The Impact of Fintech in Promoting the Achievement of Financial Inclusion (2010-2020)

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Abstract

The research aims to study the impact of fintech in promoting the achievement of financial inclusion. The study analysis the reality of the fintech and financial Inclusion with a report. And using panel data for high, middle and low income countries, during the period from 2010-2021, through application of Pooled Ordinary Least Squares (Pooled OLS). The study found that Fintech plays an effective role in achieving financial inclusion by the theoretical analysis and by the estimation by using three financial inclusion indicators Automated Teller Machines Numbers (ATMs), commercial bank branches per 100,000 adults) (FICBB), and credit provided by the financial sector to the private sector % GDP (FICFS), and two financial technology indicators subscribers to mobile networks (MNS), account holders with Mobile phone usage (MAU).

Keywords: Fintech, Financial Inclusion, Panal data

Introduction:

Financial technology, or fintech, has had a significant impact in promoting financial inclusion in the world countries over the past decade. Fintech innovations have provided access to financial services for underbanked and unbanked populations, who previously lacked access to traditional banking systems. These advancements include mobile banking, digital payments, peer-to-peer lending, and crowdfunding.

As a result of these developments, financial inclusion has improved in the globally, with an increase in the number of people who have access to basic financial services. For example, the use of mobile banking has increased significantly, allowing people to make transactions and access financial services using their mobile phones, even in rural areas where access to banks is limited.

Additionally, fintech has created new opportunities for entrepreneurship and small business growth, as access to finance has become easier and more accessible through digital platforms. This has helped to drive economic growth and create jobs in the region.

In recent years, fintech has become an increasingly popular way to provide financial services to those who may have previously been excluded. Fintech companies are developing innovative technologies to make financial services more accessible, efficient, and secure. This has resulted in a decrease in the cost of financial services, as well as an increase in financial inclusion, this research aims to study the impact of financial technology on enhancing financial inclusion in low-, middle-, and high-income countries during the period from 2020 to 2010. The research aims to explore the role of financial technology in increasing access to financial services, reducing the cost of financial services, addressing the issue of lack of trust in traditional financial institutions, and providing innovative solutions to meet the unique financial needs of disadvantaged populations. The research aims to provide insights and evidence to support the hypothesis that financial technology has an important role in achieving financial inclusion in countries around the world.

The study structure is divided into:

- General framework of the study
- Concept and dimensions of financial inclusion
- Concept and development of financial technology
- Study results
- Challenges of financial inclusion and financial technology.

Research Problem:

Financial technology, or fintech, has emerged as an important driver of financial inclusion and economic growth in countries over the past decade. Despite the region's wealth and technological advancements, many individuals and businesses still lack access to basic financial services, such as savings and lending. This lack of access to financial services can limit economic opportunities and perpetuate poverty. Given the importance of fintech and the world's view of it as a tool for achieving financial inclusion, the different circumstances of countries around the world in achieving financial inclusion, and the different levels of technology in those countries. This research aims to study the impact of fintech on enhancing financial inclusion in low-income, middle-income and high-income countries during the period from 2010 to 2020. The study aims to assess the extent to which fintech innovations have contributed to increasing access to financial services for the unbanked or underbanked population, and how they have affected the regional economic growth of a number of countries, which are classified as middle-income, low-income and high-income countries, during the period (2010-2020). Research Questions:

Main Question:

What is the impact of FinTech on financial inclusion in low-, middle-, and high-income countries?

Sub-questions:

1- How has the adoption of FinTech innovations impacted access to financial services for the unbanked or underbanked population in low-, middle-, and high-income countries?

2- Have FinTech innovations increased financial literacy and understanding of financial services among the unbanked or underbanked population in low-, middle-, and high-income countries?

3- What challenges have arisen in implementing FinTech solutions in low-, middle-, and high-income countries? And how have they been addressed?

4- How has the regulatory environment in low-, middle-, and high-income countries impacted the growth and adoption of FinTech solutions to enhance financial inclusion?

5- To what extent do fintech indicators based on mobile phone subscribers and account holders affect the variables of financial inclusion, number of ATMs, commercial bank branches per 100,000 populations, credit provided by the financial sector to the private sector, and credit provided by the

financial sector to the private sector as a percentage of GDP during the period under study for the selected countries?

To explain the effects of using financial technology to achieve financial inclusion through indicators of financial inclusion and financial technology. We will present some of the previous studies for this.

Previous Studies:

Previous studies on the impact of fintech in promoting financial inclusion have shown mixed results. Some studies have found that fintech has had a positive impact on financial inclusion, while others have found that the impact has been limited.

Studies that have found a positive impact of fintech on financial inclusion have shown that fintech has expanded access to financial services, particularly for underserved populations such as low-income individuals, women, and rural areas. Fintech has also been found to increase financial literacy and help build trust in formal financial services, which can help to promote financial stability and economic growth.

On the other hand, studies that have found a limited impact of fintech on financial inclusion have highlighted challenges such as low levels of financial literacy, a lack of digital infrastructure in some areas, and a lack of regulatory support for fintech companies. These challenges can make it difficult for fintech to reach its full potential in promoting financial inclusion.

The role of fin in achieving financial inclusion, a study in a group of Arab countries for the period (2014-2018) (2020 ،جاسم)

This study investigated the role of fintech in achieving financial inclusion for a group of Arab countries, and this study tested the feasibility of using financial technology in achieving financial inclusion in each of the (United Arab Emirates, Saudi Arabia, Kuwait, Iraq, Jordan, Lebanon), And that was during the period (2014-2018), and the study concluded that financial technology works to achieve financial inclusion during the study period in the sample applied to a number of Arab Gulf countries.

Fintech as a mechanism to enhance financial inclusion in the Arab world - a case study in the Middle East and North Africa (دحمان، و زهرة 2020)

This study aimed to analyze the financial inclusion index in the Arab world, especially the countries of the Middle East and North Africa, and to identify the most important fintech companies in the Middle East and North Africa, the

extent of the ability of these companies to provide new and innovative financial services in those countries, based on an analytical study According to these indicators, based on indicators issued by the Arab Monetary Fund and the Union of Arab Banks, the study concluded that the Arab countries record the lowest levels of financial inclusion in the world, as only 37% of adults in the Arab countries have bank accounts, or about 160 million Arabs or 63 % are excluded from financial services, despite the concentration of financial technology companies in the Gulf countries.

Financial technology and its role in promoting financial inclusion in the Arab world. (مرزق و زيان، 2021)

This study aims to analyze and classify indicators of financial inclusion, as well as to identify the reality of fintech in the Arab world. The descriptive analytical approach was relied on for data and indicators issued by international institutions such as the Arab Monetary Fund and the Union of Arab Banks. The study reached a set of results, the most important of which is The Arab region records the lowest levels of financial inclusion in the Arab world, with the exception of the Gulf countries, which record acceptable levels. The level of financial culture varies from one Arab country to another, as there are various initiatives to promote the spread of financial inclusion in the Arab world.

(Telukdarie & Mungar, 2023) The impact of digital financial technology on accelerating Financial inclusion in developing economies.

This study dealt with some illustrative evidence that financial inclusion enhances the economic situation of countries and has a positive impact on the economies of developing countries, especially African countries, and the use of digital financial technology, especially artificial intelligence(AI), is a powerful tool to help individuals in developing countries to access the required financial services and Hence, achieving financial inclusion. This is done through the use of quantitative and qualitative analysis by analyzing the literature and developing a systems dynamics model. The system dynamics model approach is used to identify the main drivers or constraints within the economies of developing countries that can hinder or help these economies towards achieving financial inclusion.

Overall, previous studies suggest that while fintech has the potential to play a significant role in promoting financial inclusion, the impact of fintech on financial inclusion is likely to vary depending on the specific context and the measures put in place to address the challenges

As we show in the previous studies they didn't addressed what this research tends to study. The impact of fintech in promoting the achievement of financial inclusion in the Arab countries in the sample required to be tested through indicators for each of the financial inclusion and the fintech. Which raises a number of main and sub questions?

Research hypotheses:

This research is based on the following hypothesis: "Fintech plays an effective role in achieving financial inclusion."

This hypothesis is divided into four assumptions:

1- Increased access to financial services through Fintech leads to greater financial inclusion

2- Fintech helps to reduce the cost of financial services, making them more affordable for underserved populations

3- Fintech helps to address the issue of lack of trust in traditional financial institutions

4- Fintech provides innovative solutions to meet the unique financial needs of underserved populations.

1. Financial Inclusion

Financial inclusion refers to efforts to make financial products and services accessible and affordable to all individuals and businesses, regardless of their personal net worth or company size. It means that individuals and businesses have access to useful and affordable financial products and services that meet their needs – transactions, payments, savings, credit and insurance – delivered in a responsible and sustainable way.

There are many concepts of financial inclusion, as some define it as the ability of individuals to access financial services, while other studies define it as providing sustainable and rational financial services to individuals, or the provision of services. Financial inclusion is of high quality with a commitment to protecting users of these services, while the World Bank (World Bank WB) defines financial inclusion, according to its report issued for the year 2014, as "the percentage of the population using financial services out of the total population."

The Group of Twenty (G20) defined financial inclusion as "promoting the access and use of all segments of society, including marginalized and poor

groups, to financial services and products that are commensurate with their needs so that they are provided to them in a fair and transparent manner and at reasonable costs."

In light of the increasing global interest in financial inclusion, represented by global economic organizations and central banks, those in charge of the Arab Monetary Fund have realized its importance, and a regional working group has been formed in order to enhance financial inclusion in the Arab countries. And the use of all financial services for the various segments of society through official channels, including bank accounts, savings, payment and transfer services, insurance services, financing and credit services, to avoid some resorting to informal channels and means that are not subject to a minimum level of control and supervision and at relatively high costs, which leads to misuse of needs These are from the financial and banking services."

Based on the previous concepts that were put forward, it can be said that financial inclusion: It is everyone's access to financial services at affordable prices and of good quality, which specifically targets the poor and low-income groups in society and meets their financial requirements. It is also necessary to provide such services in a sustainable and continuous manner. In order to enhance trust between users of financial services and those in charge of them.

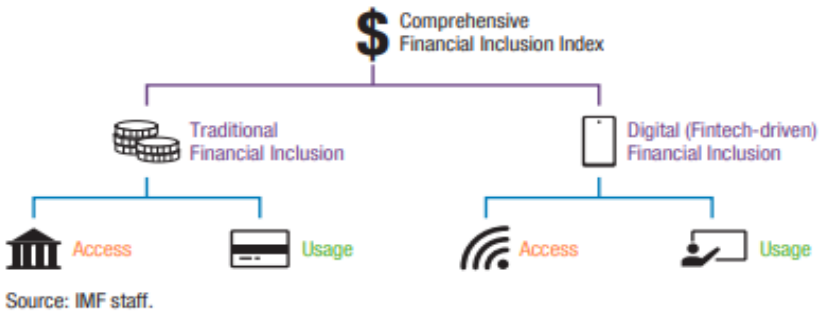

Figure (1): Financial Inclusion Index

Obstacles to financial inclusion

Not dealing with banks and financial institutions is closely related to the disparity in income levels, and that (75%) of the poor in the world do not have dealings with banks because of the high costs and other often burdensome requirements in order to open a financial account, and only (25%) of them save Adults who earn less than two dollars per day spend their money in licensed financial institutions, and although the poor do not have access to financial

services to the same extent as people with high incomes, their need for financial services is greater, so it can be said that income levels clearly help explain Some differences in the use of financial services or not, as the global survey (Findex) of the World Bank provides new data on the barriers to financial inclusion based on a survey that included a group of adults around the world who do not have official financial accounts and the most cited reason for not .

The presence of an official account is the lack of enough money, at a rate of (30%) of the sample size, as shown in Figure (2), while the other reason is the presence of a financial account in a financial institution for one of the family members, and their percentage was (25%), and this indicates a correlation .The individual is indirectly involved in a financial institution, while the other reasons can be mentioned in order of importance, which are the high costs of financial products and services (23%), the distance between the customer and the bank or financial institution (20%), and the lack of the necessary documents in order to enter the financial system (18% and lack of trust between clients and financial service providers from banks and institutions (13%), in addition to religious reasons (5%).

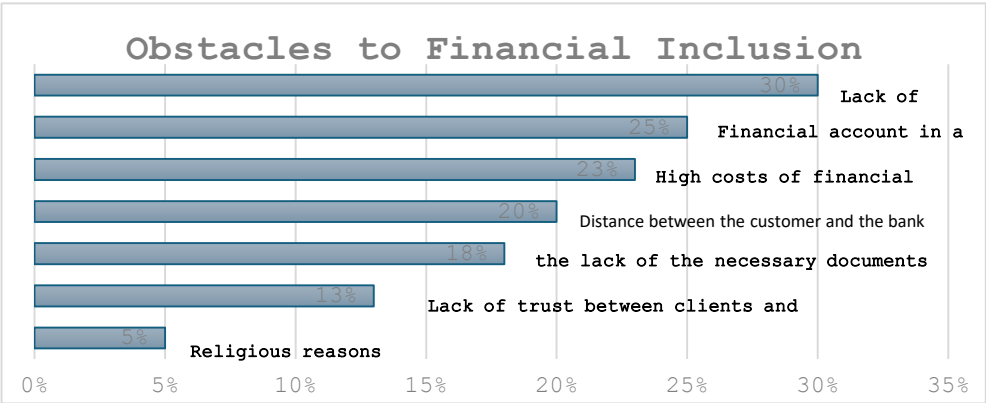

Figure (2): Obstacles to Financial Inclusion

Source: Global Financial Inclusion (Global Findex) Database, World Bank, Washington

What is meant by religious reasons are financial products and instruments that are compatible with Islamic law, and that can play an important role in promoting financial inclusion among the Muslim population, because about 700 million of the world's poor live in Muslim-majority countries. In recent years, there has been a growing interest in financing. Islamic as a tool to increase financial inclusion among the Muslim population and increase growth rates and get rid of poverty.

Dimensions of financial inclusion

It can be said that financial inclusion has different dimensions, namely (access to financial services, use of financial services, quality of financial services) and each of these dimensions has implications for the relationship between financial service providers and their customers, and each has a different role in achieving financial inclusion. The three dimensions in the various efforts made to collect data related to financial inclusion by the World Bank, the International Monetary Fund, and the Global Alliance for Financial Inclusion, and these dimensions can be clarified through Table (1).

The first dimension: - Access to financial services, and it is usually the responsibility of the supply side and involves the physical banking infrastructure, the availability of bank branches, ATMs and points of sale, or access to digital infrastructure, but there are some obstacles that impede access to these services, for example, Are there discriminatory practices between individuals and institutions with regard to the level of income and the provision of service, and do customers know the quality of services provided to them, and here the responsibility rests on financial education

The second dimension: - the use of financial services, which is primarily the responsibility of the demand side, which involves the frequency and extent of interaction of individuals and institutions with financial services, and if financial services are available to the customer, does he use them, for example, if the customer has a bank account, and does he perform transactions Withdrawals, deposits and payments.

The third dimension: - the quality of financial services, which is mainly the responsibility of the supply side and is intended to provide financial products of high quality to meet the needs of users. Quality usually refers to the competitive market between the providers of these services, and the role of governments and independent bodies is through setting standards that motivate service providers. To make their products easy to use, affordable and presented in an effective and efficient manner.

Table (1): Dimensions of Financial Inclusion

T	Dimensions	The Description
1	Access	Provides regulated and formal financial services close to customers and affordability
2	The use	The actual use of financial services and products and the regularity of frequency by the user of these services
3	The quality	Services are well tailored to customer needs and products are developed to suit all income levels

2. Fintech

Fintech is a term used to describe the use of technology to improve the delivery of financial services. It is a rapidly growing industry that is transforming the way financial services are provided to customers. Financial inclusion is the process of providing access to financial services to those who historically have been excluded from the formal financial system.

Fintech refers to the integration of technology into offerings by financial services companies to improve their use and delivery to consumers. It primarily works by unbundling offerings by such firms and creating new markets for them. One way fintech works is by safely unlocking financial account data (e.g. transactions and account balances) with an app or service that performs an action to enhance or enrich that data. Fintech platforms enable users to access financial services through their mobile devices or computers.

Historical Evolution of Fintech

FINTECH 1.0 (1866-1967)

Fintech history dates to the 19th century and even before that. In 1860, a device called PENTELEGRAPH was developed to verify signatures by banks. Historians accept 1866 as the first valid Fintech footprints. This was the year the transatlantic cables were setup leading to an era of creating network infrastructure & linkages around the world. Setting up of Electronic fund transfer through Telegraph & Morse code in 1918 by Fedwire led to first baby step in digitalization of money. The two World Wars also saw a new set of coders & codebreakers mainly for the military purposes (though this set up the idea of coding & future digital development). The publication of book "The Economic consequences of Peace" in 1919 is treated as the first thought on the fintech driven future.

Generally, Fintech historians miss one important and life altering event of Fintech 1.0 and that is Diner's Card in 1950. This was first honest effort to make your payments cashless and while the beginning was humble and limited to restaurants payments. This was followed by introduction of Credit Card by Amex in 1958. With introduction of Screen based stock data by Quotron in 1960, the Financial Market took the huge stride.

FINTECH 2.0

Fintech 2.0 is considered to begin with the introduction of ATM machine by Barclay's in 1967. Just the year before in 1966, Telex had replaced Telegraph for transferring information across the world; thus heralding an era of connected financial transactions & communication.

The major fintech growth came in 1971 with setup of NASDAQ as the first electronic stock market. It changed the way bidding is done and modernized the Initial Public Offering (IPO) process significantly. This is considered as one of the most important Fintech development of all times. This was followed by introduction of SWIFT in 1973, another revolutionary service standard. The 80's saw the development of electronic trades and online banking systems. Tradeplus (E-trade) introduced the E-trade for the first time in 1982. 1983 was the year, when Mobile phones were launched for the first time too. The development of complex computing systems helped in launching of newer and more dynamic processes & products. One major breakthrough was the evolution of E-commerce during the mid-90's which made the reliance of digital finance much more significant. 1998 saw the launch of PAYPAL, the pioneer of cashless payments in years to come.

The Year 2000 (Y2K) bubble burst and subsequent years saw a rapid development of technology in financial sectors, mainly being deployed by the traditional banks as a support function to their primary channels. The 2008 financial crisis led the fundamental change in the outlook towards the Fintech sector and the need of innovation led to the real boom that unveiled in the coming years.

FINTECH 3.0

The 2008 crisis led to the following requirements among others:

- Post crisis reforms required stricter regulatory compulsions for traditional banks and it opened up a new market for smaller players. This was further helped by mistrust of public in large financial institutions; and
- Overall focus of the industry was on cutting down operational cost using technology

These requirements and developments led to a new era of financial services and to FINTECH as we know it today. Two major events were development of Bitcoin in 2009 as the first cryptocurrency and P2P payment systems in 2011. The western world has been churning new developments and hundreds of new unicorns since then. RegTech, Digital Lending, InsurTech, Wallets and many more segments are seeing growth and innovations on a daily basis.

FINTECH 3.5

The year 2014 onwards saw a non-linear rise of two most populous countries in Fintech; namely China and India. Devoid of large chains of complex physical banking infrastructures, these two countries saw a very fast paced growth in the

Fintech sector. This along with Fintech developments in Africa is considered as the growth engine for 2014-2018. This is led by SaaS developments like financial software by Indian IT companies, M-Pesa in Africa, Payment banks in India, and Alipay in China to name a few. The following figure (3) summarizes the history of Fintech.

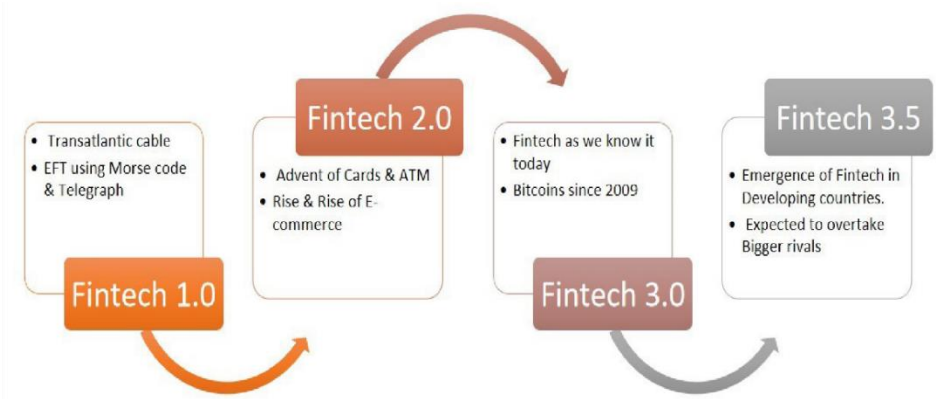

Figure (3): History of Fintech

Source: Vivek Agrawal "History of Fintech" Linkden.com/pulse/history-fintech-vivek-agrawal. August 27, 2021.

The Reality of the Fintech and Financial Inclusion:

Since 2010, more than 55 countries have made commitments to financial inclusion, and more than 60 countries have launched or are in the process of developing a national strategy.

At the World Bank Group (WBG), they look at financial inclusion across three dimensions – 'Access, Usage, and Quality' of financial services. Fintech has the potential to lower costs, while increasing speed and accessibility, allowing for more tailored financial services that can scale.

Financial technology (fintech) has played a significant role in promoting financial inclusion by providing access to financial services to underserved communities. Here are some numbers to highlight the impact of fintech on financial inclusion:

Over the last decade, 1.2 billion previously unbanked adults gained access to financial services, and the unbanked population fell by 35%, primarily boosted by the increase in mobile money accounts. While globally 1.7 billion adults remain unbanked, fintech is helping make financial services more accessible to an increasing number of people. As figure (4) shows worldwide account

ownership has reached 76 percent of the global population—and 71 percent of people in developing countries.

Account ownership in developing countries rose from 63% to 71% in the past few years due to the increase in access to accounts in dozens of developing countries, in stark contrast to the growth experienced from 2011 to 2017, which occurred mostly in China or India.

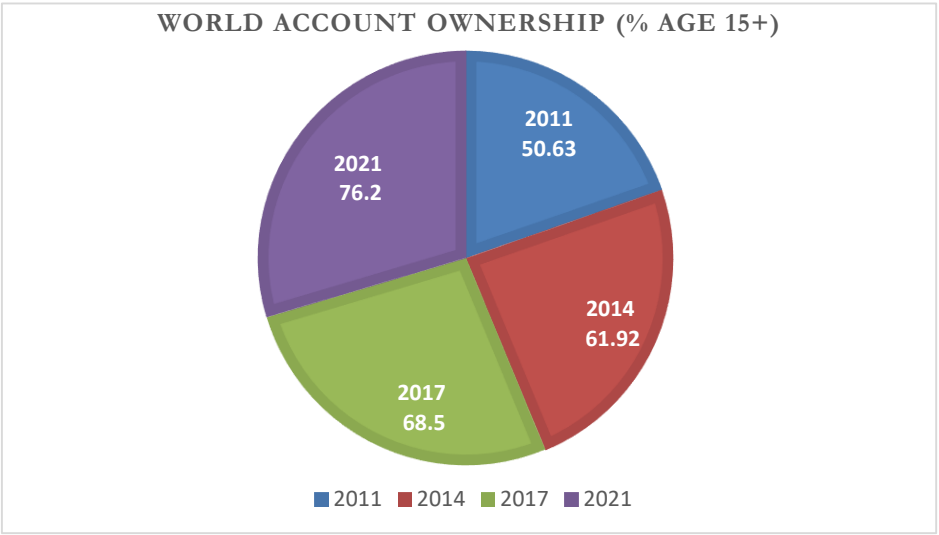

Figure (4): World Account ownership

Source: Source: Data from database: Global Financial Inclusion https://www.worldbank.globalfindex

In 2020, the global fintech market was valued at $550 billion. This market is expected to grow at a compound annual growth rate of 23.8% from 2021 to 2028. Fintech companies have helped increase the number of people with access to mobile money accounts. As of 2020, there were over 1.2 billion registered mobile money accounts globally. Figure (5) shows the increase in the mobile money accounts from 2.06 in 2014 to 10.4 in 2021, this reflect how the fintech helped increase the number of people with access to financial services.

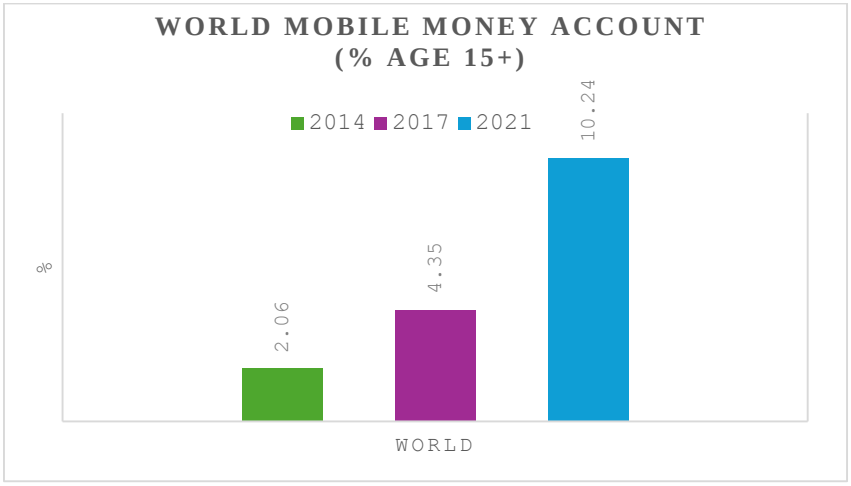

Figure (5): Mobile Money Accounts

Source: Data from database: Global Financial Inclusion https://www.worldbank.globalfindex

Figure (6) the development of the financial account in the different regions with high-low-middle income countries. The percent of the low income countries has increased from 7% in 2011 to 19% in 2021 that increase due to the fintech increase the number of people with access to mobile money accounts

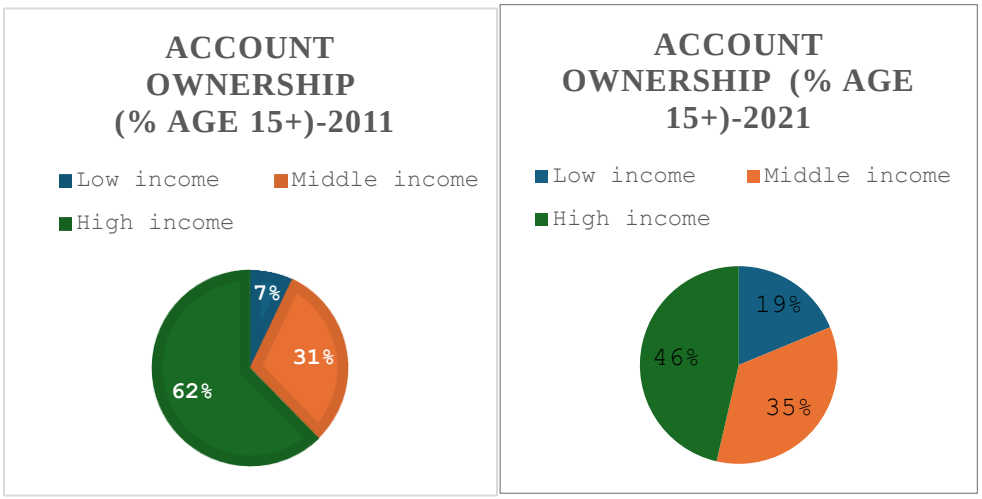

Figure (6): The Development of the financial account in high-low-middle income countries.

Source: Data from database: Global Financial Inclusion https://www.worldbank.globalfindex

Digital financial services - including those involving the use of mobile phones - have now been launched in more than 80 countries, some of them reaching a large scale. As a result, millions of poor, formerly excluded and underserved clients are moving exclusively from cash transactions to formal financial services, using mobile phones or other digital technology to access these services.

According to a report by the Global Findex Database, the use of digital financial services has increased in developing countries. In 2017, 21% of adults in developing countries reported using a mobile money account, up from just 2% in 2011. In Africa, where traditional banking services are limited, fintech has been particularly effective in promoting financial inclusion. The number of adults with a mobile money account in sub-Saharan Africa grew from 12% in 2011 to 21% in 2017, according to the World Bank.

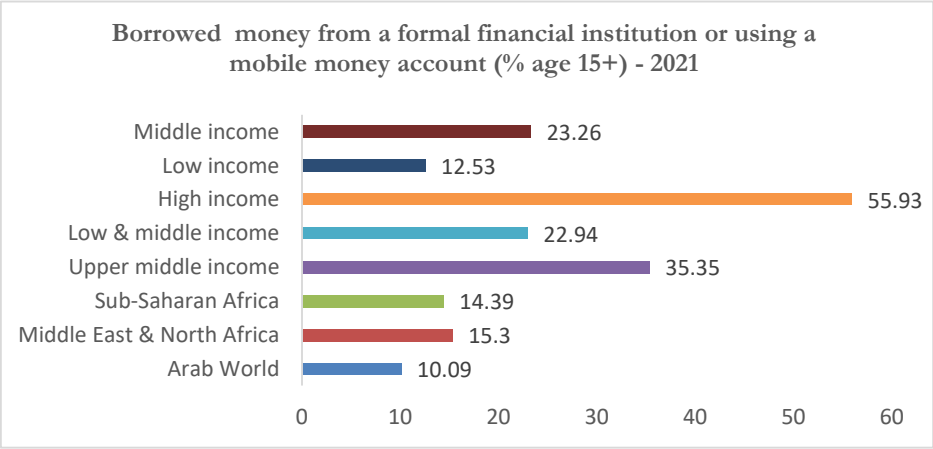

Figure (7): Borrowed Money by Region in 2021

Source: Data from database: Global Financial Inclusion https://www.worldbank.globalfindex

In China, where mobile payments are widely used, the number of adults without a bank account fell from 557 million in 2011 to 225 million in 2017, according to the World Bank. Mobile money has become an important enabler of financial inclusion in Sub-Saharan Africa—especially for women—both as a driver of account ownership and of account usage through mobile payments, saving, and borrowing.

Between 2011 and 2017, the gender gap in account ownership remained stuck at 9 percentage points in developing countries, hindering women's ability to take effective control of their financial lives. Countries with high mobile money account ownership had less disparity between the sexes. The gender gap in

account ownership across developing economies has fallen to 6 percentage points from 9 percentage points, where it hovered for many years. In sub-Saharan Africa, mobile money has greatly increased account ownership, and the gender gap in account ownership has narrowed for the first time in the past decade.

The year 2021 saw the long-standing gender gap in developing economies decline from 9 percentage points to 6 percentage points. The data now shows that 74% of men and 68% of women in developing countries have a bank account. Globally, 78% of men and 74% of women had an account, meaning a gender gap of 4 percentage points.

In Figure (8) the present of female account ownership is almost near to the present of male and the gender gap reduces from 2017 and 2021 by 4% to reach in 2021 only 2% in the world.

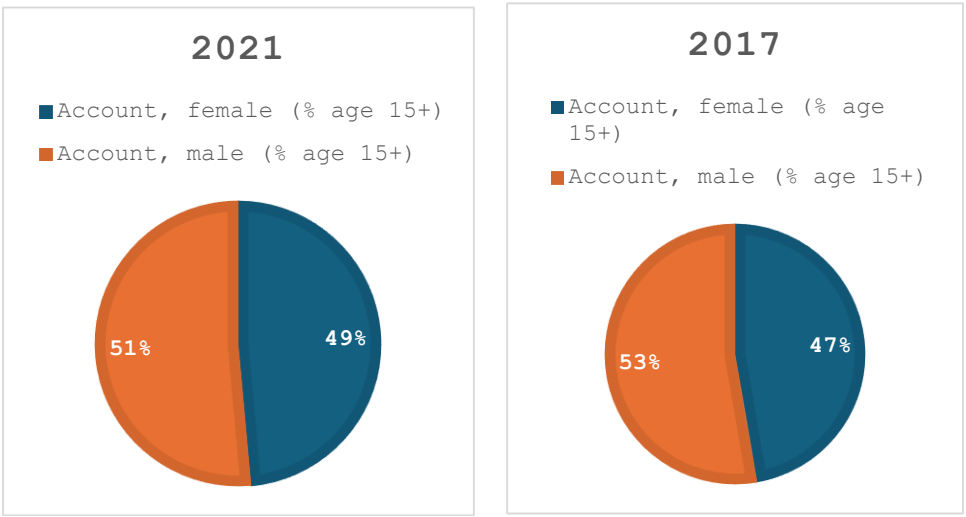

Figure (8): World Account Ownership between Female, Male.

Source: Data from database: Global Financial Inclusion https://www.worldbank.globalfindex

Global Mobile payment market is estimated to grow with approx.22.25% CAGR during the year 2018-2026. The base year considered for the study is 2017 and forecast period is 2018-2026. The important driver increasing growth in the global mobile payment market is the growth in e-commerce. Significant growth in e-commerce through online businesses such as online retail shopping, recharges, money transfer, and gas refill and so on is giving rise to mobile payment.

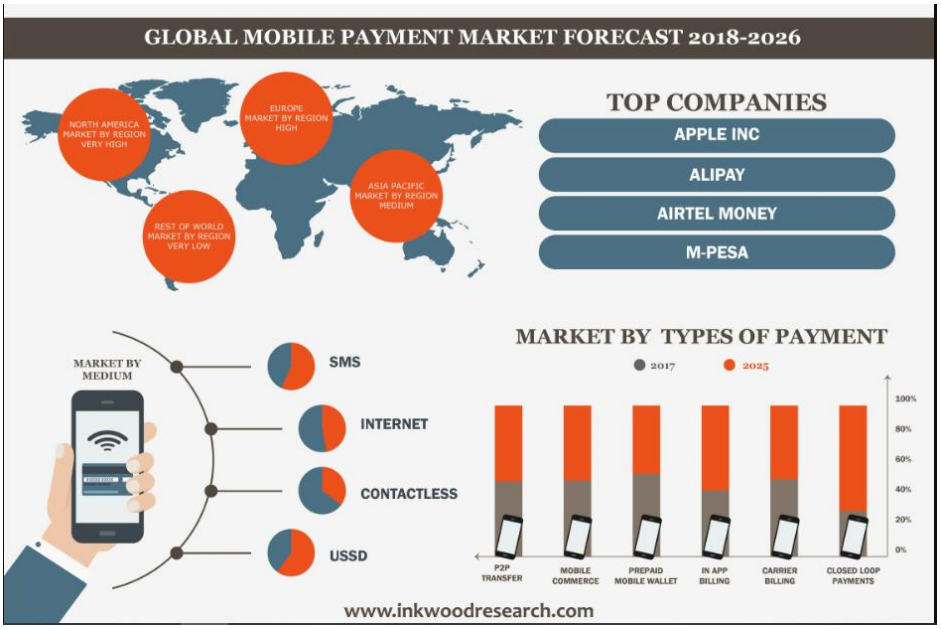

Figure (9): Global Mobile Payment Market Forecast 2018-2026

Source: https://inkwoodresearch.com/reports/mobile-payment-market/#report-summary

Governments, private employers and financial service providers can improve access to financial services for the 1.4 billion unbanked adults.

The database reveals a number of opportunities to expand access to the unbanked, particularly by leveraging digital payments. Millions of unbanked adults received cash payments for wages, government transfers or the sale of agricultural commodities. Of these, about 85 million unbanked adults received government payments in cash. Digitizing some of these payments could be cheaper, and could reduce corruption for the government while integrating the beneficiaries into the formal financial system.

And we already have evidence that this is working - the Global Financial Inclusion Index 2021 finds that 865 million account holders in developing countries opened their first account with a financial institution for the purpose of receiving money from the government.

COVID-19 boosted the adoption of digital financial services: About 40 percent of adults in developing economies excluding China who made a digital merchant payment using a card, phone, or the internet, and more than one-third of adults in developing economies who paid a utility bill directly from an account, did so for the first time after the start of the pandemic.

In developing economies, about 40 percent of adults who paid utility bills (18 percent of adults) did so directly from an account. In China, about 80 percent of adults made a digital merchant payment, whereas in other developing economies 20 percent of adults did so. About half of adults in developing economies could access extra funds within 30 days if faced with an unexpected expense

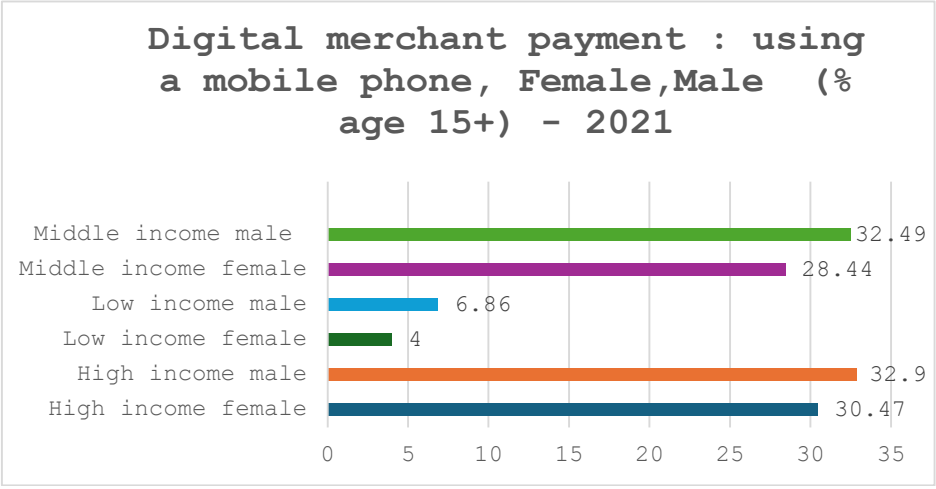

Figure (10): Digital merchant payment in-store: using a mobile phone Female& Male

Source: Data from database: Global Financial Inclusion https://www.worldbank.globalfindex

Fintech has also made it easier for small and medium-sized enterprises (SMEs) to access finance. In the United States, for example, online lenders provided over $22 billion in loans to SMEs in 2018. According to the same report from the Cambridge Centre for Alternative Finance, alternative finance platforms provided $300 billion in funding to SMEs globally in 2018.

In the United States, the percentage of small business loan applications approved by big banks declined from 23% in 2011 to 16.8% in 2017, according to the Small Business Credit Survey. This decline has been partially offset by the growth of online lending platforms, which provided $22.4 billion in loans to small businesses in 2018. Also, online lenders provided over $20 billion in loans to small businesses in 2019, according to the Small Business Administration. The following chart shows Global Fintech Lending by Main Segments consumer and business from 201 to 2017.

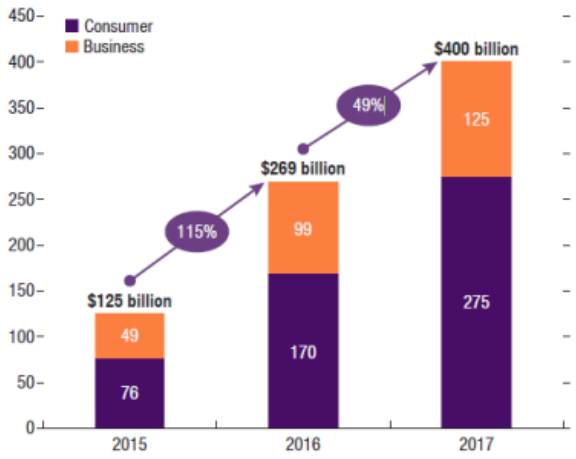

Figure (11): Global Fintech Lending by Main Segments

Source: The Promise of Fintech: Financial Inclusion in the Post COVID-19 Era, IMF Paper No. 2020/009.

According to a market study by Mordor Intelligence, the digital lending market was valued at $311.06 billion in 2020 and is expected to reach $587.27 billion by 2026. The lending market is expected to register a CAGR of approximately 11.9% during the forecast period 2020 – 2025. These figures show that the lending landscape has changed drastically over the years due to rapid digitization.

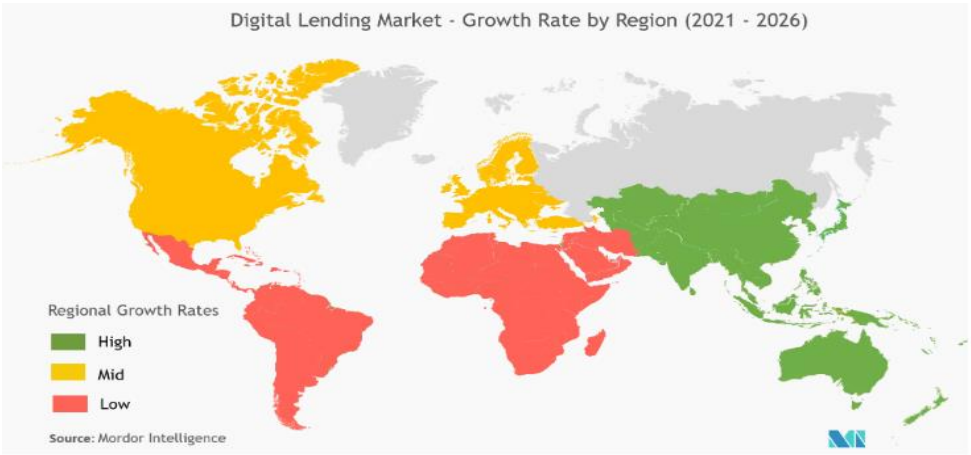

Figure (12): Digital lending market growth rate by region (2021-2026)

Source:https://www.mordorintelligence.com/industry-reports/digital-lending-marke

According to a report by the Cambridge Centre for Alternative Finance, global fintech investment increased from $20 billion in 2011 to $111.8 billion in 2018. This investment has helped drive innovation in the fintech industry and increase access to financial services.

	RANK	STRENGTH	POPULATION	FINTECH CITIES IN TOP 100	LOCAL FINTECH LEADERS	FINTECH INVEST-MENTS	WIFI SPEED
USA	1	Payments, B2B fintech, Security	329 million	22	Stripe (val: $22.5bn) Coinbase ($8bn) Robinhood ($5.6bn)	$9.4bn (H1 2019)	#20
UK	2	Challenger banks, personal finance & wealth, lending, blockchain	67.5 million	3	TransferWise (val: $3.5bn) Greensill ($3.5bn) BGL Group ($3bn)	$2.29bn	#6
Singapore	3	Wealth management, digital banking, SME	5.8 million	1	TenX (val: US$159.1m) Quoine ($123m) KyberNetwork ($105m)	$735M	#12
Lithuania	4	Payments, lending, banking	2.8 million	1	Stockinvest us Coingate NEO Finance		#1
Switzerland	5	Cryptocurrency & blockchain, wealth management, crowdfunding	8.6 million	4	Avaloq Group Ethereum Numbrsa		#14
Netherlands	6	Digital payments, alternative lending, investment	17.1 million	2	Adyen, Ohpen, BUX		not in top 20
Sweden	7	Digital payments, SME, neobanks	10 million	1	Klarna, iZettle, Anyfin	$736.7 m	#17
Australia	8	Digital payments, personal finance, alternative lending	25.3 million	2	Judo Capital, Airwallex, MoneyMe		not in top 20
Canada	9	Crypto and blockchain, lending, insurance	37.5 million	5	Carta, Borrowell, Wave		#19
Estonia	10	Digital payments, personal finance, alternative lending	1.3 million	1	Fortumo, Veriff		#3

Sources: Global Fintech Index 2020, CBInsights, Holland Fintech, London & Partners, Medici, Ooma, Pitchbook, Statista, Tracxn, Go Vilnius

Figure (13): Fintech's Top 10

Source:fintechweekly.com

FinTech adoption rates vary greatly by country. As professional services firm EY has shown in its latest research on the industry, China is the most advanced when it comes to the share of the digitally active population using FinTech services. Overall, this figure sits at 69 percent in 2017. Breaking it down by sector, China dominates in four of the five areas covered. Only in insurance-oriented services do India and the UK have a higher rate of adoption. In each sector, the top three is chiefly dominated by China, India and Brazil.

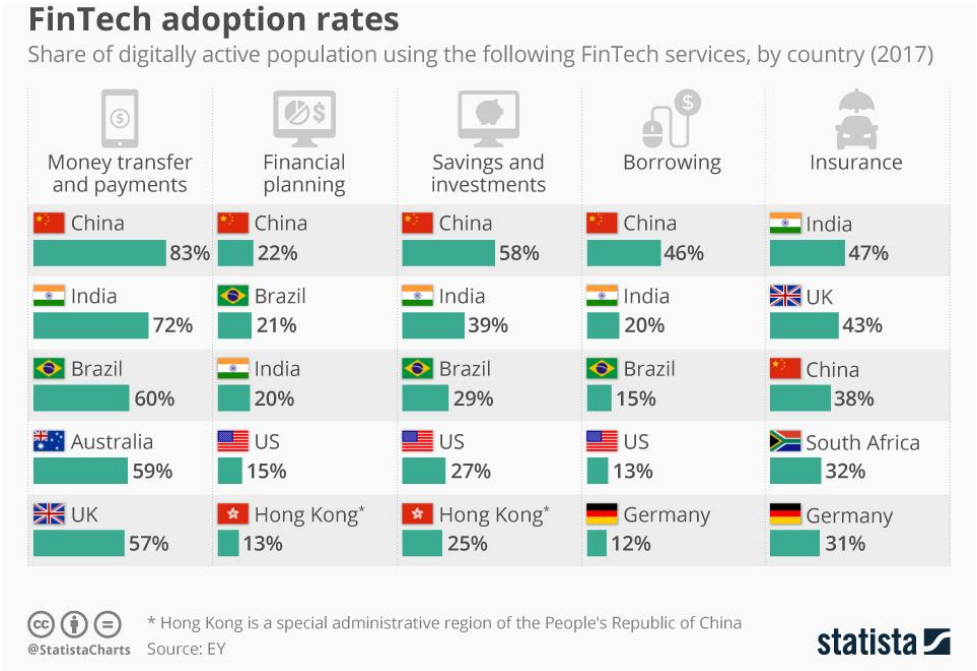

Figure (14): The share of the digitally active population using certain FinTech services, by country in 2017.

Source: https://www.statista.com/chart/10012/fintech-adoption-rates/

These numbers demonstrate the potential of fintech to promote financial inclusion and provide access to financial services to underserved communities. As the fintech industry continues to grow, we can expect to see even greater progress in this area.

1. Benefits of Fintech and Financial Inclusion

Fintech and financial inclusion provide a number of benefits to those who traditionally have been excluded from the formal financial system. By making financial services more accessible and affordable, fintech and financial inclusion can help to reduce poverty and inequality. Additionally, fintech and financial inclusion can help to promote economic growth and development.

Fintech and financial inclusion also provide a number of benefits to businesses. By making financial services more accessible, businesses are able to access capital more easily. This can help businesses to grow and create jobs, which in turn can help to boost economic growth and development. The following figure (15) shows the top benefits of using fintech according to users.

Figure (15): Top benefits of using fintech according to users

Source: The Fintech Effect 2021

2. The research methodology:

Studying the impact of financial technology through two approaches as follows:

1- Theoretical approach:

A comprehensive review of the existing literature and studies related to financial technology and financial inclusion and their impact on countries in the world during the specified time period.

Collecting indicators of low-, middle-, and high-income countries, and the financial inclusion index based on data a Empirical model vailable on the World Bank database.

2- Empirica approach:

Analyzing the collected data using statistical methods, or any other appropriate methods to understand the impact of fintech on financial inclusion in low-, middle- and high-income countries, using tablet data models, where the study includes four dependent variables, which are financial inclusion indicators (number of ATMs, commercial bank branches per 100,000 adults) FICBB, financial sector credit to the private sector (FIMSCP), financial sector credit to the private sector as a percentage of GDP, and two independent variables, which are fintech indicators, which are mobile subscribers (MCS), account holders using mobile (AOF), during the period from 2010-2020.

Therefore, the formula for the statistical model is as follows:

$$\text{FIATM} = \alpha_0 + \alpha_1 MCS_{it} + \alpha_2 AoF_{it} + e_{it}$$

$$\text{FIMSCP} = \alpha_0 + \alpha_1 MCS_{it} + \alpha_2 AoF_{it} + e_{it}$$

$$\text{FILCP} = \alpha_0 + \alpha_1 MCS_{it} + \alpha_2 AoF_{it} + e_{it}$$

FICBB= $\alpha_0 + \alpha_1 MCS_{it} + \alpha_2 AoF_{it} + e_{it}$

As:

FIATM: is the indicators of financial inclusion indices "Automated Teller Machines Numbers".

FICBB: is the indicators of financial inclusion indices "branch of commercial banks per 100 thousand adults".

FIMSCP: is the indicators of financial inclusion indices "credit provided by the financial sector to the private sector".

FILCP: is the financial inclusion indices "credit provided by the financial sector to the private sector as a percentage of GDP".

MCS: is the fintech index of subscribers to mobile networks.

AOF: is the fintech index of account holders with mobile phone usage

Empirical Study:

This Research is based on the following hypothesis: "Fintech plays an effective role in achieving financial inclusion." In order to test the hypothesis of the study statistically, a standard model was adopted, consisting of three regression equations (models) that include indicators of financial inclusion as dependent variables and two indicators of financial technology as independent variables of the equations Using Panel Data for high, middle and low income countries, during the period from 2010-2021, estimated panel data by using pooled OLS.

Therefore, the formula for the model is as follows:

FIATM= $\alpha_0 + \alpha_1 MNS_{it} + \alpha_2 MAU_{it} + e_{it}$

FICBB =$\alpha_0 + \alpha_1 MNS_{it} + \alpha_2 MAU_{it} + e_{it}$

FICFS= $\alpha_0 + \alpha_1 MNS_{it} + \alpha_2 MAU_{it} + e_{it}$

As:

FIATM: is the indicators of financial inclusion indices "Automated Teller Machines Numbers per 100 dults".

FICBB: is the indicators of financial inclusion indices "branch of commercial banks per 100 thousand adults".

FICFP: is the indicators of financial inclusion indices "credit provided by the financial sector to the private sector% GDP".

MNS: is the fintech index of subscribers to mobile networks.

MAU: is the fintech index of account holders with mobile phone usage.

1. Model Specification:

- **Data:**

Using Panel Data for high, middle and low income countries, during the period from 2010-2021, the data were collected from:

- World Bank open data base (credit provided by the financial sector to the private sector % GDP and subscribers to mobile networks).
- Global Findex (Automated Teller Machines Numbers, commercial bank branches per 100,000 adults and account holders with Mobile phone usage).

- **Variables:**
  - First the dependent Variable:

    Study includes three dependent variables: which are financial inclusion indicators Automated Teller Machines Numbers (ATMs), commercial bank branches per 100,000 adults) (FICBB), credit provided by the financial sector to the private sector % GDP (FICFS).

  - Second the independent variable:

    Two independent variables: which are financial technology indicators subscribers to mobile networks (MNS), account holders with Mobile phone usage (MAU).

- **The Model:**

Pooled Ordinary Least Squares (Pooled OLS) is a statistical technique used in regression analysis to estimate the relationship between a dependent variable and one or more independent variables.

Pooled OLS is typically used in cross-sectional data analysis, where data is collected from multiple sources at a single point in time. This method assumes that the data is a random sample from a large population, and that the relationship between the dependent variable and the independent variable(s) is the same for all observations.

The general equation for Pooled OLS can be expressed as:

$$Yi = \beta 0 + \beta 1Xi1 + \beta 2Xi2 + ... + \beta kXik + \varepsilon i$$

Where:

- Yi is the dependent variable for the ith observation
- β0 is the intercept term
- β1, β2, ..., βk are the coefficients of the independent variables X1, X2, ..., Xk, respectively
- Xi1, Xi2, ..., Xik are the independent variables for the ith observation
- ɛi is the error term or the residual for the ith observation

The goal of the Pooled OLS method is to estimate the values of the coefficients β0, β1, β2, ..., βk that minimize the sum of squared residuals across all observations. This involves finding the values of the coefficients that provide the best fit to the data, in terms of minimizing the difference between the predicted values and the actual values of the dependent variable.

Note that in the Pooled OLS method, all observations are treated equally, regardless of their source or any other characteristics that may differ across observations. This is why the method is called "pooled", as the data from all sources are pooled together to estimate a single regression model.

2. Results of regression by using pooled OLS for the Study Variables

1) FIATM= $\alpha_0 + \alpha_1 MNS_{it} + \alpha_2 MAU_{it} + e_{it}$

The first equation tests the effect of fintech on the financial inclusion represented by Automated Teller Machines Numbers per 100 adults". Results of the test presented in the tables below.

- Firstly: defining the variables

Dependent variable	Independent variables
• ATM refers to Automated teller machines (ATMs) (per 100,000 adults)	• AF refers to mobile Account ownership • MS refers to Mobile cellular subscriptions (per 100 people)

- Secondly: Eviews output

A) The result of the Aggregate High, Middle and low income countries:

Table (4)

Dependent Variable: AUTOMATED_TELLER_MACHINES__ATMS___PER_ 100_000_ADULTS_
Method: Panel Least Squares
Date: 04/06/23 Time: 21:08
Sample (adjusted): 2014 2021
Periods included: 4
Cross-sections included: 2
Total panel (unbalanced) observations: 6

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-23.37385	2.638088	-8.860148	0.0030
MOBILE_ACCOUNT_OWNERSHIP_____ OF_POPULATION_AGES_15__	-0.064431	0.078040	-0.825616	0.4696
MOBILE_CELLULAR_SUBSCRIPTIONS __PER_100_PEOPLE_	0.530421	0.026105	20.31845	0.0003

Root MSE	0.977819	R-squared	0.994618
Mean dependent var	17.43160	Adjusted R-squared	0.991030
S.D. dependent var	14.60055	S.E. of regression	1.382846
Akaike info criterion	3.793017	Sum squared resid	5.736786
Schwarz criterion	3.688896	Log likelihood	-8.379050
Hannan-Quinn criter.	3.376215	F-statistic	277.1963
Durbin-Watson stat	0.000000	Prob(F-statistic)	0.000395

Source: researcher preperation using (E-views)depend on data on table-2)

Economic Analysis and Commentary on the Results:

1. **Dependent Variable**: Number of Automated Teller Machines (ATMs) per 100,000 adults.
2. **Independent Variables**:
   - **Mobile Account Ownership of Population Ages 15+**: This variable did not show a significant impact on the number of ATMs, as the p-value is 0.4696, which is greater than 0.05. This indicates that the variable does not have a statistically significant effect on the dependent variable.
   - **Mobile Cellular Subscriptions per 100 People**: This variable demonstrated a strong and significant positive impact on the number of ATMs, with a p-value of 0.0003, which is less than 0.05. This suggests

that an increase in mobile cellular subscriptions is associated with an increase in the number of ATMs per 100,000 adults.

3. **R-squared**: This indicates that 99% of the variation in the number of ATMs per 100,000 adults is explained by the changes in the independent variables. This suggests that the model explains the dependent variable quite well.
4. **Durbin-Watson Statistic**: The value of 0.000000 may indicate an issue with serial correlation in the data, which means there could be autocorrelation in the residuals. This could suggest that the model might require further evaluation or correction.

Commentary:

The results show a significant and positive relationship between mobile cellular subscriptions and the increase in the number of ATMs, supporting the hypothesis that fintech promotes financial inclusion through increasing the number of ATMs. However, the relationship between mobile account ownership for the population aged 15 and above and the number of ATMs was not significant, indicating that this aspect of fintech might not have a substantial impact on financial inclusion through this specific indicator.

Moreover, the high R-squared value suggests that the model is strong in explaining the variations in the number of ATMs, but attention should be given to the Durbin-Watson statistic, which may indicate a potential issue in the model.

B) The result of the High income countries:

Table (5)

Dependent Variable: ATM

Method: Panel Least Squares
Date: 04/17/23 Time: 15:39
Sample (adjusted): 2011 2021
Periods included: 4
Cross-sections included: 47
Total panel (unbalanced) observations: 167

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	107.3019	30.40135	3.529511	0.0005
MAU	0.536587	0.247689	2.166374	0.0317
MNS	-0.514432	0.129534	-3.971399	0.0001

R-squared	0.131638	Mean dependent var	87.33509
Adjusted R-squared	0.121048	S.D. dependent var	51.24064
S.E. of regression	48.03934	Akaike info criterion	10.59972

Sum squared resid	378475.7	Schwarz criterion	10.65573
Log likelihood	-882.0765	Hannan-Quinn criter.	10.62245
F-statistic	12.43067	Durbin-Watson stat	0.000000
Prob(F-statistic)	0.000009		

Source: researcher preperation using (E-views).

The result shows that there is significant relationship between the mobile cellular subscriptions per 100 people and the financial inclusion indicator number (ATM) per 100 Adult as the p-value is less than 0.05. Also the relationship between the mobile account ownership of population age 15% is significant because p-value is less than 0.05.

R^2 predicted that about 13% of the variation in the number (FIATM) per 100 Adult is explained by the predictor's variables mobile cellular subscriptions per 100 people (MNS) and between the mobile account ownership of population age 15% (MAU).

C) The result of the Middle income countries:

Table (6)

Dependent Variable: AUTOMATED_TELLER_MACHINES__ATMS___PE R_100_000_ADULTS_
Method: Panel Least Squares
Date: 04/28/23 Time: 18:00
Sample (adjusted): 2012 2021
Periods included: 10
Cross-sections included: 104
Total panel (unbalanced) observations: 947

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MOBILE_CELLULAR_SUBSCRIPTIONS__ PER_100_PEOPLE_	0.148593	0.018374	8.087142	0.0000
C	21.41416	1.921832	11.14258	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.949960	Mean dependent var	36.85099
Adjusted R-squared	0.943780	S.D. dependent var	28.98548
S.E. of regression	6.872692	Akaike info criterion	6.797223
Sum squared resid	39770.94	Schwarz criterion	7.335339
Log likelihood	-3113.485	Hannan-Quinn criter.	7.002284
F-statistic	153.6988	Durbin-Watson stat	0.551976
Prob(F-statistic)	0.000000		

Source: researcher preperation using (E-views)

The result shows that there is significant relationship between the mobile cellular subscriptions per 100 people and the financial inclusion indicator number (ATM) per 100 Adult as the p-value is less than 0.05.

R^2 predicted that about 94% of the variation in the number (FIATM) per 100 Adult is explained by the predictor's variables mobile cellular subscriptions per 100 people (MNS).

So that we will accept the hypotheses that say the fintech promotes the financial inclusion through the indicator of the number (ATM) per 100 Adult in the three level of income countries in the selected sample.

D) The result of the low income countries:

Table (7)

Dependent Variable: ATM
Method: Panel Least Squares
Date: 04/17/23 Time: 19:00
Sample (adjusted): 2011 2021
Periods included: 4
Cross-sections included: 23
Total panel (unbalanced) observations: 56

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.225382	0.742729	0.303451	0.7627
MAU	0.089576	0.020664	4.334953	0.0001
MNS	0.024673	0.012655	1.949652	0.0565

R-squared	0.410574	Mean dependent var	3.766035
Adjusted R-squared	0.388331	S.D. dependent var	2.885231
S.E. of regression	2.256518	Akaike info criterion	4.517606
Sum squared resid	269.8692	Schwarz criterion	4.626107
Log likelihood	-123.4930	Hannan-Quinn criter.	4.559671
F-statistic	18.45899	Durbin-Watson stat	0.000000
Prob(F-statistic)	0.000001		

Source: researcher preperation using (E-views)

The result shows that there is an insignificant relationship between the mobile cellular subscriptions per 100 people and the financial inclusion indicator number (ATM) per 100 Adult as the p-value is more than 0.05. Also the relationship between the mobile account ownership of population age 15% is significant because p-value is less than 0.05.

R^2 predicted that about 41% of the variation in the number (FIATM) per 100 Adult is explained by the predictor's variables mobile cellular subscriptions per 100 people (MNS) and between the mobile account ownership of population age 15% (MAU).

So that we will accept the hypotheses that say the fintech promotes the financial inclusion through the indicator of the number (ATM) per 100 Adult in the three level of income countries in the selected sample .But there is a variation in the strength of the relation between the countries. And the fitech indicators (MNS, MAU) is a weak predictors of the relation between financial inclusion through its indicator (ATM) and the financial inclusion as the R-square is quite small value in the high income countries and the low income countries also.

2) FICBB $=\alpha_0+ \alpha_1 MNS_{it} + \alpha_2 MAU_{it} + e_{it}$

The equation tests the effect of fintech on the financial inclusion represented by the branches of the commercial banks (FICBB)".Results of the test presented in the tables below.

- Firstly: defining the variables

Dependent variable	Independent variables
CBB refers to Commercial bank branches (per 100,000 adults)	MAU refers to mobile Account ownership MNS refers to Mobile cellular subscriptions (per 100 people)

- Secondly: Eviews output:

A) The result of the Aggregate High, Middle and low income countries:

Table (8)

Dependent Variable: COMMERCIAL_BANK_BRANCHES__PER_100_000_ ADULTS_
Method: Panel Least Squares
Date: 04/06/23 Time: 21:14
Sample (adjusted): 2014 2021
Periods included: 4
Cross-sections included: 2
Total panel (unbalanced) observations: 6

Variable	Coefficient	Std. Error	t-Statistic	Prob.

C	-3.200002	1.315702	-2.432163	0.0931
MOBILE_ACCOUNT_OWNERSHIP_____OF_POPULATION_AGES_15__	-0.085901	0.038921	-2.207043	0.1144
MOBILE_CELLULAR_SUBSCRIPTIONS__PER_100_PEOPLE_	0.140229	0.013020	10.77060	0.0017

Root MSE	0.487671	R-squared	0.984058
Mean dependent var	6.815752	Adjusted R-squared	0.973430
S.D. dependent var	4.231019	S.E. of regression	0.689671
Akaike info criterion	2.401649	Sum squared resid	1.426938
Schwarz criterion	2.297528	Log likelihood	-4.204946
Hannan-Quinn criter.	1.984847	F-statistic	92.59058
Durbin-Watson stat	0.000000	Prob(F-statistic)	0.002013

Source: researcher preperation using (E-views)depend on data on table-2)

The result shows that there is significant relationship between the mobile cellular subscriptions per 100 people and the financial inclusion indicator the branches of the commercial banks (FICBB)"as the p-value is less than 0.05. Also the relationship between the mobile account ownership of population age 15% is insignificant because p-value is more than 0.05.

R^2 predicted that about 98% of the variation in the represented by the branches of the commercial banks (FICBB)" explained by the predictor's variables mobile cellular subscriptions per 100 people (MNS) and between the mobile account ownership of population age 15% (MAU).

B) The result of the High income countries:

Table (9)

Dependent Variable: CBB
Method: Panel Least Squares
Date: 04/17/23 Time: 15:24
Sample (adjusted): 2011 2021
Periods included: 4
Cross-sections included: 48
Total panel (unbalanced) observations: 170

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	55.59852	8.677278	6.407368	0.0000
MAU	-0.317605	0.077766	-4.084130	0.0001
MCS	-0.018319	0.039272	-0.466455	0.6417

Effects Specification

Cross-section fixed (dummy variables)			
R-squared	0.881243	Mean dependent var	25.19994
Adjusted R-squared	0.832750	S.D. dependent var	15.11839
S.E. of regression	6.182844	Akaike info criterion	6.721363
Sum squared resid	4587.308	Schwarz criterion	7.643656
Log likelihood	-521.3158	Hannan-Quinn criter.	7.095619
F-statistic	18.17274	Durbin-Watson stat	0.000000
Prob(F-statistic)	0.000000		

Source: researcher preperation using (E-views)

The result shows that there is significant relationship between the relationship between the mobile account ownership of population age 15% and the financial inclusion indicator the branches of the commercial banks (FICBB)"as the p-value is less than 0.05. Also the relationship between the mobile cellular subscriptions per 100 people is insignificant because p-value is more than 0.05.

R^2 predicted that about 88% of the variation in the represented by the branches of the commercial banks (FICBB)" explained by the predictor's variables mobile cellular subscriptions per 100 people (MNS) and between the mobile account ownership of population age 15% (MAU).

C) The result of the Middle income countries:

Table(10)

Dependent Variable: COMMERCIAL_BANK_BRANCHES__PER_100_00
0_ADULTS_
Method: Panel Least Squares
Date: 04/28/23 Time: 18:02
Sample (adjusted): 2012 2021
Periods included: 10
Cross-sections included: 103
Total panel (unbalanced) observations: 954

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MOBILE_CELLULAR_SUBSCRIPTIONS__ PER_100_PEOPLE_	0.015939	0.007799	2.043712	0.0413
C	13.31882	0.815647	16.32915	0.0000
Effects Specification				
Cross-section fixed (dummy variables)				

R-squared	0.949918	Mean dependent var	14.97446
Adjusted R-squared	0.943849	S.D. dependent var	12.35802
S.E. of regression	2.928378	Akaike info criterion	5.089376
Sum squared resid	7289.088	Schwarz criterion	5.619260

Source: researcher preperation using (E-views)

The result shows that there is significant relationship between the mobile cellular subscriptions per 100 people and the financial inclusion indicator the branches of the commercial banks (FICBB)"as the p-value is less than 0.05.

R^2 predicted that about 94% of the variation in the represented by the branches of the commercial banks (FICBB)" explained by the predictor's variables mobile cellular subscriptions per 100 people (MNS).

D) The result of the low income countries:

Table (11)

Dependent Variable: CBB
Method: Panel Least Squares
Date: 04/17/23 Time: 18:58
Sample (adjusted): 2011 2021
Periods included: 4
Cross-sections included: 23
Total panel (unbalanced) observations: 60

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.721956	0.388611	1.857787	0.0684
MNS	0.028323	0.006829	4.147458	0.0001
MAU	0.024827	0.011052	2.246463	0.0286

R-squared	0.402787	Mean dependent var	2.895614
Adjusted R-squared	0.381832	S.D. dependent var	1.563236
S.E. of regression	1.229074	Akaike info criterion	3.299106
Sum squared resid	86.10550	Schwarz criterion	3.403823
Log likelihood	-95.97317	Hannan-Quinn criter.	3.340066
F-statistic	19.22163	Durbin-Watson stat	0.000000
Prob(F-statistic)	0.000000		

Source: researcher preperation using (E-views)

The result shows that there is significant relationship between the mobile cellular subscriptions per 100 people and the mobile account ownership of population age 15% with the financial inclusion indicator the branches of the commercial banks (FICBB)"as the p-value is less than 0.05.

R^2 predicted that about 40% of the variation in the represented by the branches of the commercial banks (FICBB)" explained by the predictor's variables mobile cellular subscriptions per 100 people (MNS) and between the mobile account ownership of population age 15% (MAU).

So that through the Four models we will accept the hypotheses that say the fintech promotes the financial inclusion through the indicator of the represented by the branches of the commercial banks (FICBB)" in the three level of income countries in the selected sample. But in the high and middle income countries the relation is strong than in the low income countries that it may be because of the lack of the access of technology in that countries and the financial literacy in that areas.

3) FICFP= $\alpha_0 + \alpha_1 MNS_{it} + \alpha_2 MAU_{it} + e_{it}$

The equation tests the effect of fintech on the financial inclusion represented by credit provided by the financial sector to the private sector% GDP (FICFP)". Results of the test presented in the tables below.

- Firstly: defining the variables

Dependent variable	Independent variables
• MSC refers to Monetary Sector credit to private sector (% GDP)	• AF refers to mobile Account ownership • MS refers to Mobile cellular subscriptions (per 100 people)

- Secondly: Eviews output

A) The result of the Aggregate High, Middle and low income countries

Table (12)

Dependent Variable: MONETARY_SECTOR_CREDIT_TO_PRIVATE_SECTOR____GDP_
Method: Panel Least Squares
Date: 04/06/23 Time: 19:58
Sample (adjusted): 2014 2020
Periods included: 3
Cross-sections included: 2
Total panel (unbalanced) observations: 5

Variable	Coefficient	Std. Error	t-Statistic	Prob.

C	-64.22107	1.663728	-38.60071	0.0007
MOBILE_CELLULAR_SUBSCRIPTIONS__PER_100_PEOPLE_	1.557976	0.017917	86.95556	0.0001
MOBILE_ACCOUNT_OWNERSHIP_____OF_POPULATION_AGES_15__	-0.429378	0.044077	-9.741592	0.0104

Root MSE	0.444009	R-squared	0.999856
Mean dependent var	43.26697	Adjusted R-squared	0.999711
S.D. dependent var	41.32069	S.E. of regression	0.702039
Akaike info criterion	2.414055	Sum squared resid	0.985719
Schwarz criterion	2.179718	Log likelihood	-3.035137
Hannan-Quinn criter.	1.785117	F-statistic	6927.545
Durbin-Watson stat	0.000000	Prob(F-statistic)	0.000144

Source: researcher preperation using (E-views)depend on data on table-2)

The result shows that there is significant relationship between the mobile cellular subscriptions per 100 people and the financial inclusion indicator the credit provided by the financial sector to the private sector% GDP (FICFP)"as the p-value is less than 0.05. Also the relationship between the mobile account ownership of population age 15% and the financial inclusion indicator the credit provided by the financial sector to the private sector% GDP (FICFP) is significant because p-value is less than 0.05.

R^2 predicted that about 44% of the variation in the represented by the the credit provided by the financial sector to the private sector% GDP (FICFP)"explained by the predictor's variables mobile cellular subscriptions per 100 people (MNS) and between the mobile account ownership of population age 15% (MAU).

B) The result of the High, income countries:

Table (13)

Dependent Variable: MSC
Method: Panel Least Squares
Date: 04/17/23 Time: 15:42
Sample (adjusted): 2011 2017
Periods included: 3
Cross-sections included: 47
Total panel (unbalanced) observations: 129

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-73.91089	33.76149	-2.189207	0.0304
MAU	1.485342	0.255808	5.806472	0.0000
MNS	0.326805	0.155218	2.105455	0.0372

R-squared	0.213418	Mean dependent var	97.31204
Adjusted R-squared	0.200932	S.D. dependent var	50.24546
S.E. of regression	44.91471	Akaike info criterion	10.47039
Sum squared resid	254183.7	Schwarz criterion	10.53690
Log likelihood	-672.3401	Hannan-Quinn criter.	10.49741
F-statistic	17.09335	Durbin-Watson stat	0.000000
Prob(F-statistic)	0.000000		

Source: researcher preperation using (E-views)

The result shows that there is significant relationship between the mobile cellular subscriptions per 100 people and the financial inclusion indicator the credit provided by the financial sector to the private sector% GDP (FICFP)"as the p-value is less than 0.05. Also the relationship between the mobile account ownership of population age 15% and the financial inclusion indicator the credit provided by the financial sector to the private sector% GDP (FICFP) is significant because p-value is less than 0.05.

R^2 predicted that about 21% of the variation in the represented by the branches of the commercial banks (FICBB)" explained by the predictor's variables mobile cellular subscriptions per 100 people (MNS) and between the mobile account ownership of population age 15% (MAU).

C) The result of the Middle income countries:

Table (14)

Dependent Variable: MONETARY_SECTOR_CREDIT_TO_PRIVATE_S ECTOR____GDP_
Method: Panel Least Squares
Date: 04/28/23 Time: 18:03
Sample (adjusted): 1990 2020
Periods included: 11
Cross-sections included: 101
Total panel (unbalanced) observations: 1046

Variable	Coefficient	Std. Error	t-Statistic	Prob.
MOBILE_CELLULAR_SUBSCRIPTIONS__ PER_100_PEOPLE_	0.150715	0.007462	20.19772	0.0000
C	26.19277	0.715651	36.59993	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.886776	Mean dependent var	39.38797
Adjusted R-squared	0.874662	S.D. dependent var	26.68918

S.E. of regression	9.448799	Akaike info criterion	7.422079
Sum squared resid	84280.14	Schwarz criterion	7.905041
Log likelihood	-3779.747	Hannan-Quinn criter.	7.605237
F-statistic	73.20255	Durbin-Watson stat	0.765543
Prob(F-statistic)	0.000000		

Source: researcher preperation using (E-views)

The result shows that there is significant relationship between the mobile cellular subscriptions per 100 people and the financial inclusion indicator the credit provided by the financial sector to the private sector% GDP (FICFP)"as the p-value is less than 0.05.

R^2 predicted that about 88% of the variation in the represented by the branches of the commercial banks (FICBB)" explained by the predictor's variables mobile cellular subscriptions per 100 people (MNS).

D) The result of the low income countries:

Table (15)

Dependent Variable: MSC
Method: Panel Least Squares
Date: 04/17/23 Time: 19:01
Sample (adjusted): 2011 2017
Periods included: 3
Cross-sections included: 23
Total panel (unbalanced) observations: 54

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.574102	2.368428	3.197944	0.0024
MNS	0.027519	0.042505	0.647425	0.5203
MAU	0.207404	0.076342	2.716781	0.0090

R-squared	0.184039	Mean dependent var	13.21095
Adjusted R-squared	0.152040	S.D. dependent var	7.648771
S.E. of regression	7.043350	Akaike info criterion	6.795997
Sum squared resid	2530.047	Schwarz criterion	6.906497
Log likelihood	-180.4919	Hannan-Quinn criter.	6.838613
F-statistic	5.751487	Durbin-Watson stat	0.000000
Prob(F-statistic)	0.005592		

Source: researcher preperation using (E-views)

The result shows that is the relationship between the mobile cellular subscriptions per 100 people and the financial inclusion indicator the credit provided by the financial sector to the private sector% GDP (FICFP)" is

insignificant the p-value is more than 0.05. and the relationship between the mobile account ownership of population age 15% and the financial inclusion indicator the credit provided by the financial sector to the private sector% GDP (FICFP) is significant because p-value is less than 0.05.

R^2 predicted that about 18% of the variation in the represented by the branches of the commercial banks (FICBB)" explained by the predictor's variables mobile cellular subscriptions per 100 people (MNS) and between the mobile account ownership of population age 15% (MAU).

So that we will accept the hypotheses that say the fintech promotes the financial inclusion through the indicator of the represented by the and the financial inclusion indicator the credit provided by the financial sector to the private sector% GDP (FICFP)" in the three level of income countries in the selected sample.

Finally, from the previous analysis we will accept the research hypothesis: "Fintech plays an effective role in achieving financial inclusion".

3. Challenges of Fintech and Financial Inclusion

While fintech and financial inclusion provide a number of benefits, they also present a number of challenges. One of the main challenges is the lack of financial literacy. Many people who are excluded from the formal financial system lack the knowledge and skills to effectively use financial services. Additionally, there are concerns about the security and privacy of financial data.

Another challenge is the lack of access to financial services in some areas. This is particularly true in rural and remote areas, where access to financial services is often limited. Additionally, there is the challenge of providing financial services to those who are unbanked or underbanked, such as those living in poverty.

The Dark Side of Fintech:

What do we mean by the "dark side" of Fintech? It is about the exclusion of certain groups in society: women, the aged, the poor and minority groups. The "dark side" also refers to algorithm biases and predatory lending practices that have a negative impact on vulnerable groups. As the pandemic accelerated the switch towards digital financial services there is a risk that the "dark side" has grown even bigger. For example, those without access to digital payments or deposit accounts are excluded from government support that is delivered via government-to-person (G2P) payments. Even in the US, where financial inclusion is high – 93% of adults have a bank account – there exists a 13 percent

point gap between the wealthiest households and the poorest. Financial exclusion could arise from various sources, including the lack of access to digital infrastructure such as mobile phones, computers or the internet, financial and digital illiteracy, potential biases in algorithms, and/or lack of trust. The following paragraphs highlight the areas where financial exclusion might arise. However, our focus in this paper is on the Fintech gender, rural and class divide as this was dictated by the data available.

1- Fintech gender gap: Women in general have lower rates of bank account ownership than men , are less likely to manage household finances) or to participate in the stock market found that while Fintech has contributed to closing gender gaps in financial inclusion in most countries, there is a concern that this gender gap might widen in the post COVID era. This finding is supported by interviews with stakeholders who pointed out that Fintech does not address barriers such as cultural or social norms, financial and digital literacy, and safety and disparity in access to resources, and that such barriers are higher for women.

A recent paper by the BIS1 found that 29% of men use Fintech products and services as compared to 21% of women. The Fintech gender gap (8 percent point) was larger than the gap in bank account ownership between men and women3 (7 percent point), and existed in all countries. The authors found that the gap could not totally be explained by either country-specific circumstances or individual characteristics such as age, education, income, and marital and employment status. Their results suggest that the gap in Fintech use is due to differences in attitudes and preferences towards new financial technology between genders. Women are more risk averse than men and are less willing to adopt new financial technology, irrespective of whether it is offered by new players or incumbents.

The gender gap could narrow as these new Fintech products become more standardized and regulated over time. This difference in attitudes between men and women could reflect social norms. For example, women worry more about privacy and personal data protection than men. It could also reflect gender-based discrimination, such as previous bad experiences with financial institutions.

In addition, the fintech gender gap could be traced to the lack of access to the internet. According to the Alliance for affordable internet (2021), only 48% of women has access to the internet compared to 55% for men globally. The answer could also lie in the design of Fintech applications that are too male-centric and do not cater to women. Further research is needed in this area.

2- Aging and financial exclusion: The G20 Fukuoka Policy Priorities on Aging and Financial Inclusion (2019)5 noted ten factors that could contribute to financial exclusion of elderly people. They are: low digital capability; low financial literacy; cognitive decline; physical decline; social isolation; living on a fixed income, pension or annuity; reliance on family members; difficulty accessing financial advice; lack of financial products for older persons; and reliance on financial professionals. This is an important area that deserves more research. As many developed and developing economies are aging rapidly, technology could be leveraged to help the aged and understand the factors that drive financial exclusion for this segment of the population. It would also help in the design of products and policies to address this gap.

3- Solutions to Fintech and Financial Inclusion Challenges

There are a number of solutions to the challenges of fintech and financial inclusion. One solution is to increase financial literacy. This can be done through public education campaigns and the use of technology, such as mobile apps, to provide financial education. Additionally, there is a need to increase access to financial services in rural and remote areas.

Another solution is to develop innovative technologies to make financial services more secure and private. This can be done through the use of block chain technology and other security measures. Additionally, there is a need to develop financial products and services that are tailored to the needs of those who are unbanked or underbanked, such as those living in poverty

4- The Role of Governments in Fintech and Financial Inclusion

Governments have an important role to play in the development of fintech and financial inclusion. Governments can provide support for fintech companies and financial institutions to help them develop innovative technologies and products. Additionally, governments can provide incentives to encourage financial institutions to provide services to those who are excluded from the formal financial system.

Governments can also provide support for public education campaigns to increase financial literacy. Additionally, governments can provide support for research and development to develop innovative technologies to make financial services more secure and private. Finally, governments can provide regulatory oversight to ensure that financial services are provided in a safe and secure.

Conclusion

Fintech and financial inclusion are transforming the way financial services are provided. They are providing access to financial services to those who have historically been excluded from the formal financial system. Fintech and financial inclusion provide a number of benefits, but they also present a number of challenges.

Governments have an important role to play in the development of fintech and financial inclusion. Governments can provide support for fintech companies and financial institutions, as well as public education campaigns and research and development. With the right support, fintech and financial inclusion can help to reduce poverty and inequality, as well as promote economic growth and development.

References:

G20. (2016). Global Partnership for Financial Inclusion (GPFI), Financial Inclusion Indicators, Working Paper, chaina.

Armstrong, M. (2017, Jun 27). *FinTech Adoption Rates*. Retrieved from Statista: https://www.statista.com/chart/10012/fintech-adoption-rates/

Fintica. (, 2021, August 27). *FINTICA*. Retrieved from History of Fintech: https://www.fintica.com/history-of-fintech/

Klapper,). S. (2013 September). , Designing Government Policies to Expand Financial Inclusion:Evidence from Around the World , University of California at Santa Cruz.

Kumar, N. D. (August 2013). International Journal of Management and Social Sciences Research (IJMSSR),. In .. International Journal of Management and Social Sciences Research (IJMSSR).

Malvern Chinaka. (2016,). Blockchain technology applications in improving financial inclusion in developing economies, Master of science in management studies at the Massachusetts institute of technology, USA, Cambridge, .

Michael S. Barr, A. K. (2007). Building Inclusive Financial Systems A Framework for Financial Access, Brookings Institution Press, Washington.

review, F. (2020, November 20). *Can Fintech help with financial inclusion?* Retrieved from Funtech review : https://fintechreview.net/fintech-help-financial-inclusion/

Sahay, R. (2020). *The Promise of Fintech Financial Inclusion in the Post COVID-19 Era.* (IMF), Monetary and Capital Markets Department . Washington, : Monetary and Capital Markets Department (IMF).

Satya R. Chakravarty and Rupayan Pal, , . (March 2010). In *Measuring Financial Inclusion: An Axiomatic Approach, Indira Gandhi Institute of Development Research (IGIDR), Mumbai, India,* (pp. p(1-3) .).

Telukdarie, A., & Mungar, A. (2023). The Impact of Digital Financial Technology on Accelerating Financial Inclusion in Developing Economies. *4th International Conference on Industry 4.0 and Smart Manufacturing. 217*, pp. 670–678. Johannesburg: Procedia Computer Science. Retrieved from www.sciencedirect.com

The World Bank Group, T. (2014). Financial Inclusion , Global Financial Development Report.

Tok, Y. W., & Heng, D. (2020, May). Fintech: Financial Inclusion or Exclusion? *Institute of Capacity Developmen IMF, WP/22/80*.

Walden, S. (2022,, Jul 25,). *What Is Fintech?* (D. Whiteman, Editor) Retrieved from Forbes Advisor: https://www.forbes.com/advisor/banking/what-is-fintech/

لعربي, ص. ا , .(2015) .ورقة عمل حول العلاقة المتداخلة بين الاستقرار المالي والشمول المالي

جاسم, م. م .(2020) .دور التكنولوجيا المالية فى تحقيق الشمول المالى دراسة فى مجموعة من الدول العربية لمدة .(2014-2018) *جامعة البصيرة- مركز دراسات الخليج العربى ,44 ,* 175-242. doi: :005-044-000-1287/33762.1

حسان, ع ,2019) .سبتمبر .(التكنولوجيا المالية و مستقبل الشمول المالى .*المرساه المصرفية ,* *23*, 8-13.

زهرة, س. ا & .,دحمان, ب .(2020 ,3 31) .التكنولوجيا المالية كآلية لتعزيز الشمول المالى فى الوطن العربى - دراسة حالة الشرق الأوسط وشمال أفريقيا .*مجلة التكامل الاقتصادى ,* *8*(1), 63-79.

مرزق , س & .,زيان, ن .(2021, 12) .التكنولوجيا المالية ودورها في تعزيز الشمول المالي في الوطن العربى .*مجلة ادارة الأعمال والدراسات الاقتصاد*.631-646 ,(2)*7 ,*

Appendix:

Table (2): Study Variables (2010-2021)

Income	Year	FIATM	FICFP	FICBB	MAU	MNS
high income	2010	67.44909	90.02231	24.05806	..	109.2905
	2011	66.5926	88.50575	23.83137		113.0337
	2012	66.28455	86.59393	23.27041	..	115.3399
	2013	63.6128	85.38769	22.81915	..	117.0765
	2014	63.11146	83.94208	22.18243		118.4606
	2015	68.06521	82.63597	22.01491	..	118.7248
	2016	68.01225	83.25628	21.5331	..	119.5129
	2017	67.3028	81.88682	20.72926		119.3688
	2018	67.91832	81.88135	20.44232	..	120.6474
	2019	68.09417	81.69788	19.89355	..	121.9566
	2020	64.32125	87.79604	18.66058	..	121.8988
	2021	62.66353		17.42644		124.6133
Middle income	2010	20.0763	68.00893	8.888181	..	73.14985
	2011	24.92178	68.72988	9.757465		81.65329
	2012	26.7847	73.03925	9.921436	..	86.22642
	2013	27.38737	77.61631	10.1976	..	91.24608
	2014	25.20417	82.71348	10.81521	2.22	94.55694
	2015	28.297	92.41339	10.42908	..	95.74531
	2016	29.36615	94.16116	10.36546	..	100.111
	2017	30.8513	93.92413	10.39829	4.58	103.0752
	2018	30.67845	99.35209	10.91602	..	105.3516
	2019	33.34893	103.4017	10.35967	..	108.5467
	2020	34.05264	117.9783	10.31473	..	107.9285
	2021	35.25537		10.8107	12.07	109.5793
low income	2010	1.459953	11.30578	2.497952		27.49472
	2011	1.461385	11.04918	2.497903		34.80192
	2012	1.714288	12.33566	2.765548		39.91648
	2013	4.005809	12.44912	3.061729		46.04011
	2014	4.017943	12.84443	3.124662	6.75	51.61584
	2015	4.228892	13.21426	3.142161		54.76992
	2016	4.602612	13.24919	2.977021		53.03022
	2017	4.742825	12.72905	2.860826	14.7	53.14349
	2018	4.519051	13.21537	2.943011		60.18177
	2019	4.872782	13.44895	3.07666		55.25327
	2020	4.517991	14.12378	2.884825	26.95	57.78215
	2021	4.454843		3.023957		..

Source:https://data.albankaldawli.org/indicator/FB.CBK.BRCH.P5?view=chart

Table (3): Descriptive statistics of the variables (2010-2021)

1-Common:

	AUTOMATED_TELLER_MACHINES__ATMS___PER_100_000_ADULTS_ FIATM	COMMERCIAL_BANK_BRANCHES__PER_100_000_ADULTS_ FICBB	MOBILE_ACCOUNT_OWNERSHIP_____OF_POPULATION_AGES_15__ MAU	MOBILE_CELLULAR_SUBSCRIPTIONS__PER_100_PEOPLE_ MNS	MONETARY_SECTOR_CREDIT_TO_PRIVATE_SECTOR____GDP_ FICFP
Mean	13.86685	6.016763	11.04000	72.03473	43.26697
Median	4.742825	3.124662	6.750000	57.78215	14.12378
Maximum	30.85130	10.81521	26.95000	103.0752	93.92413
Minimum	4.017943	2.860826	2.220000	51.61584	12.72905
Std. Dev.	13.08297	4.193928	10.05549	24.73716	41.32069
Skewness	0.477399	0.410189	0.836163	0.428050	0.435742
Kurtosis	1.319620	1.175851	2.212514	1.275285	1.227824
Jarque-Bera	0.778191	0.833445	0.711835	0.772406	0.812519
Probability	0.677670	0.659204	0.700531	0.679632	0.666137
Sum	69.33423	30.08382	55.20000	360.1736	216.3349
Sum Sq. Dev.	684.6565	70.35613	404.4518	2447.708	6829.596
Observations	5	5	5	5	5

Source: researcher preperation using (E-views)depend on data on table-2)

2-Indivedual:

	AUTOMATED_TELLER_MACHINES__ATMS___PER_100_000_ADULTS_	COMMERCIAL_BANK_BRANCHES__PER_100_000_ADULTS_	MOBILE_ACCOUNT_OWNERSHIP_____OF_POPULATION_AGES_15__	MOBILE_CELLULAR_SUBSCRIPTIONS__PER_100_PEOPLE_	MONETARY_SECTOR_CREDIT_TO_PRIVATE_SECTOR____GDP_
Mean	32.89585	11.52477	11.21167	88.88926	61.96695
Median	28.83157	10.36257	9.410000	100.1110	81.88135
Maximum	68.09417	24.05806	26.95000	124.6133	117.9783

Minimum	1.459953	2.497903	2.220000	27.49472	11.04918
Std. Dev.	26.15076	7.805701	9.003731	30.54841	36.51114
Skewness	0.229006	0.314763	0.850636	-0.533746	-0.500979
Kurtosis	1.493899	1.636684	2.569806	1.807119	1.561433
Jarque-Bera	3.717175	3.382402	0.769849	3.736984	4.225917
Probability	0.155893	0.184298	0.680502	0.154356	0.120880
Sum	1184.251	414.8917	67.27000	3111.124	2044.909
Sum Sq. Dev.	23935.18	2132.514	405.3359	31728.98	42658.02
Observations	36	36	6	35	33

Source: researcher preperation using (E-views)depend on data on table-2)

Tables Unit Root Test:

1- AUTOMATED_TELLER_MACHINES__ATMS

	Panel unit root test: Summary			
Series: AUTOMATED_TELLER_MACHINES__ATMS				
	Date: 04/06/23 Time: 22:19			
		Sample: 2010 2021		
Exogenous variables: Individual effects				
		User-specified lags: 1		
Newey-West automatic bandwidth selection and Bartlett kernel				
	Balanced observations for each test			
	Cross-			
Obs	sections	Prob.**	Statistic	Method

Null: Unit root (assumes common unit root process)				
30	3	0.0923	-1.32655	Levin, Lin & Chu t*
Null: Unit root (assumes individual unit root process)				
30	3	0.3788	-0.30864	Im, Pesaran and Shin W-stat
30	3	0.2990	7.24267	ADF - Fisher Chi-square
33	3	0.2043	8.49111	PP - Fisher Chi-square
** Probabilities for Fisher tests are computed using an asymptotic Chi				
-square distribution. All other tests assume asymptotic normality.				

Source: researcher preperation using (E-views)depend on data on table-2)

D(AUTOMATED_TELLER_MACHINES__ATMS)

	Panel unit root test: Summary			
Series: D(AUTOMATED_TELLER_MACHINES__ATMS)				
	Date: 04/06/23 Time: 22:46			
		Sample: 2010 2021		
Exogenous variables: Individual effects				
		User-specified lags: 1		
Newey-West automatic bandwidth selection and Bartlett kernel				
	Balanced observations for each test			
	Cross-			
Obs	sections	Prob.**	Statistic	Method
Null: Unit root (assumes common unit root process)				
27	3	0.0081	-2.40268	Levin, Lin & Chu t*
Null: Unit root (assumes individual unit root process)				
27	3	0.0733	-1.45142	Im, Pesaran and Shin W-stat
27	3	0.0614	12.0251	ADF - Fisher Chi-square
30	3	0.0000	31.1857	PP - Fisher Chi-square
** Probabilities for Fisher tests are computed using an asymptotic Chi				
-square distribution. All other tests assume asymptotic normality.				

Source: researcher preperation using (E-views)depend on data on table-2)

2 - COMMERCIAL_BANK_BRANCHES

	Panel unit root test: Summary	
Series: COMMERCIAL_BANK_BRANCHES__PER_1		
	Date: 04/06/23 Time: 22:20	
		Sample: 2010 2021
Exogenous variables: Individual effects		
		User-specified lags: 1
Newey-West automatic bandwidth selection and Bartlett kernel		

	Balanced observations for each test			
	Cross-			
Obs	sections	Prob.**	Statistic	Method
Null: Unit root (assumes common unit root process)				
30	3	0.6828	0.47548	Levin, Lin & Chu t*
Null: Unit root (assumes individual unit root process)				
30	3	0.4608	-0.09853	Im, Pesaran and Shin W-stat
30	3	0.0701	11.6571	ADF - Fisher Chi-square
33	3	0.0040	19.0787	PP - Fisher Chi-square
** Probabilities for Fisher tests are computed using an asymptotic Chi				
-square distribution. All other tests assume asymptotic normality.				

Source: researcher preperation using (E-views)depend on data on table-2)

D(COMMERCIAL_BANK_BRANCHES__PER_1)

	Panel unit root test: Summary			
Series: D(COMMERCIAL_BANK_BRANCHES__PER_1)				
	Date: 04/06/23 Time: 22:21			
		Sample: 2010 2021		
Exogenous variables: Individual effects				
		User-specified lags: 1		
Newey-West automatic bandwidth selection and Bartlett kernel				
	Balanced observations for each test			
	Cross-			
Obs	sections	Prob.**	Statistic	Method
Null: Unit root (assumes common unit root process)				
27	3	0.0364	-1.79446	Levin, Lin & Chu t*
Null: Unit root (assumes individual unit root process)				
27	3	0.2885	-0.55789	Im, Pesaran and Shin W-stat
27	3	0.2527	7.80541	ADF - Fisher Chi-square
30	3	0.0071	17.6666	PP - Fisher Chi-square
** Probabilities for Fisher tests are computed using an asymptotic Chi				
-square distribution. All other tests assume asymptotic normality.				

Source: researcher preperation using (E-views)depend on data on table-2)

3- MOBILE_CELLULAR_SUBSCRIPTIONS

	Panel unit root test: Summary
Series: MOBILE_CELLULAR_SUBSCRIPTIONS__	

	Date: 04/06/23 Time: 22:24			
		Sample: 2010 2021		
Exogenous variables: Individual effects				
		User-specified lags: 1		
Newey-West automatic bandwidth selection and Bartlett kernel				
	Cross-			
Obs	sections	Prob.**	Statistic	Method
Null: Unit root (assumes common unit root process)				
29	3	0.0004	-3.33517	Levin, Lin & Chu t*
Null: Unit root (assumes individual unit root process)				
29	3	0.1715	-0.94839	Im, Pesaran and Shin W-stat
29	3	0.1278	9.92662	ADF - Fisher Chi-square
32	3	0.0000	36.4912	PP - Fisher Chi-square
** Probabilities for Fisher tests are computed using an asymptotic Chi				
-square distribution. All other tests assume asymptotic normality.				

Source: researcher preperation using (E-views)depend on data on table-2)