DEMOGRAPHIC DYNAMICS OF FINTECH ADOPTION: EXPLORING PATTERNS AND PREFERENCES IN AN EMERGING ECONOMY

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ABSTRACT

In recent years, the global financial landscape has undergone a significant transformation propelled by the rapid proliferation of Financial Technology (Fintech). This technological revolution has not only reshaped traditional financial services but has also democratized access to financial products and services, ushering in a new era of financial inclusion and empowerment. Understanding the underlying demographic dynamics behind Fintech adoption has become increasingly crucial for policymakers, financial institutions, and market participants alike, especially within emerging economies. This research aims to delve into the intricate interplay between demographic factors and Fintech adoption within the context of emerging economies. Through a multidimensional approach encompassing quantitative analysis and theoretical frameworks, the study endeavors to investigate the patterns and preferences across different demographic segments. By analyzing data from 15 emerging countries representing diverse regions across the globe, the research seeks to uncover insights into the drivers and barriers influencing Fintech adoption.

Key findings indicate that while demographic factors intersect with technological trends to shape the Fintech landscape, other variables like economic prosperity and regulatory policies also play crucial roles. The study highlights the complexity of factors influencing Fintech adoption, emphasizing the need for tailored strategies to address the specific needs and preferences of different demographic segments. This research contributes to the evolving discourse on Fintech adoption by providing a comprehensive understanding of the demographic dynamics within emerging economies.

Keywords: Fintech adoption, demographic factors, emerging economies, financial inclusion, technological innovation, multidimensional approach Top of Form.

JEL Codes: C32, E31, E52, H62

INTRODUCTION

In recent years, the global financial landscape has witnessed a profound transformation driven by

DOI: 10.48165/iitmjbs.2024.SI.17

the rapid proliferation of Financial Technology, or Fintech. This technological revolution has not only reshaped traditional financial services but has also democratized access to financial products and services, ushering in a new era of financial inclusion and empowerment. As Fintech continues to gain momentum, understanding the underlying demographic dynamics behind its adoption becomes increasingly crucial for policymakers, financial institutions, and market participants alike.

This research seeks to delve into the intricate interplay between demographic factors and the adoption of Fintech within the context of an emerging economy. By analyzing patterns and preferences across different demographic segments, this study aims to uncover insights into the drivers and barriers influencing Fintech adoption. Moreover, it endeavors to shed light on how socio-economic characteristics such as age, gender, income level, educational attainment, and geographic location intersect with technological trends to shape the Fintech landscape.

Through a multidimensional approach encompassing quantitative analysis, qualitative research, and theoretical frameworks from disciplines such as economics, sociology, and psychology, this study endeavors to provide a comprehensive understanding of the demographic dynamics of Fintech adoption. By doing so, it aims to inform policymakers, financial institutions, and Fintech firms about strategies to foster greater inclusivity, address disparities, and harness the full potential of Fintech to drive socio-economic development in the emerging economy context.

In summary, this research aims to contribute to the evolving discourse on Fintech adoption by elucidating the nuanced relationship between demographic factors and technological innovation within the financial services sector of an emerging economy.

Financial Technology (fintech)

Financial technology (fintech) denotes the application of technology in the delivery of diverse financial services (Baber, 2020). Fintech entities are pioneering financial intermediaries leveraging technological innovations to foster innovative business models, refine operational processes, and offer enhanced products and services (Zhang et al., 2021). Emerging in the early 1990s alongside the internet revolution, fintech's trajectory has been profoundly influenced by the advent of the internet (Haddad & Hornuf, 2019). However, scholarly exploration of fintech, primarily documented in the Scopus database, dates back to Mackenzie's seminal article in 2015 (Mackenzie, 2015).

Fintech is hailed for its potential to render finance more transparent, user-friendly, and cost-efficient. Moreover, it is poised to disrupt the financial landscape by challenging incumbent financial institutions, including banking, insurance, and investment firms. Notably, fintech benefits from a distinct regulatory environment, enabling firms to operate more flexibly within regulatory sandboxes to innovate new products and services(Buchak et al., 2018).

The fintech ecosystem comprises various stakeholders and encompasses a wide array of business models and services. This ecosystem includes fintech startups, technology developers, government agencies, customers, and traditional financial institutions. Business models within fintech span payment solutions, wealth management, crowdfunding, peer-to-peer (P2P) lending, capital markets, and insurance (Insurtech) (Lee & Shin, 2018).

Fintech, a convergence of financial services and cutting-edge technology, encompasses a diverse array of services, from alternative credit scoring to mobile payments, all aimed at providing innovative solutions to traditional banking services (Ratecka, 2020).

The advent of the fourth industrial revolution (4IR) has propelled fintech to the forefront of innovation, leveraging technologies such as Artificial Intelligence (AI) and Distributed Ledger Technology (DLT) to enhance efficiency, accessibility, and security in financial services provision. Fintech emerges as a catalyst for financial inclusion, offering novel solutions to the unbanked and under banked populations, while also challenging traditional banking institutions to adapt to changing consumer preferences and market dynamics (Brynjolfsson and McAfee, 2016).

Drawing on a nationwide-representative sample, that the mobile access, lower levels of security concerns, and fewer geographic obstacles are positively associated with fintech adoption. Conversely, high levels of security concerns, lack of confidence in new technological solutions, and obstacles with service intuitiveness act as deterrents to fintech adoption (Hwang and Kim, 2018).

Adoption Factors

In recent years, the adoption of fintech solutions, particularly those aimed at individual consumers, has gained significant momentum, reshaping traditional banking practices and challenging established financial institutions. The transformative potential of fintech lies in its ability to leverage the digital technologies of the fourth industrial revolution (4IR), including artificial intelligence, distributed ledger technology, and high-speed internet connectivity, to democratize access to financial services and promote financial inclusion (World Bank Group & International Monetary Fund, 2019).

However, the successful adoption of fintech hinges not only on technological innovation but also on understanding the factors influencing users' willingness to embrace these digital financial solutions. The factors affecting the adoption of fintech can be listed as follows: -

Accessibility and Convenience: Fintech services offer convenience and accessibility, especially through mobile applications, which can be accessed by individuals at their convenience. Factors such as mobile access and geographic obstacles influence adoption rates (Int. J. Financial Stud. 2023).

Security Concerns: Users' perception of security risks associated with fintech services significantly affects adoption. Lower levels of reported concerns with security increase the

DOI: 10.48165/iitmjbs.2024.SI.17

likelihood of fintech adoption, while high levels of concerns for security and financial scam issues decrease adoption rates (Int. J. Financial Stud. 2023).

Technological Confidence: Users' confidence in using new technological solutions influences fintech adoption. Lower levels of confidence using new technology decrease adoption rates (Int. J. Financial Stud. 2023).

Service Intuitiveness: The ease of use and intuitiveness of fintech services impact adoption. High reported levels of obstacles with service intuitiveness decrease fintech adoption rates (Int. J. Financial Stud. 2023).

Trust: Trust in service providers plays a crucial role in fintech adoption. Lack of trust in service providers negatively affects adoption rates (Hwang and Kim, 2018).

Previous Experience: Users' previous experience, especially related to security incidents on fintech platforms, influences adoption rates. Negative experiences can deter users from adopting fintech services (Hwang and Kim, 2018).

Demographic and Economic Factors: Factors such as demographic characteristics (e.g., gender, age), economic variables (e.g., disposable income), and attitude variables (e.g., risk tolerance, financial knowledge) also influence fintech adoption (Gerlach and Lutz, 2017).

These factors interact in complex ways and vary between different contexts and user groups. Understanding and addressing these factors are crucial for successful fintech adoption strategies. By addressing these adoption factors comprehensively and strategically, fintech providers, policymakers, and regulators can create an enabling environment that encourages widespread adoption of digital financial services, driving financial inclusion and empowerment on a global scale.Top of Form

LITERATURE REVIEW

In Jordan, Al-Okaily et al. (2021) demonstrated that perceived usefulness and enjoyment significantly influenced the intention to adopt fintech services. Personal variables emerge as crucial determinants or mediators of the relationship between factors and their impact on fintech adoption intention, extending beyond mere demographic or socio-economic dimensions. For instance, Kakinuma (2022) highlighted that individual with ample leisure time exhibited a greater propensity to experiment with novel fintech solutions, consequently manifesting higher levels of adoption intention. This correlation was found to be mediated by factors such as quality of life and financial literacy.

Xie et al. (2021) expanded upon the factors influencing technology adoption by extending the Unified Theory of Acceptance and Use of Technology (UTAUT) model. Their study revealed that perceived usefulness, perceived risk, and social factors collectively determined user adoption intention. Moreover, the investigation of perceived value emerged as another significant dimension, where factors such as performance expectancy, effort expectancy, and perceived risk interacted to influence the perceived value of the technology, thereby significantly impacting adoption intention.

In a study conducted in Bahrain, Ahmed et al. (2020) emphasized that perceived benefit outweighed perceived risk in influencing fintech adoption. Given the varying demographic and economic profiles across customer segments and countries, the relative importance of these factors naturally varies. Mu and Lee (2017) conducted a comparative study in China and Korea, elucidating that while cost was a primary factor for Chinese customers, the credibility of fintech service providers played a more pivotal role in adoption intention among Korean customers.

Daragmeh et al. (2021) surveyed Generation X fintech users in Hungary and found that perceived usefulness, perceived ease of use, COVID-19-related norms, and risks collectively accounted for a significant proportion of the variation in intention to use mobile payment systems. Similarly, Nawayseh (2020) identified that perceived benefits and social factors exerted significant influence on intention to use fintech services, especially during the COVID-19 pandemic. Moreover, Nawayseh (2020) highlighted the mediating effect of trust on fintech adoption intention.

Following the Technology Acceptance Model (TAM), Jin et al. (2019) in Malaysia found that perceived usefulness, ease of use, awareness, and costliness significantly predicted fintech usage. Notably, perceived benefits positively impacted intention to use fintech services, whereas perceived risks exerted a negative influence. However, Ryu (2018) suggested that the effect of risks, including financial, legal, security, and operational risks, was stronger among early adopters, whereas other variables played a more significant role for late adopters. This finding was corroborated by Gerlach and Lutz (2021), who emphasized the nuanced interplay between benefits and risks in influencing fintech adoption intention among different customer groups.

There appears to be an inverse correlation between age and fintech utilization, with financial literacy serving as a facilitator for customers to engage with new fintech services (Hasan et al., 2022). The findings from Hasan et al. (2022) corroborate similar trends observed across multiple studies in the Asia-Pacific (APAC) region, emphasizing the necessity for targeted initiatives to enhance financial inclusion, particularly among older demographics. The significance of fintech in advancing financial inclusion extends even to developed markets, as evidenced by its role in expanding access to financial services in regions like British Columbia, where underbanked communities have benefited from the introduction of new fintech solutions (Clements, 2020). The advantages offered by fintech have the potential to mitigate the limitations inherent in microfinance facilities, as highlighted by findings from Nigeria, which underscore the existence of constraints and systemic biases within traditional microfinance systems (Pedrosa and Do, 2011).

Across various studies, a consistent pattern emerges regarding disparities in adoption rates and intentions among different gender and age cohorts. Generally, fintech adoption rates skew higher among younger demographics and males. This pattern persists in assessments of fintech adoption intentions across multiple

DOI: 10.48165/iitmjbs.2024.SI.17

markets, including the South Asian Association for Regional Cooperation (SAARC) and the Association of Southeast Asian Nations (ASEAN), where males and younger users exhibit greater propensity for adopting fintech services compared to their female and older counterparts (Imam et al., 2022). This underscores the imperative for fintech service providers and regulators to address these disparities and ensure equitable distribution of the anticipated benefits of fintech. Achieving universal appeal necessitates the design of fintech platforms that cater to diverse demographics, with specific measures required to facilitate equal access for women and the elderly (Imam et al., 2022). Furthermore, comprehensively capturing the intricate interplay among these factors calls for enhanced measurement methodologies. Cross-country comparisons could benefit from improved indexes that account for the complexity of interactions among variables influencing varying levels of fintech adoption (Huong et al., 2021).

Substantial disparities persist across countries, underscoring the pivotal role of macro-level indicators in shaping user intention and adoption levels at the national scale. Kumar et al. (2021) elucidated significant country-level heterogeneity in adoption intention, evident both between and within countries, drawing insights from data spanning 30 different nations. Concurrently, adoption rates exhibit marked divergence across countries (Ernst & Young, 2019a). Notably, an intriguing revelation surfaced from research conducted in Indonesia, where financial literacy emerged as the least influential factor in determining customer adoption (Setiawan et al., 2021). Instead, the study highlighted the pivotal role of user innovativeness, suggesting the necessity for intensified efforts from fintech service providers alongside supportive regulatory frameworks.

Amidst lower debt levels and the ascension of a burgeoning middle class, Asia largely circumvented the severe repercussions of the 2008-2009 Global Financial Crisis. Favorable macroeconomic conditions facilitated the rise of an empowered middle class with increasing purchasing power, fostering a burgeoning demand for novel services and products. Consequently, Asia witnessed the proliferation of a robust banking network, albeit significant portions of populations in countries such as India and China remained excluded from traditional banking channels. Fintech emerged as a transformative force, leveraging this conducive environment to extend financial services to substantial under banked and unbanked populations, particularly in Asia's largest economies (Alexander et al., 2017). Moreover, the role of supporting industries and ICT clusters emerged as instrumental in nurturing fintech ecosystems, with financial services clusters assuming a comparatively subdued role (Laidroo and Avarmaa, 2020).

At the national level, fintech emerges as a catalyst for empowering female populations, as evidenced by the International Monetary Fund's (IMF) cross-country analysis across 114 nations. Loko and Yang (2022) demonstrated the significant economic benefits of fintech in facilitating financial access for women, with countries exhibiting higher fintech penetration witnessing a surge in the number of female

workers in firms. Fintech's transformative potential extends beyond borders, holding vast promise for under banked and unbanked populations worldwide (Salampasis and Mention, 2018). While regulatory oversight, institutional quality, and macroeconomic and technological landscapes shape the nature of fintech's impact, its overarching effect manifests in expanded financial access and enhanced opportunities for financial prosperity. Strategic interventions and commercial strategies must intricately navigate these variables to maximize impact.

Moreover, Laos, Vietnam, and Cambodia emerge as frontrunners in the ASEAN region, boasting conducive geopolitical, technological, political, and socio-economic environments that foster fertile ground for fintech firms (Loo, 2019). The discourse in international development literature accentuates the imperative of harnessing digital technologies, including blockchain, mobile networks, and cloud computing, to uplift populations long excluded from formal banking channels. Fintech serves as a conduit for realizing financial inclusion in some of the world's poorest nations, with factors such as network effects, customer-centricity, and the appropriateness of commercial strategies standing out among the determinants of firms' success in this endeavor (Soriano, 2017).

RESEARCH OBJECTIVES

Investigate the interplay between demographic factors and Fintech adoption within an emerging economy.

Analyze patterns and preferences across different demographic segments to uncover insights into the drivers and barriers influencing Fintech adoption.

MATERIAL AND METHODOLOGY

This study examines fintech adoption across 15 emerging countries. It analyzes various types of fintech based transactions, including those conducted through mobile devices, the internet, and other digital platforms. To conduct this analysis, the study relies primarily on data sourced from the *Global Findex Database*.

The *Global Findex Database* conducts surveys periodically, with editions published in 2011, 2014, 2017, and 2021. These surveys are nationally representative and encompass a diverse array of economies globally. For instance, the 2021 edition surveyed approximately 128,000 adults across 123 economies, offering comprehensive insights into financial inclusion, particularly amidst the challenges posed by the COVID-19 pandemic.

This study requires data on demographic, economic indicators, and technological infrastructure from multiple authentic sources. The data from these sources are heterogeneous, varying in range and the number of indicators used to compute each dimension. Therefore, the study will aggregate the heterogeneous data subset into one to devise corresponding scores. Based on the stated approach following scores have devised:

Economic Index Score (EI_{Score})

Economic Index Score (EI_{Score}) adopted a normalization and aggregation methodology for

DOI: 10.48165/iitmjbs.2024.SI.17

the country specific indicators data taken from Human Development Index (HDI) and the Sustainable Development Goals Index (SDGI). *Economic Index Score* ensure comparability and equal weighting across the dimensions. This standard methodology involved a two-step process described involves two-step normalization and aggregation procedure to calculate a new metric, the "EI_{Score}," which serves as a baseline measure for assessing the relationship between economic development and households' financial decisions.

In the first step, raw dimensional scores for the EI_{Score} are normalized for each country using the min-max method. This normalization ensures that scores are on a consistent scale across different dimensions and countries. The formula used for normalization is:

$$\text{Normalized Score} = \frac{\text{Raw Score-Min Score}}{\text{Max Score-Min Score}}$$

Here, the Raw Score represents the original score for a various economic and human development indicator, while the Min Score and Max Score denote the minimum and maximum scores observed across all countries for these indicators, respectively.

In the second step, the normalized scores are aggregated using the geometric mean approach. This method is chosen due to its suitability for aggregating heterogeneous variables with limited substitutability. The geometric EI_{Score} for each country is computed as:

$$EI_{score} = (S_{Quantity} \times S_{Quality} \times S_{Environment})^{\frac{1}{3}} \times 100 \quad (1)$$

Here, refer to the normalized scores for the three dimensions. The resulting " " represents a composite measure of a country's economic performance. It ranges from 0 to 1 (0-100%), where higher scores indicate better performance. This score serves as a baseline measure for analyzing the relationship between fintech development and households' financial decisions, allowing for assessment based on percentage changes rather than absolute changes.

ICT Infrastructure Score

The ICT Infrastructure Score, derived from data provided by the *ICT Indicators database* (International Telecommunication Union, 2018) and the Inclusive Internet Index 2020 (The Economist Intelligence Unit, 2020). It offers a comprehensive assessment of a country's technological landscape. By amalgamating key indicators such as mobile phone subscriptions, fixed broadband subscriptions, internet users, and indices like the Inclusive Internet Index, this score provides valuable insights into a nation's readiness and accessibility in the realm of information and communications technology. The formula for calculating the ICT (Information and Communications Technology) Infrastructure Score based on the provided indicators and weights can be expressed as follows:

$$ICT_{Score} = \frac{W_1 \times N_{Mobile} + W_2 \times N_{Broadband} + W_3 \times N_{Internet} + W_4 \times N_{IntIndex} + W_5 \times N_{IntIndex}}{5} \quad (2)$$

Where:

- W_1, W_2, W_3, W_4 are the weights assigned to each indicator (in this case, each weight is 0.25 since all indicators are considered equally important).
- N_{Mobile},is Normalized Mobile Phone Subscriptions
- $N_{Broadband}$,is Normalized Fixed Broadband Subscriptions
- $N_{Internet}$,is Normalized Internet Users
- $N_{IntIndex}$,is Normalized Inclusive Internet Index Score
- $N_{IntIndex}$, is Normalized Mobile Connectivity Index

With higher scores indicating superior infrastructure and accessibility, and lower scores highlighting potential areas for improvement, the ICT Infrastructure Score serves as a vital tool for decision-makers.

Financial Infrastructure Score

To calculate the Financial Infrastructure score, a systematic approach has followed. Relevant indicators are identified, focusing on components that reflect the accessibility and availability of financial services within an economy. This includes metrics such as commercial bank branches per 100,000 adults, commercial bank branches per 1,000 km2, ATMs per 100,000 adults, and ATMs per 1,000 km2.Each indicator is assigned a weight to reflect its relative importance in the overall assessment. For example, if all indicators are considered equally important, a weight of 0.25 is assigned to each.

The raw data for each indicator is normalized using the min-max normalization method. This scales the data to a common range between 0 and 1, allowing for meaningful comparison across different indicators. The normalized values of all indicators are then aggregated to compute the Financial Infrastructure score. This can be done by taking the average of the normalized values, giving each indicator equal importance in the final score. The formula for calculating the Financial Infrastructure score based on the provided indicators and weights can be expressed as follows:

Where:

- W_1, W_2, W_3, W_4 are the weights assigned to each indicator (in this case, each weight is 0.25 since all indicators are considered equally important).
- N_{BBI},is Normalized Commercial Bank Branches per 100,000 Adults" refers to the normalized value of this indicator using min-max normalization.
- N_{BBG},is Normalized Commercial Bank Branches per 1,000 square km" refers to the normalized value of this indicator using min-max normalization.
- N_{ATMI},is Normalized ATMs per 100,000 Adults" refers to the normalized value of this indicator using min-max normalization.
- N_{ATMG},is Normalized ATMs per 1,000 square kmrefers to the normalized value of this indicator using min-max normalization.

This formula calculates the Financial Infrastructure score by combining the normalized values of the four indicators, each weighted equally. It provides a comprehensive measure of financial infrastructure, taking

DOI: 10.48165/iitmjbs.2024.SI.17

into account the density of commercial bank branches and ATMs per capita and per unit area.

These scores provide an indication of the overall ICT infrastructure readiness and accessibility in each country, considering factors such as mobile and fixed broadband subscriptions, internet users, and various ICT indices.

ANALYSIS AND RESULT

These 15 emerging countries including Argentina, Brazil, Chile, China, Colombia, India, Indonesia, Korea, Rep., Malaysia, Mexico, Nigeria, Russian Federation, South Africa, Turkey, and UAE have selected for this study. These countries have been selected based on their significant economic, technological, and demographic characteristics. They represent diverse regions across the globe, encompassing Latin America, Asia, Africa, and the Middle East. Additionally, these countries are known for their growing economies, large populations, and increasing integration into the global financial and technological

Table. 1: Computed Data for Adult Population, and another Score

Country	Adult population Growth (2011-21) %	Economic Index Score	ICT Infrastructure Score	Financial Infrastructure Score
Argentina	*13.65*	*10.2*	*0.561*	*0.29*
Brazil	*14.52*	*21.5*	*0.499*	*0.41*
Chile	*16.11*	*8.2*	*0.559*	*0.42*
China	*6.03*	*21.8*	*0.767*	*0.76*
Colombia	*20.37*	*9.6*	*0.565*	*0.30*
India	*19.32*	*25.7*	*0.413*	*0.18*
Indonesia	*17.68*	*7.5*	*0.484*	*0.34*
Korea, Rep.	*8.92*	*13.8*	*0.658*	*0.67*
Malaysia	*21.89*	*9.2*	*0.556*	*0.44*
Mexico	*18.88*	*13.8*	*0.588*	*0.26*
Nigeria	*31.28*	*5.7*	*0.384*	*0.22*
Russian Federation	*-3.20*	*12.6*	*0.429*	*0.37*
South Africa	*17.22*	*10.5*	*0.584*	*0.35*
Turkey	*21.30*	*8.3*	*0.491*	*0.27*
UAE	*13.48*	*12.6*	*0.640*	*0.47*

landscape. By including them in our analysis, we aim to provide insights into the financial and technological development trends across different regions and economic contexts, thus contributing to a comprehensive understanding of the global fintech landscape."

The scores devised above have utilized datasets prepared by multilateral agencies, as mentioned earlier. Using these datasets and formulations presented in (1), (2), and (3), we have computed the Economic Index Score, ICT Infrastructure Score, and Financial Infrastructure Score for selected countries. The score calculated for these countries have been presented in the table-1

The table-1 presents the Adult Population Growth (% change from 2011 to 2021) alongside scores for Economic Index, ICT Infrastructure, and Financial Infrastructure for 15 countries. Countries with positive Adult Population Growth rates, such as Malaysia (21.89%), Nigeria (31.28%), and Turkey (21.30%), show significant increases in the adult population over the past decade. This suggests potential expansion in the adult consumer base for financial and technological services. Whereas, the Russian Federation stands out with a negative Adult Population Growth rate (-3.20%), indicating a decrease in the adult population over the same period. This may pose challenges for economic and technological development initiatives due to a shrinking consumer base.

There seems to be no direct correlation between Adult Population Growth and Economic Index or Infrastructure Scores. While some countries with high population growth also have high scores in these indices (e.g., Nigeria, Malaysia), others show a mix of

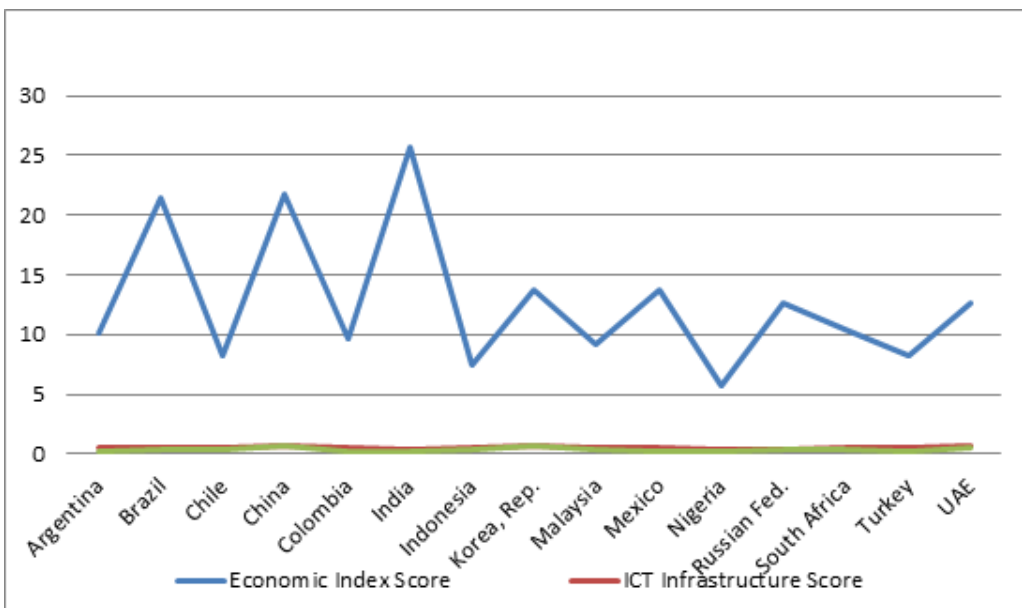

Fig. 1: Comparison of Scores for Different Countries

DOI: 10.48165/iitmjbs.2024.SI.17

high and low scores. High population growth rates in countries like Nigeria and Turkey, coupled with relatively moderate to high scores in infrastructure and economic indices, suggest significant market potential for financial and technological services. Conversely, negative growth in Russia may require different strategies for market penetration and expansion.

Financial Technology Score (FT Score')

The 'FT_{Score}' is a composite metric designed to assess the level of engagement with digital technology based financial transaction services within a population. It combines various indicators related to the adoption, usage, trust, and accessibility of digital money services into a single index, providing a holistic measure of digitalfinancial inclusion. It ensures fairness and comparability across the dimensions,

In *Fintech Score,* normalization and aggregation approach were adopted. This approach consisted of a two-step procedure. Initially, the min-max normalization method was applied to the raw scores of each dimension within the fintech scoreframework. This method standardized the scores across all countries, ensuring that each dimension's scores were transformed into a common scale. The normalization equation utilized was:

$$\text{Normalized Score}=\frac{\text{Raw Score-Min Score}}{\text{Max Score-Min Score}}$$

Here, the Raw Score represents the original score for a dimension, while the Min Score and Max Score denote the minimum and maximum scores observed across all countries for that dimension, respectively.

This normalization process facilitated equitable comparison and interpretation of mobile money engagement across the diverse emerging economies studied, enabling a more robust analysis of their respective levels of engagement with mobile financial services. By aggregating these components into a single index, Fintech Scoreoffers a comprehensive snapshot of the extent to which individuals within a population are engaged with mobile money services. The formula for can be expressed as:

$$FT_{Score}=\frac{w_1 \times M_1+ w_2 \times M_2 +w_3 \times M_3 + w_n \times M_n}{n}$$

Where:

- w_1,w_2,w_3…are weights assigned to each component, ensuring that the sum of weights equals 1.
- M_1,M_2,M_2…represents the respective percentages or proportions for each component.
- n, is the total number of components

Higher Fintech Scorescores indicate greater levels of engagement and adoption of mobile money services, while lower scores suggest areas for improvement in promoting mobile financial inclusion. The index allows for comparisons across countries and over time to assess trends in mobile-based financial transactions.

Applying the Mobile Money Engagement Index (Fintech Score) approach to the Global Findex Database table-N yields thefor 15 selected countries.

Table. 2: for 15 Emerging Economies During (2011-21)

Country	2011	2014	2017	2021
Argentina	0.485	0.543	0.592	0.618
Brazil	0.553	0.593	0.632	0.615
Chile	0.558	0.598	0.647	0.697
China	0.623	0.662	0.697	0.915
Colombia	0.558	0.598	0.647	0.697
India	0.553	0.593	0.632	0.615
Indonesia	0.558	0.598	0.647	0.697
Korea, Rep.	0.558	0.598	0.647	0.917
Malaysia	0.563	0.603	0.652	0.752
Mexico	0.558	0.598	0.647	0.697
Nigeria	0.558	0.598	0.647	0.697
Russian Federation	0.558	0.598	0.647	0.522
South Africa	0.553	0.593	0.632	0.667
Turkey	0.558	0.598	0.647	0.547
United Arab Emirates	0.495	0.553	0.602	0.765

The Fintech scorefor 15 emerging economies from 2011 to 2021 illustrate significant variations and trends in mobile money engagement over the past decade. Here's the interpretation along with the COVID-19 aspect:

Argentina, Brazil, Chile, Colombia, India, Indonesia, Malaysia, Mexico, and Nigeria show relatively steady Fintech scores over the period, with slight fluctuations but no clear upward or downward trend. Despite facing the COVID-19 pandemic, their Fintech scorescores remained stable, suggesting that the adoption and engagement with mobile money services were resilient or possibly unaffected by the pandemic.

China demonstrates a substantial increase in fintech scorescores, particularly from 2017 to 2021, indicating significant growth in mobile money engagement. This trend could be attributed to China's advanced digital infrastructure, robust mobile payment systems, and widespread adoption of fintech solutions, which may have been further accelerated by the COVID-19 pandemic as people turned to contactless payments and digital financial services.

South Korea exhibits a remarkable surge in fintech scorescores, especially in 2021, suggesting a rapid increase in mobile money engagement. This sharp rise could be influenced by the country's innovative mobile payment platforms, strong Smartphone penetration, and perhaps the impact of the COVID-19 pandemic, which may have accelerated the shift towards digital payments and financial inclusion.

Russian Federation: Russia's fintech scorescores show a decline in 2021 compared to previous years. This could be due to various factors, including changes in consumer behavior, regulatory policies, or economic conditions. The impact of the COVID-19 pandemic on mobile money engagement in Russia is uncertain and would require further analysis.

South Africa, Turkey, and United Arab Emirates: These countries demonstrate mixed

DOI: 10.48165/iitmjbs.2024.SI.17

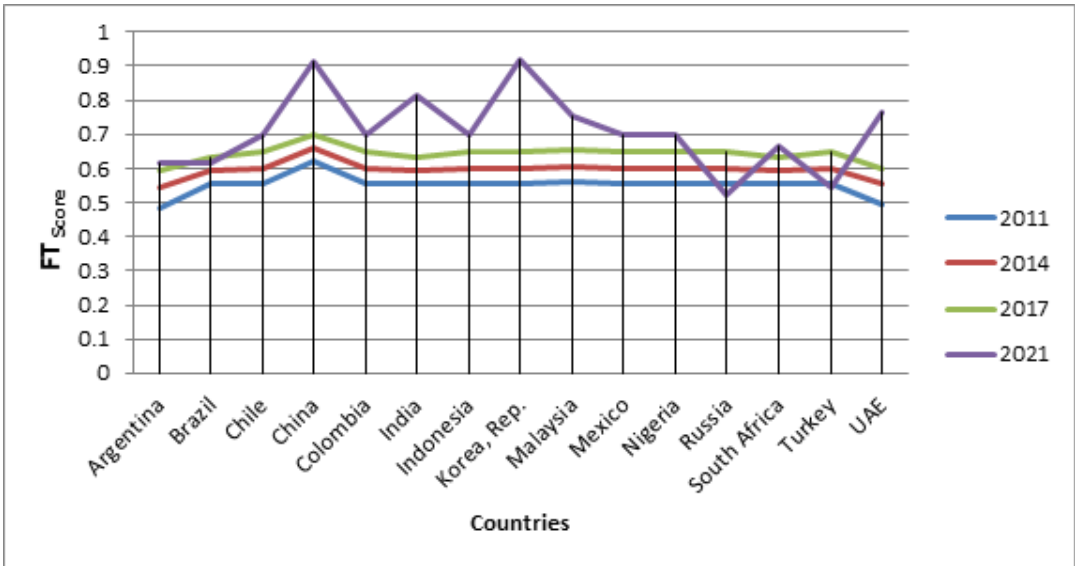

Fig. 2: Country-wise Fintech Score

trends in fintech scorescores. While South Africa and Turkey show relatively stable scores over the years, the United Arab Emirates experiences a notable increase in 2021. The COVID-19 pandemic may have influenced mobile money engagement differently in each of these countries, depending on factors such as digital infrastructure, financial policies, and socioeconomic dynamics.

Overall, the fintech scorescores reflect the diverse landscape of mobile money engagement across emerging economies during the past decade, with some countries experiencing significant growth, while others show stability or fluctuations. Understanding these trends in the context of the COVID-19 pandemic provides valuable insights into the resilience and adaptability of mobile financial services in response to global challenges.

Economic Index Score vs. FT Score:

The Economic Index Score vs. FT_{Score} scatter plot serves as a visual representation of the relationship between a country's economic performance and its level of mobile money engagement over time. By plotting the Economic Index Score on the x-axis and the Fintech Scoreon the y-axis for each year, we can observe any patterns or trends that emerge. A positive correlation between these two variables would suggest that countries with higher economic prosperity, as indicated by their Economic Index Scores, tend to exhibit higher levels of mobile money engagement, reflected in their Fintech Score. This positive correlation implies that economic factors play a significant role in driving mobile money adoption and usage, highlighting the importance of economic development in fostering digital financial inclusion and promoting the use of mobile financial services.

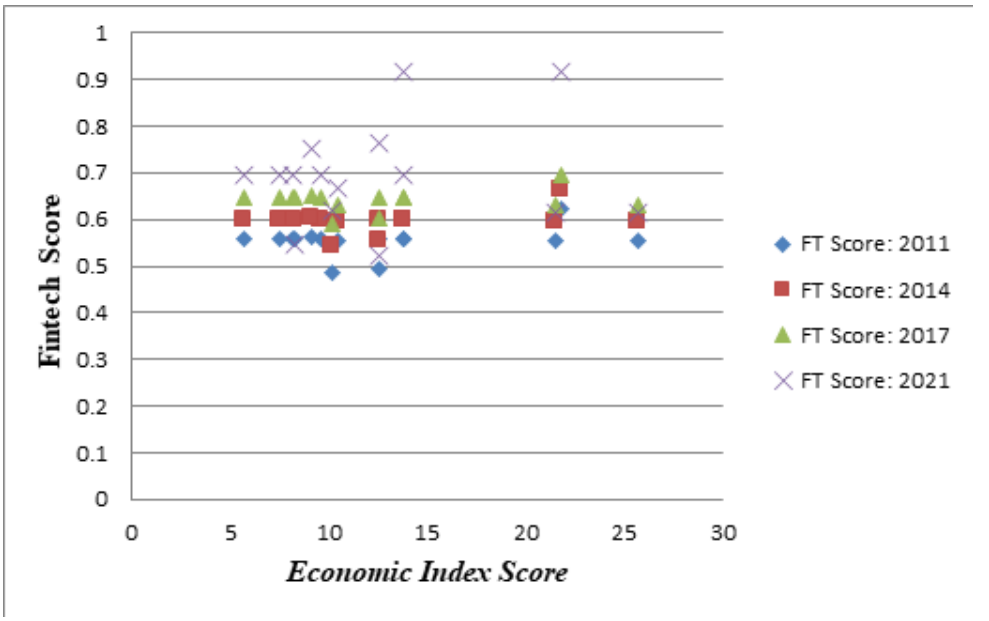

Fig. 3: Scatter plot of Economic Index Score vs. FT $_{Score}$

The scatter plot of Economic Index Score vs. FT Score allows us to visualize the relationship between a country's economic index and its fintech adoption across various years. As we examine the data points, we notice a general trend where countries with higher Economic Index Scores tend to have higher FT Scores. This positive correlation suggests that as a country's economic prosperity increases, it is more likely to embrace fintech solutions.

Analyzing the scatter plot over time (from 2011 to 2021), we can observe any changes or trends in this relationship. For instance, we may notice that some countries experience significant increases in both Economic Index Scores and FT Scores over the years, indicating a positive momentum in economic development and fintech adoption.

However, it's essential to identify outliers in the scatter plot. These outliers represent countries that deviate from the general trend. Understanding the reasons behind these deviations can provide valuable insights into the factors influencing fintech adoption in those specific countries.

Overall, the scatter plot helps us understand how economic development and fintech adoption are intertwined, offering insights into the global landscape of financial technology across different countries and time periods.

Adult Population Growth vs. FT Score

The scatter plot illustrates the association between the rate of adult population growth and the FT Score for different countries over

DOI: 10.48165/iitmjbs.2024.SI.17

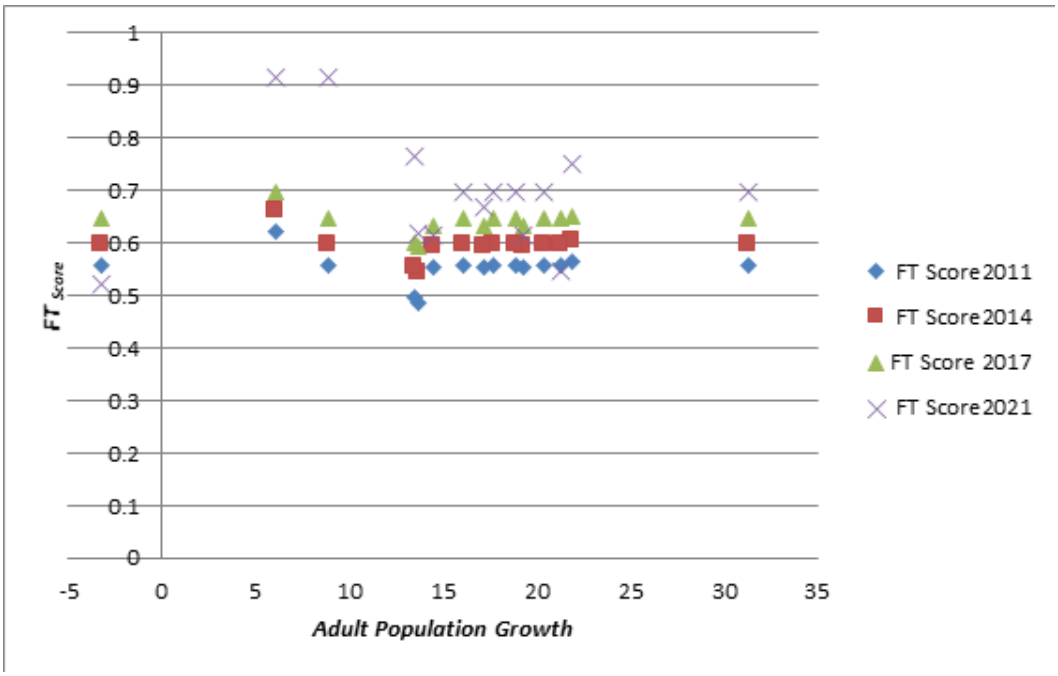

Fig. 4: Scatter Plot for Adult Population Growth vs. FT Score

the years 2011, 2014, 2017, and 2021. By examining the plot, we can discern diverse trends across nations, indicating a lack of uniform correlation between population growth and fintech adoption. While some countries with higher rates of population growth demonstrate correspondingly higher FT Scores, suggesting a potential positive correlation, others display no discernible pattern. The presence of outliers in the plot further underscores the complexity of factors influencing fintech adoption within specific countries. This complexity could stem from various socio-economic, regulatory, and technological factors unique to each nation. Hence, while the scatter plot offers valuable insights into how demographic dynamics might impact fintech adoption, it also emphasizes the multifaceted nature of this relationship, necessitating a nuanced understanding of local contexts and conditions.

ICT Infrastructure Score vs. FT Score

The scatter plot depicts the relationship between the ICT Infrastructure Score and the FT Score across different countries for the years 2011, 2014, 2017, and 2021. Analysis of the plot reveals varying patterns in the relationship between ICT infrastructure development and fintech adoption. Some countries exhibit a positive correlation between higher ICT infrastructure scores and increased FT scores, suggesting that nations with more advanced ICT infrastructure tend to have higher levels of fintech adoption. However, this correlation is not universal, as certain countries with relatively

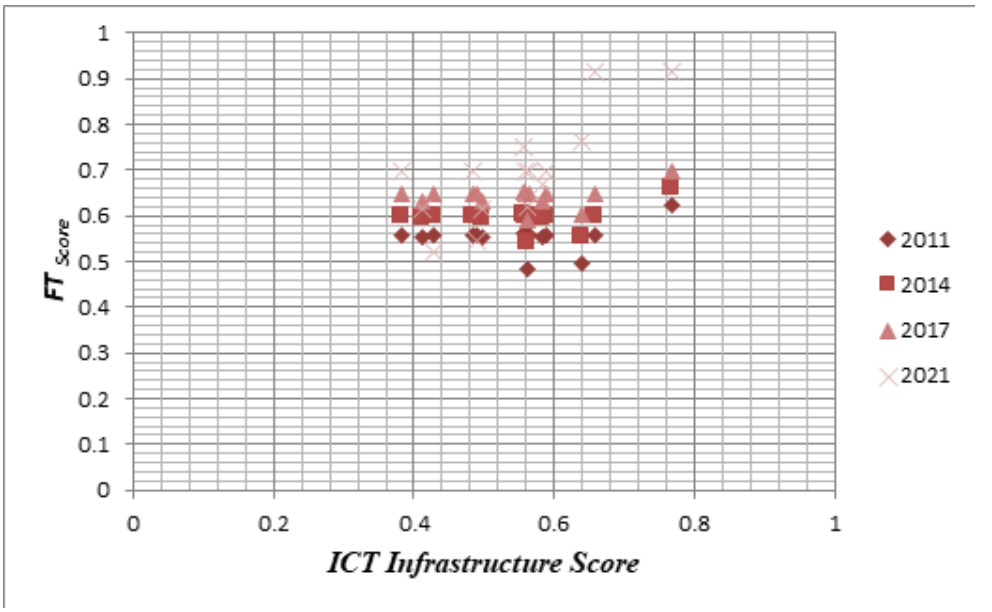

Fig. 5: Scatter Plot for ICT Infrastructure Score vs. FT Score

high ICT infrastructure scores display lower FT scores, indicating a disconnect between infrastructure development and fintech utilization. Additionally, the presence of outliers underscores the influence of other factors, such as regulatory frameworks, economic conditions, and cultural attitudes, on fintech adoption. Consequently, while ICT infrastructure serves as a critical enabler for fintech expansion, its impact on fintech adoption varies across different contexts, highlighting the need for a nuanced understanding of the interplay between infrastructure development and fintech utilization.

Financial Infrastructure Score vs. FT $_{Score}$

The scatter plot illustrates the relationship between the Financial Infrastructure Score and the FT Score across various countries for the years 2011, 2014, 2017, and 2021. Examining the plot reveals trends in the connection between financial infrastructure development and fintech utilization. Countries with higher financial infrastructure scores generally exhibit higher FT scores, indicating a positive correlation between the two variables. This suggests that nations with more robust financial infrastructure, including banking facilities and digital payment systems, tend to have greater adoption and integration of fintech solutions. Conversely, countries with lower financial infrastructure scores often display lower FT scores, implying that inadequate financial infrastructure may hinder fintech development and adoption. However, it's important to note that the relationship may not be linear for all countries, as other factors

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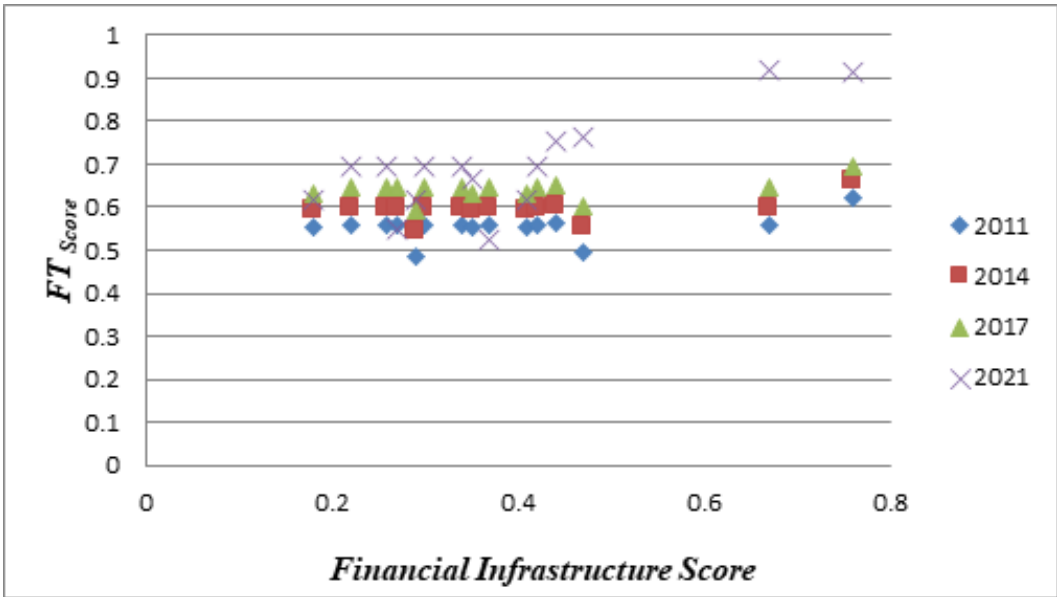

Fig. 6: Scatter Plot Financial Infrastructure Score vs. FT Score

such as regulatory environment, technological readiness, and consumer behavior can also influence fintech adoption. Therefore, while financial infrastructure lays the foundation for fintech expansion, its impact on FT scores may vary depending on the specific context and dynamics within each country.

DISCUSSION & CONCLUSION

The selection of 15 emerging countries for this study, including Argentina, Brazil, Chile, China, Colombia, India, Indonesia, Korea, Rep., Malaysia, Mexico, Nigeria, Russian Federation, South Africa, Turkey, and UAE, was based on their significant economic, technological, and demographic characteristics. These countries represent diverse regions across the globe, encompassing Latin America, Asia, Africa, and the Middle East. Additionally, they are known for their growing economies, large populations, and increasing integration into the global financial and technological landscape.

The Economic Index Score, ICT Infrastructure Score, and Financial Infrastructure Score were computed for these selected countries using datasets prepared by multilateral agencies. The analysis revealed interesting insights into the demographic and technological trends shaping the fintech landscape in emerging economies.

When examining the Adult Population Growth rates alongside the Economic Index and Infrastructure Scores, no direct correlation was found between population growth and economic or infrastructure development. While some countries with high population growth rates also exhibited high scores in economic and infrastructure indices (e.g.,

Nigeria, Malaysia), others showed a mix of high and low scores. This suggests that while population growth may indicate market potential for financial and technological services, other factors such as regulatory policies and consumer behavior also play crucial roles in driving adoption and usage.

The analysis of Fintech scores over the past decade revealed significant variations and trends in mobile money engagement across the selected countries. While some countries demonstrated steady Fintech scores with slight fluctuations, others experienced substantial increases or declines, influenced by factors such as digital infrastructure, regulatory policies, and the COVID-19 pandemic. For instance, China and South Korea exhibited remarkable growth in mobile money engagement, attributed to their advanced digital infrastructure and innovative payment systems.

The scatter plots further illustrated the relationships between economic, demographic, and technological factors and fintech adoption. While a positive correlation was observed between Economic Index Scores and Fintech Scores, indicating that countries with higher economic prosperity tend to have higher levels of fintech adoption, the relationships between population growth, ICT infrastructure, financial infrastructure, and fintech adoption were more nuanced. While ICT and financial infrastructure serve as critical enablers for fintech expansion, their impact on fintech adoption varies across different contexts due to factors such as regulatory frameworks and consumer behavior.

The key findings of the study can be summarizing as follows:

- It revealed that while demographic factors such as age, gender, income level, educational attainment, and geographic location intersect with technological trends to shape the Fintech landscape, other variables like economic prosperity and regulatory policies also play crucial roles.
- The analysis highlighted the complexity of factors influencing Fintech adoption, emphasizing the need for a nuanced understanding of local contexts and conditions.
- It found that while some demographic segments may show higher propensity for Fintech adoption due to factors such as digital literacy and access to technology, others may face barriers such as lack of awareness or trust in Fintech solutions.
- The research emphasized the importance of tailored strategies to address the specific needs and preferences of different demographic segments, thereby promoting greater inclusivity and adoption of Fintech services within the emerging economy context.

CONCLUSION

In conclusion, the analysis of demographic dynamics and technological trends in emerging economies provides valuable insights into the factors driving fintech adoption. While population growth may indicate market potential, economic prosperity, digital infrastructure, and regulatory policies play equally crucial roles in shaping fintech

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landscapes. The COVID-19 pandemic has further accelerated the shift towards digital financial services, highlighting the importance of resilience and adaptability in the face of global challenges.

Moving forward, policymakers, financial institutions, and fintech firms need to collaborate to foster greater inclusivity, address disparities, and harness the full potential of fintech to drive socio-economic development in emerging economies. By understanding the complex interplay between demographic factors, technological innovation, and regulatory environments, stakeholders can design tailored strategies to promote financial inclusion and digital transformation, ultimately leading to more equitable and sustainable economic growth.

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