5 presents this information for institutional research and Table 3.6 contains the research that has included Pakistan as a case study.

Table 5: Potential Benefits- Academic Research

Authors	Title	Sample	Technique	Study Type	Key Words
Ozili (2023)	Central bank digital currency research around the world: a review of literature	Nigeria	systematic literature review	Theoretical	Digital currency, Money, CBDC, Digital finance, financial inclusion, CBDC design, Blockchain, Distributed ledger technology, motivation and benefits of issuing a CBDC
Mallesha & Archana (2023)	Central bank digital currency (cbdc) and its potential benefits and challenges	India	households' preferences	Empirical	benefits and associated risks, RBI, money creation, digital rupee, monetary policy, CBDC,
Bofinger et al. (2020)	CBDC: A systemic perspective	Germany	price-theoretical banking model	Empirical	central bank digital currency, central banks, payment systems, secure and modern central bank money, strengthening the resilience, availability and contestability of retail payments
Février (2020)	CBDC and Monetary Policy	Canada	Comparative analysis	Theoretical	CBDC, benefits, versatile instrument, non-linear transfers, maintain the effectiveness of monetary policy
Bindseil (2020)	Central Bank Digital Currency:	European	a tiered remuneration	Empirical	central bank digital currencies; Advantages, central

	Financial System Implications and Control	Central Bank	of CBDC, in line with long-tested central bank logic and practice		banks; financial instability; financial accounts
Mu & Mu (2022)	CBDC: Concepts, Benefits, Risks, Design, and Implications	Global data	Descriptive and Comparative analysis	Theoretical	CBDC, Fintech, Payments, e-Money, digital currency, central bank, benefits and risks
Nelson (2021)	The Benefits and Costs of a Central Bank Digital Currency for Monetary Policy	U.S. central bank	Case study Analysis	Theoretical	CBDC could pay negative interest and paper currency were eliminated, costs, benefits
Volodymyrovych et al. (2023)	Digital Currencies of Central Banks (CBDC): Advantages and Disadvantages	China	system-structural analysis	Empirical	CBDCs, implementation in various socio-economic conditions, advantages and disadvantages of using digital currencies

Source: Authors Tabulation

Table 6: Potential Benefits-Institutional Research

Authors	Title	Sample	Technique	Study Type	Key Words
IMF report (2023)	Financial system effects of introducing a CBDC in Bahrain	Kingdom of Bahrain	Counterfactual analysis	Empirical	CBDC, financial system and monetary policy, digitalization and fintech, benefits and risks
BIS – IMF – World Bank central bank conference (2023)	Paving the way for cross-border CBDC payments	350 people from more than 80 jurisdictions around the world representing central banks and selected international organizations	Discussion	Theoretical	Cross-border use of CBDCs, technical feasibility, financial inclusion, key challenges and opportunities
Lannquist & Tan (2023)	Central Bank Digital Currency's Role in Promoting Financial Inclusion	USA	Survey	Theoretical	central bank digital currencies, financial inclusion, Complementary policies, e financial stability, effectiveness of monetary policy transmission
Ricci et al. (2024)	Central Bank Digital Currency and Other Digital Payments in Sub-Saharan Africa	Sub-Saharan Africa	Region Survey	Empirical	stock of developments in CBDCs, digital money, Financial inclusion, CBDC design, benefits of CBDCs
Ozili & K (2023)	CBDC, Fintech and cryptocurrency for financial Inclusion and financial stability	Central Bank of Nigeria	Systematic literature review	Theoretical	CBDC, Fintech, cryptocurrency, financial inclusion, financial stability, blockchain, central bank digital currency.
BIS Publication (2021)	Central bank digital currencies: system design and interoperability	Bank of Canada, European Central Bank Bank of Japan, Sveriges Riksbank, Swiss National Bank, Bank of England, Board of Governors Federal Reserve System, Bank for International Settlements	Survey	Theoretical	central banks, CBDC ecosystems, innovation, ecosystem design, benefit from private-public collaboration and interoperability
BIS report (2023)	A security and resilience framework for CBDC systems	Global	Polaris framework	Theoretical	implementation of retail CBDC systems, secure and resilient CBDC systems, cyber threat
Jordan (2024)	The Swiss National Bank's pilot for wholesale CBDC	Swiss National Bank	Project Helvetia III	Theoretical	technological innovation, tokenization, monetary system, safe means of payment, risks

						and benefits
Zhou et al. (2024)	Rise of Digital Money Implications for Pacific Island Countries	Pacific Island Countries		Descriptive Analysis	Theoretical	Digital Technology, financial inclusion and cross-border payments, key benefit, technological, and legal risks
Drakopoulos et al. (2024)	Cross-Border Payments Integration in Latin America and the Caribbean	Latin America and the Caribbean (LAC)		Review	Theoretical	Cross-Border Payments; Financial Innovation; International Trade; Economic Integration

Source: Authors' tabulation

Table 7: Potential Benefits- Pakistan

Authors	Title	Sample	Technique	Study Type	Key Words
Lee et al. (2021)	A global perspective on central bank digital currency	Global	two-tier or multi-tier ledger design	Theoretical	Central Bank Digital Currency (CBDC), Digital Currency Electronic Payment (DCEP), Cryptocurrency, Distributed Ledger Technology, Token, Inclusive Finance
Auer et al. (2022)	Central Bank Digital Currencies: Motives, Economic Implications, and the Research Frontier	Emerging markets and developing economies	Systematic Literature review	Theoretical	money, digital currencies, central banks, central bank digital currencies, CBDC, stablecoins, cryptocurrencies, distributed ledgers, big tech, data privacy, opportunities and challenges
Edwards (2021)	Central Bank Digital Currencies and the Emerging Markets: The Currency Substitution Challenge	emerging countries	(BIS) survey (between 2018 and 2021)	Theoretical	developing CBDCs, benefits of global CBDC, currency substitution, lower costs for migrants' remittances
Said & Ahmed (2018)	The Economic Impact of Digital Fiat Currency (DFC): Opportunities and Challenges	Central Bank of Egypt	Analytical Analysis	Theoretical	Digital Fiat Currency, security, digital ecosystem, financial inclusion, cost, opportunities
Foster et al. (2021)	Digital currencies and CBDC impacts on least developed countries (LDCs)	Developing Countries	Technical and Design Feature Analysis	Theoretical	central bank digital currencies (CBDCs), digital ledger technology (DLT)-based currencies, LDCs, e-money, financial inclusion, innovations
Feyen et al. (2021)	What does digital money mean for emerging market and developing economies?	emerging market and developing economies (EMDEs)	Graphical Analysis	Empirical	fintech, stablecoins, crypto-assets, e-money, central bank digital currencies, emerging market and developing economies, financial inclusion, remittances, payments

Source: Authors tabulation

Tables 3.7-3.8 summarizes the institutional, academic and research on Pakistan to explore different implications of CBDC, respectively.

Table 8: Implications - Institutional Research

Authors	Title	Sample	Technique	Type	Key Words
Kiff et al. (2020)	A Survey of Research on Retail Central Bank Digital Currency	Global	survey of Published research	Theoretical	money, CBDCs, monetary policy, issuance of CBDC, governance and regulatory perspectives
Das et al. (2023)	Implications of Central Bank Digital Currencies for Monetary Policy Transmission	Global	Survey (2022) from the BIS	Theoretical	<u>monetary policy transmission, baseline CBDC design, unremunerated CBDC, CBDC adoption, remunerated CBDCs, Central Bank digital currencies</u>
Feyen et al. (2021)	Fintech and the digital transformation of financial services: implications for market structure and public policy	Global	Cost-benefit analysis, Game theory model	Empirical	big tech, fintech, credit, financial markets, data, technology, digital innovation, network effects, regulation, financial intermediaries
Popescu (2022)	Cross-Border Central Bank Digital Currencies, Bank Runs and Capital Flows Volatility	Worldwide data set by Consumers and Domestic commercial banks	A classical model of bank runs	Empirical	Central bank digital currency, CBDC, capital flows, open-economy, financial stability
Lukonga (2023)	Monetary Policy Implications of Central Bank Digital Currencies	CBDC launched Countries	conceptual analysis	Theoretical	CBDC, Issuance of CBDC, speed of adoption, monetary policy, financial systems, conventional and Islamic banking
Griffoli et al. (2018)	Casting Light on Central Bank Digital Currencies	summary of pilot projects and analyses from central banks	Discussion	Theoretical	<u>ease liquidity pressure, CBDC token, CBDC infrastructure, rival CBDC, store of value, unit of account, money, monetary policy, CBDC adoption, CBDC development, market power, fiat money, transaction costs, due diligence, Currencies, Bank deposits, Commercial banks, Central bank policy rate, Caribbean</u>
Wang & Gao (2020)	International Dimension of CBDC: A Network Analysis	global financial network	Analytical approach	Theoretical	CBDC, global financial network, network's structure, policy diffusion, international financial system, international monetary system
Source: Authors' tabulation					

Table 9: Implications- Academic Research

Authors & Years	Title	Sample	Technique	Study Type	Key Words
Luu et al. (2023)	Implications of central bank digital currency for financial stability: Evidence from the global banking sector	data on 1176 banks operating in 86 countries from 2010 to 2021	A time varying CBDC adoption index	Empirical	CBDC Financial stability Banking sector Retails CBDC Wholesale CBDC Central banking CBDC adoption index
Lucas (2023)	Central bank digital currencies and financial stability in a modern monetary system	Global	Diamond and Dybvig (1883) model	Empirical	CBDC Banking sector financial stability Bank runs

Panetta (2022)	More than an intellectual game: Exploring the monetary policy and financial stability implications of central bank digital currencies	European Central Bank	Theoretical Analysis	Theoretical	Central bank digital currencies, CBDC research, digital euro, monetary policy, financial stability, financial intermediation, implications for monetary and financial system
Brokke & Engen 2018	Central Bank Digital Currency (CBDC): An Explorative Study on its Impact and Implications for Monetary Policy and the Banking Sector	Norway	systematic literature review	Theoretical	CBDC, Impact and Implications for Monetary Policy and the Banking Sector, zero lower bound (ZLB), helicopter money
Kim & Kwon (2018)	Central Bank Digital Currency and Financial Stability	Central banks around the world	monetary general equilibrium model	Empirical	CBDC adoption & implications, financial stability, banking, liquidity
Adalid et al. (2022)	Central bank digital currency and bank intermediation	digital euro project (2020)	Theoretical analysis	Theoretical	CBDC, digital euro, bank intermediation, bank runs
Bidder et al. (2024)	CBDC and banks: Disintermediating fast and slow	Germany	a survey of German households	Empirical	CBDC, slow and fast disintermediation, financial stability,
Wilmer (2023)	Different designs of CBDC, the likelihood of bank disintermediation and the impact on monetary policy, a literary review	Literature from multiple central banks, financial institutions, leading economists	Literature review	Theoretical	CBDC, design options, bank disintermediation, monetary policy, negative interest rates, financial stability

Table 10: Implications- Research Including Pakistan

Authors	Title	Sample	Technique	Study Type	Key Words
Šiaudinis (2018)	Digital currencies and central banking: A Sense of Déjà V	Bank of Lithuania	Discussion	Theoretical	Private cryptocurrencies, central bank digital currency (CBDC), fintechs, financial stability, monetary policy
Maryaningsih et al. (2022)	Central bank digital currency: what factors determine its adoption?	Emerging and advanced countries (a cross-country dataset)	Ordered probit model	Empirical	Central bank digital currency, Financial development, Financial inclusion, Technology adoption
Tran (2024)	Implementing central bank digital currency in Asian countries and lessons for Vietnam	Asian countries	Survey of research	Theoretical	CBDC, digital currency, central bank, Asian countries, lessons, Vietnam, challenges and risks
Juhro (2023)	Future central banking in emerging market economies	Emerging market economies	Comprehensive analysis	Theoretical	Central bank policy mix, integrated policy framework, inflation targeting, central bank in emerging markets
Sadiq et al. (2023)	Digital currency and blockchain security in accelerating financial stability: A mediating role of credit supply	Survey-based questionnaire from Pakistan, Punjab, and five industrial zones	Structural equation modeling (SEM)	Empirical	Blockchain, Central bank Credit supply, Digital currency, financial stability

Source: Authors' tabulation

The research also summarizes the challenges countries have faced or are perceiving to launch and implement CBDC and present it in Table 3.10-3.12.

Table 11: Challenges-Institutional Research

Authors & Year	Title	Sample	Technique	Study Type	Key Words
Bouza et al. (2024)	Central Bank Digital Currencies in the Middle East and Central Asia	Middel East (31 countries) and Central Asia (18 countries)	Survey	Empirical	Objectives, implications and challenges and risks regarding CBDC
Bore & Wehrli (2021)	Central banks and payments in the digital era	66 central banks	Survey	Empirical	Access, cost, and quality of CBCD, growth in GDP, lower risk, policy implications
Fullerton & Morgan (2022)	The People's Republic of China's Digital Yuan: Its Environment, Design, and Implications	The People's Bank of China	Ant Group's Alipay and Tencent's WeChat Pay	Empirical	Financial inclusion, e-CNY design, implications of digital currency
Report of BIS (2023)	High-level technical requirements for a functional central bank digital currency (CBDC) architecture	BIS member central banks in the Americas	Workshops and Webinars	Theoretical	CBDC policy objectives, Experiences and adoption of CBDC, High- level requirements for CBDC
Ballivián & Tombini (2023)	Central bank digital currency (CBDC) information security and operational risks to central banks	BIS member central banks in the Americas and the central banks of Brazil, Canada, Chile, Colombia, Mexico, Peru and the United States	systematic literature review	Theoretical	Risk-management, reliable means of payments, security, implications of CBDC
Islam et al. (2018)	Promoting full-fledged electronic money in South Asia: evidence from Bangladesh	Primary data of Bangladesh	Regression analysis, factor analysis and structural equation modeling	Empirical	Money laundering, tax evasion, inflation, financial inclusion, transparency, challenges in the digitization process
Revati Prasad (2022)	Central Bank Digital Currency (CBDC): identifying appropriate policy goals and design	NEPAL RASTRA BANK	review of literature related to CBDC & 5-point Likert-type rating scale	Theoretical	Foundational issues, challenges, managing CBDC system, recommendations

	for Nepal				
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Table 12: Challenges- Academic Research

Authors & Year	Title	Sample	Technique	Study Type	Key Words
Alkhowaiter (2020)	Digital payment and banking adoption research in Gulf countries: A systematic literature review	Gulf Countries	Review of 46 studies	Theoretical	New forms of banking and financial payments, convenient and effective financial transactions, improve adoption and quality of digital banking
Revathi (2018)	Digital Banking Challenges and Opportunities in INDIA	The Reserve Bank of India	Electronic transaction for the years 2015-18	Empirical	E- Banking, RTGS, NEFT, Plastic Money, key challenges, benefits, remedies
Nguyen-Viet & Huynh (2021)	Empirical analysis of internet banking adoption in Vietnam	475 bank customers in Vietnam	Interviews	Empirical	Adoption, perceived risk, usefulness, ease of use, consumer innovativeness
Tuli (2023)	Exploring digital banking adoption in developing Asian economies: Systematic literature review and bibliometric analysis	4211 articles	systematic literature review	Theoretical	Constraints, difficulties/challenges, crowdfunding, Robo-advisors, payment apps, neo banks, P2P lending apps and investing apps, future directions
Edwards (2021)	Central Bank Digital Currencies and the Emerging Markets: The Currency Substitution Challenge	Emerging countries	mathematical modeling approach	Empirical	Currency substitution, benefits and costs, remedies
Zhang (2020)	Opportunities, Challenges and Promotion Countermeasures of Central Bank Digital Currency	China	Technological analysis	Theoretical	Opportunities and challenges of CBDC issuance in the context of Blockchain technology and proposes technical routes and countermeasures for its development
Ozili (2022)	Central Bank Digital Currency in Nigeria: Opportunities and Risks	Nigeria	discourse analysis	Theoretical	CBDC, ENaira, improved monetary policy transmission, convenience, efficient payments and increased financial inclusion, digital illiteracy, increased propensity for cyber-attacks, data theft, the changing role of banks in a full-fledged CBDC economy
Yang et al. (2015)	Exploring consumer perceived risk and trust for online payments: An empirical study in China's younger generation	870 respondents of Shanghai and Macao, China	Survey	Empirical	perceived risk, system dependent risk and transactional risk, trust in online payment,
Broby (2023)	Central bank digital currencies: policy implications	United Kingdom	technological approach	Theoretical	Central bank digital currencies; CBDCs, stablecoins, cryptocurrencies, monetary policy, digital payment, banking
Yoon et al. (2020)	An empirical study on factors affecting customers' acceptance of internet-only banks in Korea	online survey from 305 respondents of	structural equation modeling (SEM)	Empirical	perceived enjoyment, perceived usefulness, internet-only banks, difficult Technology use, suggestions

		Korea			
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Table 13: Challenges-Research Related to Pakistan

Authors & Year	Title	Sample	Technique	Study Type	Key Words
Rizvi et al. (2018)	Is Pakistan Ready to Embrace Fintech Innovation?	Pakistan	Qualitative data analysis	Theoretical	Fintech, disruption, innovation, financial services, emerging market, Pakistan.
Siddique et al. (2024)	Prospects, Issues ,and Policy Implications for Islamic Fintech Development in Pakistan	different categories of stakeholders, Pakistan	semi-structured interview technique	Empirical	Fintech, Regulations, Policy Implications, Islamic Finance
Otonne (2023)	Exploring the influence of financial technology on banking services in Nigeria	quarterly data from 2012 to 2018were utilized, sourced from the Central Bank of Nigeria (CBN) payment system statistics and the financial statements of selected banks	the price-earnings ratio (P/E ratio), earnings per share (EPS), return on equity (ROE) and return on assets (ROA)	Empirical	Financial technology, banking services, Automated Teller Machine, Point of Sales, Online Payment Transactions
Asif, 2022	Integration of Information Technology in Financial Services and its Adoption by the Financial Sector in Pakistan	Worldwide Literature reviews	Theoretical analysis	Theoretical	Banking, Business, Financial Technology, FinTech, Financial Institutions
Syarifuddine (2023)	Optimal Central Bank Digital Currency (CBDC) Design for Emerging Economies	Emerging economies	SWOT analysis	Empirical	CBDC, Optimal design, SWOT analysis
Corbet et al. (2023)	Monetary Doping? Understanding the Rapid Development of CBDC in Emerging Economies	Emerging economies	SWOT analysis	Empirical	Central Bank Digital Currencies, Financial Development, monetary policy, Governance, Regulation
Lien et al. (2020)	Fintech and Banking: Evidence from Vietnam	a survey of 620 customers of banks in Ho Chi Minh City, Vietnam	exploratory factor analysis (EFA)	Empirical	Banking, Financial Technology, Fintech, Intention, Vietnam

Table 14: Similarities and Differences

Aspect	Similarities	Differences
Regulatory Authority	All three countries' CBDCs are regulated by their respective central banks: Reserve Bank of India (RBI), People's Bank of China (PBOC), and State Bank of Pakistan (SBP).	China has the most active regulatory framework with the People's Bank of China leading CBDC development. India and Pakistan are still developing or refining their frameworks.
Legal Basis	CBDC development is generally tied to existing laws on currency issuance and digital	India and Pakistan are adapting their laws, like the <i>RBI Act</i> and <i>SBP Act</i> , respectively, while

	payments. All three countries operate within their central bank's broad mandate.	China has already developed regulatory measures for e-CNY under its financial regulations.
Stage of Development	All three countries are engaging with CBDCs at different stages: from research to pilot and implementation.	China is at an advanced stage with extensive e-CNY pilots. India is in pilot phase with the ₹ (Digital Rupee). Pakistan is in the research and exploration phase.
Technological Focus	All central banks are exploring the use of blockchain and distributed ledger technologies (DLT) for their CBDCs.	China is using a combination of blockchain and traditional database technologies. India and Pakistan are exploring blockchain but have not finalized the exact technology.
Purpose of CBDC	Financial inclusion, digitalization of the economy, and modernization of the payment system are common goals across all three countries.	China aims to reduce reliance on foreign currencies (like the U.S. dollar) in global trade. India and Pakistan are primarily focused on enhancing financial inclusion and domestic efficiency.
Cross-border Payment Focus	All three countries recognize the potential role of CBDCs in cross-border payments, although not yet a major priority.	China is actively exploring cross-border uses of e-CNY, especially within its Belt and Road Initiative (BRI). India and Pakistan are currently focused on domestic use cases.
Pilot Testing Approach	India and China are conducting CBDC pilots to explore real-world applications.	China has conducted large-scale e-CNY tests in major cities, while India has more limited retail and wholesale pilots. Pakistan has not yet launched a pilot phase.
Regulatory Innovations	Both India and China are updating their regulatory frameworks to support digital payments and CBDCs.	China is ahead in regulatory innovation, having already rolled out multiple laws and regulations for digital currency management. India is adapting its regulatory framework, while Pakistan is still at the early stage of setting guidelines.
Public and Private Sector Involvement	All three central banks are coordinating with both public and private sectors for testing and potential implementation of their CBDCs.	China is using state-owned enterprises and large tech firms in its pilot. India has also roped in major financial institutions for its pilot. Pakistan is engaging stakeholders but has not yet initiated the pilot.
Cybersecurity & Privacy Concerns	Cybersecurity and privacy are key concerns for all three nations.	China has implemented strong control mechanisms to monitor and manage the e-CNY for state supervision. India and Pakistan are working on these concerns but have not established as strict a framework as China yet.