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# Market Power of Banks in Pre and Post Digital Finance Era: Financial Inclusion and the Role of Fintech[1]

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## Abstract

The diffusion of Fintech is considered to be a promising solution for widening the reach and accessibility of financial services to the masses. However, the banking literature does not provide clear consensus over the impact of Fintech on banks. On the one hand, Fintech related advancements are poised to enhance the reach and accessibility of financial services to underserved segments of the society; whereas on the other hand, it can potentially lead to alterations in market structure dimensions. Thus, it is important to ascertain the impact of Fintech entry from both perspectives—the much talked about and promising benefits of financial inclusion (FI) and the ramifications of alteration in market structure in terms of banks' market power. However, to the best of our knowledge, no such evidence exists till date. Thus, in this study, we examine the impact of Fintech entry on financial inclusion and banking competition along with introducing certain conditionalities and non-linearity to uncover the potential transmission channels for Fintech to affect inclusion and market structure for the first time in the case of Pakistan. In addition, we also look for a pre and post Fintech entry effect on Market Power of banks. We do so, by developing a comprehensive and multidimensional index of FI with broader dimensional depth and more indicators for a relatively extensive sample and find that the country witnessed episodes of low and medium inclusion from 2005 till 2018. However, post 2018 we observe a relatively high trend of financial inclusion. Similarly, we develop a Lerner Index to measure banks' market power and observe persistent of monopolistic tendencies whereby most of the banks enjoy higher Lerner margins. The extent of Fintech is captured through a relatively new and unique proxy of digital financial services (DFS). We observe highly sluggish growth of DFS over 2005 to 2015. However, post 2016, drastic increase in DFS is observed commensurate with the central bank's regulatory push. Further, our

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analysis reveals some interesting and important findings. We find that DFS are inversely related to banks' market power however, interest rate is positively related to the same. Moreover, we propose three main transmission mechanisms for Fintech and FI to affect market structure namely, the inclusion channel, the growth channel, and the regulatory environment. Our findings render support to these channels in the case of Fintech. However, in contrast, no supportive evidence is found for the same in the case of FI. In addition, we find, Fintech to be significantly and positively impacting FI however, the relationship is essentially non-linear. Finally, in the post-Fintech era, banks' market power is significantly lower, implying that Fintech channels are essential for improving the competitive conditions in the industry.

***Key Words:*** *Financial Inclusions, Fintech, Market Power, Non-Linearity, Transmission Channels.*

# 1. Introduction

**The Backdrop**

In 1994, Bill Gates forewarned the world that *"banking is necessary, banks are not…"* (Gandhi, 2016). This statement is not coming from an ambitious Fintech entrepreneur or a CEO of a fast-growing Fintech startup, rather these words were uttered by the then chairman of Microsoft which has important implications. Though at the time, it seemed like a distant possibility as a world without banks is hard to understand for the reasons being that banks today are more *than* integrated into our daily lives and business operations. However, under the auspices of the industrial revolution 4.0, banking has become an industry which is facing irresistible forces for change (PwC, 2014). In this way, technology based financial services (commonly referred to as Fintechs) and digital transformation coupled with widespread deregulations has proven to be disruptive for banking industry. Rapid technological evolutions and disruptions in the financial services is shaping the future of banking whereby banking services outside the traditional banking industry are now deemed possible. And so, it seems like today, the statement by Bill Gates is merely a euphemism—a sweet shot of sorts for most of us. As today Fintech seems to be a profound reality and has become a buzz word for innovative financial services capable of shaping the evolving needs and expectations of customers. As a result, we are not just seeing a Fintech boom but witnessing a revolution about the way people bank; anytime, anywhere.

However, and still, despite so much technological advancements, 1.7 billion people around the globe are excluded from financial services (World Bank, 2018). Still, the discussion about the economics of Fintechs is largely and pre-dominantly centered around the idea that whether Fintechs and traditional financial services providers are complimentary or supplementary to each other (Ndwiga, 2020). In addition, in many markets, the infancy of Fintechs and regulatory constraints still limits its disruptive capacity which necessarily implies that banks may not be outdated—yet; but banks' interactions may need to change forever. As concluded in the report of (PwC, 2014), *"While we are not looking at the end of banking, we are surely looking at the end of banking and banks as we currently know them".*

The diffusion of Fintech is considered to be a promising solution for widening the reach and accessibility of financial services to the masses (Kanga et al., 2021; World Bank, 2018) as digital networks such as ATMs, payment systems and mobile money provides a technological platform which can be utilized to enhance accessibility and reach of financial services thus enhancing financial inclusion (Crowley, 2019). In this way, Fintech is argued to be the *'key driver'* for financial inclusion and sustainable finance under the auspices of the United Nation's Sustainable Development Goals (SDGS) (Arner et al., 2020). Market imperfections such as transaction costs and information asymmetry are some major hurdles in limiting access to formal financial services to the masses, particularly to the poor thus Fintechs are seen as key enablers for financial inclusion (Demir et al., 2020). In addition, Fintech innovations are dubbed as the game changer for an inclusive and deep financial sector (Senyo et al., 2020). Thus, UN and world Bank along with governments around the world have placed high hopes on Fintech innovations to ensure access, usage and availability of financial services to all—leading to poverty reduction, improving income inequality and wealth distribution (Omar & Inaba, 2019; Demir et al., 2020).

Similarly, Fintech is also viewed to enhance competition in the financial sector arising from alteration in market structure characterized by changes in entry and exit barriers, size and number of market players among others (Ndwiga, 2020). There are two opposing strands of literature in this regard—the one suggesting a supportive role of Fintech whereas the other poses a competing role of the same. The supportive role of Fintech stems from the theoretical notion of '*Finance-Growth'* nexus and views Fintechs as complimentary in nature—improving and positively affecting banking efficiency in core operations such as credit allocation (Liberti & Petersen, 2019), payment settlements, risk assessments (Carny, 2017) and enhancing diversity in banking operations among others (Lee et al., 2021). In contrast, the opposing view stems from the *'Finance-Fragility'* hypothesis and views that Fintechs are usually observed to enter a multi-dimensional and a multi-product industry with an unorthodox business model which is sometimes alien to the universal banking practices. They usually operate in a single and or in an unregulated segment of the market enjoying much more flexibility in terms of regulations and cost burden compared to formal banking institutions. This not only gives them competitive advantage but also adversely affects banks' market power (Ariss, 2010) exacerbating moral hazard and adverse selection and may add on to the fragility of the financial system through risk shifting mechanism. Furthermore,

(Brunnermeier, 2009) indicates that financial innovation increases the risk appetite and risk bearing capacity of banks which may lead to excessive credit extensions resulting in higher chances of defaults and systemic failures.

Given the opposing views, the banking literature still does not provide clear consensus over the impact of Fintech on banks (Lee et al., 2021). In this way (Frame & White, 2004) goes to an extreme level that *"everybody talks about financial innovations, but (almost) nobody empirically tests hypotheses about it"*. Thus, it is of great economic importance and policy significance to ascertain the impact of Fintech entry from both perspectives—the much talked about and promising benefits of financial inclusions and the feared ramifications of alteration in market structure in terms of banks' market power. However, to the best of our knowledge, no such evidence exists to gauge the impact of Fintech entry on financial inclusion and banking competition at the same time. This study in particular, is designed to traverse this gap. Specifically, we aim to determine the impact of Fintech entry on financial inclusion in expanding and diversifying inclusion efforts taking Pakistani economy under consideration. Further, we aim to determine the impact of Fintech entry on the banks' market power for the banking sector of Pakistan. In addition, we also allow for non-linearities and aim for certain conditional effects of Fintech and financial inclusion on banks' market power. In doing so, we aim to uncover the transmission channels and mechanisms for Fintech to affect inclusion and market structure for the first time. Finally, we compare a pre and post impact of Fintech entry on Pakistani banking industry.

**The promise of Financial Inclusion and the Role of Market Power**

The fundamental drivers of focus areas for most of the developing economies around the world, inter alia remain, poverty, unemployment and uneven distribution of wealth and resources. Governments and policy makers remain in quest to find ways to uplift social welfare of masses to ensure inclusive growth and sustainable development. The linkage between financial development and economic growth has widely been discussed in literature. For instance, (Calderón & Liu, 2003) has established that economic growth is driven by financial deepening through rapid capital accumulation and productivity growth. A well-functioning financial system catalyzes the economic growth by linking various sectors of the economy and facilitates a conducive

environment for the implementation of government policies. Efficiency of such financial system depends on its *inclusiveness* as achievement of stated objectives will not be possible with larger percentage of economy remaining outside the purview of government and regulatory frameworks. Therefore, a key feature of financial development is 'Financial Inclusion' that stimulates the efficacy of overall financial system of an economy (Babajide, Adegboye, & Omankhanlen, 2015).

Financial inclusion has become a major focus area for economic and financial policy makers around the world. The reason behind increasing attention is the potential economic and societal benefits that financial inclusion promises which include efficiency of financial intermediation, enhancement of entrepreneurial activities and increase in employment (Chinoda & Kwenda, 2019). Numerous research theories are proponent of the narrative that financial inclusion can play a significant role in economic development and social uplifting of a country. According to (Ganti & Acharya, 2017), financial inclusion results in achieving faster economic growth while Mohammed, Mensah and Dako (2017) posits that being financially included can result in developing net wealth benefits and bigger welfare benefits in comparison to those who are financially excluded. Similarly, (Dixit & Ghosh, 2013) has termed financial inclusion as a key instrument to achieve inclusive growth in India. As financial inclusion is the most effective way of generating and mobilizing resources which are required for achieving the objective of inclusive growth. They further add that financial inclusion is a key contributor to promote a culture of savings and developing efficient payment mechanisms which in turn strengthens the resource base of financial institutions. Moreover, achievement of many UN sustainable development goals such as i) no poverty, ii) no hunger, iii) good health and wellbeing, iv) gender equality and reduced inequalities can only be enabled through a well inclusive financial sector (CGAP, 2016). In addition, G20 nations have also identified financial inclusion as an important pillar of the agenda of global development.

Considering the above provided assertions, the pursuit for determining the driving force behind financial inclusion have received significant attention of researchers from all over the world. Studies have identified factors that directly and or inversely affect financial inclusion. For instance, (Ngo 2019) proposed that financial inclusion is directly and positively impacted by indicators of infrastructure such as subscriptions of cell phones. Whereas rural-urban divide and

the ratio of unemployment are important factors that adversely affect the level of inclusiveness. Among various factors, banking industry market structure and market power dynamics have also shown great deal of linkage with financial inclusion. Studies, such as (Owen & Pereira, 2018) show that countries where banks are facilitated through regulations to involve in wider scope of activities also demonstrate deep penetration of financial system. In addition, competition in banking industry helps in achieving greater financial inclusion through enhanced reach to deposit accounts. In this way, (Marin & Schwabe, 2014) provide evidence to support of a direct relationship between banking competition and accounts' penetration at the municipal level in Mexico. Thus, in light of the above propositions, this study is designed to examine the relationship between inclusion and banking competition in the case of Pakistan, owing to the fact that no such evidence exists for the economy of Pakistan as to the best of our knowledge.

**Fintech: A global phenomenon**

In the past couple of decades, information technology and digital transformation has shown significant development in the area of financial services, lending, payment systems, insurance and financial advising. In these areas, financial technology, commonly known as Fintech has greatly progressed by decreasing the cost of intermediation for financial institutions which has remarkable impact on enhancing access to finance to masses. Financial institutions have been investing in Fintech industry considering a wide range of opportunities (Vives, 2017). Since, technology has brought ease and comfort in everyone's life, financial sector is of no exception. The modern era has given us the options of a wide range of digital financial services including internet banking, branchless banks, ATMs, Mobile banking and digital lending solutions among many others. These services have enabled us to avail financial services at affordable rates with comparatively quick turnaround time.

The Financial Stability Board of the Basel Committee on Banking Supervision (BCBS), defines Fintech as *"technologically enabled financial innovation that could result in new business models, applications, processes, or products with an associated material effect on financial markets and institutions and the provision of financial services"* (BIS, 2018). As per BCBS, the innovation of Fintech is disruptive to banking industry as they have potential to reduce the impediments of entry to banking services. Unlike traditional financial services, Fintechs treat data and information as a basic commodity. This has changed the role of banking services with respect

to risk and scope (BIS, 2018). Fintech is a global development of financial services determined by technological innovation and shifts in customer expectations. Fintech firms adapt technology to provide the best financial solutions to their customers with the objective to digitize the financial sector, resulting in cost reductions and new ways of working to gain transparency in the market (Gregorio, 2017).

Fintechs can be categorized as i) traditional Fintechs which team up with incumbent-financial service providers (banking sectors) which provides them technological services by employing traditional product price models and ii) emergent Fintechs where the firm gets into partnership with a banking company by employing latest models or just dislodge financial institutions (ZTBL, 2019). Fintechs have the ability to lower intermediation costs and enhance access to finance by improving financial-inclusion. Traditional Fintechs are facilitating large banks who are already in market. The cause of this efficiency-enhancing role is vested in the potential to help overcome information asymmetries. These asymmetries rest at the root of the banking services whereas Fintechs do not have any legacy technologies to be dealt with and a culture of efficient operational design. This enables them to have a more innovating capacity than traditional entities.

However, and still there is dearth of research on the channelizing effects of Fintech on inclusion efforts and market structure dimensions in the banking industry and hence this study has made an effort in this regard.

**Problem Statement**

The evolution of Fintechs is posing dual challenges to the banking sector. On the one hand, its benefits in terms of enhancing financial inclusion is very much promising along with positive effects on banking operations. However, on the other, it may lead into changes in the market structure of financial services providers characterized by the number of participants, exit and entry barriers, competitive conditions and market power. These alterations and adjustments may have long term ramifications in terms of the binding effects of Fintech entry and Financial Inclusion on market structure dimensions. However, the empirical literature in this regard does not provide clear consensus as to how Fintech might impact the overall banking industry (Lee et al., 2021). Further, there is no evidence available on the transmission mechanism for a well-inclusive financial system augmented with Fintech that may result in improved competitive conditions. In addition, the

literature is mute in terms of the binding effects of financial inclusion through Fintech on banks' market power. And hence, this study is designed to traverse this gap.

**Research Objectives**

The traditional banking system is facing issues like stringent regulations, high operating costs, conventional business lines, average risk proposition and low involvement of customers. However, Fintechs relatively stay at a mile from these concerns and has the potential to significantly alter the market structure dimensions of traditional banking industry. In addition, Fintechs promise to enhance and diversify the inclusion efforts and hence this study aims to:

1. Determine the impact of Fintech entry on the financial inclusion in Pakistan in expanding and diversifying inclusion efforts.
2. Determine the impact of Fintech entry on banks' market power for the banking sector of Pakistan. In doing so, if Fintech is sufficiently affecting the inclusion efforts in the country, then it could be evidence to the fact that Fintech can lead to significant market alterations such as market power.
3. In addition, we also aim for certain conditional effects of Fintech and financial inclusion on banks' market power such as we look for the binding effects of financial inclusion on banks' market power through Fintech. This will provide us with evidence of the inclusion channel for Fintech strengthening the theoretical notion of enhancing competition of an inclusive financial system augmented through Fintech.
4. We also aim to determine other conditional effects of FI and Fintech on market power such as GDP and Rule of Law to identify the growth channel and regulatory quality channel.
5. Finally, we aim to determine if there is any difference in banks' market power and pre and post Fintech eras.

In the next segment, we shed some light on key developments and current state of affairs with respect to inclusion, Fintech and the entire banking industry of Pakistan.

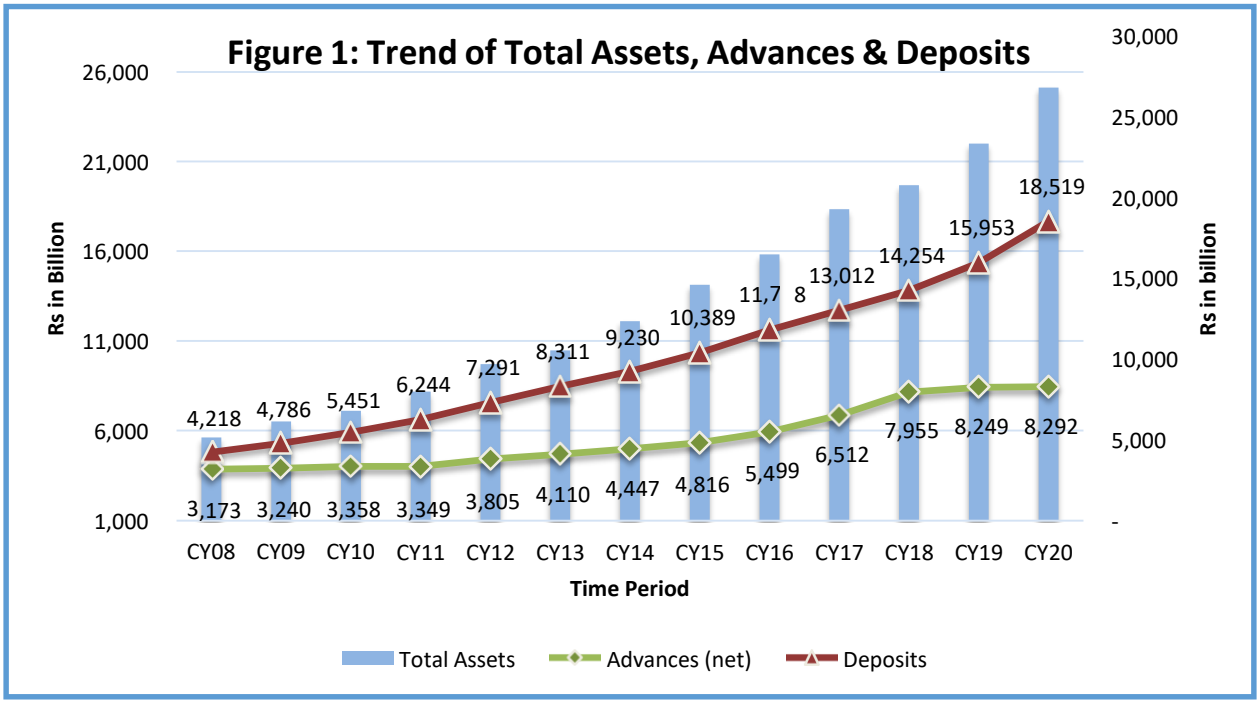
# The Case of Pakistan: Overview of Banking Sector of Pakistan, landscape of financial inclusion and Fintech Market

## Banking Sector of Pakistan

The banking sector of Pakistan is adequately capitalized and well-regulated by State Bank of Pakistan (SBP). Despite of enormous challenges faced during the pandemic and past financial crisis, the Pakistani banking industry on general stayed resilient and financially stable.

### *Market Size*

The Pakistani banking system consists of 33 commercial banks, 11 microfinance banks and 8 Development Financial Institutions (DFI) with total 16,304 branches. As of December 2020, the total number of ATMs installed in Pakistan reached to 16,041 with 62, 480 POS machines. Total banking assets across the banking sector (including public and private sector banks) increased to Rs 25 trillion in CY20 from Rs 5.8 trillion in CY2008.




### *Credit Risk:*

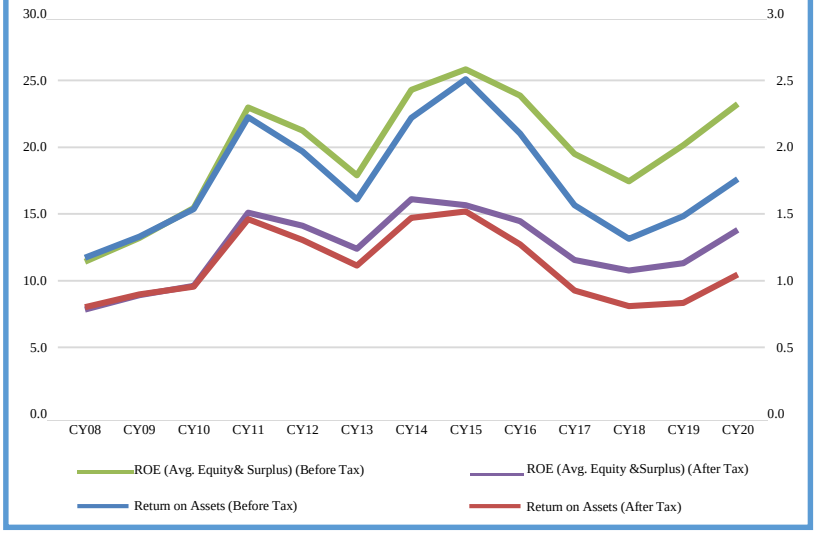
The credit risk of the banking sector mainly arises when borrowers of the banks are unwilling or not able re-pay the loans. The Gross Non-Performing Loans Ratio (GNPLR) of

Pakistani banking industry reached to 9.2 percent by December 31, 2020. Looking at the historic trend where it achieved the highest peak of 15.7 percent in CY2011, this ratio has decreased due to various measures taken by SBP.

***Earnings:***

The earnings of the banking industry have reached at 23.2 percent by CY20. From CY08 to CY20, the average earning has remained upto 20 percent. This may have happened because of lower funding cost during cut in policy rate. The profit after tax has witnessed a healthy increase of 42.92 percent to PKR 244.04 billion in CY20 (14.34 percent growth in CY19) despite of slow economic growth. The Return on Assets (ROA-after tax) and Return on Equity (ROE-after tax) increased to 1.05 percent (0.83 percent in CY19) and 13.78 percent (11.30 percent in CY19), respectively.

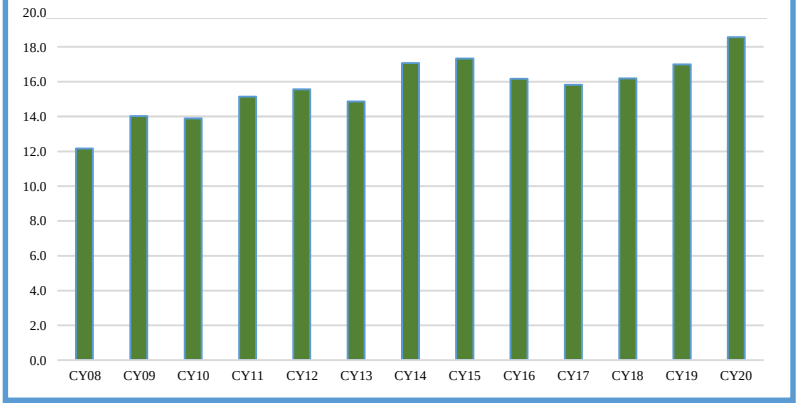
**Figure 2: Earning Ratios**




***Solvency***

The solvency of the banking sector remained robust, which further improved with, marked rise in earnings. The Capital Adequacy Ratio (CAR) increased to 18.56 percent by end Dec-20 from 17.0 percent in Dec-19. Similarly, the Basel liquidity ratio including Liquidity Coverage Ratio (LCR) and Net Stable Funding Ratio (NFSR) remained well above the required level during CY20. LCR improved to 226.0 percent (180 percent in CY19), while NFSR increased to 177.0 percent in CY20 (159.0 percent in CY19).

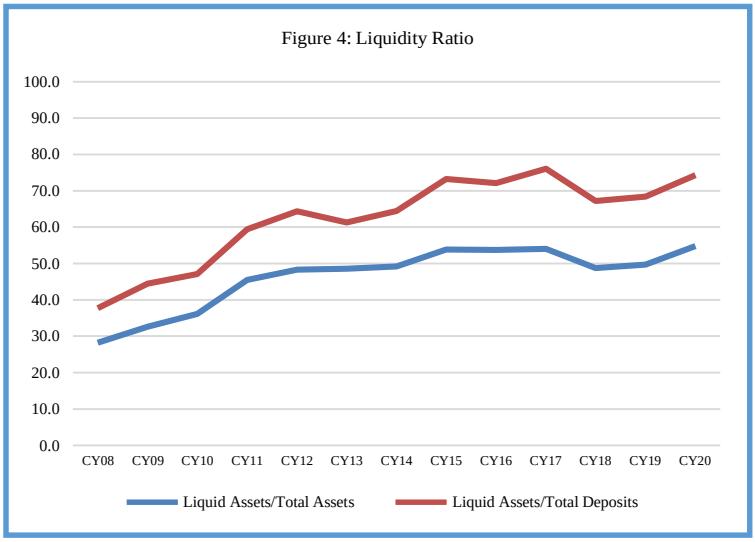
**Figure 3: CAPITAL ADEQUACY Ratio**



***Liquidity***

The liquidity buffers of the banking sector improved remarkably from CY08 to CY20 as a result of huge investments in government securities. The ratio of Liquid assets to total assets all the banks has improved to 54.76 percent in CY20 from 28.2 percent in base year. Similarly, liquid assets to total deposits ratio has also increased to 74.29 percent in CY20 from 68.44 percent in CY19.

Figure 4: Liquidity Ratio




**Overview of Financial Inclusion in Pakistan**

Financial inclusion (FI) can be defined as the access of useful and affordable financial products and services to individuals and businesses in order to meet their financial needs such as savings, payments, credit and insurance. It is the delivery of such financial services in a responsible and sustainable way. During the last decade, around 1.2 billion unbanked adults gained access to financial services; and the percentage of unbanked population dropped by 35 percent. Currently, approximately 1.7 billion adults globally remain un-banked.

As per Global Findex database-2020, financial inclusion has been increasing at global level. The 2017 Global Findex database shows that 1.2 billion adults have obtained an account since 2011, As per reported research, from 2014 to 2017, the share of adults having access to mobile account or to financial service increased from 62 percent to 69 percent, globally. This percentage was rose from 54 percent to 63 percent in developing countries. It is important to note that around 1.7 billion adults are still unbanked as per Findex data, 2017. Since 2010, around 55 countries are committed to facilitate financial inclusion and around 60 jurisdictions have devised a national inclusion strategy. Financial inclusion has become a dominant issue in the areas of financial development, policy, and inclusive growth. Globally, in 2017, 69% of adults had a bank

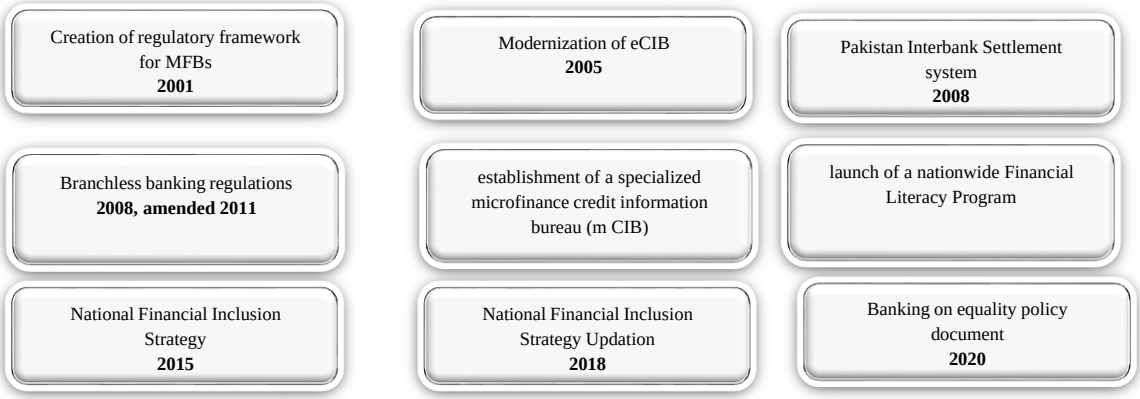
account, an increase from 51% in 2011. The number of automatic teller machines (ATMs) per 100,000 adults globally increased from 41.6 in 2011 to 53.5 in 2017 (Cavoli & Shrestha, 2020).

However, financial inclusion in Pakistan has lagged mainly on account of cost & time having to be spent by predominantly rural population of Pakistan to reach out to distantly located bank branches for low value transactions. Women have had faced additional constraints owing to lack of mobility due to cultural reasons. In recognition of state of financial exclusion in Pakistan, various measures have been adopted by government and SBP to change the overall landscape and create an enabling environment for all-inclusive financial system in the country.

SBP has taken various initiatives to improve financial inclusion in Pakistan. Launch of Microfinance Ordinance 2001 was aimed to regulate the establishment, business and operations of microfinance institutions in Pakistan. It was needed to promote the establishment of microfinance institutions for providing organizational, financial and infrastructural support to marginalized segments particularly poor women, for reducing poverty and promoting social welfare through social mobilization. This initiative was followed by a number of other measures such as the expansion and modernization of the online credit information bureau (e-CIB, 2005), establishment of the Pakistan Interbank Settlement System (PRISM) in 2008 to modernize the payment system, the adoption of Branchless Banking Regulations in 2008 and the launch of a Financial Literacy Program in 2012 for the masses. In addition to above mentioned milestones, among various measures, most notable one is adoption of National Financial Inclusion Strategy (NFIS) in collaboration with stakeholders. The strategy was formally launched and adopted by Government of Pakistan in May 2015.

The strategy aimed to establish a national vision for achievement of financial inclusion in Pakistan. The NFIS has laid-out a comprehensive action plan along with timelines and targets. It

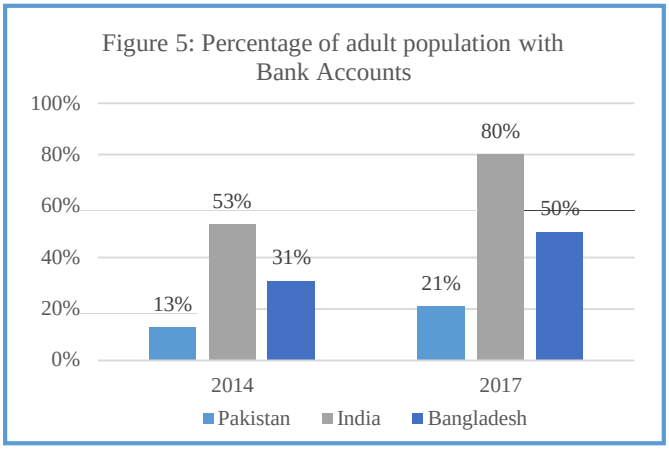
**Figure 5: Key Milestones achieved in the journey towards Financial inclusion in Pakistan**



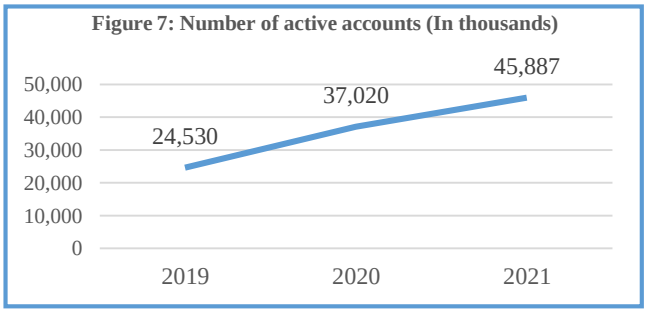

was envisioned that formal financial access will be enhanced to 50 percent of the adult population by 2020.

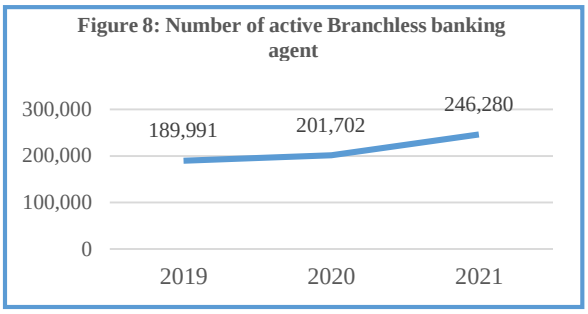
The progress has been promising, however, significant potential remains on a lot of fronts to achieve the objective of universally inclusive financial system in Pakistan. Figure 6 provides the key statistics which exhibits the journey of financial inclusion so far.

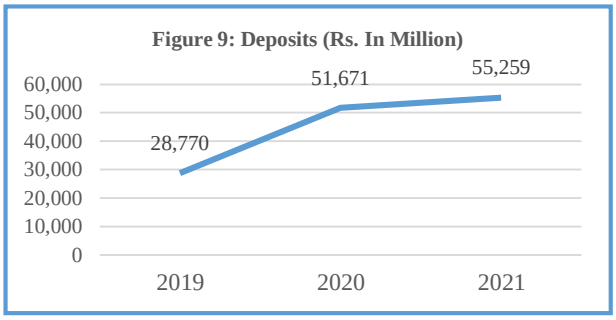
Comparing Pakistan with its peer countries like India and Bangladesh, the percentage of adults maintain bank account is very low. From 2014 to 2017, the percentage has increased from 13 percent to 21 percent; whereas this increase is comparatively high India i.e. from 53% to 80 percent followed by Bangladesh i.e. from 31 percent to 50 percent.



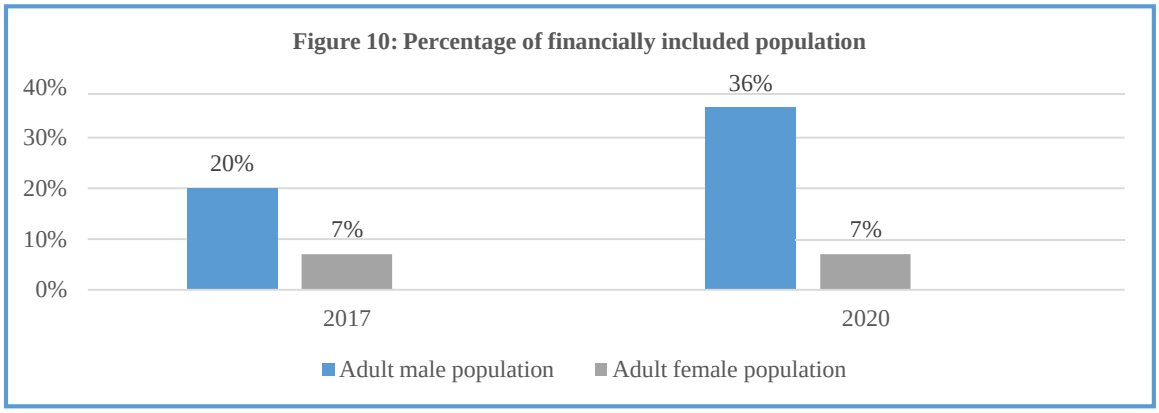

As per recent data reported by SBP, the number of active accounts in Pakistan have also been increased i.e. 24.53 Million in 2019, 37. 020 Million in 2020 and 45.887 Million in 2021 (Figure 7). Similarly, the number of branchless banking have also been increased from 189, 991 in 2019 to 246, 280 in 2021 (figure 8).






Although above matrices show an overall upward trend, however, disaggregated data exhibit a concerning picture in terms of gender polarization. As per available stats 36% (2017: 20%) of Pakistan's adult male population is now estimated to be financially included; the ratio for adult women is still in the single digits i.e., 7% (2017: 7%).




Source: karandaaz / Financial Inclusion Insight Survey, 2020

In order to address above marking gender wise disparity, SBP has taken significant steps to address the concern. Most recent one is the *Banking on Equality policy document* issued in December 2020. The document entails short-term, medium-term, and long-term policy measures aimed at encouraging uptake of formal financial services by Pakistan's adult female population.

**Landscape of Fintech in Pakistan**

The term Financial Technology, (namely Fintech) refers to computerized programming and other modern innovation adopted by business enterprises to provide improved and automated financial services. Post global financial crisis, rapid growth and investments in area of Fintech has

been seen. The fast growth and expansion in Fintech can be attributed to several including regulatory pressures and challenges faced during the last financial crises.

Fintech has been revolutionizing the financial services landscape across the globe. In 2021, Fintech investments clocked a record number of deals to drive total investment of booming $ 210 B in 2021 globally. As Fintech brings more and more convenience and affordability in unique ways in delivering financial services, the industry is only going to expand moving forward.

Technology and innovation are playing very important role in financial industry. Perhaps, the most popular example of this technological development is the usage of automated teller machines (ATMs). This may be recalled that the very first ATM machine was developed in the late 1960s. Followed by other recent developments are available in form of online banking, mobile banking, electronic banking, etc. At present, the block chain technology has a huge potential to create a transparent and trustworthy mechanism for financial transactions. As per Fintech report by report of Enhancing Financial Innovation and Access (EFInA), Fintech market has boosted due to investment in digital payments. The Fintech investment had increased in 2015 and comprises of over $100billion, wherein 50 percent comprises of digital banking, while half of the percentage include biometric, artificial intelligence, direct ledger and API technologies (EFiNA, 2018) The digital payments market is the largest segment within the Fintech spectrum and accounts for more than 80% of global Fintech revenues. As per Deloitte, the global Fintech revenue was about €92 billion in 2018; it is expected to cross at €200 billion by end of 2024. Fintech industry in Asia Pacific (APAC) and USA have the largest share of 40 percent each in global market. The share of Fintech in emerging market is comparatively low i.e., 20 percent of total market share (Deloitte, 2020).

The digital financial services have grown significantly and has witnessed a hastened upwards growth during the last decade. The high-bandwidth penetration (3G/4G) has surged past 43 percent and mobile penetration has increased beyond an overwhelming 77 percent; hence making Pakistan a hotspot for cutting-edge Fintech innovation technology.

Since 64 percent population of country is under the age of 30, the Fintechs in Pakistan are one of the critical stakeholders for the financial technology landscape because of their better positioning to leverage technology and install a new wave of digital financial services in country (Codebase Tecnologies, 2022). The nascent Fintech ecosystem has consistently attracted the global

venture capital funding from world-renowned market leaders. In this regard, Credit Book, a digital ledger for SMEs and digital payments provider Safe Pay and Naya Pay are examples. Sada Pay and Naya Pay are also examples of Electronic Money Institutions (EMIs).

Perhaps the turnkey towards rapid Fintech adoption in Pakistan is harnessing innovative, indigenous technologies, and collaborating with technology partners who have proven track records in building Fintech ecosystems that set market precedents. However, it is needed to have a well-placed infrastructure and connectivity to implement the Fintech innovations. Additionally, there is a need to have data privacy, cyber security, consumer protection and public awareness are needed to protect the financial system and users.

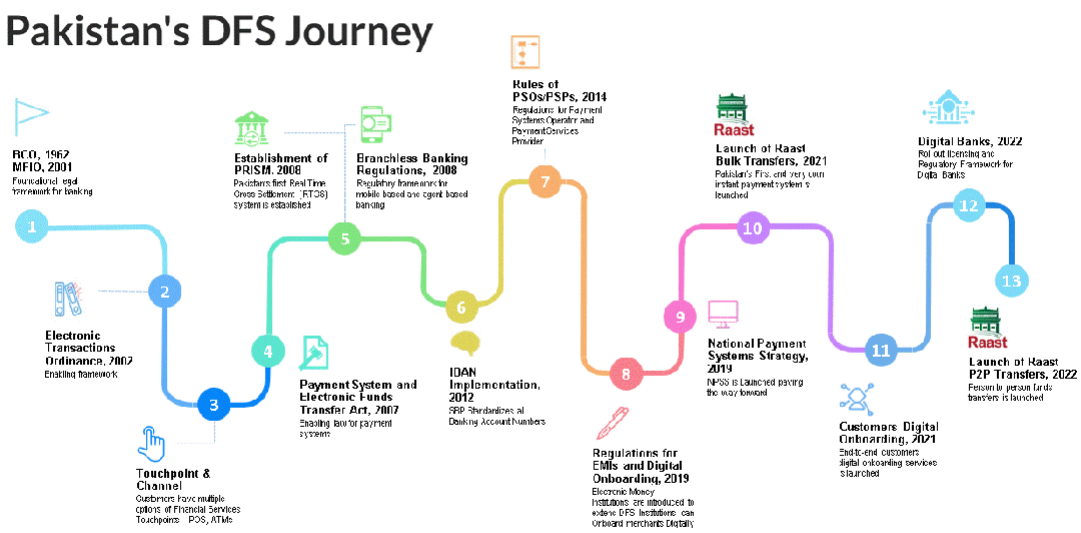
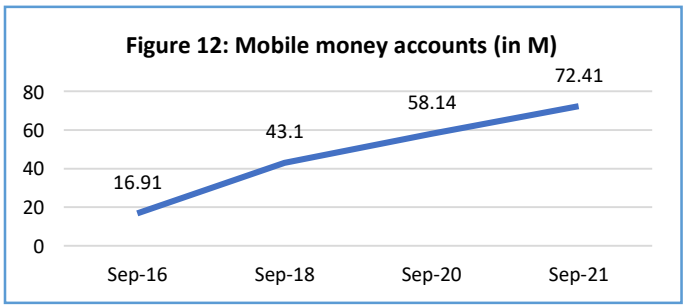



**Figure 11: Pakistan's DFS Journey**
**Source: State Bank of Pakistan**

Despite the growing population with healthy proportion of youth, Pakistan remain as slow mover in digital financial services front. With Financial inclusion ratio of 21%, it stands significantly low as compared to neighboring countries like India and Bangladesh (global index 2021). The introduction of Branchless banking regulation in 2008 by SBP was the major



breakthrough in Fintech landscape in Pakistan as it acted as a catalyst for Digital finance service providers to construct agent networks and reach out to distant rural areas. EasyPaisa was the first to enter Branchless Banking and capitalizing on first mover's advantage quickly captured a significant market share. EasyPaisa and Jazz serve almost 70% of the branchless banking (source: finclusion.org). Promising low transaction cost, ease of access and convenience, Mobile money accounts have seen a healthy growth over the years. These accounts (fig 12) have reached to Rs 72.41 million (source Karandaaz).

To further provide impetus to spread of digital finance services, SPB introduced Basic Banking regulations in 2005 and subsequently Asaan Accounts in 2015 which provided for guidelines on simplified due diligence of low risk bank accounts. Another, major development was merger of 1Link and MNET services in 2008. Before 2008, 1Link served as the ATM switch for 28 banks whereas MNET was connected to 10 banks. This resulted in ATM interoperability, allowing all ATM card holders to utilize services of any bank's ATM. The major aim was to boast the interoperability in the market.

**Current state of Fintech in Pakistan**

About 40 Fintech firms currently operate in Pakistan which can be categorized in following verticals

- ✓ Payment Service Providers
- ✓ Payment Independent Software Vendors (ISVs)
- ✓ Merchant Aggregators
- ✓ Digital Credit/Savings
- ✓ Wallet Services
- ✓ Insurance Tech
- ✓ Identity Services

Predominantly offering payment-based solutions, Fintech firms in Pakistan are yet to reach the full potential in other verticals. Following are the list of Major Fintech Firms and their businesses operating in Pakistan

**Table 1:** *Major Fintech Firms and their businesses in Pakistan*

| NAME | FUNCTIONS | MOBILE APPS |
|---|---|---|
| Askari Bank Ltd. | Digital Banking | PayMax (Android), Askari Mobile App (Android) |
| | PayMax | |
| Autosoft Dynamics | Software house | N/A |
| | AutoBANKER – Financial solutions | |

| | | |
|---|---|---|
| Avanza Solutions | Software House,<br>Digital Financial Solutions | Ambit Online & Mobile Banking Platform (Ambit) |
| Bank Alfalah | Payment Gateway | Alfa (Android) |
| CareemPay | Careem Wallet | Careem (Android) |
| CreditFix | Digital Lending<br>Loan marketplace | CreditFix (Android) |
| Finja | SIMSIM Wallet<br>Payroll software<br>Merchant solutions for payments | SIMSIM (Android) |
| Fonepay by Innov8 | Software House<br>Wallet | FonePay (Android) |
| Foree | Digital Payments | N/A |
| HBL, HBL Konnect | Payment Gateway<br>Bank Debit API<br>Wallet | HBL Mobile (Android), HBL Konnect (Android) |
| JazzCash | Payment gateway<br>Branchless Banking Solutions<br>Lending<br>Corporate Solutions | JazzCash (Android) |
| Keenu | Digital Wallet | Keenu Wallet (Android) |
| MCB Bank | Payment Gateway and related solutions | MCB Mobile Banking (Android) |
| Meezan Bank | Online/Mobile Financial Services | Meezan Mobile Banking (Android) |
| Monet | Software House<br>POS<br>Payment Gateway | N/A |
| Nayapay | Digital Payments | N/A |
| Oneload | Wallet<br>Payload | OneLoad (Android) |
| PayPro | Digital Financial Solutions | N/A |
| Standard Chartered | Online/Mobile Financial Services | SC Mobile Pakistan (Android) |
| Telenor Bank | Easypaisa – Payment Gateway<br>Easypaisa TILL<br>Virtual DebitCard | Easypaisa (Android) |
| TEZ Fin | Digital Lending | Tez (Android) |
| TPS | Software House<br>Payment backend solutions | N/A |
| UBL Omni | Mobile Financial Services. Branchless banking | UBL Digital App (Android) |

| | | |
|---|---|---|
| Ufone Pay/Upaisa | Mobile Financial Services | My Ufone (Android) |

Pakistan being a developing country is an ideal place for Fintech progression. According to the World Bank's Global Findex 2017, a major part of population is still unbanked i.e.100 million people. Due to this level of low inclusion, it is challenging to develop satisfactory and acceptable societal nets which has option of distributing targeted social payments in especially when majority of people do not have reach to a basic banking account. This also significantly refrain individuals' ability to get finance from formal sources. Fintech firms may support to plug these gaps (SBP, 2018).

The concept of electronic banking is not new to Pakistani banking sector. Pakistan has got its first even ATM machine installed in 1987. During the era of 90, the progress with regards to plastic currency, cards and digital platform was very low. From 1999, there was a remarkable increase in ATMs and switching networks i.e., 1-Link and M-Net. Further in 2002, central bank also mandated the banking sector to issue cards and get connection on these two switches. This was the beginning of Fintech era in Pakistan. Accordingly, State Bank of Pakistan (SBP), being financial regulator issued a regulatory framework to encourage banks to adapt technological developments. It has focuses on ensuring the quality in delivering digital services through both switches. Pakistan has witnessed a drastic growth in mobile penetration over the previous five years with internet penetration at 30% (Business Recorder, 2019).

As per Brooking Institutions report, "The State of Financial and Digital Inclusion Project Report for 2017", Pakistan has been ranked at 16$^{th}$ out of 26, with a total score of 69%. As per this report, the fast growth of mobile & internet technology has given access to masses. It has given an opportunity to enhance the financial inclusion in country due to advent technology. Many market players are focusing on innovations and technology used in finance to create its application on fast-track basis in Pakistan. These players are telecom and donor organizations such as Telenor and Karandaaz (Haq, 2017).

# 2. Literature Review

In this section, we briefly outline the extant literature on the relationship between Fintech, Financial Inclusion and Bank Market Power to highlight the existing and available documented evidence on the said nexus.

**Digital Financial Services and Fintech**

The extant literature suggests that technological developments have been utilized in the financial sector mainly by three types of stakeholders (European Parliment, 2017), which are:

i) start-ups being newcomers offering products and services with financial and a technological background
ii) traditional financial services providers, or incumbents, such as banks, insurers, or brokers
iii) technological companies that develop tools and products & service

The information and communication technology (ICT) have made remarkable advancements and given an opportunity to introduce and diffuse variety of technologies used in financial services which have transformed the banking sector. Kanga et al. (2021) have analyzed this diffusion of Fintech and its impact on financial inclusion and per capita income as a measurement of living standards. The study has identified two transmission mechanisms from the financial industry to income per capita which are i) Fintech diffusion channel, and ii) financial inclusion channel. It has specified the interactions between the above-mentioned channels and their relationship with GDP (income) per capita for a panel data of 137 countries over the period of 1991 to 2015. Fintech variable was represented by ATMs and their networks, mobile phones and payments systems. The research concluded that Fintech diffusion and financial inclusion have long term run impact on income per capita and investments including fixed and human capital.

On a relatively different and much promising note (Li, Renee & Laurens, 2017) analyzes the impact of Fintech startups on incumbent retail banks' share prices and conclude that even though Fintechs are at infancy stage, yet they have shown remarkable and rapid growth. However, and still the impact of these startups may remain smaller to the incumbent banks. Some of the reasons identified are low adoption and adjustments from customers towards the new platforms

and a lack of trust towards online services in a short period of time. On the contrary traditional banking institutions enjoy inherent gains from their in-built advantages, and expertise through several operations. However, Fintech still poses a greater threat and can weaken the dominance of banking sectors by offering improved and efficient financial services. And due to this very reason, retail banks have started taking several measures to cater these issues & challenges. For this they have started acquisition of Fintechs or stabilizing in-house Fintech affiliations among others.

A similar idea has also been echoed by Dickerson, Masood, and Skan (2015) who see the rise of Fintechs as a threat to the current business models of existing banking players resulting in increased systematic risk in the entire banking sector. In scenarios, where Fintechs are seen as service providers, peer to peer lenders, robotic advisors, and foreign currency exchanges, could be a direct competition with incumbent banks with regards to core banking functions. This may result in marginally increasing the probability of financial instability as well. The study further argues that the global Fintech investment have been multiplied and enhanced to a level of USD 22 billion in 2015 with further steady growth expected. Resultantly, this growth may be considered as a threat to the market power and incumbent institution with the proliferation and emergence of digital finance and banking facilities. In a similar fashion, Financial Stability Board (2017) forewarned that Fintechs are expanding in a remarkable way, however, this proliferation may result in excessive credit and liquidity risks. In fact, this may already be happening as most of the Fintechs lack sufficient risk management capacity and expertise and there is a possibility of under estimation and under reporting of the same. In addition, there is a risk of maturity mismatch as well when Fintechs are involved in lending. Similarly, in the case of holding peoples' funds in 'Wallets' may result in liquidity mismatch.

**Fintech and Bank Relationship**

So far, Fintechs are primarily focused on its complementary role in supporting incumbent banks in providing products & services effectively and efficiently. Resulting in innovations and operational efficiencies. An analysis of various surveys revealed that products & services offered by Fintech companies are progressing fast and gaining popularity because of offering easy account setting, accommodative rates, ease to have variety of products and services, online connectivity and quality services with modern products comparing with traditional banking products. Similarly,

an analysis of Fintech companies concludes that these companies have been categorized in two groups i.e., a) Fintech companies which offers products and services complimentary to bank services (e.g., offering modern technological services), b) Fintech companies which offer services conventionally covered by banks (Romānova & Kudinska, 2016). In this way, KPMG (2017) reports that, Fintechs are stimulating conventional models in financial sector including banking, insurance and fund and asset management. The biggest share of investment of Fintech has been in banking industry, with payment options and financing facilities being the prominent area consisting of around 65 percent of total investments of Fintech in banking. However, Money transfer, Personal and consumer finance, peer-to-peer lending services etc. are also growing areas.

However, the tide is turning and to balance the sentiment, banking institutions are progressing their in-house development of Fintech financial products & services. Previously, they have been sluggish to innovate and design new products, given the complexity of their businesses and strict regulatory and compliance environment in which they operate. Some examples of such innovation vary from contactless-payments and robotics advisors to a bulk of e-banking financial products (Ernst & Young, 2017). The purpose of using Fintech for banking is to improve the user experience and banking efficiency. Initially these firms seemed to show a real threat to already established banking institutions. However, conventional financial institutions are now keen to furnace conglomerates with Fintech firms to improve their operational efficiencies. This will enable them to better respond to demands of customers for innovative financial services. The technology of Fintech is developing progressively and its scope has been extended from automating the support functions in financial and banking institutions into the organized platforms, which are able of giving end-to-end personal, business, and commercial solutions and innovative financial products. The existing research is mainly about Fintech strategy and risk for banking from the supply side. However, this seems to be moving ahead well beyond banking and payments (IPSOS, 2019). For instance, (Zavolokina et al., 2016) has conducted a study on the “peer to peer” model of partnership between banks and Fintechs operating in Indonesia.

**Market Power, Banking Competition and Financial Inclusion**

By definition, a company’s ability to manipulate pricing, value and or quality of its products or services by controlling either demand or supply of the product is called market power

(Oxford Dictionary, 2019; Chang , Liang , & Yu, 2018). Market power is a characteristic of monopolistic markets where firms manipulate prevailing market prices and pass on the cost burden to customers (Kale & Loon, 2011). By this way, companies maintain a stable cash flow and profit, which resulted in low degree of cash flow instability (Kubick, Lynch, & Mayberry, 2015).

According to Boachie, Aawaar & Domehe (2021), financial inclusion may not be attained in a vacuum without involving the banking sector. Banks are important player of economic environment. Considering it as a strategic measure, financial inclusion has the aim of attracting and drawing the un-banked population of a country to access and usage of formal financial services (Boachie, Aawaar, & Domeher, 2021).

Similarly, Jagtiani and Lemieux (2017) discuss the linkages between Fintech and financial inclusion with the associated risks and alternative information channels. They have explained that these linkages show a positive relationship. This relationship is present between the share of lending by Fintech and the degree of market concentration of bank. The research explained that the Fintech lending has a share of over 40 percent in the markets where there is at least 5 percent decrease in banking branches between 2014 and 2015 (Jagtiani & Lemieux, 2017).

The aforementioned discussion indicates that there exist sufficient conditions for Fintech and FI to affect banks' market power. However, several methodologies and indicators have been adopted in this regards due to which there is little consensus and maybe inconclusive evidence. Thus, we briefly summarize the extent literature in Table 2 below with some of the more recent documented evidences along with the methods and variables being used to contextualize our case.

**Table 2:** *Summary of Literature Review and Variables*

| Sr. # | Author Name and Year | Variables | Methods | Findings/Conclusion |
|---|---|---|---|---|
| 1 | (Ghosh & Sahu, 2020) | Service potential: Bank Z-score,<br>Private credit by deposit money banks to GDP (%)<br>Deposit money banks assets to GDP (%) | Development of an index using weighted arithmetic mean and the inverse of the | Comparison in terms of mean financial inclusion scores shows significant differences between the income groups. However, the differences between the study periods turn out to be non-significant. |

| Sr. # | Author Name and Year | Variables | Methods | Findings/Conclusion |
|---|---|---|---|---|
| | | Bank deposits to GDP (%)<br>Accessibility: Depth of credit information index<br>Depositors with commercial banks (per 1,000 adults)<br>Number of commercial bank branches per 100,000 adults<br>ATMs per 100,000 adults<br>Availability:<br>Branches of commercial banks per 1,000 $km^2$<br>Automated Teller Machines (ATMs) per 1,000 $km^2$<br>Efficiency:<br>Bank return on assets (%, before tax)<br>Bank overhead costs to total assets (%)<br>Bank net interest margin (%)<br>Stability: Strength of legal rights index | Euclidean distance method. Dependent samples t-test and Wilcoxon signed-rank test, and independent samples t-test. | |
| 2 | (Cruz-García, Palac, & Ausina, 2020) | bank branches and ATMs population (number of inhabitants in thousands), density of population (inhabitants/$km^2$) and the Human Development Index (HDI) | A binary choice Model, a logit model with two alternative dependent variables, Correlation matrix. | The municipalities with large populations and high levels of income and education (HDI) have a greater probability to be financially included. In general, rural and in transition municipalities are the least financially included, together with the municipalities located in the Sur region of the country. For these types of municipalities, results also show that both population and the Human Development Index (HDI) are important in determining the probability of being financially included. However, for urban municipalities, HDI is more important than the level of population as a factor influencing financial inclusion. |
| 3 | (Yadav, Singh, & | Banking penetration: Number of accounts | Development of financial inclusion | Study show that the level of FII measure tends to indicate marginal improvement in the level of financial |

| Sr. # | Author Name and Year | Variables | Methods | Findings/Conclusion |
|---|---|---|---|---|
| | Velan, 2020) | with commercial bank per 1,000<br>Availability of banking services: Number of commercial bank branches per 100,000 adults, The number of commercial bank branches per 1,000 sq. km, Number of bank employees per customer<br>Usage of the banking system: The volume of credit and deposit as the proportion of the state's Gross State Domestic Product<br>The volume of credit and deposit as the proportion of the state's Gross State Domestic Product,<br>Access to saving: The proportion of households having access to savings account,<br>Bank risk: Number of small borrower account per 1,000 population<br>Access to credit: The proportion of household having access to credit | index (demand and supply side) using UNDP model | inclusion across states during the research period. Most of the northern and north-eastern states were found to be under low financial inclusion. On the other hand, most of the high financially included states were also better in terms of HDI and literacy. |
| 4 | (Shen, Hueng , & Hu, 2021) | Availability Branches of commercial banks per 100,000 adults, Branches of commercial banks per 1,000 $km^2$ Automated Teller Machines (ATMs) per 100,000 adults, Automated Teller Machines (ATMs) per 1,000 $km^2$ Digital element: Mobile-cellular telephone subscription (per 100 inhabitants) Internet penetration rate | Min-Max method to normalize the indicators, coefficient-of-variation method to calculate the weights, dimensional index by using the Euclidean distance | Regions with higher-income countries tend to have better digital financial inclusion. However, digital technology has helped several low-income countries to improve their financial inclusion. But this improvement does not spillover to other low-income countries in the region. |

| Sr. # | Author Name and Year | Variables | Methods | Findings/Conclusion |
|---|---|---|---|---|
| | | Usage: Financial institution account (% age 15+) Debit card ownership (% age 15+) Borrowed from a financial institution (% age 15+) Digital element: Used a mobile phone or the internet to access an account (% age 15+) *Made or received digital payments in the past year (% age 15+) Affordability National interest rate Financial Literacy & ability: Tertiary education rate, Main source of emergency funds: savings (% age 15+) | synthesis method. | |
| 5 | (Khera, NG, Ogawa, & Sahay, 2022) | Access (traditional): ATM per 100,000 populations, Bank branches per 100,000 population Usage (traditional): Account at a Financial Institution (FI) (%), Saving (%), Debit card (%), account for wages (%), account for utility (%) Access (digital): Mobile subscription per 100population, Internet (%) Usage (digital): Mobile account (%) Use internet to pay (%), Mobile for wages (%), Mobile for utility (%) Mobile money agents: Registered mobile money agents | Development of comprehensive index using a three-stage PCA | It is concluded that (i) the adoption of digital financial services has been a key driver of financial inclusion; and (ii) there is wide variation across countries and regions, with the greatest progress recorded in Africa and Asia. |

| Sr. # | Author Name and Year | Variables | Methods | Findings/Conclusion |
|---|---|---|---|---|
| 6 | (Wang, Yang, Chiu, & Lin, 2020) | Number of financial organizations, loan balance, financial assets, financial personnel, premium income, amount of securities trading, digital financial inclusion index (Peking University DFII of China (2011–2018)) | DEA framework based on the production approach, DDF dynamic non-radial DDF model | The results show that digital finance has slightly improved the efficiency of the financial sector, but there are significant differences in the impact of provincial efficiency in China |
| 7 | (Li & Li, 2021) | Digital financial Index , (i) the level of economic development (GDP), which is described by the gross regional product; (ii) government fiscal expenditure (local general public budget expenditure; the population scale (the total population of the city at the end of the year); wage level (total earnings of the city's employees); the foreign direct investment level (actual investment of foreign investors in the whole city; Internet penetration rate( number of Internet broadband access users in units of 10,000 households) in the city. | | Implementing the Plan and Principles can increase the number of urban patents indicating that digital inclusive finance has a positive effect on urban innovation. Further, digital inclusive finance can promote urban innovation by improving the allocation of credit resources, consumption, and industrial upgrading |
| 8 | (Alkhazaleh & Haddad, 2021) | Customer satisfaction, Availability to Fintech services, Accessibility to Fintech services, Ease of use and performance, Transaction cost, Service security | Regression model | The availability of financial technology services, accessibility, ease of use and performance, transaction costs, and service security of Fintech have a positive and significant effect on banks' customer satisfaction. Effective financial technology services assist and preserve customers, who increase the revenues generated by the banks and economic growth |
| 9 | (Zhang, Ashta, & | Artificial intelligence adoption, Business | Survey data analysis | Incumbents are experimenting with more different kinds of AI than |

| Sr. # | Author Name and Year | Variables | Methods | Findings/Conclusion |
|---|---|---|---|---|
| | Barton, 2021) | model (Profitability, differentiation, agility, leanness, transparency), hurdles, competitive threat, expected job creation, Differential perceptions of competitive impact and AI, Differential perceptions of competitive advantage, use of different application | | Fintechs. Fintechs use the technologies for new products and services while incumbents are using them for incremental innovations to existing products and services. |
| 10 | (Wang, Liu, & Luo, 2021) | Fintech index (from Baidu Index)<br>Size (natural logarithm of total assets)<br>Liquidity (ratio of liquid assets over total assets for individual banks)<br>Leverage (bank's equity as a share of its total assets); bank Efficiency (ratio of noninterest operating costs to total income); Income diversification (share of noninterest income in total income)<br>Shadow banking, GDP, Inflation, Monetary policy, Market structure, Rule of law | Factor analysis, Pairwise correlation, regression | The Fintech development exacerbates banks' risk taking in general. The asset quality deterioration effect brought about by prosperous Fintech is more salient in banks with larger sizes, lower efficiency, more shadow banking business and more interest-based income. Moreover, the nexus between Fintech and banks' risk taking is a U-shaped trend, with Fintech initially intensifying and then weakening banks' risk taking. |
| 11 | (Ozili, 2018) | | Literature review | Digital finance and financial inclusion have several benefits to financial services users, digital finance providers, governments and the economy; notwithstanding, a number of issues still persist which if addressed can make digital finance work better for individuals, businesses and governments. |
| 12 | (Alliance for Financial Inclusion, 2019) | DFS Access ((based on male/female and urban/rural)): Percentage of administrative units with agent outlet, No. of | Development of index | The Digital Financial Services (DFS) Indicators document is a comprehensive set of global metrics on the digital finance industry (mobile money, branchless banking, |

| Sr. # | Author Name and Year | Variables | Methods | Findings/Conclusion |
|---|---|---|---|---|
| | | DFS agents per 10,000 adults<br>Number of active DFS agents per 10,000 adults (disaggregated based on male/female and urban/rural)<br>No. of merchant payment points per 10,000 adults,<br>Percentage of adult population with registered DFS accounts.<br>DFS usage: Percentage of active DFS accounts, DFS transactions (by volume) per registered account, Value of DFS transactions (including Cash in /cash out, Bill payments, Merchant payments, P2P transfers, Disbursement, and repayment of loans (microfinance loans), G2P payments, Salary payments, Value chain payments, E-commerce payments, Cash transfers, Airtime top-ups<br>Quality: Disclosure requirement<br>Number of complaints per 10,000 active DFS account<br>Percentage of complaints resolved, Transaction Failure, Dispute resolution, financial literacy, | | agent banking, e-wallets etc.). It combines unique data sources from identified financial services providers, mobile money operators, e-money issuers, branchless and agent banking services, and any other identified digital finance services provider defined by the regulators and/ or stakeholders in a jurisdiction. |
| 13 | (Ghosh & Chaudhury, 2020) | Mobile or online banking: Mobile money account, Transaction using mobile phone or internet, Online payments, | Pooled logistic regression and marginal effect | The high-income people, educated, and males use digital financial services more than low-income group, less educated and females and favors digital financial inclusion than their respective counterparts. Older people are more prone to hold debit |

| Sr. # | Author Name and Year | Variables | Methods | Findings/Conclusion |
|---|---|---|---|---|
| | | Card availability: Debit card, Own named debit card, Credit card<br>Card usage for last 12 months: Debit card<br>Credit card<br>Time, gender, age, education | | card and credit cards, but it is true only up to a certain age |
| 14 | (Purva , Ng , Ogawa, & Sah, 2021) | log of GDP per capita, percentage share of GDP, percentage share of GDP, log of private credit as a percentage share of GDP, Population growth rate digital financial inclusion index in Khera et. al. (2021) | Regression analysis using FII | The digital financial inclusion is positively associated with growth in GDP per capita during 2011-2018, which suggests that digital financial inclusion can accelerate economic growth. Fractional logit and random effects empirical estimation identifies access to infrastructure, financial and digital literacy, and quality of institutions as key drivers of digital financial inclusion. |
| 15 | **Invalid source specified.** | Financial Inclusion Index - Number of commercial bank branches per 100,000 adults - Number of automated teller machines (ATMs) per 100,000 adults<br>- Number of depositors from commercial banks per 1000 adults<br>- Number of borrowers from commercial banks per 1000 adults<br>5-year moving average of real GDP per capita, *REMITTANCE* Personal remittances received to GDP (%) Liquid liabilities to GDP (%) Life insurance premium volume to GDP (%) Non-life insurance premium volume to GDP (%)<br>Financial system deposits to GDP (%) *Inflation, Trade,* The percentage of population | Principal component analysis for Financial Inclusion Index | Financial inclusion could strengthen the growth-enhancing effect of remittances. Thus, the study helps explain the development dilemma of remittance inflows and financial inclusion in migrant sending countries to boost their economic growth. |

| Sr. # | Author Name and Year | Variables | Methods | Findings/Conclusion |
|---|---|---|---|---|
| | | with access to electricity (%)<br>General government final consumption expenditure as a share to GDP (%) | | |
| 16 | **Invalid source specified.** | ATMs per 100k adults<br>Branches of commercial banks per 100k adults<br>ATMs per 1k km$^2$<br>Branches of commercial banks per 1k km$^2$<br>Number of Bank account per 1000 adults<br>Size, capital, ROAA, CR, GDP | non-parametric Data Envelopment Analysis | most of the countries, except some Asian and Middle Eastern countries, have inconsistent efficiency trends in Islamic banking sector. It also shows that financial inclusion is significantly allied with Islamic banking efficiency. |
| 17 | **Invalid source specified.** | Bank branches per 100,000 adults<br>ATMs per 100,000 adults<br>Financial depth Private credit by deposit money banks to GDP (%)<br>Deposit money bank assets to GDP (%)<br>Deposit money bank assets to deposit money bank assets and central bank assets (%)<br>Liquid liabilities to GDP (%)<br>Central bank assets to GDP (%)<br>Mutual fund assets to GDP (%)<br>Financial system deposits to GDP (%)<br>Life insurance premium volume to GDP (%)<br>Nonlife insurance premium volume to GDP (%)<br>Insurance company assets to GDP (%)<br>Private credit by deposit money banks and other | Composite indexes for financial inclusion and modernization are developed by using principal component analysis | there is no policy coherence and coordination between growing financial inclusion, modernization, and carbon mitigation strategies in South Asia. Thus, the prospect of financial inclusion and modernization should be cohesive into comprehensive climate change mitigation strategies at regional, national, and global levels, specifically to mitigate the adverse dynamics of higher carbon emissions associated with modern development. |

| Sr. # | Author Name and Year | Variables | Methods | Findings/Conclusion |
|---|---|---|---|---|
| | | financial institutions to GDP (%) | | |
| 18 | **Invalid source specified.** | Number of ATMs per 100,000 adults<br>Number of bank branches per 1,000 populations<br>Bank Branches per 1,000 square km<br>ATMs per 1,000 Square km Borrowers from commercial banks per 1,000 adults<br>Number of accounts per 1,000 populations<br>Life insurance premium volume to GDP<br>Non-life insurance premium volume to GDP, per capita income, education, agricultural growth, militarization and urbanization | fixed-effect model, two-stage least-square and system generalized method of moments estimation techniques | here is a significant effect of financial inclusion on food security. The evidence shows that if there is more financial inclusion in the country, it will help poor people to cope with difficult situations they face and provide them food security |

# 3. Tools and Methods

This study adopts a quantitative research approach and follows a causal research strategy to draw conclusions. In this section, we first define our key variables and outline their measurement techniques followed by econometric specifications and testing methodology. The section also discusses sample and data sources for the study.

## Definition and Measurement of the Variables

This study is based on variables with long standing theoretical relationships and economic history. In this section, we outline in detail the construction and estimation of our key variables followed by the econometric methodology and testing specifications.

## Measuring Market Power and the construction of Lerner Index

A firm's ability to negotiate and set prices above its marginal costs is what known as market power. The degree of market power is inversely related to competition, higher market power indicates low competition among firms and vice versa. Market power is usually estimated through Lerner Index which indicates a relative differential between input prices and marginal costs vis a vis a firm's output prices and is thus inversely related to competition (Aleemi et al., 2022). There are other several measures to estimate the degree of competition in the banking industry such as the Panzer and Rosse H-Statitics and the Boone Indicator. However, the Lerner index has got several advantages over its peers such as that it measures market power at the bank year level. The Boone indicator in particular is time dependent and reflects the logic behind structure efficiency hypothesis (Tan & Floros, 2018). However, in this study, we invoke the theory behind structural conduct performance (SCP) hypothesis owing to neo-organizational approach (Forssbaeck & Shehzad, 2015; Aleemi et al., 2022). Similarly, the H-Statistic is a non-structural measure of competition (Apergis, 2015). In addition, Lerner index has a great advantage over other measures of competition and market power as it provides a direct measure of pricing power per year at bank level. The index ranges from 0 to 1, with 0 means perfect competition and 1 indicating monopoly.

We follow the same line of literature and to measure banks' market power, a localized Lerner Index for Pakistani banks has been estimated following (Ndwiga, 2020; Aleemi et al., 2019;

Nguyen, 2020; Dao Bui & Ume, 2020; Aleemi et al., 2022) and express the Lerner index as inverse of the price elasticity as such that:

$$Lerner_{it} = \frac{P_{it} - MC_{it}}{P_{it}} \quad \ldots (1)$$

Where $P_{it}$ represent output prices for bank $i$ at time $t$ and $MC_{it}$ represents the marginal costs. All the variables follow the definitions provided in Table 1 accordingly. The marginal costs are estimated through stochastic frontier analysis by setting up a translog cost function as follows:

$$lnTC = \alpha + \sum_{k=i}^{1} \beta_k \ln(Q_{kit}) + \sum_{h=1}^{3} \beta_h \ln(W_{hit}) + \sum_{h=1}^{3}\sum_{m=1}^{3} \frac{1}{2}\gamma_{hm} \ln(W_{hit}) \ln(W_{mit}) + \sum_{k=i}^{1} \frac{1}{2}\delta_k (\ln(Q_{kit}))^2 + \sum_{h=1}^{3}\sum_{k=i}^{1} \rho_{hk} \ln(W_{hit}) \ln(Q_{kit}) + \sum_{n=i}^{1} \pi T^n + \sum_{h=1}^{3} \sigma_h \ln(W_{hit}) T + \sum_{k=i}^{1} \varphi_k \ln(Q_{kit}) T + \sum_{p=1}^{p} X_{pit} + u_{it} \quad \ldots (2)$$

Where $TC_{it}$ represents total cost for bank $i$ at time $t$, as a function of $Q_{it}$ representing output prices and $W_{h,it}$ are the three input prices emulating from the prices of labour $W_1$ , $W_2$ the price of physical capital, and $W_3$ the price of funding and time trend ($T$) representing technological and technical changes. Finally, $X_p$ is a vector representing bank level control variables. We estimate the above specification as constrained linear regression with linearity and homogeneity. The Marginal costs are then obtained by taking a partial differential as indicated in equation 3 below. All variables follow the definitions as presented in Table 1 accordingly.

$$MC_{it} = \frac{\partial TC_{it}}{\partial \ln Y_t} = \frac{TC_{it}}{Q_{it}} [\beta_1 + \beta_2 LnQ_{it} + \sum_{k=1}^{3} \phi_k LnW_{hit}] \quad \ldots (3)$$

The choice of the cost functions in our estimated models are based on the assumption that a bank produces mainly one output in the form of earning assets by utilizing three inputs—labour, capital and funding (Aleemi et al., 2022).

**The Construction of Financial Inclusion Index for Pakistan**

The multidimensionality of an inclusive financial system warrants that financial inclusion should be treated and assessed as such. Thus, we follow the work of (Sarma, 2008a) who adopted a multidimensional approach similar to that of UNDP's Human Development Index (HDI) to compute a composite index of financial inclusion for the first time. Following the seminal work of (Sarma, 2008a) several studies have estimated several indices of financial inclusion with various dimensions across the globe. A few examples to outline would be (Sarma, 2008b; 2012; 2016; Goel & Sharma, 2017; Omar & Inaba, 2020; Park & Mercado, 2018; 2021; Camara & Tuesta, 2014; Nguyen, 2020) among others. However, and to the best of our knowledge, there is no such attempt exclusively and indigenously done for Pakistan. Most of the empirical literature comes from developed nations to which one can argue that since the bulk of the unbanked and poor population come from developing nations with characteristics of case dependency and case to case variation, thus needs to be studied accordingly. In addition, most of studies about financial inclusion on Pakistan are either cross country evidence conducted by foreign authors or adopt a few individual indicators[5] of inclusion such as the number of ATMs, bank branches among several others. In other cases, and in most official statements, usually figures are quoted either from the Global Findex Database by World Bank or Financial Access Survey by IMF. The only closely relevant study available to date is that of (Akhtar et al., 2020) who estimates an index of financial inclusion for Pakistan. However, their study lacks in several ways and does not provide considerably reliable and conclusive measure of financial inclusion for the country. Thus, we estimate a composite index of financial inclusion for Pakistan with broader dimensional depth and more indicators for a relatively extensive sample of 2005 to 2020.

We consider a number of indicators capable of capturing the depth and breadth of the outreach of a financial sector necessary to assess the extent of financial inclusion and the outcome of inclusiveness for the financial sector of Pakistan. These indicators are categorized into three distinct dimensions including i) penetration/access of financial services ($D_1$) ii) availability of financial services ($D_2$) and iii) usage of financial services ($D_3$). We consider the usage dimension to be the output of an inclusive system as in (Camara and Tuesta, 2014). In the first stage, these

[5] Camara and Tuesta (2014) argue that individual indicators cannot accurately capture the state of inclusiveness of a financial system

three dimensions are estimated as sub-indices and then aggregated to form a composite index of financial inclusion as a weighted average index of individual dimensions. The categorization of indicators into three sub-indices provides us with disaggregated and meaningful information which is helpful in policy making by pointing towards points for necessary interventions. Further, the construction of a composite index gives us the advantage of aggregating several indicators into a single, monotonous, and homogenous index capable of summarizing the complex nature of financial inclusion. In addition, methodologically an index may give us better opportunity to study the relationship of FI with other variables of interest. The construction of an exclusive financial inclusion index for Pakistan in itself is a major contribution and is the principal task of this study.

There are two ways of constructing index of financial inclusion. The one is a parametric method as in (Camara & Tuesta, 2014; Park & Mercado, 2021; Nguyen; 2020) and the other is a non-parametric method as in (Sarma, 2012; 2015; 2016; Park & Mercado, 2018; Omar& Inaba; 2020) among others. In this study, we mainly follow the methodology of Sarma primarily due to lack of data availability. As following a parametric method such as a Principal Components Analysis (PCA) for construction of FI index would mean to sacrifice a considerable number of significant indicators such as mobile money, the data for which is available only from 2011 and onwards. We include indicators for mobile money mainly for the reason that we hypothesize that Fintech is instrumental in enhancing inclusion efforts. Thus, the explosion of mobile phone usage particularly in developing countries has affected all the FI dimensions including penetration availability and usage resulting in increased mobile banking activities and hence should be adopted for FI measurements (Chauvet & Jacolin, 2017). In addition, previous research highlights that technological advancement has enabled financial inclusions to expand. With the advent in ICT especially, mobile phone usage and IT services subscriptions has led to several digital innovations such as mobile money etc. However, the estimation of Financial Inclusion Index would be under-estimated if aspects of digital innovation are excluded. Hence, it is important to include different technologies, which can lead the increase in the access, availability, and usage of financial services.

There are two important concerns while estimating FI such as *i)* the selection of indicators and *ii)* weights assigned to each indicator and dimension. The indicators are selected with well-established economic theory and long-standing relationships following the literature. The

indicators included in the three dimensions are indicated in figure 13 below and are defined in Table 3 accordingly. The weights have been assigned to each dimension to enable the best Index estimation, which is based on extracting information from all variables and keeping the biases at their minimum level. However, unlike, most of the studies, which arbitrarily and intuitively assign weights to different indicators, we assign equal weights to each dimension owing to the fact that for a developing country like Pakistan, all the dimensions are equally important to achieve the dream of an inclusive financial system.

In the first stage, each dimension indexes $d_i$ is estimated as:

$$d_i = w_i \frac{X_i - m_i}{M_i - m} \quad \ldots (4)$$

Where $w_i$ = is the weight assigned to each indicator for dimension $i$ as such that $0 \leq w_i \leq 1$

$X_i$ = indicates actual value of dimension $i$

$m_i$ = is the minimum value or the lower limit for dimension $i$

$M_i$ = is the maximum value or upper bound for dimension $i$

In equation (4), higher value indicates higher achievement in a particular dimension and vice versa. The composite index for FI is then estimated through normalized Euclidean distance between the ideal situation W and the worst situation 0, as indicated in equation (5) and the normalized inverse Euclidean distance as indicated in equation (6) accordingly. And the composite FI index is then obtained as indicated in equation (6).

$$X_1 = \frac{\sqrt{d_1^2 + d_2^2 + \ldots d_n^2}}{\sqrt{(w_1^2 + w_2^2 + \ldots w_n^2)}} \quad \ldots (5)$$

$$X_2 = 1 - \frac{\sqrt{(w_1 - d_1)^2 + (w_2 - d_2)^2 + (w_n - d_n)^2}}{\sqrt{(w_1^2 + w_2^2 + \ldots w_n^2)}} \quad \ldots (5)$$

$$CFII = \frac{1}{2}[X_1 + X_2] \quad \ldots (6)$$

The expression in equation (6) gives us the mean of Euclidean distance between 0 and W. A higher value would suggest higher degree of financial inclusion and vice versa. The composite

index thus ranges between 0 and 1 where 1 is the highest level of inclusion. Thus, depending on the value of our estimated CFII, the following levels of inclusiveness can be categorized by the following ranges (Goel & Sharma, 2017):

1) When $0 \leq CFII \leq 0.4$, indicates low financial inclusion
2) When $0.4 \leq CFII \leq 0.6$, indicates medium financial inclusion
3) When $0.6 \leq CFII \leq 0.1$, indicates high financial inclusion

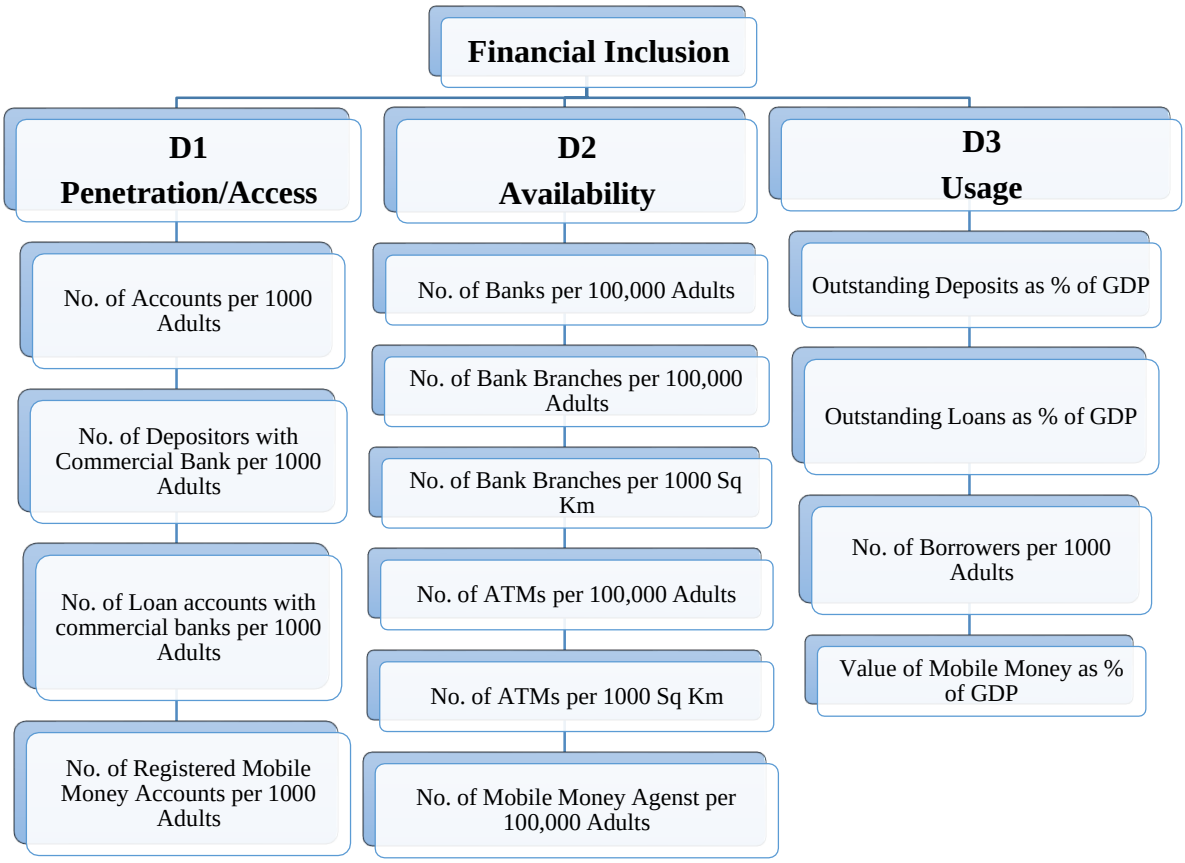



***Figure 13:*** Indicators and Dimensions of FI

**Digital Financial Services: Measuring Fintech**

For a country's economic and financial development, it's important to foster financial innovations such as Fintechs to enhance competitiveness, operational performance, lowering the costs and providing diversity in terms of financial services (Lee et al., 2021). However, as a relatively new industry, there is no consensus on the fact that how to measure the extent of Fintech and there is no unified measure available. Most of the literature either relies upon consumer level surveys about the usage of particular services or look towards text mining practices for extracting

relevant information from various sources such as (Wang et al., 2021) who gauges Fintech development for China by capturing media's attention towards Fintech related information. There are very few studies, which rely upon some crude measures of Fintech and or quantify the same. One of the main reasons could be that the multifaceted nature of Fintechs makes it difficult to rely on a single measure across the board. Hence, a variety of indicators have been adopted in the literature to capture several dimensions of Fintech for various purposes. For instance, (Lee et al., 2021) develops a Fintech development index for China based on enterprise level data including, number of Fintech startups, their registered capital, total number financing events and the amount of financing acquired. Similarly, (Kanga et al., 2021) relies upon the number ATMs and Mobile Phone usage to proxy the extent of Fintech diffusion, (Croutzet & Dabbous, 2021) adopts Fintech Startups formation extracted from Crunchbase database. Similarly, (Li et al., 2017) uses the volume of funding and the number of rounds to proxy for Fintech, (Demir et al., 2020) proxies Fintech by using mobile phones to pay bills following (Asongu & Odhiambo, 2018). In a survey-based study, (Senyo et al., 2020) proxies Fintech through mobile money to understand the antecedents of Fintech Use. On a much promising note, the global Findex database aims to collect indicators of Fintech indicators such as using internet or mobile phones to pay bills and or access financial services etc. However, the data is only available for 2017.

It's clear from the above discussion that various indicators have been used to capture several dimensions of Fintech across different conditions and there is no clear consensus through the available empirical literature. However, none of these indicators are applicable in our case due to several reasons. The foremost is the lack of data availability for almost all of the above-mentioned indicators. Thus, we needed a relatively different and unorthodox approach to measure the extent of Fintech in the case of Pakistan by constructing a relatively new proxy indicating 'Digital Financial Services' (DFS). We estimate DFS by the value of internet banking plus mobile banking expressed as percentage of GDP. Our proxy is robust across various models' specifications and indicates the extent, access and adoption of digital financial services[6] in the country.

[6] Though, Pakistan recently launched 'RAAST', the flagship program for digital financial services in the country with end to end instant payment settlement. However, we cannot benefit from the same as it is recently launched in 2021 and is still an ongoing project jointly undertaken by Karandaaz and the SBP. https://www.sbp.org.pk/dfs/Raast.html

## Control Variables

To account for various bank level and economy wide heterogeneity across the sample period, we adopt several bank specific and economic control variables. For example, to control for possible heterogeneity arising from economies of scale, we include the variable for size. Similarly, to control for business cycle fluctuations, we include GDP growth rate and interest rate. To account for regulatory and political characteristics, we include the variable for rule of law. Other bank specific variables are also included in various specifications as indicated in Table 1 following the literature.

***Table 3:*** *Summary and Definitions of variables*

| S. No | Indicator Name | Symbol | Measure / Remarks |
|---|---|---|---|
| **Panel A: Main Variables** | | | |
| 1. | **Market Power** | **LERNER** | **Lerner Index:** Estimated through Stochastic Frontier Approach by setting up a translog cost function with the following indicators. |
| 2 | *Total Costs* | *TC* | *Overheads: calculated as the sum of personnel and other administrative expenses* |
| 3 | *Marginal Costs* | *MC* | *Estimated through stochastic frontier approach by setting up a translog cost function* |
| 4 | *Output* | *Q* | *Total Earning Assets* |
| 5 | *Cost of Labor* | *W1* | *the ratio of expenses of salaries & allowances on employees to the total number of employees of the banks* |
| 6 | *Cost of Physical Capital* | *W2* | *The Ratio of Operating Expenses over fixed assets* |
| 7 | *Cost of Financial Capita* | *W3* | *The ratio of interest expense over total borrowed funds* |
| 8 | *Output Prices* | *P* | *Total Income over Total Assets* |

| | | | |
|---|---|---|---|
| 9 | **Financial Inclusion** | **CFII** | **Composite Financial Inclusion Index** developed by following (Sarma, 2012; 2015) and (Park & Mercado, 2018) with the following indicators |
| 10 | *Branches per 100,000* | *Branch 100K* | *No of Branches per 100,000 adults* |
| 11 | *Branches per 1000 KM* | *Branch 1000KM* | *Branches per 1000 squared kilo meter* |
| 12 | *Banks per 100,000* | *Banks 100K* | *No. of Banks per 100,000 adults* |
| 13 | *ATMs* | *ATM* | *No. of ATMs per 100,000 adults* |
| 14 | *ATMs per 1000 KM* | *ATM100KM* | *No of ATMs per 1000 Squared Kilo Meters* |
| 15 | *Accounts* | *Accounts* | *No. of Bank Accounts per 1000 Adults* |
| 16 | *Borrowers per 1000* | *Borrowers* | *No of borrowers from commercial banks per 1000 Adults* |
| 17 | Outstanding Deposits | OD | Outstanding deposits with commercial banks as % of GDP |
| 18 | Outstanding Loans | OL | Outstanding Loans with commercial banks as % of GDP |
| 19 | Borrowers | Borrowers | Borrowers per 1000 Adults |
| 20 | Loan accounts | Loans | Loan accounts with Commercial Banks per 1000 Adults |
| 21 | Depositors | Depositors | Depositors with Commercial Banks per 1000 Adults |
| 22 | Mobile Money Accounts | Mobile Accounts | Number of Registered Mobile Money Accounts per 1000 Adults |
| 23 | Mobile Money Agents | Mobile Agents | Number of Mobile Money Agents per 100,000 Adults |
| 24 | Mobile Money Value | Mobile Money | Value of Mobile Money as % of GDP |
| **Panel B: Control Variables** | | | |
| 25 | Size | Size | Log of total assets |

| | | | |
|---|---|---|---|
| 26 | Economic Activity | GDPGR | Real GDP growth Rate in % |
| 27 | Liquidity | Liquid | Liquid Assets over total assets |
| 28 | Leverage | Lev | Total Equity over total liabilities |
| 29 | Loan Share | LS | Net loans over total assets |
| 30 | Interest Rate | IR | Lending Interest Rate (1 Year KIBOR) |
| 31 | Net Interest Margin | NIM | Net Interest Margin |
| 32 | Rule of Law | RLaw | The Rule of Law index obtained from the World Governance Indicators of the World Bank |
| **Panel C: Fintech** | | | |
| 33 | Digital Financial Services | DFS | A proxy for Fintech, computed as the value of internet plus mobile banking as percent of GDP. |
| 34 | Pre and Post Fintech | --- | A dummy variable, whereby the Pre Fintech era is determined to be before 2011 and vice versa |

**Econometric Specifications**

After the estimation of our two indices (the Lerner index indicating market power of banks and the FI index) and specifying other variables as indicated in Table 1, we then tend to test the various relationships among market power, FI and Fintech by following a two steps estimation methodology. In the first step, we see for the effects of Fintech on financial inclusion in the presence of market power for the banking sector of Pakistan. While in the second, we test for the effects of Fintech on banks' market power in the presence of bank specific and macroeconomic control variables across several econometric specifications. In addition, we also specify certain conditional effects as outlined previously. These specifications can be generally represented as below:

$$CFII_{it} = DFS_{it} + Lerner_{it} + Control\,Variable(s)_{it} + e_{it} \quad \ldots (7)$$

Where *CFII* indicates Composite Financial Inclusion Index and *DFS* indicates Digital Financial Services proxied for Fintech. In doing so, if Fintech is sufficiently affecting the inclusion efforts in the country, then it could be evidence to the fact that Fintech can lead to significant market alterations such as market power. This leads us to specify the effect of Fintech on banks' market power as follows:

$$MP_{it} = DFS_{it} + Bank\ Specific\ Controls_{it} + Macroeconomic\ Controls_{it} + e_{it} \quad \ldots (8)$$

Where MP indicates market power, estimated through Lerner index. in addition to these specifications, we also look for several conditional effects of FI and Fintech on banks' market power. For example, we condition the enhanced effect of FI through Fintech on market power along with some other conditional effects as shown below:

$$MP_{it} = DFS_{it} + Bank\ Specific\ Controls_{it} + Macroeconomic\ Controls_{it} + Conditioning\ Variable_{it} + e_{it} \quad \ldots (9)$$

For instance, the conditional effects of FI through Fintech would look like:

$$MP_{it} = Bank\ Specific\ Controls_{it} + Macroeconomic\ Controls_{it} + CFII * DFS_{it} + e_{it} \quad \ldots (10)$$

Similarly, the conditional effects of FI and Fintech through GDP would be as:

$$MP_{it} = Bank\ Specific\ Controls_{it} + Macroeconomic\ Controls_{it} + DFS * GDP_{it} + e_{it} \quad \ldots (11)$$

$$MP_{it} = Bank\ Specific\ Controls_{it} + Macroeconomic\ Controls_{it} + CFII * GDP_{it} + e_{it} \quad \ldots (12)$$

And finally, we condition the rule of law with Fintech and FI against market power as:

$$MP_{it} = Bank\ Specific\ Controls_{it} + Macroeconomic\ Controls_{it} + DFS * RLaw_{it} + e_{it} \quad \ldots (13)$$

$$MP_{it} = Bank\ Specific\ Controls_{it} + Macroeconomic\ Controls_{it} + FI * RLaw_{it} + e_{it} \quad \ldots (14)$$

**Testing Methodology**

We adopt panel regression estimation techniques with bank level fixed effects for our models (equation 7 to equation 14) commensurate with the literature (Aleemi et al., 2022). Owing to the fact that there is a possibility of the presence of bank level heterogeneity. There might be

certain unobserved bank specific characteristics that may be related to market power and risk like business model and risk management expertise. The literature suggests that these characteristics are largely time invariant indicating bank level heterogeneity. To account for such time invariant bank level heterogeneity, we include fixed effects in all these estimations accordingly commensurate with the literature.

**Data and Sample**

The data for our bank specific variables and macroeconomic indicators have been collected from the State Bank of Pakistan. Whereas the data for indicators of financial inclusion is collected from the Financial Access Survey by IMF. Similarly, data for the Rule of Law indicator has been adopted from the worldwide governance indicator of the World Bank. The sample period consists of post reforms era of 2005 to most recent 2020 whereby the regulatory requirements of Basel III were adopted by the commercial banks in Pakistan. The choice of our sample period is governed by the fact that internet banking (digital financial services) in the country were started in 2005. We collect annual data for all the commercial banks through the sample period excluding specialized and foreign banks to obtain a relatively homogenous sample. In addition, it should be noted that during this period, several banks were either merged or acquired. Thus, we address the survivorship bias by excluding the merged and or acquired entities following (Afzal & Mirza, 2011). In this way, we ended up with an unbalanced panel of 25 commercial banks including public, private, and Islamic banks with the following distribution:

***Table 4:*** *Sample Distribution*

| **Banks** | **2005** | **2006** | **2007** | **2008** | **2009** | **2010** | **2011** | **2012** | **2013** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **2020** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Public | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| Private | 14 | 14 | 14 | 14 | 14 | 14 | 14 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 | 15 |
| Islamic | 2 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 6 | 6 | 6 | 6 | 6 | 6 |
| Total | 20 | 22 | 22 | 22 | 22 | 22 | 23 | 24 | 24 | 24 | 25 | 25 | 25 | 25 | 25 | 25 |

# 4. Empirical Results and Findings

In this section, we report the findings of our models described in previous section. The chapter starts from estimation, of out two key indices, the FI index and the Lerner index followed by the regression models.

## Estimated Composite Financial Inclusion Index

Summary statistics for the indicators of FI index are shown in Table 5 separately for the three dimensions. Similarly, the different categories of FI index are indicated in Table 4 below.

***Table 5:*** *Descriptive Statistics for FI indicators*

| Variables | Mean | Std. Dev. | Min | Max | Obs. |
|---|---|---|---|---|---|
| ***Penetration/ Access Dimension (D1)*** | | | | | |
| Accounts | 276.05 | 85.61 | 133.3 | 418 | 16 |
| Depositors | 275.72 | 77.31 | 137.33 | 402.27 | 16 |
| Loan Accounts | 33.02 | 10.54 | 18.46 | 50.11 | 16 |
| Mobile Accounts | 175.52 | 158.14 | 8.08 | 435.86 | 10 |
| ***Availability Dimension (D2)*** | | | | | |
| Banks 100K | 0.0245 | 0.0035 | 0.0192 | 0.0307 | 16 |
| Branch 100K | 9.0619 | 0.9585 | 7.670 | 10.41 | 16 |
| Branch 100KM | 14.2598 | 3.2793 | 9.5709 | 19.265 | 16 |
| ATM | 10.453 | 6.5398 | 1.4529 | 20.808 | 16 |
| ATM 100KM | 6.3268 | 3.3773 | 1.1639 | 11.1412 | 16 |
| Mobile Agents | 209.0235 | 119.9044 | 19.5893 | 334.6588 | 10 |
| ***Usage Dimension (D3)*** | | | | | |
| OD | 32.2230 | 2.7908 | 27.9818 | 38.1394 | 16 |
| OL | 20.5440 | 4.3437 | 15.9603 | 28.3231 | 16 |
| Borrowers | 24.7267 | 3.8230 | 16.8924 | 31.3226 | 16 |
| Mobile Money | 7.4160 | 4.6557 | 0.9801 | 16.2624 | 10 |

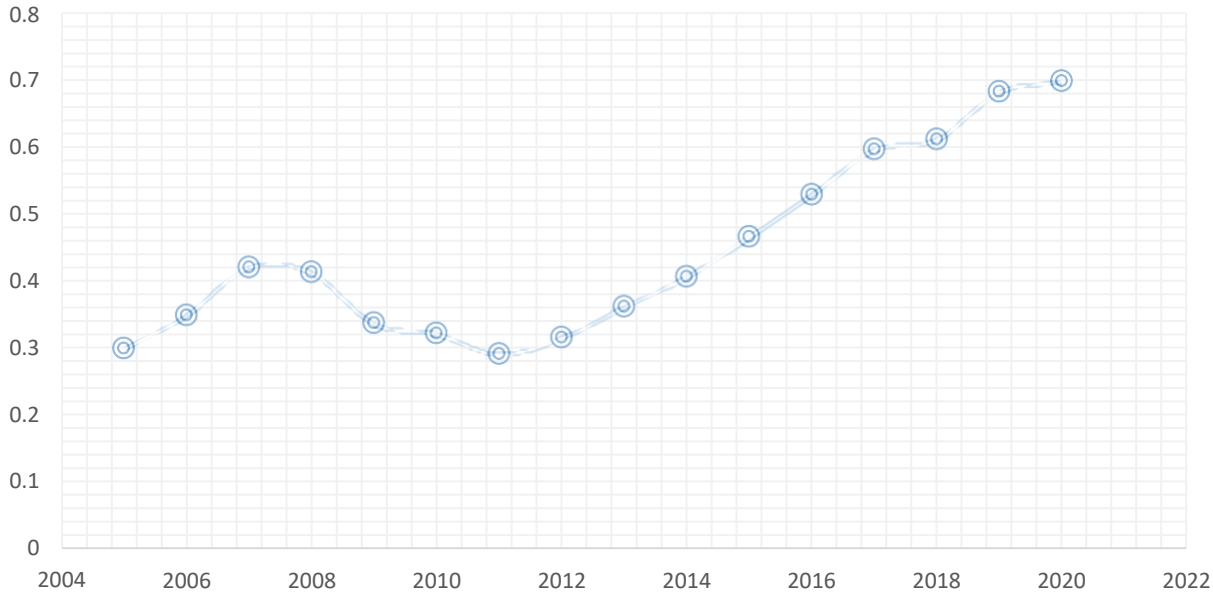
The results of CFII in Table 6 indicates that in Pakistan, the financial inclusion remained relatively low over the sample period. It can be observed that during 2005 and 2006, the financial inclusion in Pakistan was considerably low followed by a brief episode of slightly medium FI in 2007 and 2008. The trend is again reversed in 2009 till 2013 whereby lower FI can be observed. This can be due to the negative effects of the global financial crisis. However, the inclusion efforts seem to bear fruits after 2015 and onwards whereby medium level of financial inclusion can be observed with a consistent increasing trend till the end of the sample period. This persistent effect can be attributed to the NFIS in 2015. Further, significantly higher FI is observed during the years 2018 and onwards. This positive effect can be attributed to the renewed commitment of SBP to inclusion efforts through the revised NFIS in 2018.

***Table 6:*** *Classification of Financial Inclusion into different categories from 2005 to 2020*

| Year | X1 | X2 | CFII | CFII Range | Category |
|---|---|---|---|---|---|
| 2005 | 0.426989 | 0.172550017 | 0.299770 | 0≤CFII≤0.4 | **Low FI** |
| 2006 | 0.470404 | 0.228360288 | 0.349382 | | |
| 2007 | 0.562432 | 0.278639542 | 0.420536 | 0≤CFII≤0.6 | **Medium FI** |
| 2008 | 0.538854 | 0.288227621 | 0.413541 | | |
| 2009 | 0.409608 | 0.265784223 | 0.337696 | 0≤CFII≤0.4 | **Low FI** |
| 2010 | 0.373334 | 0.271268300 | 0.322301 | | |
| 2011 | 0.342971 | 0.240549558 | 0.291760 | | |
| 2012 | 0.349779 | 0.282527785 | 0.316153 | | |
| 2013 | 0.391809 | 0.331978580 | 0.361894 | | |
| 2014 | 0.44231 | 0.370744378 | 0.406527 | 0≤CFII≤0.6 | **Medium FI** |
| 2015 | 0.520158 | 0.411903509 | 0.466031 | | |
| 2016 | 0.589187 | 0.467896098 | 0.528542 | | |
| 2017 | 0.669211 | 0.522807064 | 0.596009 | | |
| 2018 | 0.722809 | 0.499219798 | 0.611014 | 0≤CFII≤1.0 | **High FI** |
| 2019 | 0.781698 | 0.581414296 | 0.681556 | | |
| 2020 | 0.846187 | 0.548963666 | 0.697575 | | |

In addition, the trend of FI over the sample period presented in Figure 14 below. It can be observed that significant and positive upward trend persists from 2011 and onwards which can be due to the introduction of mobile money indicators from 2011 and onwards. This further, highlights the importance of mobile money in expanding the inclusion efforts across the country.

Figure 14: Financial Inclusion over the Years




**Estimation of Lerner Index for Market Power**

The summary statistics for the parameters of Market Power are presented in Table 7 below. We proxy market power through Lerner index estimated through a translog cost function as laid out in the methodology. However, it should be noted that the input and output prices were entered in log form whereas the summary statistics presented herein are in levels for illustrative purposes which are self-explanatory.

***Table 7:*** *Descriptive Statistics for indicators of market power.*

| ***Variables*** | ***TC*** | ***Q*** | ***P*** | ***W1*** | ***W2*** | ***W3*** |
|---|---|---|---|---|---|---|
| ***Mean*** | 33393.6 | 372706.2 | 8.551659 | 1.222412 | 2.061304 | 4.738265 |
| ***Median*** | 19959.49 | 193994.7 | 8.724500 | 1.122842 | 1.05339 | 4.597973 |
| ***Maximum*** | 270459.6 | 2800378 | 21.95600 | 4.283602 | 80.17389 | 9.71691 |
| ***Minimum*** | 178.954 | 1001.444 | 0.017100 | 0.161228 | 0.002642 | 0.162865 |
| ***Std. Dev.*** | 39126.86 | 469523.1 | 1.991554 | 0.526729 | 5.627086 | 1.694598 |
| ***Skewness*** | 2.510825 | 2.36089 | 0.005675 | 2.082744 | 9.939978 | 0.252499 |
| ***Kurtosis*** | 11.64244 | 9.550004 | 9.313614 | 10.83032 | 120.3788 | 2.783325 |

| | | | | | | |
|---|---|---|---|---|---|---|
| ***Jarque-Bera*** | 1561.073* | 1018.715* | 622.8414* | 1229.144* | 221453.1* | 4.71829* |
| ***Observations*** | 375 | 375 | 375 | 375 | 375 | 375 |
| *Whereas the '*' indicates statistical significance at 1% level of significance* | | | | | | |

Similarly, the parameters of the translog cost functions are presented in Table 8 along with their standard errors and t-statistics accordingly. Subsequently, the mean Lerner Index over the sample period are then estimated and presented in Table 9 below.

***Table 8:*** *Estimates of the Translog Cost Function*

| ***Variables*** | ***Coefficient*** | ***Std. Error*** | ***t-statistics*** | ***P. Value*** |
|---|---|---|---|---|
| ***Constant*** | 8.3772 | 0.8059 | 10.3947 | 0.0000 |
| ***ln Q*** | -1.0329 | 0.1585 | -6.5165 | 0.0000 |
| ***ln $w_1$*** | 0.0524 | 0.3863 | 0.1356 | 0.8921 |
| ***ln $w_2$*** | -0.5651 | 0.1608 | -3.5143 | 0.0004 |
| ***ln $w_3$*** | 0.9398 | 0.2159 | 4.3533 | 0.0000 |
| ***1/2 ln $w_1$*ln $w_2$*** | 0.1050 | 0.1166 | 0.9006 | 0.3678 |
| ***1/2 ln $w_1$*ln $w_3$*** | -0.4981 | 0.1574 | -3.1636 | 0.0016 |
| ***1/2 ln $w_2$*ln $w_3$*** | -0.1676 | 0.0514 | -3.2590 | 0.0011 |
| ***1/5 ln $Q^2$*** | 0.1784 | 0.0149 | 12.0051 | 0.0000 |
| ***ln Q*ln $w_1$*** | 0.0518 | 0.0393 | 1.3158 | 0.1882 |
| ***ln Q*ln $w_2$*** | 0.0491 | 0.0153 | 3.2077 | 0.0013 |
| ***ln Q*ln $w_3$*** | -0.0438 | 0.0242 | -1.8111 | 0.0701 |
| ***Trend*** | 0.2919 | 0.0352 | 8.3020 | 0.0000 |
| ***Trend$^2$*** | -0.0025 | 0.0013 | -1.9044 | 0.0569 |
| ***Trend*ln Q*** | -0.0219 | 0.0034 | -6.3556 | 0.0000 |
| ***Trend*ln $w_1$*** | -0.0151 | 0.0104 | -1.4487 | 0.1474 |
| ***Trend*ln $w_2$*** | 0.0020 | 0.0044 | 0.4452 | 0.6561 |
| ***Trend*ln $w_3$*** | 0.0122 | 0.0106 | 1.1526 | 0.2491 |
| ***Adj. $R^2$*** | 0.9640 | | | |

The mean of our Lerner index indicates that very little has changed in Pakistan in terms of market power over the years. The banking industry in Pakistan remained considerably

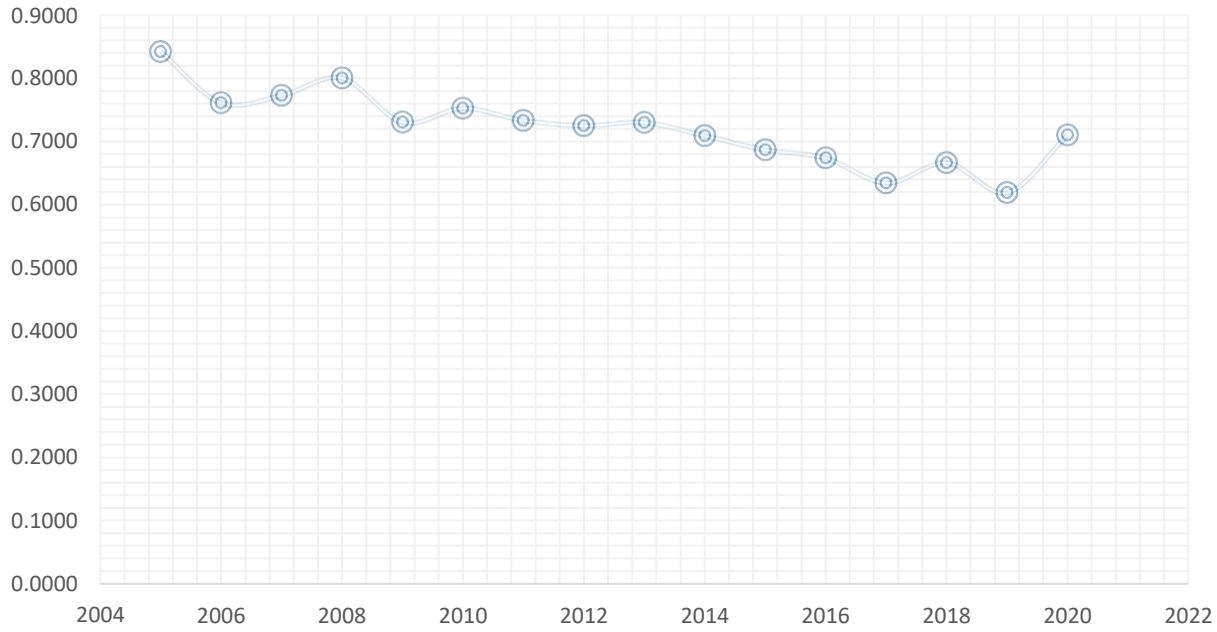
monopolistic over the years as can be inferred from the higher Lerner margins. However, overall a steady negative trend can be observed as indicated in Figure 15 which is a good indication.

***Table 9:*** *Market power over the sample period*

| ***Year*** | ***Mean Lerner Index*** | ***Std. Deviation*** | ***Min*** | ***Max*** |
|---|---|---|---|---|
| 2005 | 0.8415 | 0.1820 | 0.0903 | 0.9171 |
| 2006 | 0.7610 | 0.2472 | 0.0700 | 0.9182 |
| 2007 | 0.7727 | 0.2004 | 0.0469 | 0.9074 |
| 2008 | 0.7999 | 0.0968 | 0.4237 | 0.8875 |
| 2009 | 0.7303 | 0.1836 | 0.0933 | 0.8752 |
| 2010 | 0.753 | 0.1074 | 0.3380 | 0.8750 |
| 2011 | 0.7331 | 0.1491 | 0.0863 | 0.8378 |
| 2012 | 0.7249 | 0.1400 | 0.0922 | 0.8232 |
| 2013 | 0.7299 | 0.0812 | 0.4105 | 0.8147 |
| 2014 | 0.7091 | 0.1395 | 0.0752 | 0.8040 |
| 2015 | 0.6870 | 0.1904 | 0.0796 | 0.8171 |
| 2016 | 0.6740 | 0.1864 | 0.0623 | 0.8129 |
| 2017 | 0.6437 | 0.1616 | 0.0867 | 0.7743 |
| 2018 | 0.6667 | 0.1470 | 0.1268 | 0.8279 |
| 2019 | 0.6197 | 0.1685 | 0.1148 | 0.7736 |
| 2020 | 0.7103 | 0.0839 | 0.3710 | 0.7752 |

However, the significantly higher Lerner margins indicates higher market power and warrants that further competition should be induced to improve the competitive conditions of the banking industry.

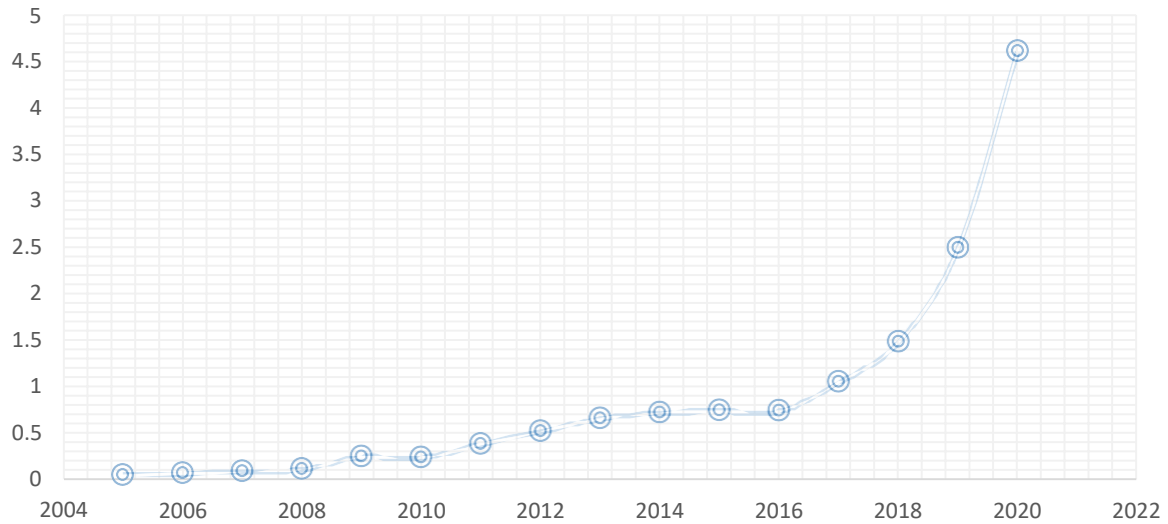
Figure 15: Lerner Index over the Years




**The Evolution of Digital Financial Services**

We proxy Fintech for Pakistan by digital financial services in the country as percent of GDP. The evolution of the same is presented through Figure 16. It can be observed that from a humble beginning in 2005 when internet/mobile banking was introduced in the country for the first time, a steady growth is observed till 2018 whereby the ratio of DFS was almost 1.5% of GDP. However, post 2018, a steep growth in DFS can be observed reaching to 4.6% in 2020. This sharp increase can be attributed to the ongoing pandemic of Covid-19 and the associated nationwide lockdowns whereby digital financial services were preferred. Similarly, a comparative outlook of FI and Fintech is presented in Figure 17 indicating that post 2016, significant improvements in both FI and Fintech can be observed.

Figure 16: DFS as a percentage of GDP over the Years




The evolution of Digital Financial Services over the years.

**Impact of Fintech on Market Power**

We now move towards our main regression models as outlined in the previous chapter. First the Descriptive Statistics for the main regressors are presented in Table 10.

***Table 10:*** *Descriptive Statistics for Main Variables*

| Variables | LERNER | FI | DFS | GDPGR | IR | LEV | LIQ | LS | SIZE | RLAW | NIM |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Mean** | 0.7185 | 0.4502 | 0.9378 | 3.6799 | 11.431 | 0.1117 | 0.3594 | 0.4351 | 5.3437 | -0.8026 | 0.0475 |
| **Median** | 0.7532 | 0.4135 | 0.6638 | 3.9400 | 11.730 | 0.0866 | 0.3756 | 0.4317 | 5.4054 | -0.8046 | 0.0381 |
| **Maximum** | 0.9182 | 0.6976 | 4.6151 | 5.5600 | 14.538 | 0.9907 | 0.8305 | 1.0000 | 6.5619 | -0.6674 | 0.5196 |
| **Minimum** | 0.0469 | 0.2918 | 0.0516 | -0.4700 | 8.2100 | -0.1008 | 0.0524 | 0.0843 | 3.6047 | -0.9687 | -0.0225 |
| **Std. Dev.** | 0.1658 | 0.1349 | 1.1632 | 1.7317 | 2.0464 | 0.0941 | 0.1710 | 0.1133 | 0.5964 | 0.0889 | 0.0578 |
| **Skewness** | -2.4501 | 0.5938 | 2.1562 | -1.0980 | -0.084 | 4.2826 | -0.162 | 0.2636 | -0.405 | -0.0005 | 6.1214 |
| **Kurtosis** | 9.5565 | 1.9408 | 7.0002 | 3.3720 | 1.8218 | 30.9311 | 2.1017 | 3.9498 | 2.6320 | 1.8564 | 43.888 |
| **Jarque-Bera** | 1046.85* | 39.56* | 540.59* | 77.50* | 22.14* | 13336.07* | 14.25* | 18.43* | 12.37* | 20.43* | 28465.4* |

'*' Indicates statistical significance at 1% level

The correlation coefficients are presented in Table 11 indicating negative relationship between FI and Fintech against market power indicating that competitive conditions in the banking sector can be improved by enhancing FI and digital financial services. However, GDP, interest rate, Size and other bank specific variables except leverage are positively related with the Lerner index. Indicating that potential size and economies of scale effect exists for Pakistani banks. The

only control variable found negative is the leverage which again follows the theory and indicates that with increased leverage, banks may lose considerable market power.

***Table 11:*** *Correlations*

| Variables | LERNER | FI | DFS | GDPGR | IR | LEV | LIQ | LS | SIZE | RLaw | NIM |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **LERNER** | 1.000 | | | | | | | | | | |
| **FI** | -0.240 | 1.000 | | | | | | | | | |
| **DFS** | -0.161 | 0.809 | 1.000 | | | | | | | | |
| **GDPGR** | 0.071 | -0.292 | -0.250 | 1.000 | | | | | | | |
| **IR** | 0.107 | -0.544 | -0.218 | -0.391 | 1.000 | | | | | | |
| **LEV** | -0.307 | -0.194 | -0.214 | 0.072 | 0.096 | 1.000 | | | | | |
| **LIQ** | 0.025 | 0.099 | 0.235 | -0.086 | 0.082 | 0.042 | 1.000 | | | | |
| **LS** | 0.133 | -0.124 | -0.196 | -0.116 | 0.053 | -0.164 | -0.352 | 1.000 | | | |
| **SIZE** | 0.236 | 0.372 | 0.349 | -0.103 | -0.163 | -0.476 | 0.061 | -0.113 | 1.000 | | |
| **RLaw** | -0.254 | 0.766 | 0.674 | -0.170 | -0.395 | -0.215 | 0.080 | -0.164 | 0.368 | 1 | |
| **NIM** | -0.332 | -0.130 | -0.087 | 0.003 | 0.131 | 0.054 | -0.008 | -0.022 | -0.064 | -0.093 | 1 |

To find out that whether banks' market power is affected by Fintech, we ran a fixed effects regression model with the results being presented in Table 12. Most of coefficients are found statistically significant except those of GDP and Liquidity. In addition, our coefficients are found to be following the expected sign conventions except those two which are insignificant. It can be observed that Fintech is negatively and significantly affecting banks' market power implying that further increase in digital financial services can considerably lower banks' market power. our findings are in contrast to those of (Ndwiga, 2020) who finds increase in market power positively related to Fintech entry in Kenya. Another important finding is that of interest rate which is found to be significantly and positively affecting market power. Thus, policy makers should be cognizant of the fact when increasing interest rate if competition in the banking sector is on the agenda. Further, bank specific variables such as leverage, and net interest margins are negatively impacting market power while increase in loan share and size are found to be positively affecting the same indicating potential economies of scale effects for Pakistani banks. Finally, the adjusted $R^2$ indicates a 58% explanatory power for our model which is quite reasonable.

| *Table 12: Fixed Effect Regression Results for the effects of Fintech on Market Power* | | | | |
|---|---|---|---|---|
| **Variable** | **Coefficient** | **Std. Error** | **t-Statistic** | **Prob.** |
| **C** | -3.0018 | 0.9777 | -3.0704 | 0.0023 |
| ***ln* DFS** | -0.0686 | 0.0392 | -1.7496 | 0.0812 |
| ***ln* GDPGR** | -0.0191 | 0.0266 | -0.7194 | 0.4724 |
| ***ln* IR** | 0.2745 | 0.1008 | 2.7240 | 0.0068 |
| ***ln* LIQ** | -0.0217 | 0.0264 | -0.8238 | 0.4107 |
| ***ln* LEV** | -0.1811 | 0.0599 | -3.0242 | 0.0027 |
| ***ln* LS** | 0.2286 | 0.0846 | 2.7030 | 0.0072 |
| ***ln* NIM** | -0.0688 | 0.0350 | -1.9671 | 0.0501 |
| **SIZE** | 0.2719 | 0.1647 | 1.6508 | 0.0998 |
| **Adjusted R-squared** | 0.584272 | | | |

**Conditional Models-1: Interaction Effects of FI and Fintech on Market Power**

Interacting FI and Fintech against banks' market power, we find supporting evidence in favor of the inclusion channel for Fintech with negative relationship against market power. The interaction coefficient was found statistically significant, implying that a well-inclusive financial system augmented with Fintech will result in improved competitive conditions among the banking sector. This is an interesting and important finding, strengthening the notion for the need and promise of digital financial revolution to enhance inclusion efforts and improve competitive conditions simultaneously. The rest of the coefficients follow the suite with the previous findings as expected.

| ***Table 13:*** Interaction effects of FI and Fintech on Market Power | | | | |
|---|---|---|---|---|
| **Variable** | **Coefficient** | **Std. Error** | **t-Statistic** | **Prob.** |
| **C** | -0.0358 | 0.3213 | -0.1115 | 0.9113 |
| ***ln* FI*DFS** | -0.0351 | 0.0117 | -2.9911 | 0.0030 |
| ***ln* GDPGR** | -0.0054 | 0.0093 | -0.5751 | 0.5656 |
| ***ln* IR** | 0.0688 | 0.0343 | 2.0053 | 0.0458 |
| ***ln* LIQ** | -0.0083 | 0.0091 | -0.9158 | 0.3605 |
| ***ln* LEV** | -0.0615 | 0.0209 | -2.9414 | 0.0035 |
| ***ln* LS** | 0.0853 | 0.0290 | 2.9452 | 0.0035 |
| ***ln* NIM** | -0.0244 | 0.0121 | -2.0124 | 0.0450 |
| **SIZE** | 0.0720 | 0.0566 | 1.2718 | 0.2044 |
| **Adjusted R-squared** | 0.606993 | | | |

**Conditional Models-2: Interaction Effects of FI and GDP on Market Power**

FI is dubbed to improve economic conditions of developing and under-developed nations across the globe resulting in higher economic growth. We test this phenomenon and interact the FI with GDP growth rate against market power. However, we do not find evidence in favor of the growth channel for FI to affect banks' market in the case of Pakistan. Though the coefficient of the interaction term is found to be negative as expected. However, its statistically insignificant implying that FI coupled with economic activity does not affect market power.

***Table 14:*** Interaction effects of FI and GDP on Market Power

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| **C** | 0.77734 | 0.17187 | 4.52283 | 0.0000 |
| ***ln* FI*GDP** | -0.00143 | 0.01013 | -0.14192 | 0.8872 |
| ***ln* IR** | 0.07551 | 0.03727 | 2.02610 | 0.0436 |
| ***ln* LIQ** | -0.01245 | 0.00912 | -1.36533 | 0.1731 |
| ***ln* LEV** | -0.08555 | 0.01952 | -4.38130 | 0.0000 |
| ***ln* LS** | 0.10678 | 0.02829 | 3.77394 | 0.0002 |
| ***ln* NIM** | -0.01980 | 0.01216 | -1.62788 | 0.1046 |
| **SIZE** | -0.07880 | 0.02600 | -3.02989 | 0.0027 |
| **Adjusted R-squared** | 0.597041 | | | |

**Conditional Models-3: Interaction Effects of Fintech and GDP on Market Power**

We also see for the conditional effect of Fintech through economic activity against market power by interacting digital financial services and GDP growth rate in the presence of control variables. As expected, Fintech coupled with enhanced economic activity may lead to improve competitive conditions in the country. The interaction coefficient is statistically significant and negative implying that increase in digital financial services and GDP growth can lead to a reduction in banks' market power.

***Table 15:*** Interaction effects of Fintech and GDP on Market Power

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| **C** | 0.5103 | 0.2205 | 2.3144 | 0.0213 |
| ***ln* DFS*GDP** | -0.0148 | 0.0079 | -1.8857 | 0.0603 |
| ***ln* IR** | 0.0713 | 0.0333 | 2.1378 | 0.0333 |
| ***ln* LIQ** | -0.0111 | 0.0091 | -1.2174 | 0.2244 |
| ***ln* LEV** | -0.0791 | 0.0197 | -4.0104 | 0.0001 |
| ***ln* LS** | 0.0875 | 0.0293 | 2.9876 | 0.0030 |
| ***ln* NIM** | -0.0199 | 0.0120 | -1.64843 | 0.1003 |

| | | | | |
|---|---|---|---|---|
| **SIZE** | -0.0257 | 0.0382 | -0.6742 | 0.5007 |
| **Adjusted R-squared** | 0.601542 | | | |

**Conditional Models-4: Interaction Effects of FI and Rule of Law on Market Power**

Rule of law plays a crucial role for enhancing FI. The literature suggests that weak rule of law and other regulatory constraints significantly lowers FI in emerging economies (park & Mercado, 2021). Thus, we test for the interaction of rule of law and FI in the case of Pakistan to find that whether increased regulatory quality coupled with inclusion efforts will enhance competitive conditions in the country? However, our findings are insignificant and does not render support to this notion.

***Table 16:*** Interaction effects of FI and Rule of Law on Market Power

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| **C** | 0.71581 | 0.21123 | 3.3886 | 0.0008 |
| ***ln* FI*RLaw** | -0.12330 | 0.13185 | -0.9351 | 0.3504 |
| ***ln* IR** | 0.12076 | 0.05019 | 2.4058 | 0.0167 |
| ***ln* LIQ** | -0.00953 | 0.00961 | -0.9919 | 0.3219 |
| ***ln* LEV** | -0.08525 | 0.02072 | -4.1145 | 0.0000 |
| ***ln* LS** | 0.13259 | 0.02889 | 4.58856 | 0.0000 |
| ***ln* NIM** | -0.01563 | 0.01274 | -1.22609 | 0.2210 |
| **SIZE** | -0.09728 | 0.03065 | -3.1739 | 0.0016 |
| **GDPGR** | 0.01135 | 0.00473 | 2.39694 | 0.0171 |
| **Adjusted R-squared** | 0.544105 | | | |

**Conditional Models-5: Interaction Effects of Fintech and Rule of Law on Market Power**

Similarly, we also interact rule of with Fintech assuming that supporting regulatory environment for Fintech may result in improved competitive conditions in the banking sector. Our findings support this notion and suggest that increase in digital financial services coupled with supporting regulatory environment significantly leads to a decrease in market power for Pakistani banks.

***Table 17:*** Interaction Effects: Fintech and Rule of Law on Market Power

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| **C** | 0.93420 | 0.22010 | 4.24433 | 0.0000 |
| ***ln* DFS*RLaw** | -0.01963 | 0.01119 | -1.75446 | 0.0803 |

| | | | | |
|---|---|---|---|---|
| ***ln* IR** | 0.09285 | 0.03951 | 2.34970 | 0.0194 |
| ***ln* LIQ** | -0.01383 | 0.00995 | -1.38976 | 0.1655 |
| ***ln* LEV** | -0.08589 | 0.02039 | -4.21172 | 0.0000 |
| ***ln* LS** | 0.13733 | 0.02893 | 4.74621 | 0.0000 |
| ***ln* NIM** | -0.01541 | 0.01267 | -1.21600 | 0.2248 |
| **SIZE** | -0.11913 | 0.03374 | -3.53094 | 0.0005 |
| **GDPGR** | 0.00981 | 0.00410 | 2.39303 | 0.0173 |
| **Adjusted R-squared** | 0.547067 | | | |

**Impact of Fintech on Financial Inclusion in Pakistan**

Contemporary literature declares Fintech a key driver for financial inclusion for achieving balanced development under the auspices of UN's SDGs (Arner et al., 2020). Thus, we hypothesize that increase in digital financial services can significantly enhance financial inclusion efforts in the case of Pakistan and test the above in the presence of banks' market power. The results are presented in Table 16 and suggests that Fintech is significantly and positively impacting the inclusion efforts in the country. However, the market power is found to be statistically insignificant suggesting that banks' market power does not influence FI.

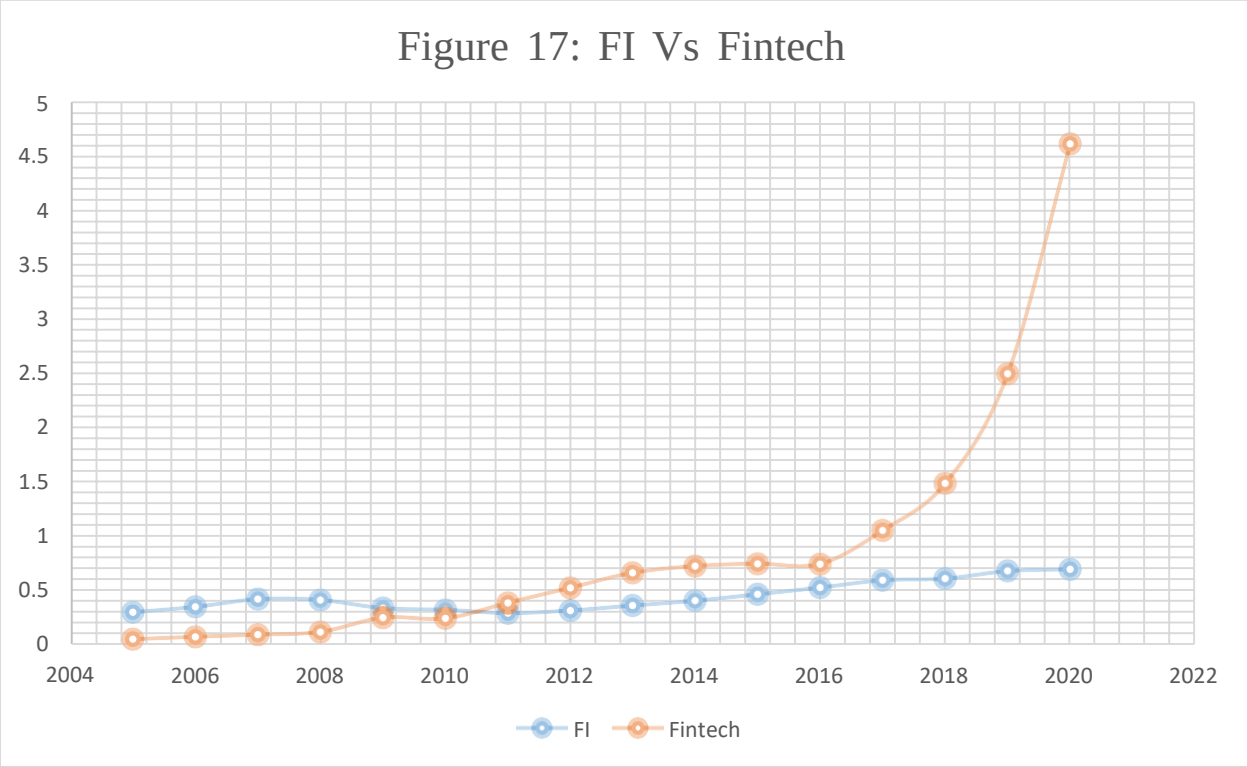
***Table 18:*** Impact of Fintech on FI

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| **C** | -0.720388 | 0.017176 | -41.94139 | 0.0000 |
| ***ln* DFS** | 0.176944 | 0.008495 | 20.82825 | 0.0000 |
| ***ln* LERNER** | -0.022633 | 0.030631 | -0.738884 | 0.4605 |
| **Adj. R-squared** | 0.537 | | | |

However, a cursory look at the Figure 17 and judging by the behavior of Fintech against FI reveals that the relationship between the two may not be linear. Thus, we allow for non-linearity by including a squared term for Fintech under a dynamic panel setting with the results being reported in Table 17. It can be observed that the squared term is significantly positive against FI along with a negative and significant coefficient of market power suggesting that the relationship is essentially non-linear. It can be inferred that increase in digital financial services is essentially important for enhancing financial inclusion efforts. At the same time, the presence of market power in the banking sector can be a potential hurdle against FI. Thus, improving competitive conditions

of the banking industry is advised to boost inclusion efforts through Fintech initiatives. This line of reasoning is consistent with that of (Wang et al., 2021).

| ***Table 19:*** Impact of Fintech on FI: Non-Linear Specs | | | | |
|---|---|---|---|---|
| **Variable** | **Coefficient** | **Std. Error** | **t-Statistic** | **Prob.** |
| **C** | -0.104237 | 0.032011 | -3.256252 | 0.0012 |
| ***ln* FI$_{-1}$** | 0.826327 | 0.035651 | 23.17841 | 0.0000 |
| ***ln* DFS** | 0.061187 | 0.011286 | 5.421468 | 0.0000 |
| ***ln* DFS$^2$** | 0.020334 | 0.004321 | 4.706083 | 0.0000 |
| ***ln* LERNER** | -0.035963 | 0.019144 | -1.87855 | 0.0612 |
| **Adjusted R-squared** | 0.873 | | | |




Comparative outlook of FI and Fintech over the sample period

**Pre and Post Fintech Analysis**

Finally, to uncover the impact of Fintech entrance on the market power of Pakistani banks, we conduct a pre and post Fintech entry analysis. This could be evidence that whether Fintech entrance improved competition among the banking industry or not? For this purpose, the pre-Fintech period is selected to be from 2005 to 2011 while the post-Fintech period is from 2012 to

2020. We identify 2011 as the breakpoint to identify the pre and post Fintech eras accordingly. This is substantiated by finding significant structural breaks in the data during this period (Table 18). This can be further attributed and alluded to the fact that globally Fintech related developments such as mobile money etc. are mainly reported through 2011 and onwards. In addition, a clear overlap can be observed between inclusion efforts and digital financial services in the country during 2011 through Figure 17. We perform the pre and post analysis by equality of means test for the means of Lerner index over the two time periods as presented below in Table 20. In addition, the descriptive statistics for the same are presented in Table 19 along with a graphical comparison of the means of Lerner index in the two time periods in Figure 18 for illustrative and comparative purposes. A cursory look at the Figure 18 and Table 21 indicates a considerable difference in the means of Lerner index in pre and post time periods whereby the mean of post Fintech market power is considerably lower than the pre-Fintech entrance. The statistical significance of the same can also be confirmed by the equality of means tests presented in Table 22 indicating that the means of the tow time periods are significantly different. These findings are in line with (Ndwiga, 2020) suggesting that Fintech entry has significantly resulted in lowering the market power of banks resulting in relatively and significantly higher competitive conditions in post Fintech period.

| ***Table 20:*** Break Point Test for Mean Lerner Index | | | |
|---|---|---|---|
| **Chow Breakpoint Test: 2011** | | | |
| **Null Hypothesis: No breaks at specified breakpoints** | | | |
| **Equation Sample: 2005 2020** | | | |
| **F-statistic** | 18.2165 | Prob. F(1,14) | 0.0008 |
| **Log likelihood ratio** | 13.33474 | Prob. Chi-Square(1) | 0.0003 |
| **Wald Statistic** | 18.2165 | Prob. Chi-Square(1) | 0.0000 |

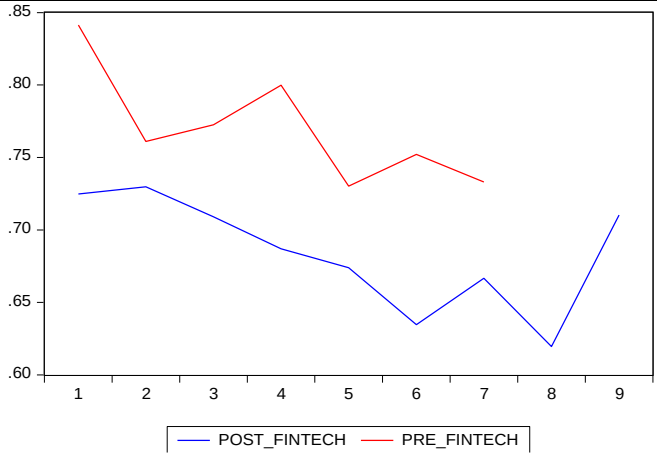



Figure 18: Market Power Pre and Post Fintech Entry

| ***Table 21:*** Market Power: Pre and Post Fintech | | |
|---|---|---|
| | **PRE_FINTECH** | **POST_FINTECH** |
| **Mean** | 0.770123 | 0.684036 |
| **Median** | 0.761048 | 0.686995 |
| **Maximum** | 0.841458 | 0.729858 |
| **Minimum** | 0.730337 | 0.61967 |
| **Std. Dev.** | 0.03944 | 0.038854 |
| **Skewness** | 0.790568 | -0.439187 |
| **Kurtosis** | 2.504396 | 1.928822 |
| **Jarque-Bera** | 0.800804 | 0.719611 |

| ***Table 22:*** Test for Equality of Means Between Pre and Post Fintech Eras for Market Power | | | |
|---|---|---|---|
| **Method** | **df** | **Value** | **Probability** |
| **t-test** | 14 | -4.368191 | 0.0006 |
| **Satterthwaite-Welch t-test*** | 12.94479 | -4.359431 | 0.0008 |
| **ANOVA F-test** | (1, 14) | 19.08109 | 0.0006 |
| **Welch F-test*** | (1, 12.9448) | 19.00464 | 0.0008 |
| *Test allows for unequal cell variances | | | |

# 5. Conclusion and Recommendations

The economy-wide implications of Fintech and Financial Inclusion are undoubtedly irrefutable. On the one hand, Fintech related advancements are poised to enhance the reach and accessibility of financial services to underserved segments of the society; while, on the other hand, it potentially poses dual challenges for the policy makers and market participants in terms of alterations in market structure and regulatory requirements. Thus, in this paper, we examine the impact of Fintech entry on financial inclusion and banking competition along with introducing certain conditionalities and non-linearity for the first time in the case of Pakistan. Further, we look for the potential transmission channels for Fintech to affect inclusion and market structure for the first time. In addition, we also look for a pre and post Fintech entry effect on Market Power of banks. Our empirical analysis reveals several conclusions and can be summarized as follows:

1. We develop a comprehensive and multidimensional index of FI for Pakistan with broader dimensional depth and more indicators for a relatively extensive sample. Our findings reveal that the country has recorded significant improvement in terms of inclusion efforts. The composite index indicates that the country witnessed episodes of low and medium inclusion from 2005 till 2018. However, post 2018 we observe a significantly positive trend and witness a relatively high trend of financial inclusion in the country.
2. Similarly, we developed a Lerner index to measure market power of banks through a stochastic frontier approach by setting up a translog cost function for 25 commercial banks in Pakistan over the period of 2005 to 2020. Our findings suggest the persistence of monopolistic tendencies across the sample period whereby most of the banks enjoy higher Lerner margins indicative of higher market power.
3. To capture the extent of Fintech, we also developed a unique proxy to measure the level of digital financial services in the country. We do so by estimating internet and mobile banking as a ratio of GDP in percentage terms. Our findings suggest that the growth in digital financial services was highly sluggish during 2005 till 2015. However, from 2016 and onwards a drastic increase is observed, courtesy of central bank's measures post NFIS in 2015.
4. Moving forward with our main regression estimations to uncover the impact of Fintech on market power, we find that digital financial services significantly reduce banks' market power.

This has serious and important implications for banks and policy makers. The policy makers can improve competitive conditions in the banking industry by promoting digital financial channels. Whereas the banks should be cognizant of the fact that Fintech channels can be of significant competition to regular banking operations. Further, we also find that increase in interest rate results in higher market power. This can be corroborated with the fact that historically the interest rate spreads, and margins relatively remained higher in Pakistan. In addition, we also observe evidence in favor of economies of scale whereby large banks are expected to be enjoying relatively higher market power.

5. Our conditional models where we interact FI with Fintech against market power significantly reduces market power. This is indicative of the inclusion channel of Fintech that a well-inclusive financial system augmented with Fintech will result in improved competitive conditions. This is an interesting and important finding, strengthening the notion for the need and promise of digital financial revolution to enhance inclusion efforts and improve competitive conditions simultaneously.
6. However, we do not find any supporting evidence in favor of the growth channel for FI to affect banks' market power. Suggesting that enhanced economic activity may be shielding banks from the positive externalities of inclusion in terms of competition.
7. In contrast, the growth channel for Fintech was found to be significantly affecting market power suggesting that Fintech coupled with enhanced economic activity may lead to improved competitive conditions in the banking industry.
8. By interacting FI with the rule of law, we find no evidence in favor of regulatory quality and inclusion efforts in enhancing the competitive conditions of the banking industry. This is in contrast to the conventional wisdom and belief. However, it does suggest that access to financial services is a basic necessity and should be treated as such.
9. In contrast, we find that a supportive and quality regulatory environment for Fintech may result in improved competitive conditions in the banking sector. Our findings support this notion and suggest that increase in digital financial services coupled with supportive regulatory environment significantly leads to a decrease in market power.
10. Further, we find that Fintech is significantly and positively impacting the inclusion efforts in the country as expected. This should be further encouraged and enhanced to reap the positive benefits of the same as evidenced from the various aforementioned transmission channels.

11. We also check for the associated nonlinearity between FI and Fintech owing to the nonlinear nature of the two. Our findings suggest that the relationship is essentially nonlinear and indicates that digital financial services are essentially important for improving inclusion efforts in the country. The diffusion of further digital financial services is expected to enhance inclusion significantly and positively.
12. Finally, we also look for a pre and post Fintech entry analysis of banks' market power and find that the market power is significantly lower in the post Fintech era. This implies that Fintech channels are essential for improving competitive conditions in the country.

**Policy Implications**

Financial Inclusion is a key enabler of economic development. It has also been featured as a goal in United Nation's sustainable development goals (SDGs). It has been noted that digital finance can impact financial inclusion; thus, Fintech may play an important role. Digital finance is revolutionizing the banking industry of Pakistan especially with the launch of National Payment Strategy of Pakistan (NPSS) by State Bank of Pakistan in 2019. Further, during COVID pandemic, there has been an increase in transaction volumes of Fintech on the supply and demand sides. However, it is important to develop a Fintech ecosystem in Pakistan. A lot has been done on the payment side such as PRISM and RAAST and implementing regulatory framework for electronic money institutions. In this way, the payments segment is most likely to see enhanced activity in the near future, followed by the infrastructure segment. The lending segment has still to witness a rise in interest by Fintech. It is recommended to developing digitalize lending mechanisms for individuals and businesses. It may also need to develop Digital Credit Scoring models at banks level which can help to allow instantaneous lending approvals and can increase the disbursements processes.

Above all, it is also important to create awareness among the masses about the usage of initiatives taken on improving financial inclusion and digital finance access in Pakistan. Still a majority is not aware about technological measures taken by government and SBP. Though RAAST has been promoted through electronic media, the total numbers availing services is still low. Further, with the emergence of electronic money institutions, it is also important to provide incentives such as taxation relief, fee waiver on digital transactions. Additionally, it is also

important to strengthen the cyber security of using banking in general and Fintech particular. With the emerging scams daily, such initiatives lose the confidence and interest of people at large. It is recommended to strengthen the cyber security of using digital financial transactions.

**Enabling interventions by Regulators and Policy Makers**

1. We recommend incentives to banks to invest in developing their in-house Fintech capacities in tandem with FI aiming at financial consolidation which will ultimately benefit the banks. In the current, banks are acting against regulatory push only. Previously banks have been sluggish to innovate on the digital front, given the complexity of their businesses and strict regulatory and compliance environment. However, entrance of non-banking entities such as Fintechs providing digital financial solutions has affected the monopolistic power of banks. In addition, a common misconception is that both channels are targeting a different market segments and operating at a different level given our demographic, social dynamics and financial needs across rural and urban landscapes. And thus, financial institutions are largely believed to be safe from these Fintech ventures. However, the monopoly of banks in the financial arena—particularly on the debt market can be broken and it's just a matter of time that someone pulls the right strings at the right time[7].
2. We recommend that any digitization effort should come with lesser intermediation costs so that it should benefit the customers. As cash has zero cost, thus any digitalization effort and mechanisms as such should be at least competitive with cash. This will not only bring unbanked and underserved segments of the society under formal umbrella but will also help in reducing dependence on cash in circulation.

[7] For instance, and as a use case; take the potential of RAAST for example: SBP has integrated RAAST with the National Savings recently. As a next step, imagine if RAAST enables people to directly participate in auctions and buy government's debt. This will not bring down the cost of borrowing for the government but will also affect banks' market power. The effect would be huge as every cell number can be linked to an account through RAAST at zero cost. In addition, depositors will get much higher returns than what banks can ever offer. In this way, retail deposits become less sticky for the banks as RAAST allows customers to easily switch between accounts. Imagine if your account can also be linked to an IPS account—the first barrier is crossed and the potential is now limitless. It's theoretically plausible as the technology and infrastructure is now already there. It would be really difficult for banks to survive or they would simply become 'post offices if they do not evolve along for reasons being that RAAST would connect customers and Fintechs just by integrating and building onto it instead of developing a separate system for each bank.

3. Securities and Exchange commission of Pakistan also needs to simplify the regulatory sandboxing to incentivize Fintech startups in Pakistan. This will open avenue for regulated ventures and crowdfunding options.
4. Scope economies benefiting overall economy. In this way, a national policy is needed to broaden DFS access to rural underserved areas as well as unbanked areas. Associated with this, a policy on protection against identity theft and misuse is also needed. In addition, a framework to tackle unlawful cyber financial activities is also the need of the day among others.

**Limitations**

This research is based on data obtained from annual accounts of banks due to not having any specific index available from the regulatory bodies. It has mostly relied either on World Bank indices or self-developed indices. Further, the study relied on supply-side (banks) information only; demand-side data has not been considered.

Since Fintech industry/market is not well-established and well-regulated in Pakistan, thus, we relied upon a conventional proxy of DFS which should be contextually interpreted with caution. With the availability of appropriated measures and the emergence of more Fintechs and improved regulations from SECP, formal data could be available for future researches.

**Future Research**

Future researchers may focus on developing separate financial inclusion index including Electronic Money institutions as many of EMIs are being issued licenses in order to increase the usage and outreach of DFS. Further market power of microfinance banks and institutions may also be checked separately in pre and post digital finance era which could be an interesting continuation of the same. In addition, it would be a significant continuation to segregate FI on provincial levels—even district levels to pin point areas of neglect and to plan need based interventions accordingly. Furthermore, it is also important to conduct an impact study on the profitability of banking sector due to increase in DFS as many of the services such as RAAST are being launched free of cost. Previously interbank fund transfer was one of the charged service of banks. Central Bank has launched Challenge Fund (e.g. Challenge Fund for SMEs) and specific refinance (SME Asaan Finance Scheme) scheme to improve the innovations in banking products. Future studies

may conduct quantitative impact of such initiatives to enhance the digital outreach and share of financing.

**Epilogue: Fintech and Financial Inclusion beyond banking and the promise of e-commerce**

As post-Script; we have recently witnessed a promising boom in the e-commerce which may push the boundaries of fintech beyond banking and may result in more financial inclusion. The global pandemic of COVID-19 has exacerbated this manifold and resulted in an exceptional improvement in the process of financial digitization. Hence it has emerged as a game changer for financial inclusion. As discussed by Alnasery, Ibrahim and Ahmed (2022), a massive increase has been seen particularly in ecommerce industry during pandemic especially during social distancing and quarantine instructions. It is discussed that ability to use ecommerce system has allowed the world to avoid face to face interactions and get better direct financial resources where they are most useful.

E-commerce is trending at domestic retail ecosystems across the world. The new digital and affordable financial transaction options by web-based platforms including internet, mobile, branchless, e-commerce has become an important driver to use digital financial services. Since e-commerce is flourishing and continues to develop, however, its success in creating demand for micro business and low income-based economy is not encouraging. Hence, it is the right time for policymakers to create an enabling environment for innovative e-commerce solutions. This will support to enhance financial inclusion by promoting access and use of digital financial services amongst the masses. In this regard, the Foundation for Development Corporation (FDC) Australia has developed a number of recommendations in creating new opportunities for financial inclusion at the base of the economy through e-commerce. These recommendations include to support the establishment and development of e-commerce models as per the needs of micro-enterprises, to support the transition from cash towards digital mechanisms for e-commerce platforms, to drive demand and support the onboarding of micro-merchants onto formal e-commerce platforms and to support the empowerment of women through e-commerce (Taylor, 2020).

Similarly, Asian Development Bank reports that, e-commerce has catalyzed the transition from conventional to a digital economy leading to enhanced economic growth in many Asian

economies. Further, the utilization of digital financial modes of payments has enhanced financial inclusion and also resulted in decreased transaction costs. Estimates suggests, the credit card usage has been increased and has added $296 billion from 2011 to 2015 in consumption. Around 2.6 million jobs are also being created. The digitization of payment systems has led to a surge in financial inclusion and wider access to digital payment options. However, a payment infrastructure is crucial for e-commerce transactions that involve online bank transfers, debit and credit cards and electronic wallets. The increasing demand for e-commerce also requires greater financial inclusion, ideally surpassing the growth in bank account penetration that economies have achieved in the past decade (Asian Development Bank, 2022). In this way, as a caveat, an interesting observation is recently made by Wenninger (2000) who reviewed the banking sector's response to online businesses and commerce. He discussed that in previous years, banks' engagement with internet services was limited. However, many banks have started to utilize the internet services as a supplementary service to sell the conventional products digitally. However, it has made banks to face new operational and strategic risks.

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