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Examining the impact of digital financial inclusion on economic growth: Evidence from Gulf countries for the period 2000-2023

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Acknowledgments and Dedication

In the name of Allah, the Most Gracious, the Most Mercifu

Praise be to Allah who guided me and helped me complete this thesis. I want to extend my deepest gratitude to everyone who supported and stood by me throughout this academic journey.

To my dear family

I dedicate this work to my beloved family members who supported and encouraged me throughout my studies. This achievement would not have been possible without your unwavering support and motivation at every step.

To my dear mother

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Abstract

Title: Examining the Impact of Digital Financial Inclusion on Economic Growth: Evidence from Gulf Countries for the Period 2000-2023

Digital financial inclusion (DFI) is a pivotal element in economic policies aimed at stimulating growth and development, particularly in developing regions. This is especially pertinent for the Gulf Cooperation Council (GCC) countries, which have seen a rapid adoption of digital financial services over the past two decades. These services, accessible via mobile phones and the internet, can bridge the gap between the banked and unbanked populations, providing a pathway to inclusive financial access. This thesis explores the impact of DFI on economic growth (EG) in the GCC countries from 2000 to 2023, focusing on various digital financial services such as ATMs, online banking, digital commerce, mobile POS payments, and digital remittances.

The main objective of this study is to assess how DFI influences EG in the Gulf countries, utilizing advanced econometric techniques to analyze panel data. Five macroeconomic variables are examined: GDP per capita, access to ATMs, online banking, digital commerce, and digital remittances. The empirical analysis indicates that DFI significantly contributes to EG by improving financial accessibility, reducing poverty, and encouraging entrepreneurial activities.

The findings suggest that while DFI has a positive impact on economic growth, there is also a need for strategic investments in digital infrastructure, regulatory reforms, and financial literacy programs to fully harness these benefits. These insights are crucial for policymakers, financial institutions, and stakeholders in the GCC countries to build a robust and inclusive financial ecosystem. The study highlights the importance of decreasing reliance on traditional banking systems and oil revenues, advocating for a diversified economic strategy to support sustained long-term growth and development.

Keywords: digital financial inclusion, economic growth, GCC countries, digital financial services, financial accessibility.

Abstract

العنوان: دراسة أثر الشمول المالي الرقمي على النمو الاقتصادي: أدلة من دول الخليج للفترة 2000-2023

يُعد الشمول المالي الرقمي عنصرًا محوريًا في السياسات الاقتصادية الرامية إلى تحفيز النمو والتنمية، لا سيما في المناطق النامية. ويكتسب هذا الأمر أهمية خاصة بالنسبة لدول مجلس التعاون الخليجي، التي شهدت اعتمادًا سريعًا للخدمات المالية الرقمية على مدى العقدين الماضيين. يمكن لهذه الخدمات، التي يمكن الوصول إليها عبر الهواتف المحمولة والإنترنت، أن تسد الفجوة بين السكان الذين يتعاملون مع البنوك والسكان الذين لا يتعاملون مع البنوك، مما يوفر طريقًا للوصول المالي الشامل. تستكشف هذه الأطروحة تأثير الخدمات المالية الرقمية على النمو الاقتصادي في دول مجلس التعاون الخليجي في الفترة من 2000 إلى 2023، مع التركيز على مختلف الخدمات المالية الرقمية مثل أجهزة الصراف الآلي، والخدمات المصرفية عبر الإنترنت، والتجارة الرقمية، والمدفوعات عبر نقاط البيع المتنقلة، والتحويلات المالية الرقمية.

الهدف الرئيسي من هذه الدراسة هو تقييم كيفية تأثير الخدمات المالية الرقمية على النمو الاقتصادي في دول الخليج، وذلك باستخدام تقنيات الاقتصاد القياسي المتقدمة لتحليل بيانات اللوحة. تم فحص خمسة متغيرات اقتصادية كلية: نصيب الفرد من الناتج المحلي الإجمالي، وإمكانية الوصول إلى أجهزة الصراف الآلي، والخدمات المصرفية عبر الإنترنت، والتجارة الرقمية، والتحويلات المالية الرقمية. يشير التحليل التجريبي إلى أن التمويل الإنمائي الرقمي يساهم بشكل كبير في تحقيق النمو الاقتصادي من خلال تحسين إمكانية الوصول إلى الخدمات المالية، والحد من الفقر، وتشجيع أنشطة ريادة الأعمال.

تشير النتائج إلى أنه على الرغم من التأثير الإيجابي لمبادرة التمويل الرقمي على النمو الاقتصادي، إلا أن هناك حاجة أيضًا إلى استثمارات استراتيجية في البنية التحتية الرقمية والإصلاحات التنظيمية وبرامج محو الأمية المالية للاستفادة الكاملة من هذه الفوائد. هذه الرؤى مهمة لصانعي السياسات والمؤسسات المالية وأصحاب المصلحة في دول مجلس التعاون الخليجي لبناء نظام مالي قوي وشامل. وتسلط الدراسة الضوء على أهمية تقليل الاعتماد على الأنظمة المصرفية التقليدية وعائدات النفط، وتدعو إلى استراتيجية اقتصادية متنوعة لدعم النمو والتنمية المستدامة على المدى الطويل.

الكلمات المفتاحية: الشمول المالي الرقمي، والنمو الاقتصادي، ودول مجلس التعاون الخليجي، والخدمات المالية الرقمية، وسهولة الوصول إلى الخدمات المالية.

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Contents:

List of Abbreviations	
GDP	Gross Domestic Product
EG	Economic Growth
HDI	the Human Development Index
MBS	Mobile Banking Systems
MENA	Middle East and North Africa
U.S	United States Dollars
GNP	Gross National Product
AD	Aggregate Demand
AS	Aggregate Supply.
LRAS	Long-Run Aggregate Supply
USSD	Unstructured Supplementary Service Data
SME	Small and Medium-Sized Enterprises
DFI	Digital Financial Inclusion
IMF	International Monetary Fund.
CO2	Carbon Dioxide
OBOR	One Belt, One Road Initiative
GFC	Global Financial Crisis
GMM	Generalized Method of Moments
ATM	Automated Teller Machine
ICT	Information and Communication Technology
OB	Online Banking
DR	Digital Remittances
DC	Digital Commerce
POS	Point of Sale
OLS	Ordinary Least Squares
GLS	Generalized Least Squares

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Chapter One: Introduction.

1.1. Preface

1.2. Hypotheses of the Study

1.3. Objectives of the Study

1.4. Importance of the Study

1.5. Structure of the Study

1.1.Preface.

The rise of digital technologies has reshaped the global financial landscape, leading to a surge in digital financial inclusion (DFI)—the accessibility and use of financial services through digital platforms **(Yang & Wu,2023).** This thesis examines the impact of DFI on economic growth, focusing specifically on the Gulf countries of Kuwait, Qatar, Saudi Arabia, and the United Arab Emirates.

This region presents a compelling case study due to its unique characteristics. Despite substantial oil wealth, high remittance inflows, and a young, tech-savvy population, the Gulf countries face challenges related to economic diversification and financial inclusion disparities **(Khera et al., 2022).** This study analyzes the period from 2000 to 2023, capturing the dynamic evolution of digital financial landscapes and their influence on economic growth within these nations.

Employing advanced econometric techniques on panel data, this thesis investigates the relationship between various DFI dimensions—including access to ATMs, online banking, digital commerce, mobile point-of-sale payments, and digital remittances—and economic growth. This analysis provides crucial empirical evidence on the efficacy of leveraging DFI for sustainable economic development.

By exploring this nexus, this research contributes to the expanding body of knowledge on financial inclusion and its impact on economic progress. It offers valuable insights for policymakers, financial institutions, and stakeholders invested in harnessing the power of digital finance for inclusive and sustainable growth. Furthermore, the thesis identifies potential benefits and challenges associated with financial digitization, laying the groundwork for future research and policy formulation within the region and beyond. Ultimately, this study aims to inform policies and initiatives that promote economic resilience, bridge

financial divides, and support the long-term development objectives of the Gulf countries.

One specific question arose that requires answer:

Does DFI have a significant impact on the EG of Gulf countries, in particular from 2000-2023?

Under this question, the following sub-questions can be extended:

- How does the availability of ATMs influence the GDP per capita in Gulf countries?
- How does online banking usage affect the economic growth indicators of Gulf countries?
- To what extent does digital commerce affect the economic performance of Gulf countries?
- What is the relationship between mobile POS payments and economic growth in Gulf countries?
- How do digital remittances impact the economic growth of Gulf countries?

1.2. Hypotheses of the Study.

To accomplish the aim of the study, the following hypotheses are formulated:

Hypothesis 1: Increased access to ATMs positively impacts economic growth in Gulf countries.

Hypothesis 2: The adoption of online banking services enhances economic growth in Gulf countries.

Hypothesis 3: The expansion of digital commerce significantly contributes to economic growth in Gulf countries.

Hypothesis 4: Increased use of mobile POS payments drives economic growth in Gulf countries.

Hypothesis 5: Digital remittances positively affect economic growth in Gulf countries.

1.3. Objectives of the Study.

The primary objective of this memorandum is to analyze the role of digital financial inclusion in fostering economic growth in developing countries. Specific aims include:

- Evaluating the extent to which digital financial services can substitute traditional banking systems in promoting financial accessibility.

- Assessing the impact of digital financial inclusion on poverty reduction and economic equality.

- Investigating the influence of digital financial tools on entrepreneurial activities and small business growth.

1.4. Importance of the Study.

Understanding the effects of digital financial inclusion is crucial for policy makers and financial institutions aiming to enhance economic development. This study provides empirical evidence on how digital financial services can bridge the gap between the banked and unbanked populations, particularly in developing regions. By focusing on the economic impacts, the findings will inform strategies to optimise financial inclusion initiatives, ultimately contributing to sustainable and inclusive economic growth.

1.5. Structure of the Study.

In addition to this introductory chapter, the memorandum is structured as follows:

Chapter Two: Theoretical Framework discusses the theoretical background of digital financial inclusion and its economic implications.

Chapter Three: Literature Review - Surveys relevant studies and existing literature on the subject.

Chapter Four: Methodology - Describes the research methods and data analysis techniques employed in the study.

Chapter Five: Results and Discussion - Analyzes the findings and assesses their significance in the hypotheses.

Chapter Six: Conclusion and Recommendations - Summarizes the research outcomes and suggests policy recommendations for enhancing digital financial inclusion.

This introduction follows the same methodology and structure as the first chapter of your document, providing a clear and organized framework for the memorandum.

Chapter Two: Theoretical Framework

2.1.Introduction.

This chapter delves into the rapidly growing field of digital financial inclusion and its significant influence on economic progress. In today's digital age, access to financial services is crucial for both individual and societal advancement. Unlike traditional financial systems that often fail to reach marginalized populations, digital financial services provide a promising avenue for creating a more inclusive and accessible financial environment.

The chapter first defines digital financial inclusion and emphasizes its role in empowering individuals, alleviating poverty, and stimulating economic development. It explores the numerous advantages, such as increased access to diverse financial products, improved security and transparency, and the wider availability of financial tools. This discussion underscores the transformative power of digital platforms in reaching underserved populations, driving economic growth, and creating positive social impact.

However, the chapter also recognises the inherent challenges and limitations within the digital sphere. Concerns about privacy, data security, and the need for strong security measures are addressed, highlighting the importance of building trust and protecting user information. Lastly, the chapter analyses the connection between digital financial inclusion and economic growth, using empirical evidence and theoretical frameworks to demonstrate how digital platforms can serve as powerful catalysts for sustainable and inclusive economic development.

2.2.The Digital Financial Inclusion.

The increasing digitization of our world makes access to basic financial services like loans, insurance, and payment systems more crucial than ever. Individuals living in poverty recognize the importance of safe and secure ways to manage their money. Unfortunately, those who resort to informal savings methods like

hiding cash often face risks of theft or are forced to deplete their savings during emergencies.

Financial inclusion strives to address this gap by connecting individuals with formal financial systems and offering affordable, high-quality services tailored to their needs. The rise of digital financial services presents a significant opportunity to accelerate this inclusion. Digital platforms reduce costs for both providers and users, leading to more efficient and impactful services for low-income and underserved communities. With access to affordable mobile phones, individuals can manage their finances conveniently, securely, and reliably. **(Wang & Gabor & Brooks, 2020).**

2.2.1. Definition of Digital Financial Inclusion.

Financial inclusion is ultimately about ensuring individuals have access to the financial services that meet their specific needs, whether it be a basic bank account, credit, insurance, or savings products. For a small business owner, this might mean obtaining a loan to support operations, while for a low-income household, it could be a secure way to save for the future. The key is that these services are reliable, affordable, and relevant to the user's circumstances.

While this ideal remains out of reach for many, particularly in developing economies, digital financial services offer a promising path forward. By creating a supportive regulatory environment and addressing the unique challenges faced by low-income communities, these services can provide a more inclusive and accessible way to engage with the financial system.

The potential benefits of digital financial services align with broader development goals, including improved income, welfare, and risk management. These services enable individuals to make better financial decisions, accumulate assets, and smooth consumption. Compared to traditional financial services, they offer lower costs, greater convenience, and the potential for innovative products

tailored to specific needs, such as loans linked to investments in education or skills training.

Ultimately, development theory suggests that embracing digital technologies can lead to macroeconomic gains in economic growth and poverty reduction. By providing a platform to deliver essential financial services to a wider audience, digital financial services offer a powerful tool for achieving these positive outcomes.

2.2.2. The Importance of Digital Financial Inclusion

Digital financial inclusion is the ability of individuals and businesses to access and use affordable financial products and services, such as payments, savings, credit, and insurance, through digital channels. This is crucial for several reasons: worldbank.org

- Economic Empowerment and Poverty Reduction:

Access to basic financial services: Digital financial inclusion allows individuals, especially in remote areas, to participate in the formal economy by providing access to bank accounts, mobile money, and other financial tools. This enables them to save, make payments, and access credit, fostering economic empowerment and reducing poverty.

- Entrepreneurship and Business Growth:

Digital financial services make it easier for entrepreneurs and small businesses to access funding, manage their finances, and grow businesses. This contributes to job creation and economic development.

- Social Inclusion and Development:

Reduced Inequality: Digital financial inclusion can bridge the gap between the banked and unbanked populations, especially for marginalized groups such as

women, rural communities, and low-income individuals. This helps to reduce inequality and promote social inclusion.

- Improved Access to Essential Services:

Digital financial tools enable people to easily pay for essential services like utilities, healthcare, and education, improving their overall quality of life.

- Financial Literacy and Education:

Digital platforms can deliver financial literacy programs and education, empowering individuals to make informed financial decisions.

- Efficiency and Transparency:

Reduced Costs: Digital financial services are often cheaper and more convenient than traditional financial services, saving time and money for both individuals and businesses.

- Increased Transparency:

Digital transactions leave a clear audit trail, which can help to reduce corruption and improve financial transparency.

- Improved Government Service Delivery:

Governments can leverage digital financial tools to efficiently deliver social welfare programs, subsidies, and other benefits directly to citizens, reducing leakages and improving transparency.

Overall, digital financial inclusion significantly drives economic growth, reduces poverty and inequality, and promotes social development. It is a critical tool for achieving sustainable and inclusive economic growth in the digital age. nce of Digital Financial Inclusion.

2.2.3. Benefits of Digital Financial Inclusion:

The push towards digital-only financial inclusion offers a multitude of advantages, impacting individuals and economies alike. Let's explore these benefits:

Expanded Access and Convenience:

Diverse Financial Services: Digital platforms act as a one-stop shop, providing easy access to a range of financial services like credit, insurance, and investments, which were previously difficult to obtain for many, especially those in remote areas. **(Hollanders, 2020).**

- Enhanced Security and Transparency:

Safeguarding Finances: Digital platforms offer a secure way to store and manage money, reducing the risks associated with cash transactions like theft or loss**. (Ng & Kwok, 2017) (Salampasis & Mention & Giudici, 2018) (Clements, 2021)**

Tracking and Accountability: Digital transactions leave a traceable record, promoting transparency and accountability in financial activities.

- Democratization and Economic Empowerment:

Financial Inclusion for All: Digital platforms break down barriers to financial services, making them accessible to everyone regardless of their background or location, fostering greater economic participation**. (Philippon, 2019) (Williams, 2021) (Ozili, 2018)**

- Reaching the Underserved:

Fintech and mobile money solutions are particularly impactful for low-income individuals, youth, women, and rural communities, who have traditionally faced challenges accessing financial services.

- Boosting Economic Growth:

By facilitating quicker access to capital and efficient business operations, digital financial inclusion empowers individuals and SMEs, contributing to overall economic growth**. (Rasheed, Siddiqui, Mahmood, & Khan, 2019) (Ye, Chen, & Li, 2022)**

- Social Impact and Development:

Poverty Reduction: Mobile money platforms enable easier and faster money transfers, supporting families and communities, especially in remote areas. **(Anzoategui & Demirgüç-Kunt & Pería, 2014)**

- Financial Literacy and Skills Development:

Engaging with digital financial platforms equips individuals with essential digital and financial literacy skills, further enhancing their ability to participate in the digital economy**. (Vyas & Jain, 2021) (Sinha& Pandey & Madan, 2018) (Chen, Teng & Chen, 2022)**

- Bridging the Gap in Remote Areas:

Overcoming Geographical Barriers: Digital financial solutions offer a way to reach individuals in remote areas where traditional banks are often absent due to cost and logistical challenges. **(Tok & Heng, 2022) (Ozili 2018)**

Overall, digital-only financial inclusion represents a significant step towards a more inclusive and equitable financial landscape, fostering economic empowerment, social development, and improved well-being for individuals and communities worldwide.

2.2.4. Challenges and Limitations.

Despite the numerous advantages of digital financial inclusion, concerns regarding security and privacy pose significant challenges. Let's delve into these issues:

- Privacy Concerns and Data Vulnerability:

Sharing Personal Information: Engaging with digital financial services necessitates sharing personal data, raising valid concerns about potential misuse or breaches of privacy. Vulnerable populations, with limited protection and legal recourse, are particularly at risk.

Fear of Fraud and Identity Theft: The possibility of stolen biometric data or personal information being exploited for fraudulent activities, such as unauthorized loans, can deter individuals from adopting digital financial services.

- Trust as a Critical Factor:

Negative Experiences and Skepticism: Previous negative encounters with technology or general skepticism towards new systems can further amplify concerns and hinder adoption. Trust plays a vital role in building a strong client-provider relationship, and overcoming this hurdle is crucial.

Risk-Benefit Analysis: As emphasized by Pazarbasioglu et al. (2020), individuals weigh the potential risks of financial loss or compromised privacy against the perceived benefits of digital financial services. If trust in a secure and private environment is lacking, individuals may hesitate to participate, hindering the progress of financial inclusion initiatives.

- Addressing these challenges requires a multi-pronged approach:

Robust Security Measures: Implementing strong data protection measures, encryption protocols, and secure authentication methods is essential to build trust and ensure the safety of user information.

Transparency and Education: Fostering transparency about data usage and promoting financial literacy initiatives can empower users and alleviate concerns.

Building Trustworthy Systems: Collaborations between governments, financial institutions, and technology providers are crucial to develop secure and reliable digital financial ecosystems that prioritize user protection and privacy.

2.3.the economic growth.

Economists have long recognized the importance of economic growth. However, pinpointing the most crucial drivers of growth, such as technological innovation, investment, education, culture, social structures, or political stability, has been a complex endeavor. While research has explored these individual factors, understanding their intricate interactions remains a challenge **(Durlauf & Blume, 2010, p. 9).**

Despite its acknowledged significance, the study of economic development experienced a lull within the field from the late 1960s. This changed in the late 1980s with a resurgence of interest, marked by the emergence of "endogenous growth theory" focusing on long-term growth models. Additionally, the older neoclassical growth model was revisited and expanded, particularly to examine its implications for convergence across different economies **(Barro & Sala-i-Martin, 2004, p. 15).**

2.3.1. Definition of Economic Growth.

Economic growth, as explained by Harvey (1991, p. 478), is a long-term phenomenon characterized by the expansion of an economy's productive

capacity over time. This growth is typically quantified by measuring the rate of change in real Gross National Product (GNP) per capita.

Choudhury (1999, p. 225) further elaborates that economic growth is assessed through two interconnected indicators. The first is the rate of change in Real GNP, calculated by adjusting the GNP for inflation. The second factor involves the growth rate of output driven by technological advancements. This encompasses the efficient utilization of production factors like labour, capital, land, and energy to maximize their contribution, with payments distributed based on their individual marginal products. Methods for enhancing factor productivity include human resource development, technological innovation, and land improvements.

(Durlauf & Blume 2010, p. 38) define economic growth as the change in per capita Gross Domestic Product (GDP). Sustained positive long-term economic growth is a relatively recent phenomenon in human history, primarily occurring within the last 200 years. They emphasize the importance of measuring growth in per capita GDP rather than aggregate GDP to accurately reflect improvements in individual incomes.

(Fraumeni 2020, p. 1) views economic growth as the continuous rise in constant dollar GDP per capita, with its origins traced back to 18th-century England. Technological innovations led to the creation of affordable new products, fostering a series of mass markets that began with cotton goods and evolved through products utilizing steam power, iron, and steel.

2.3.2. Types of economic growth.

There are two types of economic growth:

- short-run economic growth.
- long-run economic growth.

- Short-run economic growth

Short-run economic growth is when the economy uses spare capacity in order to increase the real output. Spare capacity occurs when the economy's productive potential is underutilized. In other words, not all resources are utilized efficiently. Figure 1 shows the short-run economic growth by the movements of real GDP (Y) and the price level (P) when the aggregate demand (AD) increases

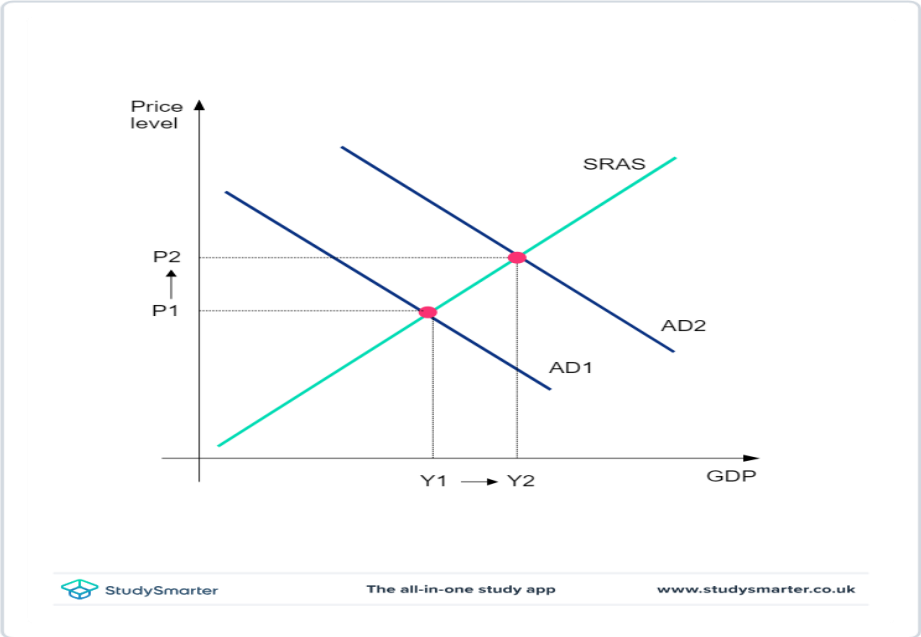

Figure 1: Short-Run Economic Growth.

When AD increases (from AD1 to AD2), the real GDP increases (from Y1 to Y2), causing a significant rise in the price level (from P1 to P2).

Aggregate supply (AS) is the total value of goods and services produced in the economy over time. Whereas aggregate demand (AD) is the total amount of money spent on goods and services produced in the economy over time.

Long-run economic growth. is an increase in the economy's productive capacity due to an increase in aggregate supply. It means that the potential or trend

economic growth rate is higher. Figure 2 shows the long-run economic growth by the movements of real GDP (Y) and the price level (P).

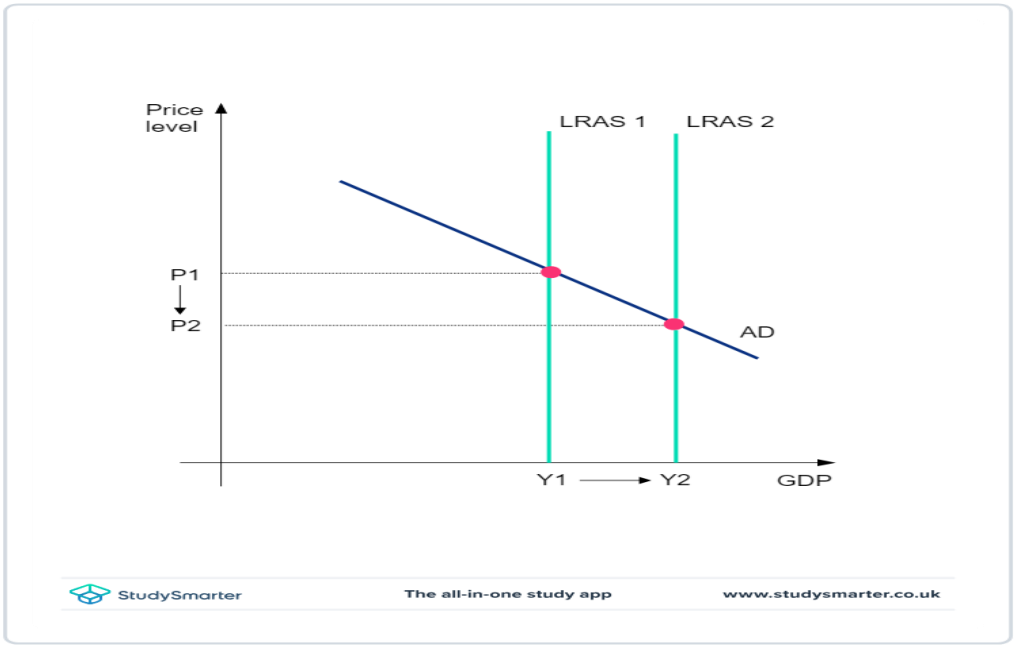

Figure 2: Long-Run Economic Growth.

When LRAS increases, the real GDP increases (from Y1 to Y2), causing a significant fall in the price level (from P1 to P2).

2.3.3. Causes of economic growth.

The engine of economic growth lies in increased productivity, which reflects how efficiently inputs like labour and capital are utilized to generate goods and services. Several interconnected factors contribute to this productivity growth, enabling an economy to produce more output with the same level of input. Here, we explore some key drivers of economic growth:

- Investment in Physical Capital.

Physical capital, encompassing machinery, buildings, and infrastructure, plays a vital role in driving economic growth. Investments in new factories, equipment,

or technology expand production capacity, leading to increased output of goods and services. For instance, India's infrastructure development projects, such as new highways and railways, have spurred economic growth by enhancing connectivity and facilitating the movement of goods and people.

- Human Capital Development.

Human capital refers to the skills, knowledge, and experience possessed by individuals or a population. Investing in education, training, and healthcare leads to a more productive workforce, consequently driving economic growth. South Korea's remarkable economic transformation from a developing to a developed nation within a few decades exemplifies the impact of prioritizing education and skills training.

- Technological Progress.

Technological advancements significantly enhance economic growth by improving efficiency and creating new business opportunities. The emergence of the internet, for example, has revolutionized industries across the globe, contributing substantially to global economic growth.

2.3.4. Economic Growth and Economic Development.

While often used interchangeably, the terms "development" and "growth" possess distinct meanings within the economic context. Economic development theory traditionally focuses on the process through which underdeveloped countries achieve a higher development stage, seeking to explain the increase in income and living standards. This is sometimes referred to as the "level effect."

In contrast, economic growth theory typically examines long-run, steady-state growth, measured by the percentage increase in national income or indicators like the Human Development Index (HDI). This is known as the "growth effect," a concept employed by Solow (1957) to highlight the dynamic role of

technological progress. Real per capita income serves as a common metric for measuring both economic development and growth **(Sengupta, 2011, p. 4).**

2.3.5. The Characteristics of Economic Growth

Economic growth can be categorized into two distinct types: quantitative and qualitative. Quantitative growth primarily focuses on increasing production by expanding inputs within existing technological and industrial frameworks. Conversely, qualitative growth emphasizes improvements in production through technological advancements driven by innovation, enhanced industrial structures, and the introduction of new products that generate fresh demand.

In agrarian societies, qualitative growth is limited due to the slow pace of technological progress. Additionally, the principle of diminishing marginal returns in agriculture leads to a gradual decline in quantitative growth, ultimately resulting in stagnation. This simple reproduction cycle traps agricultural economies in a vicious cycle of limited growth potential.

On the other hand, industrial societies experience faster technological advancements, enabling qualitative growth despite diminishing returns in short-term production. Consequently, industrial economies exhibit accelerating growth characteristics, contrasting with the decelerating growth patterns observed in agricultural economies **(Kim & Heshmati, 2014, p. 7).**

2.4. The Relationship between Digital Financial Inclusion and Economic Growth.

Existing research clearly demonstrates the positive impact of financial inclusion on mitigating problems such as unemployment, poverty, corruption, and inequality. However, traditional financial systems like banks and cooperatives have limitations. The World Bank suggests that relying solely on banks may not be sufficient for expanding economic activity. This is evident in several

developing countries where high bank penetration rates have not effectively addressed challenges like unemployment, anti-social activities, and corruption. **(Tran & Le, 2021)**

2.4.1. Impact on Economic Growth.

The use of mobile money transfers, a type of digital financial service, in East African countries like Kenya, Tanzania, and Uganda has demonstrably increased financial inclusion among economically disadvantaged populations, contributing to economic growth. Research also indicates that internet access positively impacts household financial assets, primarily by facilitating increased savings. A study encompassing 173 countries identified banks as crucial drivers of the relationship between finance and inclusive economic growth. Furthermore, there's a theoretical basis suggesting that digital financial inclusion can promote inclusive economic growth by reducing the costs associated with cash-based transactions and enabling the provision of efficient and affordable financial services. **(Zhu et al., 2020)**

Digital financial inclusion is emerging as a promising policy approach to foster improved economic growth. It entails the digital delivery of banking and financial services, distinguishing itself from traditional financial inclusion by offering direct access to financial services through digital channels for individuals without existing accounts. The potential benefits of digital financial inclusion are garnering significant attention due to its capacity to expand access to financial services, enhance individual financial resilience, facilitate government efforts in promoting financial inclusion for the economically disadvantaged, and ultimately stimulate economic growth. **(Liu et al., 2021)**

2.4.2. The Impact of Digital Financial Inclusion on Economic Growth

Digital financial inclusion plays a crucial role in advancing financial inclusion globally, particularly by fostering microfinance opportunities in developing and emerging economies and among low-income populations in even the wealthiest nations. The improvement of digital financial inclusion correlates with enhanced transactional security provided by electronic payment systems like mPayment and Mobile Banking Systems (MBS), both of which utilize USSD-based transactions. Consequently, digital financial inclusion presents opportunities to broaden access to formal financial services and stimulate economic growth. **(Pazarbasioglu et al., 2020)**

2.4.3. Role of Digital Financial Inclusion in Economic Growth.

The prevalence of dormant and low-activity formal bank accounts can significantly hinder a nation's economic growth. Digital financial services have the potential to address this issue by removing barriers to access within formal financial systems, primarily through the reduction of transaction costs. In countries with a well-managed and sustained agent-to-citizen ratio, transferring funds to and from e-wallets becomes a more cost-effective and secure alternative to storing savings in unsafe assets. While inadequate legal frameworks and inconsistent customer protection laws in low- and middle-income countries can limit access to digital financial services for many households, improved credit access can still have a positive and long-term impact on economic growth. Access to low-cost capital encourages investment in riskier yet potentially high-return small and medium-sized businesses in middle-income countries, which ultimately contributes to reducing income inequality and enhancing overall welfare, aligning with government objectives. **(Almeida et al., 2021)**

2.5. Conclusion.

In conclusion, the chapter thoroughly examines the pivotal role of digital financial inclusion in promoting economic growth and social development. By providing an accessible, secure, and efficient means for individuals and businesses to engage with financial services, digital platforms have the potential to significantly enhance economic participation and empowerment, particularly for underserved populations. The transformative benefits of digital financial inclusion include expanding access to diverse financial products, improving financial literacy, and facilitating quicker and more efficient business operations, which collectively contribute to poverty reduction and economic growth.

However, the chapter also acknowledges the challenges and limitations that accompany digital financial inclusion. Key issues such as privacy concerns, data security, and the need to build trust among users are critical factors that must be addressed to ensure the successful adoption and sustainability of digital financial services. Robust security measures, transparency in data usage, and collaborative efforts between governments, financial institutions, and technology providers are essential to overcome these barriers and foster a secure and inclusive financial ecosystem.

Overall, the chapter emphasizes that while digital financial inclusion presents significant opportunities for economic empowerment and development, careful consideration and proactive measures are necessary to mitigate the associated risks and challenges. By addressing these issues, digital financial inclusion can be a powerful catalyst for achieving sustainable and inclusive economic growth in the digital age.

Chapter Three: Literature Review.

1.1. Introduction.

1.2. the Previous studies.

1.3. Summary of previous studies.

1.4. The research gaps.

1.5. conclusion

3.1.Introduction.

Digital financial inclusion has emerged as a pivotal factor in fostering economic growth across various regions worldwide. Integrating digital financial services aims to provide underserved populations with access to financial products and services, promoting broader economic participation. This chapter delves into the existing literature to examine the relationship between digital financial inclusion and economic growth. By analyzing studies conducted across diverse geographic contexts, including China, MENA, Sub-Saharan Africa, and other regions, this review seeks to identify patterns, insights, and implications that can inform policies and strategies. The objective is to highlight how digital financial inclusion can drive economic growth and to pinpoint the specific mechanisms through which this occurs. Moreover, the chapter aims to identify gaps in the current research, particularly in the context of the Gulf countries, to guide future investigations and policy recommendations.

3.2.the Previous studies.

1. **Y. Shen (2021): Digital Financial Inclusion and Economic Growth: A Cross-country Study**

This study aimed to analyze the relationship between digital financial inclusion and economic growth. Researchers constructed a digital financial inclusion evaluation system to compare 105 countries. They used data from the World Bank and the International Monetary Fund (IMF) to calculate a digital financial inclusion index for the period. Subsequently, they analysed the link between this index and economic growth for 86 neighbouring countries using spatial data and techniques. The results revealed that digital financial inclusion has a positive and significant effect on economic growth and positive spillover effects on neighbouring economies.

2. **Y. Liu (2021): Can digital financial inclusion promote China's economic growth?**

This study investigated how digital financial inclusion, an innovative financial service, affects economic growth in China. The researchers used a Bayesian macroeconomic analysis framework and analyzed provincial panel data from 2011 to 2019. They introduced the level of internet development as a factor influencing the impact of digital financial inclusion. The analysis revealed that digital financial inclusion significantly contributes to economic growth. However, this effect is conditional on internet development. Finally, the study identified two key channels: promoting entrepreneurship among small and medium-sized enterprises and stimulating consumer spending. These findings suggest that promoting digital financial inclusion and internet access can contribute to economic growth in China.

3. **M. Ahmad, A. Majeed (2021): Digital financial inclusion and economic growth: provincial data analysis of China.**

The objective was to examine the impact of digital financial inclusion and human capital on economic growth in China. The study focused on the provinces of China from 2011 to 2018. Unlike previous studies, the methodology involved using a new proxy for digital financial inclusion based on breadth of coverage, depth of usage, and digitalisation level. Panel data analysis techniques were employed, such as fixed effect, Panel-Corrected Standard Errors model, fixed-effect robust, and Driscoll & Kraay robust standard error method. The main results showed that digital financial inclusion and human capital significantly and positively affected China's provincial economic growth during the studied period. Based on these findings, the study recommended investing in human capital development and upgrading digital financial inclusion to attain higher economic growth in China.

4. **Mohammad O. Al-Smadi (2022): Examining the relationship between digital finance and financial inclusion: Evidence from MENA countries.**

This study aimed to examine the association between digital finance and financial inclusion in the Middle East and North Africa (MENA) region. The period covered was from 2004 to 2020. The methodology employed was a system–generating method of moments (sys-GMM) panel method using annual data on 12 countries in the MENA region. Financial inclusion was measured with a composite index incorporating three subindexes: access, availability, and usage of financial services, while digital finance was measured by the number of ATMs per 100,000 adults. The main results confirmed the role of digital finance in enhancing financial inclusion in MENA countries. As the main recommendation, the study suggested that policymakers and digital financial service providers in MENA countries could use the findings to expand the boundaries of financial inclusion in their countries.

5. **U. Ugwuanyi and R. Ugwuoke (2022): Financial inclusion and economic growth nexus: traditional finance versus digital finance in Sub-Saharan Africa.**

This study aimed to examine the impact of financial inclusion on economic growth in 29 Sub-Saharan African countries from 2012 to 2020. It differentiated between traditional and digital finance and their access and usage sub-dimensions. Panel regression techniques and Granger causality tests were employed to analyze the data.

The results revealed that both traditional and digital financial inclusion positively and significantly influenced economic growth in the region. However, the impact of traditional finance was found to be greater than digital finance overall. Notably, access to financial services, regardless of the method (traditional or digital), displayed a stronger association with economic growth than usage. Furthermore, the analysis

identified income level as a differentiating factor. While traditional and digital finance mattered in middle-income countries, only digital finance held significance in low-income ones. Additionally, the Granger causality test suggested a unidirectional influence, with economic growth seemingly more impacted by traditional finance access than vice versa.

In conclusion, the study emphasises the continued importance of traditional financial institutions and digital finance's growing role in fostering economic growth within developing economies.

6. **A. Gupta (2022): Economic Growth Opportunities with Promotion of Financial Inclusion in Digital India**

This study investigated how Indian corporations could leverage government initiatives launched in 2015: Jan Dhan-Aadhar-Mobile (JAM) infrastructure and Digital India. The objective was to identify opportunities for corporations to develop affordable products and services while expanding their financial and digital reach in new markets. Focusing on India from 2015 onwards, the analysis explored how JAM's large-scale financial inclusion efforts, with over 250 million bank accounts opened, aligned with the government's vision of financial and digital inclusion for all citizens. The study did not use a specific methodology but analyzed existing initiatives and their potential impact. The main results suggest corporations can leverage JAM and Digital India to develop cost-effective solutions for a financially included population. The recommendations imply corporations should explore new avenues to serve this newly empowered demographic.

7. **M. Saraf, P. Kayal (2022): Role of Digital Financial Inclusion in Promoting Economic Growth and Freedom.**

This chapter examined the impact of digitalization on financial freedom in the modern industrial era (2010-2021). The study explored how digital financial services contribute to financial inclusion, economic growth, and financial freedom.

We began by establishing the connection between financial inclusion and financial freedom. Then, the analysis investigated how digitalization facilitates borrowing through alternative financing methods, thereby enhancing financial freedom. Furthermore, the research explored how spreading and adopting Information and Communication Technology (ICT) through digital financial services leads to financial development and freedom. Finally, the study analyzed the concept of financial freedom to past banking performance and its efficiency.

8. **Ozturk and Ullah (2022): Does digital financial inclusion matter for economic growth and environmental sustainability in OBRI economies? An empirical analysis.**

This study investigated the impact of digital financial inclusion on economic growth and environmental sustainability in 42 OBOR (One Belt, One Road Initiative) countries. The analysis covered the period from 2007 to 2019 and employed three different econometric methods: pooled ordinary least squares (OLS), two-stage least squares (2SLS), and generalized method of moments (GMM). The research found that digital financial inclusion promoted economic growth in these countries. However, it also resulted in a negative environmental consequence, with increased CO2 emissions. Based on these findings, the authors recommend that policymakers in OBOR regions design policies that encourage digital financial inclusion while addressing environmental concerns to achieve sustainable economic development.

9. **Daud and A.H. Ahmad (2023): Financial inclusion, economic growth and the role of digital technology.**

This research examined how financial inclusion and digital technology influence economic growth. They analyzed data from 84 countries following the Global Financial Crisis (GFC). The study employed a dynamic panel data analysis technique. Their findings revealed that both financial inclusion and digital technology had a positive and significant impact on economic growth in these countries. Interestingly, the research also showed that digital technology strengthens the positive effects of financial inclusion on growth. This suggests that focusing on improving financial systems through investments in digital infrastructure could be a powerful strategy to boost economic growth.

10.N. Sreenu (2023): Digital financial inclusion (DFI) can improve the economic growth: a study of India.

This research investigated how digital financial inclusion (DFI), a new and innovative financial service, can influence economic development in India. The study examined state-level panel data from 2008 to 2021. Using a Bayesian macroeconomic framework, the analysis explored the impact of DFI on economic development, considering internet growth as a potential threshold variable. The findings revealed that DFI growth significantly contributes to economic development. Furthermore, the study identified two key channels through which DFI fosters economic growth: promoting entrepreneurship among small and medium-sized enterprises and encouraging the population's broader use of financial services.

11. W. Xi, Y. Wang (2023): Digital financial inclusion and quality of economic growth.

This study examined how digital financial inclusion, which has been rapidly growing in China, affects the quality of economic growth. The researchers analysed provincial data from China between 2011 and 2017. They considered factors like technological innovation, balanced development, environmental protection, international trade, and citizen well-being to define the quality of economic growth. By employing various

models, the study found that digital financial inclusion positively impacted this quality of growth, especially in eastern provinces and areas with high market activity. The positive influence seems to stem from increased entrepreneurial activity fostered by digital financial inclusion. Interestingly, the effect grew stronger over the studied period and benefitted neighboring regions. Consequently, the study suggests that expanding the reach and depth of digital financial inclusion can significantly improve the quality of economic growth in China.

12.A. Ben Abdallah(2023): Does Digital Financial Inclusion Affect Economic Growth? New Insights from MENA Region.

This research examined the association between traditional financial services, digital financial inclusion, and economic growth in 14 Middle East and North Africa (MENA) countries from 2000 to 2021. Academics and policymakers have increasingly focused on these topics in recent years, particularly since the growth of digital financial services in Africa (post-2014) and their acceleration due to the COVID-19 pandemic in China. However, the impact of digital financial inclusion on economic growth remained understudied. This research employed PMG-ARDL and GMM-System approaches in STATA 17 and Winrats 9.0 to capture short- and long-term relationships. The analysis found that the exogenous component of digital financial inclusion positively correlated with GDP per capita, suggesting that digital financial inclusion was more beneficial for economic growth than traditional financial services in this region. Furthermore, the study identified internet users and mobile subscriptions as key determinants of digital financial inclusion. These findings can inform policy recommendations for promoting financial inclusion through digitizing financial services.

13.Bu and Xie (2024): Linking to the development of economic growth with digital financial inclusion and supply chain management in China.

This study explored how digital finance and efficient supply chains boosted regional economies in China. Analyzing data from 27 provinces between 2007 and 2022 highlighted a new way to measure access to digital financial services. The findings showed that digital financial inclusion and strong supply chain management significantly contributed to economic growth. The study recommended promoting digital finance and investing in education (human capital development) to accelerate economic expansion further. Additionally, the research emphasized the importance of good institutions and governance for achieving sustainable economic growth in China.

14. Chinoda AND Kapingura (2024): Digital financial inclusion and economic growth in Sub-Saharan Africa: the role of institutions and governance.

This study examined the role of institutions and governance in the digital financial inclusion and economic growth relationship in Sub-Saharan Africa (SSA) between 2014 and 2020. The researchers used the generalized method of moments to account for endogeneity. They analyzed four main variables: digital financial inclusion, economic growth, institutions, and governance. The findings suggested that strong institutions and good governance positively impact how digital financial inclusion leads to economic growth in SSA. The study also found that trade and population growth positively affected economic growth while inflation slowed it down.

Limitations acknowledged by the researchers include neglecting the impact of digital financial inclusion on the environment. They suggested future research to address these limitations and broaden the study to include Africa and other developing countries facing similar challenges. The results implied a positive connection between digital financial inclusion and economic growth. It's important to note that the study assumed institutions play a key role in boosting economic growth in SSA. In terms of practical implications, the findings confirmed the importance of policies that improve institutional quality and governance as additional ways for authorities to

enhance economic growth in SSA. Socially, the paper highlighted the importance of institutions in driving economic growth, which ultimately has a broader impact on social life, not just digital financial inclusion. Finally, the study's originality lies in analyzing the role of institutions and governance on the digital financial inclusion-economic growth connection rather than the more common focus on traditional financial inclusion and economic growth.

15.I. Amaliah (2024): Does digital financial inclusion forecast sustainable economic growth? Evidence from an emerging economy

This investigated the impact of digital financial inclusion on sustainable economic growth in developing economies. It examined data from Indonesia between 2011 and 2020, using the number of automated teller machines (ATMs) and debit card holders as proxies for digital financial inclusion. The effects on sustainable economic growth were measured by looking at changes in gross domestic product (GDP) and carbon dioxide (CO2) emissions. The analysis, which employed the generalised method of movement (GMM) technique, revealed that digital financial inclusion had a significant positive impact on both GDP growth (strong) and CO2 emissions (moderate). These findings suggest accelerating digital financial inclusion initiatives could be a promising strategy for developing countries to achieve sustainable economic growth.

3.3.Summary of previous studies.

The following table **Table (3.1)**: provides a short summary of each study reviewed in this chapter.

Author(s)and Year	Objectives and Periods	Estimation Methods	Main Results
Shen (2021)	Analyse the relationship between digital financial inclusion and economic growth across countries.	spatial data analysis techniques.	Digital financial inclusion positively affects economic growth, with positive spillovers to neighbouring economies.
Y. Liu (2021)	Investigated how digital financial inclusion affects economic growth in China from 2011 to 2019.	Bayesian macroeconomic analysis framework.	Digital financial inclusion significantly contributes to economic growth, conditional on internet development level. Promotes entrepreneurship and consumer spending.
M. Ahmad & A. Majeed (2021)	Examined the impact of digital financial inclusion and human capital on economic growth in China from 2011 to 2018.	Panel data analysis techniques like fixed effect, PCSE, FE robust, Driscoll-Kraay robust errors.	Digital financial inclusion and human capital significantly and positively affected China's provincial economic growth.

M.O. Al-Smadi (2022)	Examined the association between digital finance and financial inclusion in the MENA region from 2004 to 2020	System-GMM panel method.	Confirmed role of digital finance in enhancing financial inclusion in MENA countries.
U. Ugwuanyi et al. (2022)	Examined the impact of financial inclusion on economic growth in 29 Sub-Saharan African countries from 2012 to 2020.	Panel regression techniques, Granger causality tests.	Both traditional and digital financial inclusion positively impacted economic growth, but traditional finance had a greater impact overall.
A. Gupta et al. (2022)	Investigated opportunities for Indian corporations from 2015 with government's financial/digital inclusion initiatives.	/	Corporations can leverage initiatives to develop cost-effective solutions for financially included population.
M. Saraf & P. Kayal (2022)	Examined impact of digitalisation on financial freedom from 2010-2021.	/	Digital financial services contribute to financial inclusion, economic growth and overall financial freedom
Ozturk & Ullah (2022)	Investigated impact of digital financial inclusion on economic growth and	Pooled OLS, 2SLS, GMM.	Digital financial inclusion promoted economic growth but increased CO2

	environment in 42 OBOR countries from 2007-2019.		emissions.
Daud & Ahmad (2023)	Examined how financial inclusion and digital technology influence economic growth post-GFC in 84 countries.	Dynamic panel data analysis.	Financial inclusion and digital technology positively impacted economic growth. Digital technology strengthened financial inclusion's positive effects.
N. Sreenu (2023)	Investigated how digital financial inclusion (DFI) can influence economic development in India from 2008-2021.	Bayesian macroeconomic framework.	DFI growth significantly contributed to economic development by promoting entrepreneurship and broader financial service usage.
W. Xi & Y. Wang (2023)	Examined how digital financial inclusion affects quality of economic growth in China from 2011-2017.	Panel Threshold Model with FD-GMM Estimation	Digital financial inclusion positively impacted quality of growth, especially in active market regions. Effect grew over time and benefited neighbors.
A. Ben	Examined association between	PMG-ARDL, GMM-	Digital financial inclusion had a

Abdallah (2023)	traditional finance, digital financial inclusion and economic growth in 14 MENA countries from 2000-2021.	System.	positive correlation with GDP per capita, more beneficial than traditional finance for growth in the region.
Bu and Xie (2024)	Explored how digital finance and supply chains boosted regional economies in China from 2007-2022.	instrumental variable.	Digital financial inclusion and strong supply chain management significantly contributed to economic growth.
Chinoda AND Kapingura (2024):	Examined role of institutions/governance on digital financial inclusion and economic growth in Sub-Saharan Africa from 2014-2020.	Generalised Method of Moments.	Strong institutions and governance positively impacted how digital financial inclusion led to economic growth in the region.
I. Amaliah (2024)	Investigated impact of digital financial inclusion on sustainable economic growth in Indonesia from 2011-2020.	Generalised Method of Moments (GMM).	Digital financial inclusion had a significant positive impact on GDP growth and moderate positive impact on CO2 emissions.

3.4.The research gaps.

This study distinguishes itself from previous research by focusing specifically on the Gulf countries and examining the impact of digital financial inclusion on economic growth within this unique context. It incorporates mobile POS payments as a key variable, providing a more detailed analysis of this relatively new aspect of digital financial inclusion. Additionally, the study emphasises the significant positive impact of ATM infrastructure on economic growth in the region and delves deeper into the negative relationship between digital remittances and economic growth. Unlike some previous studies, it utilises the pooled OLS model as the most appropriate analysis tool. Overall, the research contributes new knowledge by offering valuable insights into the interplay between digital financial inclusion and economic growth within the Gulf countries, highlighting specific policy recommendations for optimising the positive impacts and addressing the negative impacts identified.

The following table provides a short summary of each study reviewed in this chapter.

Table 1: Contribution of the Current Study Comparing with Previous Ones

Aspect	The previous studies	The current studies
Focus of Study	Broad geographic focus including various countries and regions like China, MENA, Sub-Saharan	Specific focus on the Gulf countries (2000-2023). Examines key drivers like ATMs and digital

	Africa.	commerce.
Methodology	Utilizes diverse methodologies such as Bayesian macroeconomic analysis, sys-GMM panel methods, spatial data techniques.	Uses pooled OLS, fixed-effects, and random-effects GLS regression models. Hausman and Breusch-Pagan tests to select pooled OLS.
Findings	Positive impact of digital financial inclusion on economic growth, highlighting the role of internet development and human capital.	Identifies significant impact of ATMs and digital commerce on economic growth in Gulf countries; notes negative impacts of mobile POS payments and digital remittances
Geographic Scope	Includes cross-country analyses and region-specific studies like China, MENA, and Sub-Saharan Africa	Geographically focused on the Gulf countries, providing region-specific insights and recommendations

3.5.conclusion.

This literature review underscores the substantial positive impact of digital financial inclusion on economic growth across various regions and contexts. The

studies reviewed consistently demonstrate that digital financial services enhance economic activities by improving access to financial resources, fostering entrepreneurship, and stimulating consumer spending. However, the degree of impact varies based on factors such as internet development, human capital, and regional economic conditions. Notably, while digital financial inclusion generally promotes economic growth, its effects on environmental sustainability and the quality of growth warrant further exploration.

In focusing specifically on the Gulf countries, this study highlights unique aspects such as the significant positive impact of ATM infrastructure and digital commerce on economic growth, alongside the negative implications of mobile POS payments and digital remittances. This nuanced understanding underscores the need for tailored policy approaches that maximize the benefits of digital financial inclusion while mitigating its potential drawbacks. The chapter concludes by emphasizing the importance of continued research in this area, particularly regarding the interplay between digital financial inclusion and economic growth within the Gulf context, to develop effective strategies for sustainable and inclusive economic development.

Chapter Four: Data and Methodology

4.1.Introduction.

Scientific research involves applying various methods and procedures to generate knowledge. The main objective of this chapter is to outline the development of the study, describing in detail the data sample and the empirical model procedures used to examine the impact of digital financial inclusion on economic growth in the Gulf countries from 2000 to 2023. The chapter is divided into sections: the first provides a comprehensive description of the data, including sources, population, sample, and variables. The second section details the methodology adopted to test the hypothesis.

4.2.Data of the Study.

4.2.1. Source of Data.

Data collection involves gathering information to address the research problem. This study relies primarily on secondary data from international statistical databases, including the World Bank, the global economy, and the Statista platform.

4.2.2. Population and Sample.

The population consists of all Gulf countries, while the sample includes those with comprehensive data available for the period 2000-2023. The sample selection criteria are based on data availability and relevance to the study's objectives.

4.2.3. Variables of the Study.

The study examines the impact of digital financial inclusion on economic growth. The variables are defined and measured as follows:

4.2.4. The Dependent Variable.

Economic growth (EG) is measured by the logarithm of economic growth in US current dollars (LOGEGD).

4.2.5. The Independent Variables.

The independent variables include:

- **Number of ATMs per 100,000 adults (logatm)**: Indicates access to traditional banking services.
- **Online Banking (OB)**: Percentage of the population using online banking services.
- **Digital Commerce (DC)**: Level of commercial transactions conducted digitally.
- **Mobile POS Payments (pos)**: Volume of transactions using mobile Point-of-Sale systems.
- **Digital Remittances (DR)**: Volume of remittances sent and received digitally.

4.3. Methodology of the Study.

4.3.1. The Model.

The study uses panel data analysis to examine the relationship between digital financial inclusion and economic growth. The methodology includes:

- **Pooled OLS Regression**: This model aggregates all observations, providing a global effect regardless of time or individual aspects. It is chosen based on diagnostic tests indicating its appropriateness for this data set.
- **Fixed-effects and Random-effects Models**: These models are also employed to account for potential individual and time-specific effects.

However, diagnostic tests such as the Hausman test and Breusch and Pagan Lagrangian Multiplier test favour the pooled OLS model.

The pooled OLS regression model is specified as follows:

$$\text{Log (EGD)}=\beta 0+\beta 1\log(\text{ATM}t)+\beta 2\text{OB}t+\beta 3\text{DC}t+\beta 4\text{POS}t+\beta 5\text{DR}t+\epsilon t$$

Where:

• **log(EGD):** Logarithm of economic growth for the country at year t.

• **log(ATMt):** Logarithm of the number of ATMs per 100,000 adults at year t.

• **OB:** Online banking penetration for the country at year t.

• **DC:** Digital commerce level for the country at year t.

• **POS:** Mobile POS payments for the country at year t.

• **DR:** Digital remittances for the country at year t.

β1, β2, β3, β4, and β5 represent the coefficients for the independent variables.

• **εt:** represents the error term.

4.4. Conclusion

This chapter outlines the research methodology used to examine the impact of digital financial inclusion on economic growth in the Gulf countries. It details the sources of data, population and sample selection, and the variables involved. The chapter also describes the empirical model and the rationale behind using the pooled OLS regression model, supported by diagnostic tests. The subsequent chapter will present and discuss the results of the empirical analysis.

Chapter Five: Result and Discussion

5.1. Introduction.

5.2. Pooled OLS Regression Results.

5.3. Fixed Effect Model.

5.4. Random Effect Model.

5.5. Hausman Test Results.

5.6. Breusch and Pagan Lagrangian Multiplier Test for Random Effects

5.7. Summary of Regression Results and Diagnostic Tests.

5.8. CONCLUSION.

5.1.Introduction.

This chapter presents the results of the empirical analysis on the impact of digital financial inclusion on economic growth in the Gulf countries for the period 2000-2023. Using panel data analysis, we examine various dimensions of digital financial services, including the number of ATMs per 100,000 adults, online banking penetration, digital commerce, mobile POS payments, and digital remittances. The study employs pooled OLS, fixed-effects, and random-effects models to uncover the relationships between these variables and economic growth. Diagnostic tests such as the Hausman test and Breusch and Pagan Lagrangian Multiplier test are also conducted to determine the most appropriate model. The findings provide insights into how digital financial inclusion influences economic performance in the Gulf region.

1. Summary Descriptive

This section analyses the descriptive statistics for the variables used in this study. These statistics offer a preliminary understanding of the data's characteristics, including central tendencies, dispersion, and range.

Table 2: Summary of Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
egd	52	345.83	241.81	97.8	874.16
atm1000	52	60.39	8.90	45.96	81.21
ob	52	27.17	15.38	5.82	66.83
dc	24	8.11	5.34	2.73	21.07

pos	24	2.23	2.48	0.01	9.06
dr	24	43.73	72.81	0.01	222.2

The descriptive statistics provide a comprehensive overview of the variables analyzed in this study. The economic growth (egd) variable shows a substantial mean of 345.83 USD, with a notable standard deviation of 241.81, indicating considerable variation across the observations. The number of ATMs per 100,000 adults (atm1000) has a consistent mean of 60.39, and a low standard deviation of 8.90, suggesting uniform access to ATMs across the countries studied. Online banking (ob), with a mean of 27.17% and a standard deviation of 15.38, reflects varying levels of digital banking adoption. Digital commerce (dc) and mobile POS payments (pos) display means of 8.11 and 2.23, respectively, with digital commerce showing moderate variability and mobile POS payments exhibiting significant fluctuation. Finally, digital remittances (dr) present the highest variability, with a mean of 43.73 and a standard deviation of 72.81, highlighting diverse usage patterns. Consequently, these statistics underscore the diverse landscape of digital financial inclusion in the Gulf countries, revealing different stages of adoption and integration of digital financial services. This variability suggests opportunities for targeted policy interventions to enhance financial inclusion and spur economic growth across the region.

Table 3: Correlation Matrix

	logegd	logatm	ob	dc	pos	dr
logegd	1.0000					
logatm	0.3443	1.0000				
ob	0.4520	0.3269	1.0000			
dc	0.8573	-0.0494	0.7582	1.0000		
pos	0.6486	0.2693	0.5060	0.8459	1.0000	
dr	-0.5789	0.6250	-0.4230	-0.4187	-0.0274	1.0000

The correlation matrix reveals the relationships between the dependent variable, economic growth (logegd), and the independent variables in this study. Economic growth shows a strong positive correlation with digital commerce (dc) (0.8573) and a moderately strong correlation with mobile POS payments (pos) (0.6486) and online banking (ob) (0.4520). This suggests that higher levels of digital commerce and mobile POS payments are associated with increased economic growth. Additionally, the number of ATMs per 100,000 adults (logatm) has a weaker positive correlation with economic growth (0.3443), indicating a less pronounced but still positive relationship.

Conversely, digital remittances (dr) exhibit a negative correlation with economic growth (-0.5789), suggesting that higher digital remittances may be associated with lower economic growth in this context. This negative relationship might be due to various economic factors unique to the Gulf countries, such as the nature of remittance flows and their impact on domestic economic activities.

Furthermore, digital commerce (dc) and mobile POS payments (pos) are highly correlated with each other (0.8459), indicating that these two variables often increase together, likely reflecting the integrated nature of digital financial services. However, digital remittances (dr) show negative correlations with both digital commerce (dc) (-0.4187) and online banking (ob) (-0.4230), suggesting that higher remittance flows might not coincide with higher levels of digital financial transactions in other areas.

In summary, these correlations highlight the complex interplay between various aspects of digital financial inclusion and economic growth in the Gulf countries. The strong positive correlations of economic growth with digital commerce and mobile POS payments emphasize the potential benefits of enhancing these digital financial services to stimulate economic growth. However, the negative correlation with digital remittances warrants further investigation to understand the underlying causes and address potential challenges.

Table 03: Variance Inflation Factor (VIF) Analysis

Variance Inflation Factor (VIF) analysis helps to identify the presence of multicollinearity among the independent variables. Multicollinearity occurs when two or more independent variables in a regression model are highly correlated, distorting the estimated coefficients and statistical significance.

Table 4: Variance Inflation Factor

Variable	**VIF**	**1/VIF**
dc	12.76	0.0784
pos	7.64	0.1309
ob	3.00	0.3332

dr	2.96	0.3383
logatm	2.04	0.4892
Mean VIF	5.68	

Interpretation of Variance Inflation Factors:

The Variance Inflation Factor (VIF) values help assess the presence of multicollinearity among the independent variables in the regression model. Generally, a VIF value exceeding 10 suggests high multicollinearity, which can affect the reliability of the regression coefficients.

In this analysis, the VIF for digital commerce (dc) is 12.76, which indicates significant multicollinearity. Therefore, this high VIF suggests that dc may be highly correlated with other independent variables, potentially distorting the regression results. Mobile POS payments (pos) also show a high VIF of 7.64, implying moderate multicollinearity.

The VIF values for online banking (ob) and digital remittances (dr) are 3.00 and 2.96, respectively, indicating low to moderate multicollinearity. The number of ATMs per 100,000 adults (logatm) has the lowest VIF of 2.04, suggesting minimal multicollinearity.

The mean VIF of 5.68 indicates that, on average, there is moderate multicollinearity in the model. However, the particularly high VIF for digital commerce (dc) should be addressed. Possible remedies include removing or combining highly correlated variables or using techniques such as principal component analysis.

Overall, these VIF values highlight the need to carefully consider the effects of multicollinearity when interpreting the regression results, especially regarding digital commerce. Reducing multicollinearity will enhance the robustness and

reliability of the model, providing clearer insights into the impact of digital financial inclusion on economic growth in the Gulf countries.

1. **Regressions Results**

5.2.Pooled OLS Regression Results

Table 5: Pooled OLS Regression Results

Variable	Coefficient	Std. Error	t-value	p-value	95% Confidence Interval
logatm	3.075971	0.2317916	13.27	0.000	[2.588995, 3.562947]
ob	0.0003094	0.0028662	0.11	0.915	[-0.0057122, 0.0063311]
dc	0.1110347	0.0158004	7.03	0.000	[0.0778393, 0.1442300]
pos	-0.0618326	0.0262807	-2.35	0.030	[-0.1170462, -0.0066190]
dr	-0.0063952	0.0005576	-11.47	0.000	[-0.0075667, -0.0052238]
_cons	-7.67148	0.9662493	-7.94	0.000	[-9.701494, -5.641465]

The pooled OLS regression results provide insights into the relationships between economic growth (logegd) and the independent variables representing digital financial inclusion in the Gulf countries. The overall model is highly significant (F(5, 18) = 195.71, Prob > F = 0.0000), explaining 98.19% of the variation in economic growth (R-squared = 0.9819). The adjusted R-squared value of 0.9769 further confirms the model's strong explanatory power.

The coefficient for the number of ATMs per 100,000 adults (logatm) is 3.075971, with a highly significant t-value of 13.27 (P = 0.000). This positive relationship indicates that an increase in the number of ATMs is associated with higher economic growth.

Online banking (ob) has a coefficient of 0.0003094, which is not statistically significant (P = 0.915). This suggests that online banking penetration does not have a significant impact on economic growth within the studied period.

Digital commerce (dc) shows a positive and significant coefficient of 0.1110347 (t = 7.03, P = 0.000), indicating that higher levels of digital commerce are strongly associated with increased economic growth.

Mobile POS payments (pos) have a negative and significant coefficient of -0.0618326 (t = -2.35, P = 0.030). This negative relationship suggests that higher usage of mobile POS payments is associated with lower economic growth, which may be due to various contextual factors affecting these transactions.

Digital remittances (dr) have a negative and significant coefficient of -0.0063952 (t = -11.47, P = 0.000). This indicates that higher digital remittances are associated with a decrease in economic growth, which could reflect economic dynamics unique to the Gulf region, such as the outflow of funds reducing domestic investment.

The constant term (_cons) is -7.67148, which is significant (t = -7.94, P = 0.000), indicating the baseline level of economic growth when all independent variables are zero.

In summary, the regression results highlight the significant positive impacts of ATMs and digital commerce on economic growth, while mobile POS payments and digital remittances exhibit negative relationships. These findings suggest that enhancing digital commerce and ATM infrastructure could foster economic growth, whereas the effects of mobile POS payments and digital remittances require further exploration to understand their negative impacts

5.3.Fixed Effect Model.

Table 6: Fixed Effects Regression Results

Variable	Coefficient	Std. Error	t-value	p-value	95% Confidence Interval
logatm	1.324536	0.8203614	1.61	0.127	[-0.4240229, 3.073095]
ob	0.015683	0.0133998	1.17	0.260	[-0.012878, 0.0442441]
dc	0.0202131	0.0450805	0.45	0.660	[-0.0758738, 0.1162999]
pos	-0.015419	0.0388165	-0.40	0.697	[-0.0981545, 0.0673166]
dr	-0.0033998	0.0021228	-1.60	0.130	[-0.0079243, 0.0011248]
_cons	-0.4424749	3.555587	-0.12	0.903	[-8.02103, 7.13608]

The fixed-effects regression results provide insights into the within-group relationships between economic growth (logegd) and the independent variables for the Gulf countries. The model explains 32.74% of the variation within groups (R-squared within = 0.3274) and 83.84% of the overall variation (R-squared overall = 0.8384). However, the overall model is not statistically significant (F(5, 15) = 1.46, Prob > F = 0.2603).

The coefficient for the number of ATMs per 100,000 adults (logatm) is 1.324536, with a t-value of 1.61 and a p-value of 0.127, indicating that this positive relationship is not statistically significant.

Online banking (ob) has a coefficient of 0.015683, which is also not statistically significant (t = 1.17, P = 0.260). This suggests that online banking penetration does not significantly impact economic growth within the studied period.

Digital commerce (dc) shows a coefficient of 0.0202131, with a t-value of 0.45 and a p-value of 0.660, indicating no significant effect on economic growth.

Mobile POS payments (pos) have a coefficient of -0.015419, with a t-value of -0.40 and a p-value of 0.697, suggesting a negative but non-significant relationship with economic growth.

Digital remittances (dr) have a coefficient of -0.0033998, with a t-value of -1.60 and a p-value of 0.130, indicating a negative but non-significant effect on economic growth.

The constant term (_cons) is -0.4424749, which is not significant (t = -0.12, P = 0.903), indicating the baseline level of economic growth when all independent variables are zero.

The rho value (0.95583401) indicates that a large proportion of the variance is due to differences across groups, emphasizing the importance of accounting for fixed effects in this model.

Overall, the fixed-effects regression results show that none of the independent variables have a statistically significant impact on economic growth within the Gulf countries, highlighting the need for further investigation into other potential factors influencing economic growth in the region.

5.4.Random Effect Model.

Table 7: Random Effects Regression Results

Variable	Coefficient	Std. Error	z-value	p-value	95% Confidence Interval
logatm	3.075971	0.2317916	13.27	0.000	[2.621668, 3.530274]
ob	0.0003094	0.0028662	0.11	0.914	[-0.0053082, 0.0059271]
dc	0.1110347	0.0158004	7.03	0.000	[0.0800665, 0.1420028]
pos	-0.0618326	0.0262807	-2.35	0.019	[-0.1133417, -0.0103234]
dr	-0.0063952	0.0005576	-11.47	0.000	[-0.0074881, -0.0053024]
_cons	-7.67148	0.9662493	-7.94	0.000	[-9.565294, -5.777666]

The random-effects GLS regression results offer valuable insights into the relationships between economic growth (logegd) and the independent variables representing digital financial inclusion in the Gulf countries. The model explains a substantial portion of the variation in economic growth, with an overall R-squared of 0.9819. The model is statistically significant, as indicated by the Wald chi2(5) value of 978.56 (Prob > chi2 = 0.0000).

The coefficient for the number of ATMs per 100,000 adults (logatm) is 3.075971, with a highly significant z-value of 13.27 (P = 0.000). This positive relationship indicates that an increase in the number of ATMs is associated with higher economic growth.

Online banking (ob) has a coefficient of 0.0003094, which is not statistically significant (z = 0.11, P = 0.914). This suggests that online banking penetration does not have a significant impact on economic growth within the studied period.

Digital commerce (dc) shows a positive and significant coefficient of 0.1110347 (z = 7.03, P = 0.000), indicating that higher levels of digital commerce are strongly associated with increased economic growth.

Mobile POS payments (pos) have a negative and significant coefficient of -0.0618326 (z = -2.35, P = 0.019). This negative relationship suggests that higher usage of mobile POS payments is associated with lower economic growth, which may be due to various contextual factors affecting these transactions.

Digital remittances (dr) have a negative and significant coefficient of -0.0063952 (z = -11.47, P = 0.000). This indicates that higher digital remittances are associated with a decrease in economic growth, which could reflect economic dynamics unique to the Gulf region, such as the outflow of funds reducing domestic investment.

The constant term (_cons) is -7.67148, which is significant (z = -7.94, P = 0.000), indicating the baseline level of economic growth when all independent variables are zero.

In summary, the random-effects GLS regression results highlight the significant positive impacts of ATMs and digital commerce on economic growth, while mobile POS payments and digital remittances exhibit negative relationships.

These findings suggest that enhancing digital commerce and ATM infrastructure could foster economic growth, whereas the effects of mobile POS payments and digital remittances require further exploration to understand their negative impacts.

5.5.Hausman Test Results

Table 8: Hausman Test Results

Variable	Fixed Effects (b)	Random Effects (B)	Difference (b-B)	Std. Err.
logatm	1.324536	3.075971	-1.751435	0.7869343
ob	0.015683	0.0003094	0.0153736	0.0130897
dc	0.0202131	0.1110347	-0.0908216	0.0422208
pos	-0.015419	-0.0618326	0.0464136	0.0285666
dr	-0.0033998	-0.0063952	0.0029955	0.0020482

Test of H0: Difference in Coefficients not Systematic

- chi2(5) = 9.48
- Prob > chi2 = 0.0914

The Hausman test is used to determine whether the fixed effects or random effects model is more appropriate for the given data. The test compares the coefficients obtained from the fixed effects model (b) and the random effects model (B) to see if the differences between them are systematic.

The test statistic is chi2(5) = 9.48 with a Prob > chi2 value of 0.0914. Since the p-value is greater than 0.05, we fail to reject the null hypothesis that the difference in coefficients is not systematic. This indicates that the random

effects model is preferred as it is efficient under the null hypothesis, suggesting that individual effects are uncorrelated with the regressors.

Here are the key differences and their standard errors:

- The coefficient for the number of ATMs per 100,000 adults (logatm) shows a significant difference between the fixed effects and random effects models, with a difference of -1.751435 and a standard error of 0.7869343.
- The coefficient for online banking (ob) shows a small difference of 0.0153736 with a standard error of 0.0130897.
- The coefficient for digital commerce (dc) has a difference of -0.0908216 with a standard error of 0.0422208.
- The coefficient for mobile POS payments (pos) has a difference of 0.0464136 with a standard error of 0.0285666.
- The coefficient for digital remittances (dr) shows a small difference of 0.0029955 with a standard error of 0.0020482.

based on the Hausman test results, the random effects model is more appropriate for this analysis as it is more efficient and there is no evidence of systematic differences between the fixed and random effects coefficients.

5.6.Breusch and Pagan Lagrangian Multiplier Test for Random Effects

Table 9: Summary of Regression Results and Diagnostic Tests

Test/Model	Statistic	Value	p-value	Conclusion
Pooled OLS Regression				
- logatm	Coefficient	3.075971	0.000	Significant positive impact

- ob	Coefficient	0.0003094	0.915	Not significant
- dc	Coefficient	0.1110347	0.000	Significant positive impact
- pos	Coefficient	-0.0618326	0.030	Significant negative impact
- dr	Coefficient	-0.0063952	0.000	Significant negative impact
- _cons	Coefficient	-7.67148	0.000	Significant negative intercept
- R-squared		0.9819		High explanatory power
- F-statistic		195.71	0.000	Model is highly significant
Fixed-effects Regression				
- logatm	Coefficient	1.324536	0.127	Not significant
- ob	Coefficient	0.015683	0.260	Not significant
- dc	Coefficient	0.0202131	0.660	Not significant
- pos	Coefficient	-0.015419	0.697	Not significant
- dr	Coefficient	-0.0033998	0.130	Not significant
- _cons	Coefficient	-0.4424749	0.903	Not significant
- R-squared (within)		0.3274		Moderate explanatory power
- F-statistic		1.46	0.260	Model is not significant
Random-effects GLS Regression				

- logatm	Coefficient	3.075971	0.000	Significant positive impact
- ob	Coefficient	0.0003094	0.914	Not significant
- dc	Coefficient	0.1110347	0.000	Significant positive impact
- pos	Coefficient	-0.0618326	0.019	Significant negative impact
- dr	Coefficient	-0.0063952	0.000	Significant negative impact
- _cons	Coefficient	-7.67148	0.000	Significant negative intercept
- R-squared (overall)		0.9819		High explanatory power
- Wald chi2(5)		978.56	0.000	Model is highly significant
Hausman Test				
- chi2(5)		9.48	0.0914	Random effects model preferred
Breusch and Pagan Lagrangian Multiplier Test for Random Effects				
- chibar2(01)		0.00	1.0000	No random effects, pooled OLS model is appropriate

The pooled OLS regression results indicate that the number of ATMs per 100,000 adults (logatm) and digital commerce (dc) have significant positive impacts on economic growth, while mobile POS payments (pos) and digital remittances (dr) have significant negative impacts. The overall model is highly significant, explaining 98.19% of the variation in economic growth.

The fixed-effects regression results show no significant impact of any independent variable on economic growth, suggesting that within-group variations do not explain economic growth well.

The random-effects GLS regression results align with the pooled OLS results, confirming the significant positive impacts of logatm and dc, and significant negative impacts of pos and dr.

The Hausman test indicates that the random-effects model is preferred over the fixed-effects model. However, the Breusch and Pagan Lagrangian Multiplier test suggests that the pooled OLS model is appropriate since there are no significant random effects present.

Based on these findings, the pooled OLS model is considered the most appropriate for analyzing the impact of digital financial inclusion on economic growth in the Gulf countries.

5.7. Conclusion:

The empirical analysis reveals significant insights into the relationship between digital financial inclusion and economic growth in the Gulf countries. The pooled OLS and random-effects models indicate that the number of ATMs and digital commerce positively impact economic growth, while mobile POS payments and digital remittances have a negative effect. The fixed-effects model, however, does not show significant results for any of the variables. Diagnostic tests favor the pooled OLS model as the most appropriate for this study. These results suggest that enhancing ATM infrastructure and digital commerce can foster economic growth, whereas the negative impacts of mobile POS payments and digital remittances warrant further investigation. Overall, the study underscores the critical role of digital financial services in driving economic performance in the Gulf region.

CHAPTER SIX: Conclusion, Policy Implication, and Future Research Directions.

6.1. Introduction.

6.2. Conclusion of the Pooled OLS Regression Analysis.

6.3. Policy Recommendations.

6.4. Future Research Directions.

6.5. Conclusion.

6.1. Introduction.

This chapter presents the findings of the empirical analysis on the impact of digital financial inclusion on economic growth in the Gulf countries from 2000 to 2023. The analysis, based on the pooled OLS model, has identified key areas where digital financial inclusion drives economic performance. This model was chosen as the most appropriate for our study. The results of this analysis form the basis for our policy recommendations and future research directions. The chapter commences with a comprehensive interpretation of the pooled OLS regression results, followed by policy implications, and concludes with suggestions for future research.

6.2. Conclusion of the Pooled OLS Regression Analysis.

The pooled OLS regression analysis reveals significant insights into how various aspects of digital financial inclusion impact economic growth in the Gulf countries.

1. **Number of ATMs per 100,000 Adults (logatm):**

The highly significant positive coefficient suggests that increasing the number of ATMs per 100,000 adults is strongly associated with higher economic growth. This indicates that better access to cash and banking services facilitates economic activities by making financial transactions more convenient and accessible for the population. The presence of more ATMs likely reduces transaction costs and time, thereby promoting consumption and investment.

2. **Online Banking (ob):**

The coefficient for online banking penetration is not statistically significant, implying that the percentage of the population using online banking does not have a direct and significant impact on economic growth within this period. This may be due to the relatively recent adoption of online banking in some regions or the fact that its benefits are not yet fully realized in terms of contributing to economic growth.

3. **Digital Commerce (dc):**

The positive and significant coefficient for digital commerce highlights its critical role in economic growth. This relationship indicates that as digital commerce activities increase, they contribute substantially to economic performance. Digital commerce expands market reach, reduces transaction costs, and enhances efficiency, thus driving economic growth.

4. **Mobile POS Payments (pos):**

The negative and significant coefficient for mobile POS payments suggests that higher usage of mobile POS systems is associated with lower economic growth. This counterintuitive result might be due to inefficiencies or higher transaction costs associated with mobile POS payments in the region. It may also indicate a displacement effect, where traditional and possibly more efficient financial transactions are being replaced by less efficient mobile POS transactions.

5. **Digital Remittances (dr):**

The negative and highly significant coefficient for digital remittances indicates that an increase in digital remittances is associated with a decrease in economic growth. This might reflect the outflow of funds from the domestic economy, reducing the amount of money available for local consumption and investment. Remittances, while beneficial for recipients, might not contribute to the domestic economy if they are not used productively within the country.

6. **Intercept (_cons):**

The negative intercept suggests that when all independent variables are zero, the baseline economic growth is significantly negative. This highlights the importance of the digital financial inclusion variables in driving economic growth.

The overall model is highly significant (F-statistic = 195.71, Prob > F = 0.000) and explains 98.19% of the variation in economic growth (R-squared = 0.9819), indicating a very strong fit. The results emphasize that digital financial inclusion, particularly through the expansion of ATM networks and digital commerce, plays a crucial role in enhancing economic growth. Conversely, the negative impacts of mobile POS payments and digital remittances highlight areas that require policy attention.

6.3.Policy Implications

Based on the pooled OLS regression results, several policy recommendations can be made to enhance digital financial inclusion and, consequently, economic growth in the Gulf countries:

1. **Expand ATM Infrastructure:**

- The strong positive impact of ATMs on economic growth suggests that increasing the number of ATMs can significantly boost economic activities. Policymakers

should encourage the expansion of ATM networks, especially in underserved areas, through incentives for banks and financial institutions.

2. **Promote Digital Commerce:**

- The significant positive relationship between digital commerce and economic growth indicates that fostering digital commerce can have substantial economic benefits. Governments should invest in robust digital infrastructure, streamline regulations to facilitate e-commerce, and support initiatives that enhance digital literacy among consumers and businesses.

3. **Address Mobile POS Payment Inefficiencies:**

- The negative impact of mobile POS payments requires targeted interventions to improve their efficiency and reduce associated costs. Policymakers should work with financial technology providers to enhance the reliability and accessibility of mobile POS systems, possibly through subsidies or competitive frameworks that encourage innovation and lower transaction fees.

4. **Optimize Digital Remittance Flows:**

- To mitigate the negative impact of digital remittances on economic growth, strategies should be developed to encourage the productive use of remittances. Policies could include offering investment opportunities for remittance recipients, providing financial education on savings and investment options, and creating incentives for remittances to be used in ways that stimulate the local economy.

5. **Enhance Financial Inclusion:**

- Broader financial inclusion initiatives are essential to ensure that the benefits of digital financial services are widely distributed. This includes regulatory reforms to support fintech innovations, incentives for financial institutions to reach unbanked populations, and comprehensive digital literacy programs.

6.4.Future Research Directions

While this study provides valuable insights, it also highlights areas where further research is needed to deepen our understanding of digital financial inclusion's impact on economic growth:

1. **Longitudinal Studies:**

- Future research should conduct longitudinal studies to examine the long-term effects of digital financial inclusion on economic growth. This can help

understand the sustained impacts and potential lag effects of digital financial services.

2. **Sector-specific Analysis:**

- Investigating the impact of digital financial inclusion on specific sectors, such as retail, manufacturing, and services, can provide more targeted insights and policy recommendations.

3. **Micro-level Studies:**

- Analyzing the effects of digital financial inclusion at the micro-level, focusing on individual businesses and households, can provide deeper insights into the mechanisms through which digital financial services influence economic activities.

4. **Comparative Studies:**

- Conducting comparative studies with other regions or countries that have similar economic characteristics can help contextualize the findings and identify best practices.

5. **Technological Innovations:**

- Exploring the impact of emerging technologies, such as blockchain, artificial intelligence, and machine learning, on financial inclusion and economic growth can offer forward-looking insights for policymakers and practitioners.

6. **Behavioral Aspects:**

- Future research could investigate the behavioral aspects of digital financial inclusion, such as consumer trust, adoption barriers, and the psychological impacts of transitioning to digital financial services.

6.5. Conclusion

This chapter has provided an in-depth analysis of the results from the pooled OLS model, which was determined to be the most appropriate for this study. The findings underscore the significant positive impacts of expanding ATM infrastructure and promoting digital commerce on economic growth in the Gulf countries. Conversely, the negative impacts of mobile POS payments and digital remittances highlight areas needing policy intervention. The chapter concludes with several policy recommendations and identifies directions for future research, emphasizing the critical role of digital financial inclusion in driving economic performance. By addressing the identified challenges and leveraging

opportunities, the Gulf countries can harness the full potential of digital financial services to achieve sustainable economic growth.

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Appendices

Appendices

Descriptive statistics

```
. sum lnegd ob dca lnatm1000
```

Variable	Obs	Mean	Std. dev.	Min	Max
lnegd	52	5.608877	.6956288	4.582925	6.773263
ob	52	27.17385	15.3828	5.82	66.83
dca	52	60.73808	16.25557	30.3	83.88
lnatm1000	52	4.090662	.1424002	3.827843	4.397097

Correlation matrix

```
. pwcorr lnegd ob dca lnatm1000
```

	lnegd	ob	dca	lna~1000
lnegd	1.0000			
ob	0.4520	1.0000		
dca	-0.3904	0.3246	1.0000	
lnatm1000	0.3443	0.3269	0.1486	1.0000

VIF

```
. vif
```

Variable	VIF	1/VIF
ob	1.23	0.815252
lnatm1000	1.12	0.891119
dca	1.12	0.892639
Mean VIF	1.16	

Unit Root Test (stationarity)

```
Hadri LM test for lnegd
---------------------------

H0: All panels are stationary               Number of panels  =      4
Ha: Some panels contain unit roots          Number of periods =     13

Time trend:         Not included            Asymptotics: T, N -> Infinity
Heteroskedasticity: Not robust                                 sequentially
LR variance:        (not used)
-------------------------------------------------------------------------------
                    Statistic      p-value
-------------------------------------------------------------------------------
 z                    3.2101        0.0007
-------------------------------------------------------------------------------
```

Appendices

Hadri LM test for ob

H0: All panels are stationary — Number of panels = 4
Ha: Some panels contain unit roots — Number of periods = 13

Time trend: Not included — Asymptotics: T, N -> Infinity sequentially
Heteroskedasticity: Not robust
LR variance: (not used)

	Statistic	p-value
z	13.9626	0.0000

Hadri LM test for lndc1000

H0: All panels are stationary — Number of panels = 4
Ha: Some panels contain unit roots — Number of periods = 13

Time trend: Not included — Asymptotics: T, N -> Infinity sequentially
Heteroskedasticity: Not robust
LR variance: (not used)

	Statistic	p-value
z	11.1395	0.0000

Hadri LM test for dca

H0: All panels are stationary — Number of panels = 4
Ha: Some panels contain unit roots — Number of periods = 13

Time trend: Not included — Asymptotics: T, N -> Infinity sequentially
Heteroskedasticity: Not robust
LR variance: (not used)

	Statistic	p-value
z	10.1052	0.0000

Regression Results:

Pooled Model

Source	SS	df	MS		
Model	14.3636757	3	4.78789189	Number of obs	= 52
Residual	10.3151955	48	.214899906	F(3, 48)	= 22.28
Total	24.6788712	51	.483899435	Prob > F	= 0.0000
				R-squared	= 0.5820
				Adj R-squared	= 0.5559
				Root MSE	= .46357

lnegd	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
ob	.0257409	.0046736	5.51	0.000	.016344	.0351378
dca	-.0261961	.0042266	-6.20	0.000	-.0346943	-.0176979
lnatm1000	1.217055	.4828971	2.52	0.015	.2461251	2.187985
_cons	1.521937	1.94198	0.78	0.437	-2.382675	5.42655

Appendices

```
Fixed-effects (within) regression               Number of obs      =        52
Group variable: id                              Number of groups   =         4

R-squared:                                      Obs per group:
     Within  = 0.2185                                         min =        13
     Between = 0.0094                                         avg =      13.0
     Overall = 0.0000                                         max =        13

                                                F(3,45)            =      4.19
corr(u_i, Xb) = -0.1806                         Prob > F           =    0.0106
```

lnegd	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
ob	.0047723	.0029837	1.60	0.117	-.0012372	.0107818
dca	.0051776	.0041593	1.24	0.220	-.0031996	.0135548
lnatm1000	.0099058	.2398824	0.04	0.967	-.4732421	.4930537
_cons	5.124194	.9290307	5.52	0.000	3.25303	6.995358
sigma_u	.78772533					
sigma_e	.16783139					
rho	.9565773	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(3, 45) = 107.07                     Prob > F = 0.0000
```

```
Random-effects GLS regression                   Number of obs      =        52
Group variable: id                              Number of groups   =         4

R-squared:                                      Obs per group:
     Within  = 0.0815                                         min =        13
     Between = 0.8238                                         avg =      13.0
     Overall = 0.5820                                         max =        13

                                                Wald chi2(3)       =     66.84
corr(u_i, X) = 0 (assumed)                      Prob > chi2        =    0.0000
```

lnegd	Coefficient	Std. err.	z	P>|z|	[95% conf.	interval]
ob	.0257409	.0046736	5.51	0.000	.0165808	.034901
dca	-.0261961	.0042266	-6.20	0.000	-.0344801	-.0179121
lnatm1000	1.217055	.4828971	2.52	0.012	.2705939	2.163516
_cons	1.521937	1.94198	0.78	0.433	-2.284274	5.328149
sigma_u	0					
sigma_e	.16783139					
rho	0	(fraction of variance due to u_i)				

Hausman Test:

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) Std. err.
ob	.0047723	.0257409	-.0209686	.
dca	.0051776	-.0261961	.0313737	.
lnatm1000	.0099058	1.217055	-1.207149	.

```
                b = Consistent under H0 and Ha; obtained from xtreg.
 B = Inconsistent under Ha, efficient under H0; obtained from xtreg.

Test of H0: Difference in coefficients not systematic

chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)
        = -2230.16

Warning: chi2 < 0 ==> model fitted on these data
         fails to meet the asymptotic assumptions
         of the Hausman test; see suest for a
         generalized test.
```

Appendices

Hausman fixed Random sigmamore

	Coefficients (b) fe	(B) re	(b-B) Difference	sqrt(diag(V_b-V_B)) Std. err.
ob	.0047723	.0257409	-.0209686	.0067881
dca	.0051776	-.0261961	.0313737	.0106827
lnatm1000	.0099058	1.217055	-1.207149	.4536877

b = Consistent under H0 and Ha; obtained from **xtreg**.
B = Inconsistent under Ha, efficient under H0; obtained from **xtreg**.

Test of H0: Difference in coefficients not systematic

chi2(3) = (b-B)'[(V_b-V_B)^(-1)](b-B)
= 42.10
Prob > chi2 = 0.0000

Fixed effect is the appropriate model.

Breusch Pagan test: (choose between Pooled and Random/Fixed)

Breusch and Pagan Lagrangian multiplier test for random effects

lnegd[id,t] = Xb + u[id] + e[id,t]

Estimated results:

	Var	SD = sqrt(Var)
lnegd	.4838994	.6956288
e	.0281674	.1678314
u	0	0

Test: Var(u) = 0

chibar2(01) = 0.00
Prob > chibar2 = 1.0000

Finaly result: The appropriate model is the Pooled Model.