Investigating the Effect of Digitalization in Financial Inclusion on the Financial Performance of Deposit Banks in Türkiye

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Finansal Tabana Yayılmadaki Dijitalleşmenin Türkiye'deki Mevduat Bankalarının Finansal Performansları Üzerine Etkisinin Araştırılması

Abstract

This study investigates the impact of digitalisation in financial inclusion on the financial performance of deposit banks operating in Türkiye between 2010 and 2021. The study's dependent variables are the financial performance indicators, namely the return on assets (ROA) and return on equity (ROE). The number of ATMs and data related to Internet banking are explanatory variables, while asset size, equity ratio, and economic growth are control variables. The analyses conducted using the Two-Step System GMM method reveal that the lagged values of profitability indicators, the number of internet banking customers, financial transactions made through internet banking, equity ratio, asset size, and economic growth have a positive effect on profitability, while the number of ATMs has a negative impact.

Keywords : Financial Inclusion, Digitalization, Internet Banking, Profitability.

JEL Classification Codes : C23, G21, L25.

Öz

Bu çalışmanın amacı, 2010-2021 döneminde finansal tabana yayılmadaki dijitalleşmenin Türkiye'de faaliyet gösteren mevduat bankalarının finansal performansları üzerindeki etkisinin araştırılmasıdır. Çalışmanın bağımlı değişkenleri; finansal performans göstergeleri olarak aktif kârlılık oranı (ROA) ve özsermaye kârlılık oranı (ROE)'dir. ATM sayısı ile internet bankacılığına ilişkin veriler açıklayıcı değişkenler olup aktif büyüklüğü, özsermaye oranı ve ekonomik büyüme ise kontrol değişkenleridir. İki Aşamalı Sistem GMM yöntemi ile yapılan analizler neticesinde; kârlılık göstergelerinin gecikmeli değerleri, internet bankacılığı müşteri sayısı, internet bankacılığı ile yapılan finansal işlemler, özsermaye oranı, aktif büyüklüğü ve ekonomik büyümenin kârlılık üzerinde pozitif, ATM sayısının ise negatif etkili olduğu tespit edilmiştir.

Anahtar Sözcükler : Finansal Tabana Yayılma, Dijitalleşme, İnternet Bankacılığı, Kârlılık.

1. Introduction

Financial Inclusion (hereinafter FI) has gained notable prominence recently due to its pivotal role in fostering inclusive economic growth and driving progress within the financial sector. Furthermore, it constitutes a crucial component of the emerging development paradigm and is deemed indispensable in surmounting stagnation within the capitalist system (Abuk-Duygulu & Özyiğit, 2022). The emerging development paradigm hinges on eliminating obstacles to financial access, aiming to mitigate inequality, and is fundamentally underpinned by FI. In the aftermath of the global financial crisis of 2008, FI has taken on a central role in the public policy agenda. Particularly in emerging economies, there is a growing urgency among lawmakers, policymakers, and regulators to establish a financial system that ensures universal access to financial products and services for all adults. This system should enable individuals to address their financing requirements and facilitate investments through various financial instruments (Gündüz & Özyıldırım, 2020). According to data from the World Bank, as of 2021, it has been determined that around 1.4 billion people, constituting 24% of the global adult population, lack access to financial services through an account with any financial institution.FI is perceived to mitigate income inequality, alleviate poverty, boost savings, shape investment choices, and improve comprehensive economic well-being, as it involves integrating more individuals and businesses into the financial system.

Banks play a crucial role in promoting economic growth by offering essential financial services to individuals and businesses alike. Developments in telecommunications and information technology significantly affect banks. Information technologies have become a strategic tool in today's banking sector. The advancement of information technologies in the banking sector primarily focuses on enhancing customer service delivery, expanding market share, innovating high-quality or cost-effective products, and improving employee productivity more so than other factors (Thankgod et al., 2019). Technological progress has empowered banks to swiftly and seamlessly access novel products and services, thus broadening their customer reach. Moreover, the surge in electronic transactions has ushered in numerous benefits for banks, notably in profitability, efficiency, and efficacy (Arslan & Yavuzaslan, 2019). Increased digitisation through the Internet and mobile banking has been vital to financial development and FI (Kouladoum et al., 2022).

In short, FI, defined as the degree to which individuals benefit from financial services (Sukumaran, 2015), is an initiative to achieve inclusive growth of society by providing financing to the deprived segment of the population. One of the critical driving factors of the economic development of developing countries is an inclusive financial system (Gündüz & Özyıldırım, 2020). Undoubtedly, banks are among the most critical actors in the financial system. In this context, the impact of banks' investments in FI-enhancing innovations (primarily digital) on their financial performance is important for developing countries such as Türkiye. When the literature on the concept of FI is examined, it is seen that studies with widespread findings that it reduces income inequality (Brune et al., 2011; Honohan, 2007;

Kim, 2016) are included. When a more comprehensive review is carried out, that greater access to finance increases savings (Allen et al., 2016), reduces poverty (Park & Mercado, 2015; Bruhn & Love, 2014; Burgess & Pande, 2005); increases employment (Prasad, 2010); and finally, it is seen in the findings of the studies in the literature that it encourages the establishment of new companies (Guiso et al., 2004). Recent research shows that greater access has both social and economic benefits. While the literature generally provides evidence of the positive role of FI in promoting household welfare and economic growth, little attention has been devoted to investigating whether such a development goal has consequences for the soundness of banks. Studies, which can be described as few, implicitly reveal that FI affects banks' soundness or risk level.

Banks use innovations as influential strategic variables to leave behind all kinds of competition in financial services. Technology-based products can offer opportunities to have significant cost advantages, increase profitability and provide lower risks compared to traditional banking products (Akhisar et al., 2015). This issue allows banks to improve their financial performance by maintaining their effectiveness in the market (Chauhan et al., 2022a; Chauhan et al., 2022b; Batiz-Lazo & Woldesenbet, 2006). Turkish banks, which use innovative products that emerge in parallel with the technological developments in the world, are also rapidly digitalising (Ulusoy & Demirel, 2022). Considering that digitalisation increases FI, its effect on the profitability of deposit banks in Türkiye is deemed worth investigating. Therefore, the study examines whether digitalization-based financial inclusion indicators impact deposit banks' financial performance in Türkiye. In the study, the effects of selected traditional and digital FI indicators in Türkiye on the financial performance of banks between 2010 and 2021 are investigated with the Two-Step System GMM method. Within the scope of the study, after this section, there is a conceptual framework section where the concept of FI and its importance are mentioned. Then, a literature review section includes the findings of national and international studies addressing the effects of digital and electronic opportunities offered by FI and banks to their customers on their financial performance. Finally, information and analysis findings regarding the analysis carried out within the scope of the study are shown. The study was concluded by presenting the conclusions and recommendations for policymakers and researchers.

2. Conceptual Framework: Financial Inclusion and Digitalization

The term FI is seen to have been first introduced in a report published by the United Nations in 2005 (Zhu et al., 2016: 181). In the report above, the concept is characterised as the sustainable delivery of cost-effective financial services to integrate underprivileged individuals into the formal economy (United Nations). The World Bank, on the other hand, defines it as "the ability of individuals and businesses to have access to and use convenient and affordable financial products and services for their payments, savings, and credit needs" (World Bank).

According to the 2019 Financial Stability Report published by the Central Bank of the Republic of Türkiye (CBRT), FI is elucidated as encompassing individuals or groups

who, for various reasons, are excluded from the financial system within an economy. The term "financial exclusion" describes individuals who lack a bank account and, in essence, do not possess any financial presence or footprint. The widespread use of online banking, phone banking, and increased and diversified transactions through ATMs pushes individuals accustomed to handling cash transactions, who do not trust technology, seek wet signatures after transactions, and prefer face-to-face transactions towards financial exclusion (Bozkurt, 2019). This issue, referred to as financial exclusion, is a pervasive challenge observed in advanced and emerging economies.

It signifies individuals' inability to access financial products and services tailored to their needs, such as bank accounts, credit, savings, and insurance (Temizel, 2015). In the broadest sense, those who do not have another account are considered financially excluded. The belief that the widespread financial exclusion was one of the triggering factors for the 2008 global financial crisis has pointed to the need for more attention to the FI on a worldwide scale (Zor & Yılmaz-Küçük, 2020: 1781). Due to the recognition of financial exclusion as a significant obstacle to global development, governments have prioritised expanding banking services to ensure FI (Demirgüç-Kunt et al., 2015).

The official World Bank website states, "*FI is a key facilitator for reducing poverty and increasing welfare*". FI is a pivotal cornerstone of the United Nations' 2030 Sustainable Development Goals agenda. Additionally, FI helps increase economic growth, fight poverty, and reduce income disparities between countries (World Bank, 2007). Individuals gain access to payment instruments, payment of bills and taxes, investment transactions (securities trading), etc., through accounts opened with banks and intermediary institutions and internet-based applications. FI encompasses these very opportunities. It strives to integrate the unbanked[1] population, those who remain beyond the reach of banking services, incorporating them into the formal financial system, providing access to a wide range of services such as savings, loans, payment options, insurance, and retirement plans (Hannig & Jansen, 2010). Banks are broadening their core economic activities through financial innovation. This expansion significantly contributes to increasing FI, serving as a vital driver of economic growth, particularly in international financial transactions (Olalere et al., 2021).

In recent years, innovations spurred by technological advancements have accelerated the pace of FI. According to a World Bank report, innovations such as mobile banking services have been highly beneficial, especially in countries with low per capita income. These innovations have rendered financial services more readily available and cost-efficient for marginalised populations, including low-income individuals, women, and those residing in rural areas with restricted physical bank branch Access (Demirgüç-Kunt et al., 2015). It is evident that technological advancements, particularly in information and communication technology, have substantially influenced the banking sector. Thanks to advancing technology, numerous banking transactions can now be easily and quickly performed via the Internet and mobile banking without the need to physically go to bank branches (Yetiz &

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[1]   *Unbanked refers to those who have absolutely no access to banking services.*

Ergin Ünal, 2018). With technology advancing, competition in the banking sector has become more centred around digitalisation. This shift towards digital competition has increased the need for banks to enhance their banking services and products tailored to customer profiles (Ulusoy & Demirel, 2022). Digitalisation, which showcases itself through various technological innovations, particularly in mobile and internet banking, offers not only "general" contributions to FI but also "specific" benefits by reducing the average operational costs and overall physical overheads that banks are exposed to (DeYoung, 2001).

While achieving these goals, digitalisation simultaneously transforms the banking sector, offering significant contributions to fulfilling the fundamental indicators of FI and eliminating the barriers (Yılmaz, 2021). The reduced dependence on physical bank branches due to digital innovations and new financial technologies encourages banks to adopt electronic-based services for their growing customer base. The substantial advancements in accessibility facilitated by digital financial services have led to a remarkable shift. Millions of previously excluded and economically disadvantaged individuals have transitioned from cash-based transactions to official financial services (Lauer & Lyman, 2015). The evolution of cutting-edge financial technology empowers banks to extend their financial services to a broader clientele at a potentially reduced cost. Banks attach great importance to digitalisation and FI due to various advantages, including cost reduction, increased efficiency, profitability, and meeting customer demands and expectations. Furthermore, the factors of customer loss and declining profitability, alongside the advantages created by what is termed 'innovative destruction' in the field of Financial Technology (FinTech), have also increased banks' interest in FI. In anticipation of reaching billions of previously untapped customers, banks and non-banking entities have embarked on providing digital financial services to individuals who have been financially excluded or underserved. They are building on the strategies employed for many years to improve access channels for their existing customer base (Lauer & Lyman, 2015).

FI is better achieved through digital technologies (CAFI, 2018). With the addition of financial institutions from the private sector alongside state-owned institutions in the banking sector, the increased competitive environment, coupled with developments in digital technology, has led to significant changes and transformations. To decrease the percentage of the population lacking access to banking services, banks in developing countries are progressively integrating digital financial services into their operations to improve FI (Chinoda & Kapingura, 2023).

The phenomenon referred to as digital FI is defined "by the excluded and underserved population as digital access and usage of official financial services" (Lauer & Lyman, 2015). By harnessing digital technologies, financial products and services become accessible to all strata of society, thereby amplifying financial FI (PAL, 2020). The primary goal of digital FI is to furnish digital financial services with enduring impacts on the financial performance of banks, especially for the underprivileged, rural, and impoverished segments (Ozili, 2018).On one side, digital FI seamlessly enables individuals residing in rural and distant regions to initiate bank account openings and gain online access to financial services. This

is achieved by amalgamating digital payment technology with the capabilities of mobile phone technology (Liu et al., 2021). In this context, digital FI plays a crucial role in affording individuals who have traditionally been excluded from official financial services the chance to access these services (Izaguirre et al., 2016). Considering the not-so-distant past when accessing financial services was challenging and expensive, it is clear that access costs to financial services have substantially diminished in today's fast-expanding and ever-evolving digital technology landscape. Simultaneously, individual FI has grown, and nations have witnessed accelerated economic development (Menteş, 2019).

FI can generally be measured by the prevalence of the most basic financial institutions and service networks. The following variables are commonly used in the literature for measuring FI (Seven et al., 2020):

- Number of ATMs per 100,000 people
- Number of bank branches per 100,000 people
- Number of POS devices per 100,000 people
- Number of deposit accounts per person
- Per capita credit amount

Undoubtedly, banking is one of the sectors most affected by the rapidly evolving digitalisation trend worldwide. With digitalisation, consumer preferences have changed, and increased competition has led to digitising traditional banking practices and services (Akın, 2020). Consequently, both the customer base and financial inclusiveness of banks have transformed. Seven et al. (2020), in their study evaluating FI by comparing Türkiye and the world, found that Türkiye is better regarding FI than the country average in the same income group. Table 1 shows the change in the banking sector, which is the provider of FI, between 2017 and 2021, with the influence of digitalisation.

Table: 1
Effects of Digitization on the Banking Sector (2017-2021)

Variables	2017	2018	2019	2020	2021
Number of ATMs	45.970	46.590	46.998	46.886	46.214
Number of Employees	193.504	192.313	188.837	186.612	184.505
Number of POS Devices	2.169.471	2.792.176	2.911.909	3.364.699	4.234.614
Amount of Savings Deposits	548,7 Billion TL	636,5 Billion TL	706 Billion TL	791,3 Billion TL	988 Billion TL
Number of Credit Cards	62.453.610	66.304.603	69.825.826	75.697.214	83.791.396
Number of Debit Cards	112.134.456	120.486.669	133.199.632	144.743.198	150.099.166

Source: The Banks Association of Türkiye.

When examining the data in the banking sector, which feels the digitalisation of finance most profoundly, it is observed that the number of employees is decreasing as expected, and there is stable and significant growth in the number of bankcards and credit cards, as if documenting the expansion of the financial base. The decrease in employees and branches and the increase in ATMs and Internet banking indicate a move toward disintermediation in the banking and financial sectors. In other words, as Cairncross (2001) famously put it, we are moving closer to the *death of distances* (Yılmaz, 2021).

3. Literature Review

Due to its relatively recent introduction into the financial literature, empirical research on FI has been limited. The literature, which initially began with the definition of FI (Dev, 2006), continued with attempts to measure FI and identify relevant variables. Over the years, the body of literature has expanded to include research that explores the relationship between FI and a diverse array of economic, social, demographic, geographic, technological, and various other factors (Sarıgül, 2020). One of the most crucial steps towards measuring FI and establishing a database in this regard was taken by the World Bank with the creation of the "Global Financial Inclusion Index-Global Findex" database. In addition, Sarma (2008) developed a "Financial Inclusion Index" based on the lack of an index for measuring FI until that time, contributing it to the literature. Following the measurement of this index, countries' financial inclusiveness began to be measured, and new research and indices emerged. Looking at the sparse empirical literature available, it's evident that studies exploring the impact of banks' financial innovations on their financial performance have yet to yield consistent results. A subset of research indicates an adverse influence of financial innovation on the financial performance of deposit banks, while others posit that innovations bolster financial performance. Some of the literature asserts that no significant relationship exists between the two. Below, we provide a selection of studies investigating the impact of traditional and digital FI on banks' financial performance and stability. We begin with international studies before delving into those centred on Turkish banks. Some studies investigating the effects of digitalisation in FI on banks' financial performance and financial stability are listed below, first on international banks and then on banks in Türkiye.

Digital technologies have proven to widen financial service accessibility for people in rural regions who lack the means to open traditional bank accounts, thereby amplifying individual FI (Anarfo, 2018). Sassi & Goaied (2013) demonstrated that digital technologies significantly affect and enhance an individual's likelihood of participating in financial markets. Ngwengeh et al. (2021) argued that digital banking services not only enhance FI but also increase the profit levels of commercial banks. In their research that explored the link between digital technology and FI within 43 sub-Saharan African nations from 2004 to 2019, Kouladoum et al. (2022) discovered that digital innovations and financial technologies in the banking sector had favourable and noteworthy impacts on FI. Olalere et al. (2021) delved deeply into the consequences of financial innovation and competition on the valuation of firms operating in the banking sectors of Malaysia and Nigeria. Their findings pointed to a favourable impact of financial innovation, encompassing the introduction of novel financial instruments, technologies, institutions, and markets, on the firm value of Malaysian banks during the period spanning from 2009 to 2019. Malhotra and Singh (2010) observed that innovations exerted the slightest influence on bank performance, while Hassan et al. (2013) detected a noteworthy contribution of financial innovation to bank performance. In a research effort focused on assessing the effects of digital payment technologies on the financial performance of banks in Nigeria. Thankgod et al. (2019) deduced that the quantity of ATMs does not impact bank profitability, whereas the amount of point of sale (POS)

devices makes a favourable and substantial contribution to bank profitability. Their recommendation emphasised that banks adeptly provide POS devices and other digital FI products and services with effectiveness, efficiency, and affordability for enhanced profitability.

Úbeda et al. (2023) argued that especially multinational banks are equipped to invest in technological innovations that enhance FI due to their more significant influence, access, and freedom to operate than local banks and because they attract more capital and meet more financing needs (Gopalan & Rajan, 2018). In their research, Akhisar et al. (2015) delved into the impact of electronic-based banking services on the profitability performance of banks. They examined data from 2005 to 2013, encompassing electronic banking services in 23 developed and developing countries. Anticipating that the innovative nature of electronic banking services would substantially influence bank performance, they employed dynamic panel data analysis to scrutinise its effects on ROA and ROE. Their findings revealed a significant correlation between bank profitability and the ratio of the number of branches to the number of ATMs. Ahamed & Mallick (2019), using data from 2600 banks across 86 countries from 2004 to 2012, concluded that increased FI positively impacted overall bank stability. Furthermore, their study indicated that higher degrees of FI were associated with enhanced risk reduction performance.

Kaya (2022) aimed to unravel the connection between FI and financial performance within the banking sector. Kaya developed a comprehensive FI index encompassing various facets for 85 developing nations from 2005 to 2017 to achieve this. Through static panel data analysis, the study unearthed compelling evidence that financial performance metrics, including ROA, ROE, and net profit margin, wielded a favourable influence on FI. Moreover, dynamic panel data analysis revealed an intriguing insight: the augmentation in bank profitability emerged as a catalytic force for FI, particularly in developing nations.

In a parallel investigation, Ashiru et al. (2023) delved into the intricacies of the financial innovation landscape within Nigeria, focusing on the period spanning from 2012 to 2021 and drawing data from 24 deposit banks. Their research explored the interplay between financial innovation and bank financial performance, as gauged by ROA and ROE. The analysis of financial innovation within the banking sector involved variables including mobile and internet banking, as well as the number of POS and ATMs. The outcomes of this study painted a compelling picture: mobile and internet banking emerged as the paramount drivers of financial performance, and the utilisation of ATMs, mobile banking, credit and bank cards, online banking, and agency banking exerted a positive, short-term impact, which evolved into a substantial and enduring influence on the performance of deposit banks in the Nigerian landscape.

A study conducted by Shihadeh et al. (2018) sought to determine whether FI enhanced the performance of banks in Jordan. Their analysis was based on data from 13 commercial banks from 2000 to 2014. Their results indicated a favourable effect of FI on these banks' gross income and ROA. Ikram & Lohdi (2015) also found a favourable

association between FI and the financial performance of banks, this time in the context of Pakistan. Similarly, Oranga & Ondabu (2018) reached a congruent conclusion regarding banks in Kenya. In their study examining the influence of FI on bank profitability in Sub-Saharan Africa, Issaka Jajah et al. (2020) found a positive relationship between FI and bank profitability using data from 1990 to 2017. These results underscore the significance of FI as a substantial driver of bank profitability within the sub-Saharan African region. Khatib et al. (2022) analysed the connection between FI and the performance of banks in Palestine. They utilised dynamic panel analysis on a dataset of 11 banks over nine years (2012-2020) with two econometric models representing profitability indicators. The study's findings indicated that the availability of financial services (such as the number of ATMs and bank branches), the quality of service delivery, and the range of products offered contributed to the enhancement of banks' profitability.

Erülgen et al. (2023) investigated the effects of FI on banks' profitability in the offshore banking sector. They applied GMM dynamic panel data analysis to the data of 19 banks operating in Northern Cyprus from 2007-2020. The research findings unequivocally affirm the presence of a significant and favourable relationship between FI and bank profitability. In a study focusing on the financial stability of banks, Danisman & Tarazi (2020) delved into the impact of FI on the European banking system. The authors found that advancements in FI, primarily through increased account ownership and digital payments, exerted a stabilising influence on the banking sector. They noted that it bolsters the financial system's stability beyond the recognised advantages that FI offers society. Del Gaudio et al. (2021) carried out an investigation employing aggregate data from 28 EU member countries, aiming to evaluate the consequences of technology adoption and diffusion on banking risk and profitability. Their results demonstrated that banks' utilisation of information and communication technologies had a favourable impact on their profitability, as measured by return on assets (ROA), and on their stability, as measured by the Z-Score.

Chinoda & Kapingura (2023) delved into the effects of digital FI on the financial stability of banks in Sub-Saharan Africa during the timeframe spanning from 2004 to 2020. Their research unveiled a significant and positive relationship between digital FI and bank stability, alongside a notable inverse connection with non-performing loans. Le et al. (2019), using data from 31 Asian countries spanning from 2004 to 2016, concluded that increasing FI positively affected banks' financial stability. In another study conducted the same year, Lopez & Winkler (2019) reached similar results using data from 72 countries across various continents.

The literature's insights point towards a relationship between substantial investments in information and communication technologies to enhance FI and elevated productivity growth, holding in developed economies (Oliner & Sichel, 2000) and emerging markets (Sassi & Goaied, 2013). In their investigation, Scott et al. (2017) scrutinised the performance of 29 banks across Europe and the Americas. Their findings revealed that adopting technologies designed to enhance global interbank communication had a beneficial and enduring impact on the banking sector. Kiplangat & Tibbs (2018) conducted a study in

which they identified that financial innovations had a noteworthy influence on the financial performance of commercial banks in Kenya. Moreover, they concluded that EFT (Electronic Funds Transfer) and Internet banking did not substantially impact banks' financial performance. In their study investigating the influence of Internet banking intensity on the profitability of banks, Ghose & Maji (2022) concluded, based on data from 67 commercial banks in India spanning from 2011 to 2020, that the volume and value of Internet banking increased the overall profitability (ROA-ROE) of banks. They interpreted their findings as indicating that banks should focus on expanding their customer base to enhance profitability. Similar results were achieved by Hernando & Nieto (2007) in Spain and Dong et al. (2020) in China. However, in Jordan, Al-Smadi (2011), Mahboub (2018), and Chipeta & Muthinja (2018) in Kenya, contrasting findings were obtained.

Kagan et al. (2005) discovered that Internet banking applications directly affected banks' asset quality, operational profitability, and financial performance. Similarly, studies by Arnoldi & Claeys (2008), Pigni et al. (2002), and Weigelt & Sarkar (2012) concluded that digital innovations and Internet banking made a substantial positive contribution to enhancing competition in the banking sector and improving the performance of banks. Malhotra & Singh (2006; 2009) in India and Sumra et al. (2011) in Pakistan found that electronic banking applications lowered banks' operational expenses and enhanced their profitability. Despite that, it is also seen that Internet banking does not increase profitability at the expected level, as customers in developing countries demand traditional branch-based banking services. Moreover, the lack of electronic banking infrastructure in some developing countries hinders expected cost efficiency and profitability. Al-Samadi & Al-Wabal (2011) argued that the prevalence of traditional banking services in Jordan was due to these factors, while Gutu (2014) in Romania, Alam et al. (2007) in Bangladesh pointed to the high infrastructure costs as reasons for a negative relationship. In a different study, Beck et al. (2016) contended that financial innovations adversely affected the banking sector's performance and risk.

Empirical investigations carried out in diverse nations affirm that the widespread adoption of electronic banking services has led to an upsurge in FI, subsequently bolstering the financial performance of banks. Nonetheless, in less economically developed and developing countries, where there is a lack of adequate technological infrastructure and a prevailing preference for in-branch transactions among individuals, contrary findings have also surfaced. Kahveci & Wolfs (2018) conducted a study to assess the impact of digital banking service channels on the performance of Turkish deposit banks. Their findings indicated that banks primarily invested in digital banking services to maintain competitiveness. Still, these services did not yield any substantial strategic advantage in terms of financial performance or efficiency, given that the banks were already operating efficiently. Onay & Ozsoz (2013) contended that adopting Internet banking in Türkiye, driven by heightened competition, adversely affected profitability and decreased interest income. Gündoğdu & Taşkın (2017) conducted research in Türkiye to explore the relationship between Internet banking, telephone banking, credit card usage, and the profitability of banks, utilising simple regression analysis. Their analysis covered data from

the period spanning from 2006:1 to 2015:2. Their findings indicated that only credit card usage had a significant and positive impact on ROA and ROE.

In a general sense, the findings suggest that introducing Internet banking results in cost reduction, improved operational efficiency, and heightened bank profitability. Erol et al. (2015), in their study investigating the effect of Internet banking on banks' profitability in the light of 2006-2012 data in Türkiye, concluded that the income obtained from Internet banking activities positively affects banks' profitability. Sevim & Özkan (2017) investigated the effects of e-banking services on the financial performance of Turkish banks from 2011 to 2016. Their research unveiled that factors such as the transaction volume of customers using cards, the transaction volume of Internet banking, and the number of point-of-sale (POS) devices had a substantial and positive effect on the financial performance of banks. Korkmazgöz & Ege (2020) established that mobile banking applications in Türkiye influenced the financial performance of banks between 2011 and 2019. Kevser et al. (2022) studied Türkiye, scrutinising the relationship between FI, bank loans, and economic growth for 2010-2020. They found a significant and positive association between loans and FI and economic growth and FI. İslamoğlu & Bayrak (2022) explored the impact of digital banking services on the financial performance of banks using data from banks registered with the Turkish Banks Association. Their findings indicated that digital banking services had a beneficial effect on the financial performance of banks. Both international and national studies consistently support the idea that the utilisation of the Internet and mobile banking positively influences banks' profitability.

Due to current competition and developments in the financial system, banks are researching ways to increase customer accessibility (FI) and profitability to maintain control over their market shares (Ashiru et al., 2023). Based on the understanding that financial technologies increase financial innovation, and financial innovations, in turn, increase FI, fundamental research questions have emerged: "Do banks' financial performance indicators improve depending on the level of financial access they provide to their customers?" and "Does FI have an impact on banks' financial performance similar to the positive impact of digitalisation on FI?". Given the increasing importance of FI, it is observed that it has become a concept of recent interest in Türkiye; similar to the international literature, academic studies mainly focus on its measurement in index form, and its relationship with economic growth, and the FI-profitability relationship has been investigated in a small number of studies. In this study, it was deemed worth investigating whether digitalization-focused FI affects the financial performance of banks. In this context, it aims to contribute to the literature by analysing the data of deposit banks in Türkiye between the 2010-2021 periods with the Two-Stage System GMM, considered one of the most up-to-date and valid dynamic panel data methods.

4. Data & Methodology

Today's banking industry stands out as one of the sectors where digitalisation is advancing fastest and most comprehensively. While the rapid spread of digitalisation causes

an increase in the need for digital financial applications, especially Internet banking and mobile banking, among users, traditional services are gradually losing their attractiveness. Because most bank customers now want to quickly carry out their transactions online or use their mobile devices whenever and wherever they want. These transactions through digital channels can also positively impact banks' profitability. When ATMs first appeared, they became one of the technological elements that significantly reduced the workload of branches and were complementary to branches. However, as digital banking services have become more widespread and diverse in recent years, the role of ATMs in digital banking may be more traditional or limited compared to other digital channels (internet banking, mobile banking, etc.). Therefore, it can be said that ATMs' importance in digital banking has relatively decreased. In addition, new research shows[2] that ATM energy consumption in Türkiye is higher than in a few cities. ATMs also impose different costs on banks. It is also believed that these costs, including installation, maintenance, repair, etc., could negatively impact banks' operational costs and profitability. On this basis, the following hypotheses are tested in this research;

H1: Digitalization in FI positively affects the return on assets of deposit banks.

H2: Digitalization in FI positively affects the return on equity of deposit banks.

H3: Traditional FI negatively affects the return on assets of deposit banks.

H4: Traditional FI negatively affects the return on equity of deposit banks.

To test these hypotheses, the study's dataset consists of annual financial data of deposit banks operating in Türkiye between 2010 and 2021 and selected indicators related to the Turkish economy. The availability of data for the variables used in the analysis determined the starting and ending periods of the study. Banks for which data was not available during the relevant period and banks under the management of the Savings Deposit Insurance Fund (TMSF) were excluded from the sample. Ultimately, the study dataset covers 12 years of data for 19 deposit banks, with 228 observations. Explanations regarding the variables used in the study are provided in Table 2.

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[2] *For details: <https://www.enerjigunlugu.net/atmler-dort-ilden-fazla-elektrik-tuketti-57350h.htm>, 25.05.2023.*

Table: 2
Variables of Study

Codes	Variables	Calculation Methods	Data Sources
ROA	Return on Assets	Net Profit/Average Total Assets (%)	TBB (2010-2021) and Relevant Banks' Activity-Audit Reports
ROE	Return on Equity	Net Profit/Average Equity (%)	TBB (2010-2021) and Relevant Banks' Activity-Audit Reports
LNLOGİN	The Number of Customers Using Internet Banking (Thousands)	The logarithm is the number of customers registered in the system for Internet banking and who have logged in at least once.	TBB Digital, Internet, and Mobile Banking Statistics (2010-2021)
LNİSLEM	The Number of Financial Transactions Conducted through Internet Banking (Thousands)	The number of financial transactions, including money transfers, payments, credit card transactions, and other financial transactions, conducted using Internet banking services.	TBB Digital, Internet, and Mobile Banking Statistics (2010-2021)
ATM	Number of ATMs	Number of ATMs per 1000 square kilometres	IMF (Financial Access Survey)
SERM	Equity Ratio	Total Equity/Total Assets (%)	TBB (2010-2021) and Relevant Banks' Activity-Audit Reports
LNAK	Asset Size	The logarithm of total assets	TBB (2010-2021) and Relevant Banks' Activity-Audit Reports
EKB	Economic Growth	Growth of GDP Per Capita (Annual %)	World Bank

Numerous elements hold the potential to affect the profitability of banks. This research explores how FI, specifically within digitalisation, impacts banks' profitability. The study hinges on two key dependent variables: ROA and ROE. In dissecting this relationship, the study considers several crucial independent variables. The study's independent variables consist of the conventional FI indicator, the number of ATMs, the digital FI indicators, the number of Internet banking customers and the volume of financial transactions conducted through Internet banking channels. Control variables such as the equity ratio, asset size, and economic growth have been incorporated to augment the model's robustness and ensure consistent results. Furthermore, past period experiences may influence the current profitability ratios. Hence, the study utilises dynamic panel data analysis methods that allow the lagged value of the dependent variable to be analysed, with a preference for the Arellano & Bover (1995) and Blundell & Bond (1998) Two-Step System GMM estimator, which is a current and robust predictor. In this context, the research models developed are as follows:

$$ROA_{it} = \alpha_0 + \beta_1 ROA_{it-1} + \beta_2 LNLOGİN_{it} + \beta_3 LNİSLEM_{it} + \beta_4 ATM_{it} + \beta_5 Z_{it} + u_{it} \qquad (1)$$

$$ROE_{it} = \alpha_0 + \beta_1 ROE_{it-1} + \beta_2 LNLOGİN_{it} + \beta_3 LNİSLEM_{it} + \beta_4 ATM_{it} + \beta_5 Z_{it} + u_{it} \qquad (2)$$

Model 1 investigates the impact of traditional practices and digitalisation in FI on return on assets, and Model 2 investigates their impact on return on equity. In the models, β represents the coefficients of the explanatory variables, α_0 represents the model constant, Z_{it} represents the control variables, and u_{it} represents the error term.

5. Empirical Findings

This section of the study contains the analyses that were conducted and the findings that were obtained. Table 3 presents descriptive statistics for the variables used in the study.

Table: 3
Descriptive Statistics

Variables	Mean	Standard Error	Minimum	Maximum.	Number of Observations
ROA	1,316711	1.466288	-12	8	228
ROE	10,2961	14.45675	-168	33,9	228
LNLOGİN	10,67452	.5262551	9,754001	11,3722	228
LNİSLEM	11,69457	0.1904315	11,23851	11,91174	228
ATM	58,5319	10.72653	35,9251	68,8954	228
SERM	12,10219	3.826668	2,9	39,7	228
LNAK	10,67145	1.868999	6,79794	14,13104	228
EKB	4,577442	3.265331	-0,0281234	10,51288	228

When examining the data in Table 3, it can be observed that the average return on assets in the relevant period is 1.31%, while the return on equity is 10.2%. The variable with the highest standard error is the return on equity. The average number of ATMs per 1000 square kilometres is 58.5, and the equity ratio is 12.1%. Among the variables, equity profitability has the highest standard deviation and the broadest range between minimum and maximum values. The findings obtained through the analysis conducted using the Two-Step System GMM estimator within the scope of the study are presented in Table 4 and Table 5.

Table: 4
Analysis Findings for the Model 1

Dependent: ROA		Model 1.1	Model 1.2	Model 1.3	Model 1.4
ROA(T-1)	Coefficient	.5118417	.2344641	.2607402	.3367921
	Std. Error	.1352737	.140537	.0983222	.0988514
	Prob.	0.000***	0.095*	0.008***	0.001***
LNLOGİN	Coefficient	1.925905	2.753742	2.777083	2.198731
	Std. Error	.5130077	.7385029	.7798999	.6963556
	Prob.	0.000***	0.000***	0.000***	0.002***
LNİSLEM	Coefficient	1.704282	1.872185	2.538622	2.426718
	Std. Error	.8136284	.8093603	.9993176	1.171733
	Prob.	0.036**	0.021**	0.011**	0.038**
ATM	Coefficient	-.1181657	-.1550864	-.1738702	-.1319836
	Std. Error	.0361708	.0471975	.0532844	.0497962
	Prob.	0.001***	0.001***	0.001***	0.008***
SERM	Coefficient		.2077327	.2866787	.3043674
	Std. Error		.0324273	0490969	.0707815
	Prob.		0.000***	0.000***	0.000***
LNAK	Coefficient			.3459568	.3310367
	Std. Error			.1043196	.1358974
	Prob.			0.001***	0.015**
EKB	Coefficient				.0490609
	Std. Error				.018754
	Prob.				0.009***
Wald	chi2(4)	572.55	374.98	1275.34	1195.12
	Prob.	0.000	0.000	0.000	0.000
D.Hansen T.		0.589	0.638	0.779	0.754
AR(2)		0.637	0.282	0.203	0.252
Number of Ins. Variables		11	8	9	10
Number of Observations		209	209	209	209

Notes: ***, ** and * denotes significance at the 1%, %5 and %10 levels, respectively.

According to the results of the Wald, AR(2), and Hansen tests for Model 1, as presented in Table 4, the research models are statistically significant. The explanatory variables have sufficient explanatory power for the dependent variable, and there are no

issues of endogeneity and second-order serial autocorrelation. Therefore, based on the diagnostic test results, the estimates are consistent.

Table: 5
Analysis Findings for the Model 2

Dependent: ROE		Model 2.1	Model 2.2	Model 2.3	Model 2.4
ROE(T-1)	Coefficient	.3656065	.32227	.3272597	.3298536
	Std. Error	.0288302	.0352541	.0414069	.0437194
	Prob.	0.000***	0.000***	0.000***	0.000***
LNLOGİN	Coefficient	16.7885	24.7567	23.3064	15.20417
	Std. Error	5.731087	12.08353	9.460345	4.335834
	Prob.	0.003***	0.040**	0.014**	0.000***
LNİSLEM	Coefficient	15.05954	24.3184	27.92235	22.81145
	Std. Error	7.715671	11.08096	10.62136	7.028794
	Prob.	0.051*	0.028**	0.009***	0.001***
ATM	Coefficient	-1.01658	-1.458525	-1.529276	-.9991073
	Std. Error	.4050337	.7461897	.6423529	.2882996
	Prob.	0.012**	0.051*	0.017**	0.001***
SERM	Coefficient		.9824915	1.639359	1.646832
	Std. Error		.3905733	.5485052	.744919
	Prob.		0.012**	0.003***	0.027**
LNAK	Coefficient			3.053941	2.613003
	Std. Error			1.242523	.9136998
	Prob.			0.014**	0.004***
EKB	Coefficient				.4456292
	Std. Error				.1847218
	Prob.				0.016**
Wald	chi2(4)	1523.89	502.74	513.90	1023.04
	Prob.	0.000	0.000	0.000	0.000
D.Hansen T.		0.689	0.299	0.293	0.571
AR(2)		0.282	0.192	0.160	0.224
Number of Ins. Variables		13	16	17	18
Number of Observations		209	209	209	209

Notes: ***, ** and * denotes significance at the 1%, %5 and %10 levels, respectively.

As seen in Table 5, all diagnostic test findings required for GMM are appropriate in this model. Additionally, as seen in Table 4 and Table 5, there are four different model versions for each primary model to test the stability and consistency of the findings. When the tables are examined, the direction of the effect of the independent variables on the dependent variable has not changed; the findings are consistent and persistent.

Based on the results derived from the analysis, the lagged value of ROA has a statistically significant positive effect at the 1% significance level on current period ROA, and the lagged value of ROE has a statistically significant positive impact at the 1% significance level on current period ROE. The number of customers logged in at least once has a statistically significant positive effect on ROE and ROA at the 1% significance level. Financial transactions conducted through Internet banking have a statistically significant positive impact at the 5% significance level on ROA and the 1% significance level on ROE. The number of ATMs per 1000 square kilometres has a statistically significant negative effect on ROA at the 1% significance level. On the other hand, regarding control variables, it has been determined that firm size, equity ratio, and economic growth have a statistically significant and positive impact on profitability.

When the analysis findings in Table 4 and Table 5 are examined together, the number of ATMs negatively affects profitability in terms of both ROA and ROE, while the number of financial transactions made through Internet banking and the number of Internet banking customers has a positive effect on profitability. Therefore, all of the research hypotheses were accepted.

The conclusion that the number of Internet banking customers and financial transactions made through Internet banking has a statistically significant and positive effect on the profitability of assets and return on equity is supported by studies (e.g., Thankgod et al., 2019 and Ashiru et al., 2023 in Nigeria; Shihadeh et al., 2018 in Jordan; Erülgen et al., 2023 in TRNC; Del Gaudio et al., 2021 in EU countries; Kiplangat & Tibbs, 2022 in Kenya; Ghose & Maji, 2022 in India; Erol et al., 2015 and Ulusoy & Demirel, 2022 in Türkiye) are similar. The result that the number of ATMs has a statistically significant and negative effect on profitability is compatible with the studies of Giordani and Floros (2015), who concluded that the number of ATMs has a negative impact on banks' profitability in Greece.

6. Conclusion and Recommendations

There are many studies in the finance literature on the factors affecting banks' profitability. Among these studies, those focusing on digital technologies show that adopting online banking technologies is an important strategic choice for banks' competitive position. Because a broader range of online banking services plays a vital role in influencing a bank's financial performance by providing more profits than those with limited income (Kahveci & Wolfs, 2018), based on this, this study Since the Turkish banking sector has been offering Internet banking for more than 20 years, it was thought that it would be a good sample for the research and the question, "Do the innovative and technological products and services in the banking sector that increase FI positively affect the profitability of banks?" The answer to the fundamental question has been sought.

According to the findings of the analyses carried out within the scope of the research to find an answer to this question, the number of Internet banking customers representing digitalisation in FI and the number of financial transactions made through Internet banking has a statistically significant and positive effect on both the return on assets and return on equity of banks. Banks gain new customers through Internet banking. They offer their customers various financial services (money transfer, payments, investment transactions, etc.) by incurring less operational costs than branches and earning income from these services. Therefore, the positive effect of Internet banking on bank profitability can be explained by these issues. However, according to the analysis, the number of ATMs considered a traditional FI indicator, has a statistically significant and negative effect on bank profitability. As mentioned, ATMs are considered one of the first reflections of digitalisation in the banking sector. However, the rapid advancement of technology, differentiation of customer expectations and the fact that the services offered through ATMs are more limited compared to channels such as Internet banking and mobile banking have caused a decrease in the importance given to ATMs over time. In addition, ATMs need

installation, maintenance, energy, etc. Cost factors may have a reducing effect on banks' profitability. Therefore, these issues can be considered as issues that explain the negative impact of the number of ATMs on bank profitability.

When the findings are evaluated together, while investments in Internet banking return more profitability to banks, the return of ATM investments to the bank is negative. Based on this, it is recommended that banks in the sector increase digitalisation in FI to increase their profitability and demonstrate better financial performance. This study covers 2010-2021 and focuses on Internet banking, digital FI, and the number of traditional FI ATMs. These issues and the fact that only data belonging to Turkish deposit banks are analysed can be stated as the study's limitations. Based on this, future studies can investigate FI's reflections on banks' financial performance by including current data and traditional and digital financial indicators.

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