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# ABSTRACT

This study examines the impact of FinTech on the performance of traditional financial institutions within the Italian banking sector, particularly considering external shocks such as the COVID-19 pandemic. The research delves into how these emerging FinTech startups, by leveraging cutting-edge technology and data, may not only compete with but also potentially partner with traditional banks to enhance operational efficiency. The empirical analysis of financial performance data from Italian banks highlights that, despite the hype around FinTech, its impact on traditional banking performance metrics remains relatively negligible. However, the pandemic has acted as a catalyst, accelerating the adoption and diffusion of FinTech solutions, and potentially reshaping market dynamics more profoundly than anticipated. The findings contribute to a deeper understanding of the complex interplay between technological innovation and traditional banking, suggesting that while the FinTech revolution continues to transform the financial landscape, its direct impact on traditional banking performance banking performance is moderated by adaptive strategies and regulatory environments.

**Keywords**: FinTech, Traditional financial institutions, Banks, financial services, technology, innovation, digitalization, COVID-19.

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# **1 INTRODUCTION**

In the digital age, a world without the Internet is difficult to imagine, being an indispensable part of everyone's daily life. Its absence seems just as unimaginable in the realm of business, where even the smallest company on the most remote edge of the globe likely relies on some form of internet tool (Dapp et al. 2014). This rapid and ongoing technological development, which is increasingly taking place in the financial industry, should not come as a surprise (Boustani, 2020). The technological revolution is transforming not just how customers access financial products and services but is also introducing a new, more flexible, accessible, and customer-tailored offering (Boustani, 2020). Despite this sector being no stranger to change, the technology-driven influx of new players in the financial arena feels distinctly novel, attracting the attention of regulators, academics, and economists only recently (Haddad & Hornuf, 2021).

At the intersection of technology and finance, a dynamic wave emerges, accelerating changes and reshaping the traditional *Status quo* of established financial entities, a phenomenon known as FinTech (Haddad & Hornuf, 2021). The dynamic landscape of FinTech is significantly reshaping the financial services industry from the outside in (PwC, 2016). At the heart of this transformation are FinTech startups, whose innovative approaches are not only pioneering new services that challenge established financial institutions but are also creating a fertile ground for ongoing innovation. This raises critical questions about how the rapid expansion of FinTech affects the operational and financial metrics of traditional financial institutions, particularly in Italy, where traditional banks have historically dominated due to their regulatory protections and established customer bases (La Rocca et al., 2020). The academic opinion is controversial. Consumer theory argues that new products, as well as those offered by FinTech, can complement, or replace existing ones (Frank, 2009; Kaul,2012). While collaborations between banks and FinTech have often been evolutionary, with innovations enhancing rather than replacing existing services, researchers recognize the potential of FinTech to introduce revolutionary business models (Bhalla, 2019). Therefore, to comprehend these new dynamics, the thesis explores the following primary research question:

#### "How does the growth of FinTech impact the performance of traditional financial institutions?"

Furthermore, this study will explore secondary questions, particularly how external shocks, like the COVID-19 pandemic, may have affected this ongoing transformation. The environment disrupted by external shocks can represent a landscape where FinTech companies demonstrate their resilience and

adaptability, effectively filling the void left by traditional financial institutions. In this specific case, the health measures that enforced lockdowns and social distancing globally led to a surge in demand for digital financial solutions. FinTech firms swiftly responded by offering innovative services that met the new needs for contactless transactions, remote banking, and efficient financial management tools. In line with the Schumpeterian perspective, the pandemic can be viewed as a catalyst for creative destruction, accelerating the adoption of innovative FinTech solutions (Schumpeter, 1942). Therefore, the following question was explored:

#### "Has the COVID-19 pandemic increased the growth of the FinTech sector?"

The research will conclude by exploring whether and how the impact of FinTech start-ups on bank performance varies in the context of external shocks. This analysis aims to determine if the dynamics of bank performance have fundamentally shifted as a result of such disruptions.

The study employs empirical analysis to evaluate financial performance data from Italian banks over the past decade, using statistical techniques to determine the impact of FinTech. Understanding this impact is crucial for several reasons. It provides essential insights into the adaptation strategies that traditional banks must undertake to remain competitive in a rapidly evolving market. Additionally, it highlights the potential for profitable synergies between FinTech startups and traditional banks, which could lead to innovative partnerships. Finally, the findings will guide policymakers in designing regulatory adjustments that foster innovation while ensuring financial stability and maintaining a dynamic and stable financial landscape.

The thesis is organized as follows. Initially, the paper presents the theoretical foundations examining the evolution of the banking sector, identifying new emerging players, and analyzing the driving forces behind these changes. Based on the literature review, research hypotheses are formulated. Next, a snapshot contextualizes the studied landscape, focusing on Italy's unique environment and its peculiarities. Subsequently, the research design is outlined, which details the empirical approach adopted and explains the selection and justification of dependent, independent and control variables. The methodology employed is then thoroughly described, providing the basis for the empirical analysis. The results obtained are reviewed and discussed, providing clear interpretations of the implications of the data. The final section of the thesis is devoted to the managerial and policy implications emerging from the study, highlighting the limitations encountered and drawing conclusions.

# **2 THEORETICAL FRAMEWORK**

In today's world, individuals are experiencing an unprecedented shift toward digitization (Dapp et al., 2014). The pervasive influence of digitization is leaving an indelible mark on both personal and professional spheres. This transformative impact announces a new era in the context of globalization, with far-reaching consequences reshaping the macroeconomic landscape. The widespread access to the Internet facilitates active and interactive engagement in digital realms, fostering an environment where economic relationships are becoming more flexible and diverse. Digitization emerges as a pivotal factor in transforming the value-creation process within numerous companies (Dapp et al. 2014). Across every sector of the economy, the digital revolution is a pervasive force, and the financial services industry stands as no exception (Boustani, 2020).

# 2.1 Traditional Banking and the Rise of FinTech

The driving force of any developed economy lies in its banking sector (Tarasenko et al., 2022). Most people regard banks as a necessity. Just as schools, transport or grocery shops are, banks are part of the familiar infrastructure of modern capitalism, and individuals would struggle without them. Traditional banks, thanks to their unique relationship with central bank-issued currencies, and robust regulatory protection, have consolidated large customer bases and maintained a dominant position. Nevertheless, banks as we know them, and the traditional financial system, are changing (Blakstad & Allen, 2018). Forward-thinking start-ups have leveraged the most advanced technologies to deeply understand customer needs, enhancing accessibility and convenience for retail users. These non-bank financial services, with roots tracing back to a time predating the existence of banks, have supported business growth and shared financial risks while operating alongside the formal banking system. The new ecosystem is gradually consolidating, attracting an increasing number of customers, including those traditionally associated with banks (Blakstad & Allen, 2018). The growing interest and enthusiasm around these new financial players have also rapidly captured the attention of potential investors (Chemmanur et al., 2020).

The contemporary global market environment presents significant challenges to the financial industry and its established players. Traditional banks are under intense pressure to quickly adopt adaptive strategies, not only to safeguard their prominent positions but also to enhance their competitive advantage among evolving dynamics (Martinčević et al., 2020). The emergence of non-bank financial start-ups further intensify this pressure, particularly in the digital realm, where technology is leveraged to provide innovative services (Dapp et al., 2015). This wave of innovation thrusts the traditionally conservative financial sector into the heart of a revolution that converges finance and technology. The term FinTech precisely encapsulates the intersection of the financial sector, information technology (IT), and innovation, symbolizing the ongoing digitization of the financial industry (Haddad & Hornuf, 2021; PwC, 2016). The new trend has compelled traditional players to prioritize digital transformation (Haq, 2019). The shift from physical branches to web-based home banking is a profound change, reflecting an epochal move towards virtual banking operations (Ferrari, 2016). Major banks are rapidly implementing digital transformation initiatives across their processes and offerings: a strategic move to remain competitive in the face of the growing influence of FinTech and Big Tech companies penetrating the financial sector (Haq, 2019). The introduction of banking apps, initially simple digital replications of traditional banking functions on smartphones, is just the beginning (Ferrari, 2016). Banks are engaging in various other digital initiatives, such as acquiring stakes in FinTech and tech firms (Tenda & Schena, 2019). This strategy provides quick access to advanced technological solutions. Less frequently, some banks are forming alliances with tech firms to co-develop and distribute new products or services, while others are advancing in-house development of their technological solutions, launching their own apps and online banking services to enhance customer experiences and internal efficiency (Tenda & Schena, 2019). However, the implementation of digitalization varies significantly among financial operators. While some focus primarily on front-office solutions, others are rethinking their entire business models. For instance, Intesa San Paolo and Unicredit are transitioning certain branches to be fully automated, maintaining actual consultants only in branches dedicated to high-added-value services. Similarly, MUFG has installed a humanoid at its Narita Airport branch, capable of providing basic financial information in 19 languages. Additionally, various banks including Nordea, Deutsche Bank, HSBC, Natixis, Rabobank, Santander, Société Générale, and Unicredit have developed the we.trade platform, enabling small and medium-sized businesses to conduct cross-border negotiations and transactions in foreign currencies (Tenda & Schena, 2019). Conversely, smaller banks face the dual challenge of remaining competitive and addressing their clients' increasing demand for digital banking services, often with limited financial resources and less advanced technology. Many adopt a "wait and see" approach toward FinTech integration, possibly due to the complexity of the technology or a lack of understanding of its impact (Tenda & Schena, 2019).

Moreover, integrating new technologies with existing legacy systems is a complex and costly process, often hindering rapid innovation. Therefore, despite more incumbents recognizing the importance of digitalization, the transformation has not been uniformed worldwide, indicating not sized

opportunities for traditional banking systems to not only survive this disruptive digital wave but also to strengthen their waning dominance (Haq, 2019).

# 2.2 FinTech Ascendancy: the main drivers of the digital transformation

What emerges is a dynamic and competitive environment where technology acts as a catalyst, fundamentally reshaping the delivery and experience of financial services (PwC, 2016). Pinpointing the exact origin of this wave of innovation poses a challenge, especially from the perspective of retail customers in financial services. Nevertheless, the Global Financial Crisis (GFC) of 2008 emerges as a potential turning point (Giglio, 2021). The aftermath of the GFC, characterized by economic fragility, has provided fertile ground for the emergence and global expansion of innovative market players, alongside the adoption of new technologies in the financial services sector. Therefore, the consequential growing distrust of traditional banking systems spurred many finance professionals to explore new opportunities, notably within the burgeoning FinTech sector (Esposito & Tse, 2014). Financial startups, benefiting from a lack of prior failures, have attracted growing investor interest (Haddad & Hornuf, 2021). Notably, a 2015 survey highlighted a significant shift in Americans' confidence levels in favor of technology companies managing financial services over traditional banks. For instance, while the level of trust recorded in CitiBank was 3%, Amazon and Google boasted significantly higher levels of trust, 71% and 64%, respectively (Giglio, 2021). This underscores a transformation predicted over two decades ago: "Banking is necessary, banks are not" (Nocera, 1998).

Moreover, post-financial crisis regulations have likewise contributed to reshaping the banking landscape by increasing compliance obligations and restricting access to credit, which has led to higher costs (Bukhtiarova et al., 2018). On the other hand, the regulatory freedom enjoyed by Fintech startups, allowing new players to navigate the financial landscape with greater flexibility, has emerged as a significant driver of their ascendancy (Nair & Menon, 2017). In particular, the strict compliance requirements imposed on banks have hindered traditional providers from effectively meeting customer needs, thereby creating opportunities for innovative FinTech players to enter the market (Temelkov, 2020). Where traditional financial institutions face challenges, FinTech emerges triumphant. These forward-looking companies have seized the opportunity, to introduce solutions that deftly address consumer needs, providing greater accessibility, convenience, and tailored products (PwC, 2016). To summarize this transformation, an executive of a global banking

organization sagaciously observed that: "We thought we knew our customers, but FinTech understands them" (PwC, 2016).

However, it is crucial not to overlook the primary driver behind this innovative wave: the rapid advancement of technology. Technological progress, characterized by increased mobile phone accessibility, the utilization of big data analytics, and the omnipresence of social networks, stands as a cornerstone for the ascent of FinTech. It serves as a transformative force for enterprises, stimulating the launch of pioneering initiatives and products, while simultaneously enhancing customer service provisions and refining the efficiency and transparency of conventional financial processes (Nair & Menon, 2017). Lastly, FinTech companies have become particularly appealing to young, high-income consumers who are early adopters of new technologies. This demographic plays a significant role in the global spread and adoption of FinTech offerings (Nair & Menon, 2017). A study on the rise of shadow banks and FinTech firms in the U.S. residential loan market found that FinTech penetration is positively correlated with several socio-economic factors. These include a higher percentage of minority residents, lower unemployment rates, a high regulatory burden on traditional banks, and a more concentrated market. This suggests that FinTech companies often target riskier, less creditworthy borrowers, serving a demographic that is frequently overlooked by traditional financial institutions (Buchak et al., 2018).

Despite this abovementioned initial success in penetrating the market, maintaining and expanding their influence within the banking landscape requires substantial funding, particularly for highly innovative startups. However, the growing appeal of FinTech companies has increasingly attracted the attention of investors. Private equity and venture capital firms are particularly interested in the opportunity to develop a successful and innovative niche industry (Nathan et al., 2022). These investors not only provide essential financial support but also offer valuable knowledge and networking opportunities, which are critical for the growth of startups. This combination of funding and expertise is especially important for FinTech firms, where the success of startups often depends on these types of strategic investments (Nathan et al., 2022).

In conclusion, this nuanced understanding of the interplay between socioeconomic factors and the adoption of FinTech highlights the complex and multifaceted nature of the FinTech landscape. The conceptual analysis by the Financial Stability Board confirms that these factors—technological innovation, regulatory shifts, and demographic targeting—collectively drive the transformative impact of FinTech on the traditional financial sector. This transformation is marked by the

introduction of innovative solutions, increased accessibility, and a streamlined approach to financial services (FSB, 2019). Moreover, the rapid growth and success of FinTech startups are bolstered by substantial financial backing from various types of investors. The synergy between technological advancements and strategic investments has created a dynamic and competitive financial environment where FinTech companies continue to thrive and reshape the industry.

# **3 DEVELOPMENT OF HYPOTHESES**

Over the past decades, rapid technological progress and the digital revolution have led to significant changes in the global financial landscape. Historically, the financial sector has emerged as a major user of technology, second only to the telecommunications sector (Iman, 2020). In this context, FinTech startups emerge as key players in the modernization of the financial system, greatly improving the accessibility and supply of financial resources (PwC, 2016). The abandonment of the traditional approach, based on physical branches and territorial presence, by these increasingly established innovative startups emerges as a potentially revolutionary catalyst for the future of the banking industry (Azarenkova et al., 2018; Wonglimpiyarat, 2017).

Furthermore, as technology evolves, external shocks emerge as another crucial element impacting the landscape. These events, such as Wars, the Great Depression, or more recently, the COVID-19 pandemic, operate independently of market players' abilities to innovate and adapt. External shocks have the potential to profoundly impact market dynamics and consumer behavior, leading to significant shifts in the financial landscape (Hill, 2021; Tut, 2023). For instance, the COVID-19 pandemic has accelerated the adoption of digital financial services as preventive health measures promote social distancing and encourage reliance on online channels (Tut, 2023). This underscores the fundamental role that external factors can play in shaping the behavior and sentiment of investors regarding the successful revolutionary FinTech wave.

In this context, it becomes imperative to explore three central hypotheses. Firstly, investigate whether the growth of FinTech start-ups influences the performance of traditional financial institutions. Secondly, after examining whether external factors like the COVID-19 pandemic can stimulate investments in FinTech, the investigation will then focus on how FinTech, along with these catalytic factors, can influence the performance of traditional banks. These hypotheses are crucial for gaining a comprehensive understanding of the impact of digital transformation on the financial industry.

# 3.1 Exploring the Impact: FinTech and Traditional Financial Institutions

## 3.1.1 Disruptive effect of FinTech: Reshaping traditional banking.

The development of successful alternatives by FinTech start-ups could potentially disrupt the traditional retail banking landscape (Boustani, 2020). As stated in mainstream literature, radical innovations have the potential to alter the economic equilibrium, erasing and replacing outdated models with new products, methods, and markets (Boustani, 2020). FinTech start-ups could therefore pose a significant challenge to commercial banks, benefiting from the lack of obsolete infrastructure and low organizational complexity. This flexibility allows FinTech to be more agile, innovate faster, and adopt more radical approaches to innovation (Brandl & Hornuf, 2020). A concrete example emerges from the study by Zhang et al. (2019), who argue that a significant increase in peer-to-peer (P2P) lending balance has a negative impact on the loan balance of domestic banks. This highlights, as also pointed out by Phan et al. (2020), that the growth of FinTech negatively affects the performance of the banking sector. Indeed, due to their customer orientation and use of new technologies as the core of their business models, FinTech companies demonstrate the ability to absorb the operational inefficiency of traditional financial institutions by introducing more efficient, personalized, and quality solutions (Ferrari, 2016).

Moreover, strict regulations in the banking sector complicate access to credit for both individuals and small and medium-sized enterprises, pushing a growing part of the market towards innovative and inclusive products offered by FinTech entities (Kohardinata et al., 2020; Zhang et al. (2019). Currently, people can access peer-to-peer financing platforms, showing a preference for such solutions over traditional loans, make payments via smartphones, and manage cryptocurrency transactions themselves.

This transformation significantly underlines the unstoppable influence of FinTech start-ups in shaping the future of the financial sector. Therefore, FinTech emerges as a critical innovation, promising rapid change in banking and financial services through significant cost reductions, more diversified service offerings, and greater stability in the industry and market landscape (Lee & Shin, 2018). Indeed, a study specifically on the African context reveals that although banks retain the main role in providing financial services to businesses, individuals show a clear preference for using mobile money in sending and receiving transactions, overtaking their adherence to traditional banking institutions (Iluba & Phiri, 2021).

# 3.1.2 Complementary effect of FinTech: the emergence of potential synergies.

Alternatively, FinTech start-ups could represent an opportunity for synergistic integration with traditional retail banking services (Li et al., 2017). Collaborations between banks and FinTech, often evolutionary, see innovations that enhance rather than replace existing services. This wave of innovation could introduce revolutionary business models (Bhalla, 2019).

Several established banks recognize the importance of FinTech and actively seek to incorporate these start-ups through partnerships, outsourcing of services, or direct acquisitions (PwC, 2016). Under these circumstances, FinTech seems to offer advantages rather than being a disruptive force for traditional banks, resulting in a mutually beneficial synergy (Haddad & Hornuf, 2021). In emerging countries, such as the Middle East and North Africa, collaboration between banks and FinTech is a crucial source of economic growth and innovation for the entire ecosystem. Qualitative research in Canada, France, Germany, and the UK has highlighted banks' frequent investments in smaller FinTech firms, highlighting that collaboration between these smaller entities and larger financial institutions generates added value (Zalan & Toufaily, 2017; Haddad & Hornuf, 2021). A telling example of the complementary impact is Wealthfront, a leading online platform for investment management and financial advice. While it shares many similarities with traditional banks, its key distinction lies in offering investment services to people with more limited financial resources. In this way, Wealthfront presents itself as a complementary lender to traditional institutions, extending access to advanced financial services to a previously excluded segment of users.

In addition, established banks may opt to acquire FinTech companies as a strategy to gain access to new technologies (Haddad & Hornuf, 2021). A clear example is Capital One, the tenth largest bank in the United States by total assets and market capitalization, which acquired FinTech start-up Level Money in 2015. Level Money, based in San Francisco, has been a pioneer in digital banking technology, focusing on enabling the next generation to spend with confidence, save more, and achieve financial balance. Its award-winning personal finance app has simplified direct analysis and financial budgeting for customers, with over 800,000 downloads and interfacing with 250 US financial institutions specifically targeting Millennials. This strategic acquisition highlights how traditional banks are actively seeking to integrate FinTech innovations into their offerings, enhancing their technological capabilities to respond to modern consumer preferences and remain at the forefront of financial innovation (Li et al., 2017).

# 3.1.3 Negligible effect of FinTech: Attracting overlooked customers.

Finally, examining the idea that the incidence of FinTech companies has a negligible impact on banking performance is well founded. These new entities have demonstrated success in attracting customers previously excluded by large traditional banking institutions, especially among low-risk businesses, consumers with a limited credit history, or active in the small loan sector, by providing viable alternative solutions (Jagtiani & Lemieux, 2018; Demos, 2016; Hayashi, 2016). This suggests that FinTech lenders can fill credit gaps in regions with fewer bank offices and greater local economic complexity, playing a crucial role in ensuring the accessibility of unsecured consumer credit, especially where the number of traditional banks is declining (Li et al, 2017). In this context, FinTech does not represent a direct threat so much as a new supplementary channel to the offer of traditional financial services.

Moreover, the lack of incidence can be attributed to the relatively small size of FinTech start-ups compared to large established banks (Li et al, 2017). At the same time, it could result from the compensatory and complementary substitution effects between FinTech and traditional banks. On the one hand, FinTech offers alternatives such as peer-to-peer lending, reducing the demand for traditional banking services. On the other, it collaborates with banks to improve the overall offering through the adoption of technological advances (Li et al, 2017).

This complex dynamic explains the lack of immediate impact, highlighting the interconnection between FinTech and traditional banks. In expansive nations such as India, FinTech companies have assumed a significant role as a parallel financial channel (Panagariya, 2022). With the spread of mobile technology, wide network coverage, and mobile-based banking solutions, the digital wave is making considerable progress in extending basic financial services to previously under-represented groups, such as women, low-income people, youth, farmers, and small and medium-sized enterprises (Panagariya, 2022). Thus, the coexistence of FinTech and traditional banks outlines a more diverse and inclusive financial landscape, with large benefits for access and efficiency of financial services. This dynamic is not so much a challenge as a source of opportunity, as FinTech focuses on customer segments not traditionally served by established banking institutions. This suggests that rather than threatening the performance of traditional banks, FinTech is helping to expand financial access to new markets and meet the needs of previously neglected customers (Panagariya, 2022).

In conclusion, the sentiment surrounding the FinTech revolution is characterized by ambiguity, evidenced by the diversity of results in empirical studies. However, traditional financial institutions

have not remained passive in response to this paradigm shift. Instead, they have actively adapted by optimizing their business models and incorporating new financial and technological solutions, either through acquisitions or by independently developing new technologies. This proactive approach by traditional banks suggests that they may be aligning themselves with the changes brought about by FinTech (Haddad & Hornuf, 2021). Therefore, to contribute to the enrichment of the existing literature, it is relevant to explore whether the innovative wave brought by FinTech has truly impacted the performance of large traditional banks by testing the following hypothesis:

H1: "The growth of FinTech has no significant impact on the performance of traditional financial institutions."

# 3.2 Exploring External Catalysts: Contribution of the COVID-19 Pandemic on FinTech Development.

The sudden change in economic conditions, commonly called an economic shock, is an unpredictable phenomenon that has a significant impact on several sectors of the economy and its players (Tybout & Bark, 1988; Pham et al., 2022). The effect is controversial as previous research has shown that economic shocks can both positively and negatively influence the performance of companies, as well as the health and stability of industries and markets (Park et al., 2010; Notta & Vlachvei, 2014).

In recent decades, the frequency and magnitude of crises have increased dramatically, as evidenced by the recent COVID-19 crisis. Globally, people face crises and disasters like never before (Vasenska et al., 2021). Among these economic downturns, the COVID-19 pandemic has been recognized as an extremely negative factor for the economy, generating unprecedented levels of risk in financial markets and contributing to a global economic crisis (Baker et al., 2020; Zhang et al., 2020). It triggered an economic shock characterized by a sudden and unforeseen alteration in economic circumstances, with a widespread impact on multiple sectors of the economy (Fernandes, 2020; Zhang et al., 2020; Nicola et al., 2020). This event led to a significant increase in indicators of environmental uncertainty, including those measuring stock market volatility and subjective uncertainty in corporate expectations (Baker et al., 2020). Indeed, the devastating impact extended across global companies, economies, and governance structures, leading to business closures, disruptions in education, and extensive financial damage (Hill, 2021). Although certain activities have rebounded and the stock market has shown partial recovery, uncertainty persists, suggesting that the effects of COVID-19 will be long-lasting (Hill, 2021). This is particularly evident in shifts in

consumer behavior, which may continue to be influenced even after the immediate health risks have subsided (Hill, 2021).

The outbreak of the COVID-19 pandemic initially caused an unprecedented health crisis, requiring immediate and decisive responses from global health systems. However, the unique characteristics of the pandemic, combined with its rapid spread, necessitated drastic social distancing and lockdown measures by governments around the world. These actions have had a widespread impact on all sectors, going far beyond the health sector. Among the sectors most transformed by COVID-19 is financial services (Rowan et al., 2020). While preventive measures were primarily implemented to combat the virus, they have also yielded benefits and presented potential opportunities for innovation within the financial sector, notably through the FinTech wave (Hill, 2021). Indeed, there is a growing body of evidence suggesting that the technology sector, particularly companies that facilitate remote communication and commerce, has seen a significant increase in sales due to widespread adoption and usage (Tut, 2023). These services have emerged as lifelines for many households and businesses, enabling them to mitigate health risks and address the socio-economic challenges posed by the pandemic (Tut, 2023). The study on Kenya revealed a 19.56% increase in the number of mobile banking agents between the first and last quarters of 2020, suggesting that the COVID-19 pandemic has accelerated consumer adoption of FinTech services (Tut, 2023).

Furthermore, the fact that 60% of companies in the global FinTech industry have experienced growth through new product launches or enhancements to existing products is another testament to the benefits the industry has reaped from this disastrous situation (Tut, 2023). Moreover, restrictions and social distancing drove people to seek digital financial solutions. This is reflected in a significant increase, between 24% and 32%, in the daily download rate of FinTech apps (Tut, 2023). This is a clear sign of the growing recognition of the value of FinTech services in people's daily lives (Le, 2021).

Overall, it is evident that the shift towards online solutions, driven by the pandemic, helped the FinTech industry thrive while the broader economy struggled (Niculaescu et al., 2023). As demand increased, the FinTech sector accelerated its development (Niculaescu et al., 2023). Indeed, an increasing number of FinTech startups emerged solely to provide critical financial services to underserved and high-risk segments overlooked by traditional banks (Nair et al., 2021).

The second hypothesis of this research is based on the existing gap in the literature, suggesting that the intrinsic attractiveness of the FinTech sector experienced significant growth during the COVID-19 crisis, leading to increased popularity among investors (Niculaescu et al., 2023). Previous studies have shown that unexpected events that influence the demand or supply of FinTech services can have both immediate and long-term impacts on the local adoption rate of these technologies, thus shaping the recognition of the success of FinTech (Fu & Mishra, 2020). The pandemic has had a significant impact on investment behavior, with a large share of investors changing their methods of evaluating, evaluating, and managing potential FinTech ventures in response to the crisis (Niculaescu et al., 2023). Therefore, it is essential to explore whether external shocks, such as the COVID-19 pandemic, can influence the adoption of FinTech and, consequently, the approach of investors towards this sector. This influence could translate into an increase in financing, as the new market segment proves to be increasingly attractive and growing. Specifically, the research will initially focus on establishing a statistically significant linear relationship between the pandemic and the growth of FinTech:

## H2a: "'The COVID-19 pandemic has stimulated the growth of the FinTech sector".

Furthermore, considering that the growth of FinTech start-ups is aimed at meeting the evolving needs of consumers, what impact has this trend had on the *Status quo* of traditional financial players? Once the previous potential relationship has been accurately investigated, the study aims to determine whether COVID-19 can be considered a moderator in the relationship between FinTech startups and their impact on bank performance. The pandemic has caused unprecedented disruptions across global financial markets, with particularly pronounced effects in the rapid adoption and diffusion of digital financial technologies (Ozili, 2020). This scenario presents a unique opportunity to explore how such a significant external shock might alter the dynamics between emerging FinTech companies and traditional financial institutions.

Previous research suggests that external shocks can act as catalysts for innovation, particularly within the FinTech sector, where the demand for digital financial solutions has surged (Frost, 2020). These disruptions often lead to lasting effects, shaping the trajectory of technological development and influencing behavior and practices long after the initial shock has passed (Hill, 2021). For example, during the COVID-19 pandemic, the financial services industry in Italy experienced a significant acceleration in digitization, with many customers favoring digital interactions with financial services over traditional methods (MIP, 2020). Italian FinTech startups seized these opportunities, positioning themselves as key partners for traditional financial institutions to meet the evolving needs of customers (MIP, 2020).

Understanding the role of COVID-19 as a potential moderator is crucial, as it could provide key insights into how financial institutions and FinTech companies can better adapt and strategize in the face of future disruptions. This investigation builds on existing literature that discusses how crises can catalyze shifts in industry dynamics, drawing on frameworks such as the Technology Acceptance Model (Davis, 1989) and Schumpeter's theory of creative destruction (Schumpeter, 1942). Moreover, market research indicates that FinTech companies are increasingly embraced during periods of global turbulence, solidifying their role as key players in technology and innovation that extends beyond the current crisis (MIP, 2020).

Given that the FinTech sector has experienced significant growth and innovation even in times of turbulence, this research lastly aims to test:

H2b: "The growth of the FinTech sector in turbulent times has not significantly impacted the bank's performance."

# **4 THE ITALIAN FINTECH ECOSYSTEM**

The Italian ecosystem presents distinctive features that differentiate it from other European and non-European contexts, especially in terms of financial structure (La Rocca et al., 2020). Italy is recognized as a bank-based country, where the banking sector plays a crucial role in the economy. This sector is characterized by a traditionally hierarchical structure and a strong presence of established firms and institutions (La Rocca et al., 2020; EY Report, 2020). However, in recent years, significant changes and challenges have led the industry towards a phase of restructuring and consolidation aimed at enhancing its competitiveness and profitability.

Among the main factors that have contributed to this transformation are interest rate fluctuations, which have affected both bank investment returns and borrower costs (EY Report, 2020). The increase in non-performing loans also posed a significant challenge to banks' financial stability. In parallel, the Italian banking sector went through a rationalization phase, with a decrease in the number of banks and branches across the country (EY Report, 2020). For instance, UniCredit, one of the banks with the largest number of branches in Italy, announced the closure of more than 450 branches between 2019 and 2023, to adapt to changing market dynamics. Macroeconomic challenges, such as national and international economic policy uncertainty and the economic recession, have further complicated the picture for the banking sector (EY Report, 2020). However, most significantly, the FinTech wave has brought radical changes to the financial landscape. Technological innovation is challenging the strong lending relationships between banks and businesses, as well as between banks and ordinary citizens, undermining the competitiveness of products offered by traditional institutions (La Rocca, 3343; PwC, 2023). Customers are changing, and their needs and expectations are evolving, demanding more personalized and user-friendly services (Pwc, 2016). Therefore, to comply with customers' growing expectations in terms of digitalization and transparency, banks are approaching new business models focused on cost optimization and operational efficiency, promoted by new non-traditional competitors (EY Report, 2020).

Despite these challenges, the Italian banking sector continues to play a vital role in the country's economy, remaining an essential reference point for the development of Italian business (La Rocca et al, 2011; EY Report, 2020). Italian consumers seem to be very reluctant towards financial disintermediation compared to international peers. According to the latest data on the matter dating back to 2018, Italy's population still sees incumbents as the first point of contact for financial services

(EY Report, 2020). These statistics are also reflected in the sentiment of incumbents towards the country's competitiveness. Although a considerable 82% of Italian banks feel threatened by FinTech operators, this is 7% less than the European average (EY Report, 2020). Although Italian consumers have not yet fully embraced FinTech, a significant shift in attitude towards financial services is taking place. In 2018, only 25% of the population aged 18-74 used FinTech products, while today 45% of users want to view all their financial products in one online or app-based platform. This interest stems from the desire for commission-free services, greater transparency, and faster transaction execution, key features of the FinTech business model (EY Report, 2020).

In this scenario, while traditional operators are hesitant towards innovation, FinTech companies are bolstering their allure by capitalizing on their expertise in big data and their capacity to provide high-value-added technological solutions, thereby crafting customer-centric service models (PwC, 2016). It can thus be affirmed that the wave of innovation has reached the shores of the Italian peninsula, but the landscape is still developing compared to other European countries. The UK, for example, boasts a digital transaction volume of \$216.1 million, while Italy stops at \$36.2 million, with a GDP/FinTech ratio of 1.4%, the lowest among the countries considered (EY Report, 2020; Statista, 2018).



Figure 1: FinTech-to-GDP ratio (% transaction volume on GDP). EY Report (2020); Statista (2018)

Although the Italian digital transformation process started later than other European peers and beyond, and therefore it is still in its early days, the landscape of startups operating in the FinTech sector is continuously expanding. Interest in innovative financial services has increased over the years, especially for retail customers (EY Report, 2020).

In light of this gap, several initiatives promoted by the national government are propelling the Italian FinTech ecosystem forward. In particular, the National Recovery and Resilience Plan (PNRR) plays a key role in this area, allocating around 27% of the total funds to stimulate innovation and digitization. To further support the development of start-ups in Italy, other initiatives such as the 50% tax deduction for investments in innovative start-ups have been introduced over time. Financing programs such as *Invitalia* and *Smart&Start* have been set up to provide financial support, with more

than 120 start-ups financed in 2021 for a total of  $\notin$ 74 million. Yet another initiative aimed at promoting financial innovation is the creation of Milano Hub, an innovation center dedicated to facilitating the digital transformation of the financial market while fostering the attraction of talent and investment (EY Report, 2020). Finally, the Bank of Italy introduced the Regulatory Sandbox at the end of 2021. It is a controlled environment that allows traditional and FinTech players to experiment with innovative products and services, benefiting from a simplified transitional regime. The Sandbox facilitates the introduction of innovative models in banking, finance, and insurance while ensuring adequate levels of consumer protection and competition (EY Report, 2020).

These measures make evident the maturity of the Italian FinTech ecosystem, with strong performance in terms of both the number of FinTech firms and their financial robustness, along with notable growth in Venture Capital and Corporate Venture Capital investments (EY Report, 2023). In the EY Barometer 2022, FinTech emerged as the most attractive segment for Venture Capitalists in Italy. Figure 2 highlights the top five sectors, including FinTech, Energy and Recycling, Health and Life Science, PropTech, and FoodTech, which collectively accounted for approximately 80% of the total investment raised, totaling over  $\notin$ 2 billion. FinTech secured the first position by raising  $\notin$ 712 million exclusively from VC funds.

Top five sectors in Italy by VC funding (€m)



Figure 2: Top five sectors in Italy by Venture Capital Funding. EY Report (2023).

Moreover, the geographical distribution of FinTech companies in Italy is a peculiar characteristic of the innovation market. According to Pitchbook surveys updated to 31 December 2022, about 79% of FinTech start-ups are concentrated in Northern Italy, highlighting a gap between the different regions of the country. Milan emerges as the main center, with 54% of Italian FinTech companies and 70% of investments in the sector nationwide, consolidating its position as the financial center of reference for the FinTech market (PwC, 2023). It is clear in Figure 3 that Lombardy is once again confirmed as the Italian region with the highest concentration of FinTech, followed by the region of Lazio. The reasons for this primacy of Lombardy can be attributed to many incubators, accelerators, and

innovation centers in the region, which represent a strong catalyst for financial institutions, investors, and community builders interested in the FinTech sector (EY Report, 2023). Despite this geographical disparity, economic development policies in the south promote training and skills development initiatives to exploit the potential of the FinTech market as a growth engine for southern Italy EY Report, 2023).



Figure 3: Distribution of FinTech start-ups in Italy. PwC (2023).

Considering these peculiar features, Italy represents a context of analysis of great interest. Hence, it's evident that technology has become crucial in financial services, driven by the expansion of the cashless economy and digital transformation. The capacity to offer a swift, transparent, and efficient business strategy through technological components has become imperative even for traditional players. However, FinTech startups, being agile and efficient, have an edge over established players in meeting consumer demand for easily accessible financial services, often at minimal cost (EY Report, 2020). Therefore, despite challenges from banking dominance and lagging behind international peers, the Italian FinTech sector has shown resilience and growth potential, exceeded expectations and achieved a new level of maturity that narrows the gap with other European countries (EY Report, 2020). Indeed, while there is still considerable progress to be made, the growth prospects are highly promising. Since 2016, funding has surged at a Compound Annual Growth Rate (CAGR) exceeding 60%, nearly doubling the European average of 34%. In 2022 alone, funding reached €1,040 million, marking a significant increase from €900 million in 2021 and €247 million in 2020, making the FinTech sector the most attractive segment for capital raising in the country.



Figure 4: Italian FinTech funding by year, 2016-2022. EY Report (2020)

# **5 RESEARCH DESIGN**

The financial landscape is in a state of continual evolution, with the rapid expansion of FinTech poised to challenge the established dominance of traditional financial institutions. To explore the potential impacts of these innovative players, this study adopts a quantitative approach focusing on two primary aspects. In particular, the first part will exploit whether FinTech development has influenced bank performance. The second part, instead, aims to assess if external factors, such as the COVID-19 pandemic have spurred FinTech market growth and altered its impact on the banking sector.

# 5.1 Empirical setting

The comprehensive scope of the study necessitates a timeframe spanning from 2008 to 2023, to encapsulate all the crucial events that significantly impacted the financial services market. Beginning with the aftermath of the global financial crisis of 2008, which marked the birth of the digital innovation wave, characterized by a widespread erosion of trust in financial institutions, the timeframe extends to include significant subsequent events. These include the Sovereign Debt Crisis in 2011, the multifaceted challenges posed to the financial sector by the COVID-19 pandemic, and the recent geopolitical tensions stemming from the conflict between Russia and Ukraine. These events have left lasting impacts on the financial services market, influencing consumer behaviors, regulatory responses, and the strategic trajectories of financial institutions (Hill, 2021; Tut, 2023). However, the research will focus specifically on the shock caused by the COVID-19 pandemic, offering a comprehensive understanding of how the financial sector is coping with the most recent series of challenges and opportunities.

The sample comprises all established financial institutions actively operating within the Italian market throughout the relevant period from 2008 to 2023. Information on Italian banks is provided by the Wharton data platform, where the selection criteria include the Standard Industrial Classification (SIC) code between 6000 and 6700. This range encompasses entities engaged in banking, insurance, and real estate, ensuring a holistic perspective on the impact of FinTech across the entire spectrum of financial services. In addition, the identification of traditional financial service providers was confirmed via the FactSet database. Twenty-six financial institutions were included in the analyzed sample, of which the majority, twenty to be exact, are banks. The selected organizations meet well-

defined criteria: they were active during the reference period, are listed on the stock exchange and have their headquarters in Italy. The prevalence of banks in the sample is significant, making the other financial operators relatively few. This makes it possible to consider the results obtained in the course of the study primarily representative for the banking sector, while also including a limited representation of other types of financial institutions. Although the sample may appear small, industry experts testify that the Italian banking market is dominated by a few players (Comana, 2021). The Italian banking sector has undergone significant consolidation, characterized by numerous takeover bids over the years. This process has reduced the number of banks operating in the Italian market and at the same time strengthened a few large and powerful entities that now dominate the sector (Comana, 2021). For instance, statistical surveys show how Intesa Sanpaolo reigns supreme in the Italian banking sector. Its market capitalization of €49 billion as of February 2023 makes it the first listed bank and its market penetration of 120% among large companies underlines its dominance. Furthermore, in most cases, banks belong to banking groups. Therefore, all branch information is excluded, as it is already included in the consolidated data published by the holding companies. The same exclusion applies to foreign banks with branches in Italy, the results of which are included in the data published by the bank holding company based in the home country. In conclusion, the dataset comprises annual financial statements and profit and loss accounts for listed financial entities sourced from the Factset database. Additionally, it includes data on Annual Stock Returns from Borsa Italiana, adjusted for factors like price and share count, ensuring precise market valuations.

# 5.2 Dependent Variables

The aim is to understand whether the innovation in the financial landscape, represented by the expansion of these new financial players, has a significative effect or not on the profitability of established banks and financial services companies in a quantifiable way. Thus, the dependent variables under consideration encompass the major indicators of bank performance (Phan et al., 2020). For instance, previous research revealed that the emergence of FinTech has a positive influence on profitability metrics such as return on assets (ROA) and net interest margin (NIM) (Siska, 2022; Puspa & Hendratno, 2020). Similarly, findings from Lestari et al. (2021) indicate that banking innovation through FinTech services contributes to the enhanced financial performance of Islamic banks, particularly in terms of ROA, efficiency ratio (BOPO), and non-performing loans (NPL). Furthermore, Kristianti & Tulenan (2021) arrived at a similar conclusion, demonstrating that FinTech services play a pivotal role in improving the financial performance of conventional banks. Drawing on several prior studies, this research employs the most established performance measures:

Return on Equity (ROE) and Net Interest Margin (NIM) (Phan et al., 2020; Haddad & Hornuf, 2021; Beltrame et al., 2022; Bezawada, 2020). Lastly, a market-oriented metric, Annual Stock Returns, is included in the analysis as the fifth dependent variable. This metric reflects current market sentiment and expectations regarding the company's future profitability (Haddad & Hornuf, 2021).

## 5.2.1 Return on Equity

For a comprehensive assessment of a bank's profitability and management efficiency, it is essential to supplement the analysis with the Return on Equity (RoE). The latter is a key metric that measures how efficiently a bank uses shareholders' capital to generate profits (Koch and MacDonald, 2009; Oktaviaand and Genjar, 2019; Siska, 2022). It is calculated by dividing net profit by equity, thus providing a direct insight into the profitability derived from the bank's equity (Haddad & Hornuf, 2021).

According to Damodaran (2012), RoE is particularly significant because it highlights operational efficiency and financial sustainability, crucial aspects in a sector like banking that is increasingly influenced by innovative and disruptive FinTech technologies. A high RoE can signal to shareholders that the bank is using its capital effectively, despite the challenges imposed by the rapid technological development in the financial sector (Brealey et al., 2020).

## 5.2.2 Net Interest Margin

The Net Interest Margin (NIM) is a key indicator to assess the efficiency and profitability of financial institutions within the banking sector (Palepu et al., 2007). Calculated as the ratio of net interest income to total interest-bearing assets, NIM measures the difference between interest income earned by assets and interest expense paid to lenders, such as depositors (Haddad & Hornuf, 2021). A high NIM suggests that the bank is managing its resources effectively, generating more income from loans than the interest paid on deposits (Palepu et al., 2007). This indicates sound financial management and a stable competitive position in the financial market (Park et al., 2010).

When analyzing the impact of FinTech innovation on bank performance, especially concerning traditional banking activities such as deposits or loans, net interest margin plays a crucial role (Demirguc-Kunt & Huizinga,1999). The increase in FinTech innovations supply, such as technological credit, have the potential to alter the dynamics of interest income and expense within banking operations. An increase in technological credit is associated with a compression of the interest spread in the banking sector, resulting in lower bank lending rates and higher bank deposit

rates (Demirguc-Kunt & Huizinga,1999). Indeed, numerous studies indicate that net interest margin (NIM) plays a key role as a critical indicator for assessing the resilience and adaptability of banks in coping with an ever-changing landscape influenced by technological advances and rapidly changing market dynamics (Haddad & Hornuf, 2021; Phan et al., 2020; Beltrame et al., 2022).

## 5.2.3 Annual Stock Returns

Annual stock returns are a critical indicator that captures the total percentage change in a company's share price over one year, taking into account dividends paid (Haddad & Hornuf, 2021). This financial indicator is useful for investors to assess the return on their investment in a particular stock over a given period (Palepu et al., 2007).

Moreover, in the context of assessing the impact of financial technology on traditional banking institutions, the analysis of annual stock returns becomes particularly significant. These returns may signal how the market assesses banks' adaptability and innovation efforts in response to the digital revolution driven by FinTech firms (Fama and French, 2015; Zhang, 2021). High returns could indicate a vote of confidence from investors, who believe in a bank's potential to thrive amidst these advances (Fama and French, 2015). The variability of these returns may reflect the market's perception of the risk associated with banks' responses to FinTech challenges. As scholars have noted, share prices can be a barometer for corporate governance and strategic decisions (Jensen and Meckling, 1976). Thus, annual returns provide a lens through which to view banks' efficiency in deploying new technologies and optimizing operations in the FinTech era (Jensen and Meckling, 1976). In light of FinTech developments, these returns may also underline the importance of customer-centric innovation. According to Demirgüç-Kunt and Huizinga (1999), when banks manage to exploit FinTech technologies to improve customer service and expand product offerings, this tends to positively influence their market valuation. Furthermore, in a study by King and Levine (1993), it was shown that banks that are quick to assimilate FinTech technologies can experience an increase in profitability and shareholder performance due to increased operational efficiency and customer proximity.

# 5.3 Independent variables

# 5.3.1 FinTech

FinTech start-ups represent a source of innovation and discontinuity from traditional business models. It is therefore essential to understand how their expansion can redefine the competitive and operational landscape of established financial institutions. To gain insights into the evolution of the FinTech market segment and its interactions with established financial institutions is possible to examine the emergence of FinTech start-ups each year. Based on data obtained from the Crunchbase database, a total of 273 FinTech start-ups were founded in Italy during the studied period. As highlighted in Figure 5, the number of FinTech companies founded in Italy has been steadily increasing since 2008. Additionally, the cumulative number of FinTech start-ups has exceeded 300, demonstrating the robust growth trajectory of the FinTech industry in Italy. Given this increasing presence of new innovative players, it is plausible to affirm that the market segment is indeed consolidating, generating possible implications for the performance of traditional financial institutions.



Figure 5: FinTech startups in Italy in 2008-2023.

To explore the impact of the innovative wave represented by FinTech on the entire financial landscape, particularly on the consolidated performance of the traditional banking sector, the growth of this new market segment is considered the main explanatory variable. This growth is proxied by the increase in funding to the FinTech sector, as it can lead to greater competitiveness and changes in market dynamics. The stability and growth of fintech companies are closely linked to the variability and magnitude of their funding rounds (Carbó-Valverde et al., 2022). According to insights from McKinsey & Company, Fintechs with access to additional funding rounds have more resources to invest in technological advancements and innovation, which is essential to building a sustainable growth path (McKinsey & Company, 2023). Indeed, this financial support not only underpins day-to-day operations but also fuels long-term strategies vital for securing a competitive advantage in the dynamic financial sector (McKinsey & Company, 2023). This, in turn, may prompt traditional banks to review their strategies and adapt to new technologies and services offered by FinTech firms. The

independent variable, FINTECH, is constructed using the Crunchbase database, which contains all relevant information on start-ups operating across various sectors and geographic areas. Specifically, to accurately represent the growth of the FinTech sector, only the funds raised during each additional funding round announced annually from 2008 to 2023 have been considered from the vast dataset available. The context of the analysis is the overall FinTech market segment in Italy. Therefore, the selection criteria included keywords such as FinTech, InsurTech, crowdfunding, digital payments, cryptocurrencies and blockchain, and digital real estate services to capture all relevant aspects of the sector. Moreover, in line with the purpose of the study, only those innovative firms with headquarters in Italy were considered among the financed entities.

In conclusion, the rationale to consider additional funding rounds within FinTech start-ups as a key variable assumes that an increase in the stability of these innovative firms, and consequently in their activity, reflects a greater engagement with technology and innovation within the financial sector. This, in turn, could have profound effects on the operational and financial performance of traditional banks (Haddad & Hornuf, 2021; Phan et al., 2020). By adopting this approach, it is possible to quantitatively assess whether the expansion of FinTech correlates with changes in traditional banking metrics, potentially providing valuable insights into the competitive landscape and strategic adjustments that banks may need to make in response to this new challenge.

#### 5.3.2 COVID-19

The second part of the study has the "COVID-19" pandemic period as an independent variable that acts as a switch to capture the potential impact of the pandemic on FinTech development. It is constructed as a binary variable that takes the value 1 for data collected after the start of the pandemic in 2019, and 0 for previous data. This variable allows to compare investments in FinTech start-ups with the pre-pandemic period and to quantitatively test whether it is indeed significant to consider COVID-19 as a catalyst for FinTech innovation.

# 5.4 Control Variables

As previously mentioned, the sample encompasses a diverse array of financial institutions, extending beyond banks. To ensure the accuracy of the analysis and to account for the sector's heterogeneity, various control variables commonly employed in the literature on bank performance are incorporated (Phan et al., 2020). The objective of these controls is thus to capture the different operational

characteristics and dynamics of the financial institutions studied, allowing for a comprehensive analysis of the impact of FinTech market development while minimizing any confounding effects.

#### 5.4.1 Size

Size is crucial in determining economies of scale, risk profiles, and market power, all of which significantly influence performance outcomes (Demsetz & Strahan, 1997). Therefore, the logarithm of total assets is included as a control variable to address the scale of the financial institution. However, the impact of bank size is ambiguous with unknown implications (Phan et al., 2020). Largesized banks potentially benefit from economies of scale, leading to enhanced operational efficiency, as well as economies of scope, allowing for greater product and loan diversification compared to smaller counterparts (Phan et al., 2020). Consequently, a positive effect on profits is anticipated, consistent with findings by other researchers (Pasiouras & Kosmidou, 2007; Smirlock, 1985). It is posited that large banks access cheaper capital, contributing to healthy profitability (Short, 1979). Djalilov and Piesse (2016) argue that diversification in product and service offerings by large banks mitigates risk, thereby fostering higher operational efficiency and profitability. Moreover, in noncompetitive environments, the propensity for large banks to secure higher profits compared to smaller peers is facilitated by their larger market share, enabling them to offer lower deposit rates while maintaining higher lending rates (Flamini et al., 2009). However, contrasting perspectives exist suggesting a negative relationship between bank size and profits due to bureaucratic inefficiencies (Stiroh & Rumble, 2006; Berger et al., 1987; Pasiouras & Kosmidou, 2007). Conversely, mixed results are presented on the nexus between size and bank performance, further complicating the understanding of this relationship (Shaban & James, 2018; Chen et al., 2018).

#### 5.4.2 Financial health

Following the approach adopted by Haddad & Hornuf (2021), several variables are incorporated to assess the financial resilience and health of institutions. These include the capital ratio, which gauges financial resilience, and the cost-income ratio, indicative of operational efficiency. The latter is fundamental to measuring bank efficiency (Pasiouras & Kosmidou, 2007; Dietrich & Wanzenried, 2014). Indeed, as corroborated by previous empirical studies, an increase in the CTI ratio indicates lower efficiency within the bank's operations, thereby potentially exerting a negative impact on bank performance (Athanasoglou et al., 2008, Pasiouras & Kosmidou, 2007; Dietrich & Wanzenried, 2014).

#### 5.4.4 Macroeconomic indicators

In the model testing the second hypothesis (H2a) is crucial to address the country-specific heterogeneity, therefore several macroeconomic indicators are also taken into consideration.

#### Gross Domestic Product

The annual growth rate of Gross Domestic Product (GDP), obtained from the World Bank data platform, is included since it can significantly influence investment behaviour, reflecting the general economic conditions of the country (Niculaescu et al., 2023). Venture capital investments may experience cyclical fluctuations in response to macroeconomic changes (Niculaescu et al., 2023). Therefore, it is crucial to consider such variations when analysing the effects of external shock events on the growth of a particular market segment, especially in the case of the emerging FinTech sector (Bernstein et al., 2019; BVCA, 2022; Gompers et al., 2008; Howell et al., 2020; Ning et al., 2014; Ning et al., 2019). In addition, extensive literature suggests that economic growth stimulates innovations in the financial system, consequently encouraging the inflow of finance into the sector (Demirguc-Kunt & Huizinga, 1999; Bikker & Hu, 2002; Athanasoglou et al., 2008; Phan et al., 2020).

#### Annual Inflation Rate

The annual inflation rate, which influences borrowing costs, directly impacts investment margins and profitability (Haddad & Hornuf, 2021). High inflation rates can undermine the returns on investments, making it challenging for investors to preserve or increase their purchasing power (libo ife). Additionally, inflation introduces uncertainty into the economy, making it harder for investors to predict future returns and increasing overall investment risk (libro ife). As a result, investors tend to be more risk-averse, preferring investments considered safer in established market sectors over fintech start-ups, perceived as riskier. This may lead them to revise their investment strategies, directing funds toward real assets such as real estate or commodities, historically more protective against inflation. However, this leads to a reduction in the availability of capital for the fintech sector. In conclusion, inflation presents a challenge for the fintech sector, making access to capital more complex.

#### Real Interest Rate

Finally, the model will control for the long-term real interest rate, as it can influence the development of the FinTech market segment. Interest rates influence the cost of capital for both FinTech start-ups and potential investors. Indeed, high interest rates make borrowing money more expensive and alternative investments such as bonds more attractive (Berk & DeMarzo, 2023). As a result, capital may be diverted away from raising FinTech ventures. Like any kind of external shock, the COVID-

19 pandemic has caused considerable economic disruptions, particularly interest rate fluctuations (Tut, 2023; Hill, 2021). Therefore, it seems clear that controlling for this variable makes the analysis more robust and allows for a better understanding of how COVID-19 has affected FinTech funding channels.

# 5.5. Descriptive statistics

Table 1: Descriptive Statistics

Variable	Description	SD	Min	Max	
ROE	Return on Equity	9,96	17,42	-90,61	77,44
ROA	Return on Asset	1,51	4,72	-6,5	41,4
NIM	Net Interest Margin	0,01	0,01	0	0,06
ANNUAL STOCK RETURN	Annual Stock Return	1,03E+04	8,57E+04	-8,96E+04	1,15E+06
FINTECH	Total additional funding raised by FinTech	1,19E+12	3,59E+12	0	1,5E+13
SIZE	Bank size	10,06	2,43	2,03	13,88
CAP	Capital Ratio	0,22	0,55	0	4,85
CTI	Cost Income Ratio	0,44	0,33	-0,08	2,95
INF	Inflation Rate	1,95	2,21	-0,14	8,2
INR	Real interest Rate	2,54	1,38	-0,69	4,33
GDP	Gross domestic product	0,05	3,68	-8,97	8,31

Table 1 presents an overview of the descriptive statistics for the variables utilized in the analysis, highlighting their central tendencies and variations. Each variable is accompanied by its mean, standard deviation, minimum, and maximum values, along with a brief description of the corresponding acronyms.

The dependent variables of interest in Hypotheses 1 and 2B are ROE, ROA, NIM, and Annual Stock Return. Specifically, the mean Return on Equity (ROE) is 9.96 with a standard deviation (SD) of 17.42, indicating significant variability in equity returns among the banks, ranging from -90.61 to 77.44. Return on Assets (ROA) has a mean of 1.51 and a SD of 4.72, also showing substantial variability. The Net Interest Margin (NIM) is relatively stable with a mean of 0.01 and minimal variation (SD of 0.01). Annual Stock Return exhibits considerable fluctuation, with a mean of 1.03E+4 and an extensive range from -8.96E+04 to 1.15E+06, reflecting the volatility in stock performance.

Additionally, the primary explanatory variable in the analysis, as well as the dependent variable for Hypothesis 2a, is FINTECH. This variable represents the total additional funding raised by FinTech companies. It has an exceptionally high mean (1.19E+12) and a standard deviation (3.59E+12), indicating significant disparities in funding levels across different observations.

Regarding the control variables, firstly, bank SIZE has a mean of 10.06 and a SD of 2.43, suggesting moderate variability in bank sizes. The Capital Ratio (CAP) shows relatively low variation with a mean of 0.22 and SD of 0.55. The Cost-to-Income Ratio (CTI) has a mean of 0.44 and a SD of 0.33, indicating varying levels of operational efficiency among banks. Inflation Rate (INF) has a mean of 1.95 with a SD of 2.21, reflecting diverse inflation environments. The Real Interest Rate (INR) shows a mean of 2.54 and a SD of 1.38, with values ranging from -0.69 to 4.33, highlighting differences in interest rate regimes. Gross Domestic Product (GDP) has a mean of 0.05 and a SD of 3.68, indicating substantial economic growth variability, ranging from -8.97 to 8.31.

Overall, the descriptive statistics reveal significant variability across most variables, indicating diverse conditions and performance metrics within the banking sector. This variability underlines the importance of considering a broad range of factors in analyzing bank performance and the impact of external influences such as FinTech development and macroeconomic conditions.

# 5.6 Correlation

#### 5.6.1 Pearson correlation matrix

The Pearson correlation matrix was employed to examine relationships between the considered variables and identify potential multicollinearity issues, where strong linear relationships among independent variables might undermine their explanatory power. To mitigate this, correlations between independent variables should ideally remain below 0.8 (Bell et al., 2019).

Table 2: Pearson Correlation Matrix

	ROE	ROA	NIM	AN	NUAL STO(FINTECH	C	OVID_19	SIZE	CAF	P CTI	INF	INF	۲ G	DP
ROE	1,	00												
ROA	0,	61	1,00											
NIM	-0,	07	0,00	1,00										
ANNUAL STOCK RETURN	0,	26	0,09	-0,05	1,00									
FINTECH	0,	11	0,00	-0,01	0,05	1,00								
COVID_19	0,	18	-0,01	-0,22	0,05	0,49	1,00	)						
SIZE	-0,	33	-0,57	-0,37	-0,10	0,04	0,09	)	1,00					
CAP	0,	42	0,85	0,08	0,11	-0,04	-0,05		-0,64	1,00				
CTI	-0,	22	-0,07	0,42	-0,01	-0,06	-0,07		-0,14	0,03	1,00			
INF	0,	03	-0,05	-0,02	-0,07	0,36	0,40	)	0,06	-0,07	-0,07	1,00		
INR	-0,	15	-0,01	0,29	0,03	0,12	-0,65		-0,07	0,03	0,00	-0,23	1,00	
GDP	0.	06	-0,03	-0,12	0,03	0,15	0,15		0,04	-0,02	-0,02	0,32	-0,23	1,00

The correlation matrix (Table 2) reveals several key insights into the relationships between various financial performance metrics and external factors. Return on Assets (ROA) exhibits a strong positive correlation with Return on Equity (ROE) (0,61), indicating that as a bank's assets become more
profitable, these profitability measures also increase. Similarly, ROE is positively correlated with Annual Stock Return (0,26), suggesting that higher equity returns are associated with better stock performance. The presence of a correlation between profitability measures variables may provide redundant information. However, the research focuses on investigating the effect of FinTech development on each performance indicator separately. As a result, the issues of multicollinearity should be mitigated, given that each performance metric is analyzed in isolation, reducing the risk of overlapping information influencing the regression outcomes. This approach helps ensure that the individual impact of FinTech on different aspects of bank performance is accurately assessed without the confounding effects of multicollinearity.

FINTECH shows moderate correlations with other variables, implying that while FinTech growth is a relevant variable, it is not the most direct influencer of profitability and stock performance. The COVID-19 variable has a positive correlation with FINTECH (0,49). Bank SIZE has a significant negative correlation with Capital Ratio (CAP) (-0,64), suggesting that larger banks maintain higher capital reserves and operate more cost-efficiently. Additionally, SIZE has a strong negative correlation with ROA (-0,57), indicating that larger banks tend to have lower returns on assets. Net Interest Margin (NIM) shows a moderate positive correlation with Cost-to-Income ratio (CTI) (0,42), suggesting a trade-off between interest income and operational efficiency. Capital (CAP) exhibits a strong positive correlation with ROA (0,85), emphasizing that well-capitalized banks are more efficient in generating returns from their assets. The moderate positive correlation between COVID\_19 and SIZE (0.49) suggests that the impact of the pandemic might have been more significant on larger banks due to their exposure to different markets and operational complexities.

Between Inflation Rate (INF) and Interest Rate (INR), there is a weak negative correlation (-0.23) suggesting that as inflation increases, interest rates tend to slightly decrease, and vice versa. This relationship is contrary to the typical positive correlation expected, where interest rates rise to control inflation. However, this result implies that other factors or policy measures might be influencing interest rates more significantly than inflation. Moreover, a notable negative correlation exists between INR and GDP (0,23), implying that higher interest rates are associated with lower economic growth.

Overall, these statistical correlations highlight the interdependencies between profitability, operational efficiency, and macroeconomic factors within the banking sector. The variability in the strength of these correlations suggests that while some factors like bank size and capital ratios consistently influence performance metrics, others like COVID-19 and FINTECH may have more nuanced effects.

#### 5.6.2 Variance inflation factor

The Variance Inflation Factor (VIF) is a crucial diagnostic tool for detecting multicollinearity among independent variables in a regression model (O'Brien, 2007). Multicollinearity arises when two or more predictor variables are highly correlated, which can inflate the standard errors of the coefficients, leading to less reliable estimates and reduced statistical power (Kutner, Nachtsheim, & Neter, 2004). By incorporating VIF in this analysis, is possible to ensure that each independent variable contributes meaningfully and independently to the model's explanation of the dependent variable, thereby enhancing the robustness and reliability of the regression results. Typically, VIF values above 5 are considered problematic, as they indicate that the variables may not be providing independent information to the model (Hair et al., 2010).

_	MODEL ROE	MODEL NIM	MODEL ANNUAL STOCK RETURN
Variable	VIF	VIF	VIF
FINTECH	1.01	1.02	1.00
ROE LAST	1.39		
NIM LAST		1.18	
ANN_RETURN LAST			1.01
SIZE	1.77	1.94	1.75
CAP	1.96	1.75	1.72
СТІ	1.08	1.04	1.03

#### Table 3: Variance Inflation Factor (VIF)

In this study, the VIF results across all three models demonstrate low multicollinearity among the independent variables (Table 3). For instance, in the ROE model, VIF values range from 1.01 for FINTECH to 1.96 for CAP, all well below the threshold of 5. This indicates that the predictor variables are not strongly correlated with each other, ensuring reliable coefficient estimates and confirming that each variable contributes independently to the model. Similarly, the NIM model exhibits VIF values far below the commonly accepted threshold, indicating minimal correlation among the predictors. This low level of multicollinearity ensures that the coefficient estimates remain stable and reliable, thereby making the results both robust and dependable. Finally, in the model with Annual Stock Return as the dependent variable, the VIF results show minimal multicollinearity, with all values close to 1. This suggests that both the FINTECH variable and the control variables are not strongly correlated, thereby allowing for reliable coefficient estimates. As a result, the model is robust concerning multicollinearity, confirming that the contributions of the explanatory variables are independent and trustworthy.

### 5.7 Model specification

This study aims to explore the complex relationship between traditional financial institutions and the rapidly expanding FinTech sector, while also examining the impact of significant external shocks such as the COVID-19 pandemic on the emerging market segment. Based on the sample dataset containing information on Italian banks operating in the period from 2008 to 2023, the research performs a Panel data linear regression with firm fixed effect. More in-depth, panel data involves pooling observations on the cross-section of a specific entity, in this case, banks, over a specified time series, 2008-2023 (Bell et al., 2019). The advantage of using a panel dataset lies not only in its ability to account for individual heterogeneity but also in the extensive and informative data collection it provides, resulting in more reliable estimates. This is facilitated by the availability of a larger number of data points and greater variability compared to using time series or cross-sectional data alone. However, it is important not to overlook the presence of measurement errors, with which it is important to interface. Furthermore, employing firm fixed effects allows for the analysis of the relationship between dependent and explanatory variables for each entity over time (Brooks, 2014).

The study will implement the following FE panel regression model to test the effect of FinTech expansion on incumbents' performance (H1):

$$PER_{i,t} = \alpha + \beta_1 FINTECH_{i,t} + \beta_2 SIZE_{i,t} + \beta_3 CAP_{i,t} + \beta_4 CTI_{i,t} + \beta_5 PER_{i,t-1} + \varepsilon_{i,t}$$

where the impact of the total amount of additional funding rounds raised by fintech start-ups year by year,  $FINTECH_{i,t}$ , on the performance of each Bank *i* in the sample is tested for each major performance indicators. Thus, the dependent variable,  $PER_{i,t}$ , represents one of the following at a time: Net Interest Margin, ROE (Return on Equity), and Annual Stock Returns. The other explanatory variables are  $SIZE_{i,t}$  (the natural logarithm of total assets),  $CAP_{i,t}$  (Capital Ratio calculated as the firm equity over total assets),  $CTI_{i,t}$  (Cost-Income Ratio such as total expenses over total generated revenues) and  $PER_{i,t-1}$ (respectively, the performance indicator of the previous year).

Moreover, to test whether the COVID-19 pandemic may have accelerated the Fintech sector development (H2a), the study refers to the following linear regression model:

$$FINTECH_t = \alpha + \beta_1 COVID_t + \beta_2 INF_t + \beta_3 INR_t + \beta_4 GDP_t + \varepsilon_{i,t}$$

where the independent variable  $COVID_t$ , computed as a binary variable, accounts for the potential catalytic effect it may have on the expansion of the innovative emerging financial segment,  $FINTECH_t$ , proxied by the total amount of additional funds raised annually by FinTech. The validity of the results will be ensured though the inclusion of control variables such as  $GDP_t$  (annual GDP growth rate),  $INF_t$  (annual inflation rate), and  $INR_t$  (real annual interest rate).

Lastly, the study will conclude by testing the possible changes in the expected impact of FinTech growth, accelerated by external shocks such as the COVID-19 pandemic, on bank performance (H2b). Therefore, as with Hypothesis 1, the model will employ a panel data regression, explained as follows.

$$PER_{i,t} = \alpha + \beta_1 FINTECH_{i,t} + \beta_2 FINTECH_{i,t} * COVID_19 + \beta_3 COVID_19 + \beta_4 SIZE_{i,t} + \beta_5 CAP_{i,t} + \beta_6 CTI_{i,t} + \beta_7 PER_{i,t-1} + \varepsilon_{i,t}$$

where the potential impact on the performance of each Bank *i* in the sample,  $PER_{i,t}$ , measured using the major performance indicators (Net Interest Margin, ROE, and Annual Stock Returns) is not explained only by the variable  $FINTECH_{i,t}$ , as in the first regression, but also by the interaction term  $FINTECH_{i,t} * COVID_{19}$ , which captures the effect COVID-19 had on FinTech development, along with the standalone variable for COVID-19. As in the first regression, the control variables remain the same:  $SIZE_{i,t}$ ;  $CAP_{i,t}$ ;  $CTI_{i,t}$  and  $PER_{i,t-1}$ .

# 6. RESULTS

### 6.1 Hypothesis 1

Table 4: HP1"The growth of FinTech has no significant impact on the performance of traditional financial institutions".

	Panel Data Fixed Effect Regression - HP1		
	Dependent variables		
	ROE	NIM	Annual Stock Return
FINTECH	0.06 .	0.13	0.44
	(-1.55E+6)	(4.65E-4)	(-4.18E+6)
Last Year's ROE	0.02*		
	(0.15)		
Last Year's ROA			
Last Year's NIM		0.07.	
		(0.10)	
Last Year's Stock Retum		()	0.03*
			(-0.13)
Size	0.02 *	5.83E-5***	0.30
	(-3.55E+6)	(-3.26E-3)	(-1.01E+7)
Capital Ratio	0.02*	2.99E-3 * *	0.07.
	(-9.25E+6)	(1.39E-3)	(-4.55E+7)
Cost-Income Ratio	0.13	3.96E-4***	0.67
	(-5.08)	(6.52E-3)	(-9.2E+6)
Observations	249	249	249
Year dummies Firm effects	Included Individual	Included Individual	Included Individual
R-Squared	0.11	0.29	0.03
Adj. R-Squared	0.03	0.23	0.050
F-statistic	588.536	195.378	160.997
Note:			* p <0. 1 **p<0.01,***p<0.001

The results obtained from the data analysis reveal new insights into the relationship between the development of the FinTech sector and the performance of traditional financial institutions. The analysis of the main findings is crucial to understanding whether the rise of this new market segment represents a risk or opportunity factor for traditional banks. By applying a panel regression model, as described previously, for each of the four dependent variables (ROE, ROA, NET INTEREST MARGIN, ANNUAL STOCK RETURN), Hypothesis 1 has been tested. The results of this investigation are systematically illustrated in Table 4.

#### 6.1.1 ROE

The first column of the table analyzes how bank performance, measured by Return on Equity (ROE), is affected by the consolidation of the FinTech sector. In the regression analysis, the independent variable representing FinTech development positively affects banks' ROE, with a coefficient of 1.553 and a p-value of 0.06572. This suggests a positive relationship between FinTech development and bank profitability, statistically significant at the 10% level. However, the effect is marginal, implying that innovations in the FinTech sector may only slightly improve banks' operational efficiency and economic performance. Additionally, the R-squared value of 11.43% indicates that the model accounts for only a small portion of the variability in ROE, highlighting the limited explanatory power of the model. Given the low statistical significance and the modest R-squared value, the overall impact of FinTech development on bank performance can be considered weak and negligible.

Furthermore, the control variables significantly impact banks' return on equity (ROE). In particular, the variable SIZE shows a positive and significant coefficient, suggesting that larger banks tend to benefit from economies of scale and scope, which may allow them to generate higher profits. This is consistent with financial theory that states that larger banks can operate more efficiently. The positive and significant coefficient of the previous period's ROE indicates that historically high ROE positively influences current ROE, reflecting the persistence of profitability in the financial sector. Banks with a strong history of profitability typically have more effective business models and a robust risk culture, which contributes to sustained profitability over time. Regarding the Capital Ratio (CAP), a positive and significant coefficient suggests that banks with higher capital ratios tend to achieve higher ROE. This supports the notion that maintaining adequate capital not only ensures financial stability but also positively impacts profitability. Lastly, the Cost-Income Ratio (CTI), a measure of efficiency, shows a negative but not significant coefficient. While financial theory predicts a negative relationship between the cost-income ratio and ROE, in this model, the ratio does not emerge as a strong predictor of profitability. This lack of significance may be due to the increasing influence of FinTech, which could have improved operational efficiency, thereby reducing the traditional importance of the cost-income ratio metric.

#### 6.1.3 Net Interest Margin

The results using NIM as the dependent variable remain insignificant. The regression output shows that the variable representing FinTech development has a positive coefficient (0.00046513) but is not statistically significant with a p-value of 0.134238. This suggests that, although there may be a slight positive relationship between FinTech development and NIM, the evidence is not strong enough to be considered statistically significant. The overall model is statistically significant, with an F-statistic of 19.5378 and a p-value of less than 0.0001, indicating a good fit. However, the model's R-squared of 29.995% (adjusted R-squared of 23.854%) suggests that it only explains about 30% of the variability in NIM, leaving a significant portion of the variation unexplained.

In this model, the variable SIZE is negative and statistically significant, indicating an inverse relationship between company size and net interest margin (NIM). This could be due to economies of scale allowing larger companies to negotiate lower interest rates on loans or higher interest rates on deposits. Similarly, the coefficient for the previous performance variable is negative and significant, suggesting an inverse relationship between the previous period's NIM and the current period's NIM, likely due to regression to the mean. Banks with a high NIM in one period tend to have a lower NIM in the subsequent period, and vice versa. Additionally, regarding the Capital Ratio (CAP), banks are subject to regulations requiring minimum capital ratios to ensure the stability of the financial system. Banks with higher capital ratios often exceed these minimums, reflecting a more prudent risk management approach. This can result in lending to less risky borrowers, who typically carry lower interest rates, thereby negatively affecting NIM. Finally, the cost-income ratio (CTI), is significant and has an inverse relationship with the dependent variable, NIM. The negative and significant coefficient suggests that an increase in the cost-income ratio typically reduces the bank's efficiency. Consequently, banks may raise interest rates to cover the additional costs. Alternatively, this relationship could indicate that banks are investing in future growth, which temporarily raises costs but may lead to higher profits in the long run.

#### 6.1.4 Annual Stock Returns

Regarding the last dependent variable, Annual Stock Return, the coefficient for FinTech development is not statistically significant, with a p-value of 0.44683. This suggests there is no evidence to support a significant effect of FinTech development on the annual stock returns of the banks in this study. Between the control variables, the previous year's performance has statistical significance, which shows a significant inverse relationship with the current period's Annual Stock Return. The significant negative coefficient for Annual Stock Return in year t-1 suggests that banks' annual stock returns tend to mean revert, influenced by several factors. Mean reversion implies that exceptionally high returns in one period are likely to be corrected in the next period, while unusually low returns may rebound. Investor behavior also plays a role, as investors may sell stocks after high returns to lock in profits, or buy stocks at a discount after low returns, influencing subsequent prices and returns. Market adjustments, including changes in economic indicators, industry trends, and regulatory updates, can induce corrections following periods of exceptional performance. Regulatory and risk management practices can drive a more conservative strategy after high returns, reducing profitability, while low returns can encourage risk-taking to recoup losses. Furthermore, earnings management by banks, where earnings are smoothed over time to present stable financial performance, can result in high earnings being deferred to future periods, causing lower current returns but potentially higher future returns. These factors collectively contribute to the observed inverse relationship between stock returns of consecutive periods. Lastly, the coefficient for Capital Ratio (CAP) is significantly positive, suggesting that higher capital ratios are associated with an increase in Annual Stock Return. This positive relationship indicates that banks with higher capital ratios generally see better stock performance. However, the p-value for this coefficient is 0.07038, which indicates marginal significance. Therefore, while there is an observed positive relationship, the evidence is not robust enough to conclusively affirm this finding.

In conclusion, based on these findings, the null hypothesis that FinTech development has no significant impact on bank performance can be rejected only for the metric of ROE, where a positive effect is observed, albeit weakly. However, for ROA, NIM, and annual stock returns, the hypothesis cannot be rejected as the impact of FinTech is either insignificant or overshadowed by other factors. Furthermore, despite the potential positive impact of FinTech on ROE, the significance level is lower than commonly accepted standards. Therefore, the study fails to reject the null hypothesis that FinTech development has no significant impact on bank performance across the considered metrics.

#### 6.2 Hypothesis 2A

The primary findings related to Hypothesis 2a, which explores the relationship between external shocks, such as the COVID-19 pandemic, and their impact on the annual funding FinTech companies can secure, are detailed in Table 5 This analysis aims to elucidate how significant disruptions influence the financial landscape of FinTech, potentially accelerating their growth. By examining the correlation between the presence of such shocks and funding trends, we can better understand the resilience and adaptability of the FinTech sector in the face of global crises.

COVID-19 Impact on Fintech			
	Dependent variable:		
	Fintech		
	(1)	(2)	
COVID_19	3.35e-16***	< 2e-16***	
	(3,94E+15)	(6,98E+15)	
GDP		1.38e-05***	
		(-1,96E+14)	
INF		1.39e-06***	
		(-1,96E+14)	
INR		< 2e-16***	
		(1,87E+15)	
Constant	0.853	< 2e-16***	
	(4,74E+13)	(-6,38E+15)	
Observations	249	249	
R2	0.2367	0.6074	
Adjusted R2	0.2336	0.601	
Residual Std. E	rr $3.32E+12(df = 247)$	2.395E+12(df = 244)	
F Statistic	$76.6^{***} (df = 1; 247)$	$94.39^{***}$ (df = 4; 244)	
Note:	*p<0.1;**p<0.01,***p<	< 0.001	

Table 5: HP 2A: "The COVID-19 pandemic has led to an increase in funds raised by FinTech start-ups."

Considering first the benchmark model that examines the relationship between COVID-19 and the total additional funding received by FinTech companies, the coefficient for the explanatory variable indicates a significant increase in funding with the presence of COVID-19. Specifically, the positive coefficient (3.94E+15) suggests that COVID-19 substantially increases additional funding. This relationship is further validated by considering control variables like Inflation rate, Interest rate, and GDP. Specifically, GDP has a negative coefficient (-1.96E+14), indicating that higher Gross Domestic Product levels are associated with a decrease in FinTech funding. This relationship is particularly interesting and multifaceted, as FinTech funding might rise during periods of low GDP, often triggered by external shocks. In a low GDP environment, businesses and consumers become

more cost-conscious, driving demand for the more affordable and efficient solutions offered by FinTech. Additionally, during economic downturns, traditional banks might tighten lending or become more risk-averse, providing FinTech startups with opportunities to serve the underbanked or those struggling to access traditional financial services. Economic hardships can also foster innovation, positioning FinTech startups as disruptors with alternative solutions, which attracts investors seeking to capitalize on this disruption.

Moreover, when traditional sectors become less attractive due to low GDP, investors might turn to FinTech as a promising alternative with potential for growth and high returns. However, it's important to note that this trend is not guaranteed, as the overall funding environment might still be tight, and investors could remain cautious. The type of FinTech company also plays a role, with areas like digital lending or financial inclusion potentially drawing more interest during downturns. The health of the broader FinTech ecosystem is another factor, as a global economic crisis could still dampen investor enthusiasm. Inflation (INF) shows a significant negative relation (-1,96E+14) indicating that higher inflation may deviate investment in FinTech. Regarding the interest rate (INR), with a positive significant coefficient (1.87E+15) indicating that higher interest rates correspond to increased FinTech funding. Thus, elevated interest rates can make traditional financing more expensive, pushing investors toward FinTech solutions. These relationships are all highly significant (p < 0.001), underscoring the strong impact of these macroeconomic factors on fintech funding dynamics. Moreover, considering that the model's quality has improved with the addition of these control variables, as indicated by a greater R-squared value, it is evident that these factors provide a more comprehensive understanding of the determinants of fintech funding.

In conclusion, Hypothesis 2a that FinTech funding increased during COVID-19 is accepted. The presence of COVID-19 is significantly associated with increased additional funding for FinTech companies. This relationship holds even when controlling for other macroeconomic factors such as GDP, inflation, and interest rates, which also play substantial roles in determining funding levels. The improved model with these control variables offers a robust explanation of the dynamics affecting FinTech funding during periods of external shocks.

#### 6.3 Hypothesis 2B

The last Hypothesis of this study, 2b, focuses on a possible change in expectations regarding the impact that FinTech has on bank performance, considering the presence of the moderating effect of

economic shocks such as COVID-19. In the previous analysis, it was observed how the total funds received by the FinTech start-ups increased significantly in the presence of such shocks, making it interesting to examine whether the presence of this catalyst effect of COVID-19 changed the impact of FinTech on banks' performance To investigate this, a regression model similar to that of the first hypothesis was employed, with the key addition of an interaction term between COVID-19 and FinTech. This interaction term allows for the examination of whether the relationship between FinTech and bank performance differs in the presence of the pandemic. Table 3 shows all the results obtained for each dependent variable considered, including ROE (Return on Equity), NIM (Net Interest Margin), and the Annual Stock Return.

	Panel Data Fixe	ed Effect Regression - H	P2B
	Dependent variables		
	ROE	NIM	Annual Stock Return
FINTECH	0,00827**	0.117	3.21E-3**
	(6.86E+7)	(-0.014)	(5.32E+8)
COVID-19	0.039*	0.355	2.99E-3**
	(-1.82E+7)	(2.39E-3)	(-1.67E+8)
FINTECH:COVID-19	8.92E-3**	0.097.	1.45E-3**
	(-6.8E+7)	(0.015)	(-5.28E+8)
Last Year's ROE	0.013*		
	(0.165)		
Last Year's NIM		0.259	
		(-0.069)	
Last Year's Stock Retum			0.015*
			(-0.15)
Size	0.24	0.013***	0.98
	(1.92E+6)	(-2.6E-3)	(0.89)
Capital Ratio	0.03*	4.22E-3**	0.97
	(8.6E+5)	(-1.39E-3)	(0.82)
Cost-Income Ratio	0.05.	7.49E-4***	0.53
	(-6.46E+1)	(6.86E-3)	(1.33E+4)
Observations	249	249	249
Year dummies Firm effects	Included Individual	Included Individual	Included Individual
R-Squared	0.15	0.32	0.15
Adj. R-Squared	0.07	0.26	0.06
F-statistic	59085	59155	58951
Note:			* p <0. 1 **p<0.01,***p<0.00

Table 6: HP 2b "The accelerated adoption of FinTech services has not significantly impacted the bank's performance."

#### 6.3.1 ROE

The first regression analysis examines the impact of FinTech development on bank performance, specifically focusing on Return on Equity (ROE) in the context of the COVID-19 pandemic. The results, displayed in the first column, provide key insights into this relationship.

The coefficient of FINTECH variable (6.86E+7) is statistically significant at the 1% level, suggesting that advancements and innovations in the FinTech sector contribute positively to the profitability and performance of banks. However, when considering the moderating effect of COVID-19, the interaction term between FinTech and the pandemic reveals a more complex relationship. The coefficient for this interaction term is significantly negative, with a statistical significance at the 1% level, suggesting that the positive impact of FinTech on ROE is substantially diminished by approximately 68.05 units during the pandemic period. This finding implies that while FinTech innovations typically enhance bank performance, the economic and operational challenges introduced by COVID-19 significantly weaken these benefits. The pandemic likely introduced heightened economic uncertainty, increased loan defaults, and operational disruptions, which could have diluted the advantages typically brought about by FinTech developments.

Additionally, the standalone COVID-19 variable shows a negative and statistically significant relationship with ROE, reflecting the adverse impact of the pandemic on bank profitability. Specifically, during the COVID-19 period, ROE decreased by approximately 18.26 units, holding other variables constant. The decline in ROE can be attributed to widespread economic disruption causing increased loan defaults, reduced lending activity, and lower interest income. Additionally, banks faced operational challenges such as implementing health and safety measures, which likely increased operational costs and reduced efficiency. The necessity to increase provisions for loan losses as borrowers struggled, along with compressed net interest margins due to lower interest rates from central bank monetary easing, further strained profitability. Moreover, the uncertainty and economic slowdown reduced credit demand and made banks more risk-averse, tightening lending criteria and decreasing income from interest and fees. In response, many banks accelerated their digital transformation to maintain customer engagement and streamline operations, incurring short-term costs. Thus, the significant negative coefficient underscores the multifaceted challenges faced by the banking sector during the pandemic, emphasizing the need for strategic navigation of post-pandemic recovery by policymakers, regulators, and bank management.

Moreover, regarding the previous ROE performance, the coefficient indicates a statistical significance at the 5% level. This result implies that a one-unit increase in the previous year's Return on Equity is associated with an increase of approximately 0.165 units in the current year's ROE, holding other variables constant. This positive and significant relationship suggests that banks with higher past performance tend to sustain improved profitability in the subsequent year, possibly due to the persistence of favorable business practices, strong management, and consistent financial strategies. Meanwhile, the Capital Ratio (CAP) is also statistically significant at the 5% level. This strong positive relationship highlights the importance of a robust capital base, which not only enhances a bank's ability to absorb losses and manage risks but also signals financial health and stability to investors and regulators. Banks with higher capital ratios can undertake more profitable ventures and withstand economic downturns more effectively, thereby boosting their ROE. Together, these findings underscore the critical roles of past performance and capital strength in driving bank profitability and stability.

Lastly, Cost to income ratio (CTI) has a marginal statistical significance at the 10% level. The negative relationship implies that higher operating costs relative to income significantly detract from bank profitability. This can be attributed to several factors, including inefficiencies in operations, higher administrative expenses, or increased spending on non-revenue-generating activities, which collectively reduce the overall profitability of the bank. Although the p-value indicates that this effect is only marginally significant, it still highlights the critical impact of cost management on financial performance. Effective cost control measures, such as optimizing operational efficiency, reducing unnecessary expenditures, and leveraging technology to streamline processes, are essential strategies for improving the cost-to-income ratio and, consequently, enhancing ROE.

Finally, the coefficient for the interaction term FINTECH and COVID-19 indicates a negative statistical significance at the 1% level. This significant negative coefficient suggests that the positive impact of FinTech development on Return on Equity (ROE) is substantially diminished by approximately 68.05 units during the COVID-19 period. While FinTech development generally contributes positively to bank performance, as evidenced by the standalone coefficient (-6.8E+7 with a p-value of 8.92E-3), the pandemic introduces significant challenges that offset these benefits. The adverse effects of COVID-19, such as economic uncertainty, increased loan defaults, and operational disruptions, likely undermine the advantages brought by fintech innovations. During the pandemic, banks might have faced heightened operational costs, rapid shifts in market dynamics, and increased risk aversion, all of which could dilute the effectiveness of fintech advancements. This interaction term highlights the complexity of the relationship between FinTech and bank performance in a crisis context, showing that while FinTech provides substantial benefits under normal conditions, these benefits can be significantly eroded in the face of severe external shocks like a global pandemic. It underscores the need for banks to develop robust contingency plans and adaptive strategies to mitigate the impact of such disruptive events. This dual finding emphasizes the importance of resilience and flexibility in the banking sector, ensuring that FinTech investments are complemented with strong risk management frameworks to sustain performance even during unprecedented crises.

#### 6.3.2 Net Interest Margin

The regression analysis with Net Interest Margin (NIM) as the indicator of bank performance reveals that neither the FinTech development variable nor the COVID-19 variable independently show statistically significant effects on NIM. These results suggest that, when considered separately, FinTech development and the COVID-19 pandemic do not significantly influence NIM. However, the interaction term between FinTech development and COVID-19 shows a coefficient of 0.015 with a p-value of 0.09, indicating marginal significance at the 10% level. This suggests that during the COVID-19 period, FinTech development had a somewhat positive impact on NIM, though this effect is not strongly conclusive. This interaction effect implies that FinTech innovations may help banks to maintain or slightly improve their interest margins in the face of pandemic-induced challenges, likely by enhancing digital capabilities, customer outreach, and operational efficiencies.

Additionally, other variables in the model provide deeper insights into bank performance. The SIZE variable has a significant negative coefficient (-2.6E-3, p-value < 0.001), indicating that larger banks tend to have lower NIM, possibly due to more competitive interest rates and economies of scale that compress margins. The Capital Ratio (CAP) variable also shows a significant negative effect (-1.39E-3), p-value < 0.01), suggesting that higher capital adequacy ratios are associated with lower NIM, likely reflecting a more conservative approach to risk and lending. In contrast, the Cost to income ratio (CTI) variable has a significant positive coefficient (6.86E-3, p-value < 0.001), indicating that higher operating costs relative to income are associated with higher NIM, which may be due to banks increasing interest rates to cover higher expenses.

Overall, while FinTech development and COVID-19 independently do not significantly affect NIM, their interaction suggests a potential mitigating effect of FinTech during the pandemic. The findings underscore the importance of bank size, capitalization, and cost management in determining NIM, while also highlighting the nuanced role that FinTech innovations can play in enhancing bank performance in challenging times.

#### 6.3.3 Annual Stock Return

The regression analysis reveals several important insights into the factors affecting the measure of bank stock performance, Annual stock Return. Notably, FinTech development has a significant positive impact on stock performance, with an estimated increase of approximately 5.32E+8 units, highlighting the substantial benefits of FinTech innovations in enhancing bank efficiency, customer engagement, and competitive positioning. This effect is statistically significant at the 1% level, underscoring the critical role of technological advancements in driving bank performance. However, the COVID-19 pandemic has a significant negative impact, reducing Annual Stock Return by about 1.67E+8 units, as evidenced by its statistically significant coefficient. This reflects the severe economic disruptions, increased loan defaults, and operational challenges that banks faced during the pandemic, which adversely affected their stock performance. Moreover, the interaction term between FinTech development and COVID-19 reveals a significant negative coefficient, suggesting that the positive impact of FinTech on stock performance is substantially diminished during the pandemic, by approximately 528,720.5 units. This finding indicates that while FinTech innovations generally enhance stock performance, the benefits are considerably offset by the adverse effects of the pandemic. The moderating effect of COVID-19 underscores the complexity of the relationship between FinTech development and bank performance in times of crisis, suggesting that the advantages brought by FinTech can be significantly eroded by external shocks. In addition to these key findings, the analysis of control variables offers further context. The SIZE variable does not show a significant impact on Annual Stock Return indicating that bank size does not play a crucial role in this model. In contrast, Annual Stock Return of last period has a significant negative coefficient, suggesting a mean-reversion tendency in stock returns, where high past returns are followed by lower current returns. The Capital Ratio (CAP) variable is not statistically significant, indicating that the capital adequacy ratio does not significantly influence stock performance in this context. Interestingly, the Cost to income (RATIO) also does not show a significant impact, suggesting that operating efficiency does not directly affect stock performance in this model.

To conclude, based on the results obtained from the regression models considering the moderating effect of COVID-19,, FinTech development has a significant positive impact on ROE and Annual Stock Returns, enhancing therefore bank performance and profitability in these areas. However, the interaction between FinTech development and COVID-19 shows a negative moderating effect on ROE and Annual Stock Returns, indicating that the pandemic has diminished the positive benefits that FinTech typically offers. This suggests that while FinTech innovations generally enhance bank performance, their effectiveness is significantly compromised during periods of severe external

shocks like the COVID-19 pandemic. In contrast, for indicators such as ROA and NIM, FinTech development and its interaction with COVID-19 do not show strong, significant effects, suggesting that traditional financial metrics are more influential in these areas. Therefore, Hypothesis 2b is partially rejected. While FinTech development does significantly affect some performance indicators (specifically ROE and Annual Stock Returns), the pandemic's moderating effect further complicates these relationships, making it evident that the impact varies across different performance metrics

### 6.4 Robustness analysis

#### 6.4.1 Robustness analysis with long term effect

This thesis employs regression analysis to explore the long-term effects of FinTech development on bank performance, serving as a robustness check. This method aims to ascertain the sustainability of the relationship between bank performance indicators and FinTech growth. It's crucial to consider that the impact of FinTech on banks may evolve due to factors like strategic adaptations, competitive responses, and shifts in consumer behavior. Using a lagged regression analysis to investigate delayed effects offers a rigorous robustness check. Hence, confirming consistent results across various models and time frames enhances the credibility and validity of the findings. Moreover, analyzing the dynamic interaction between FinTech and banking performance is interesting, given the ongoing evolution of financial technologies and their increasing incorporation into traditional banking systems, which may yield varying outcomes over time. Initial negligible impacts might be due to the resistance to adopting new technologies, while later observations could reveal significant benefits from successful technological integration. This exploration helps elucidate the timing and extent of FinTech's influence on banking performance. Additionally, certain financial technologies, like digital wallets, online banking, or blockchain platforms, may require extensive shifts in consumer behavior, with their full advantages becoming apparent only over time. Therefore, assessing delayed effects is vital to fully understand the long-term impact of FinTech innovations on the banking sector.

#### Table 7: HP1 Robustness Analysis

	I Cobu	Seriess Analysis Eate E	
	Dependent variables		
	ROE	NIM	Annual Stock Return
FINTECH	0.04*	0.30	0.46
	(3.12E+6)	(5.95E-4)	(7.56E+3)
Last Year's ROE	0.02*		
	(0.15)		
Last Year's NIM		0.08	
		(0.10)	
Last Year's Stock Retum			0.03*
			(-1.39E+1)
Size	0.025*	7.4E+8***	0.30
	(3.5E+6)	(-3.25E-3)	(1.08E+4)
Capital Ratio	0.21*	0.002**	0.07.
	(9.29E+6)	(-0.004)	(4.55E+4)
Cost-Income Ratio	0.129	4.95E+7***	0.68
	(-5.15E+6)	(6.47E-3)	(8.99E+3)
Observations	249	249	249
Year dummies Firm effe	Included Individual	Included Individual	Included Individual
R-Squared	0.11	0.29	0.033
Adj. R-Squared	0.038	0.23	-0,05
F-statistic	59.921	19.193	1.601
Note:		* p <c< td=""><td>0.1**p&lt;0.01,***p&lt;0.001</td></c<>	0.1**p<0.01,***p<0.001

Robustness Analysis - Late Effect HP1

The results from this second regression model referring to Hypothesis 1, as presented in Table 6, show that NIM, and Annual Stock Returns remain statistically insignificant concerning FinTech development, even when considering long-term effects. However, the results differ for ROE, where there is a slight increase in significance, suggesting that FinTech may have a positive impact on banking performance as measured by ROE, particularly over the long term. It is crucial to note that the coefficient is low, the significance is at the minimum threshold, and the R-squared value remains modest. These factors suggest that while there could be a potential positive effect of FinTech on bank profitability as indicated by ROE, the impact is likely limited, and the model's explanatory power is weak.

The robustness test results align with and confirm the findings of the initial analysis related to Hypothesis 1. The statistical insignificance of NIM, and Annual Stock Returns concerning FinTech development, along with the modest significance and impact observed for ROE, reinforce the idea that while FinTech may have some influence on bank profitability, particularly in the long term, its

overall effect appears to be limited. This indicates that the initial hypothesis remains valid, even when subjected to further analysis.

	Robus	tness Analysis - Late El	ffect HP2B
	Dependent variables		
	ROE	NIM	Annual Stock Return
FINTECH	8.39E-2**	0.11	0.001**
	(4.92E+6)	(-0.01)	(3.82E+5)
COVID-19	0.05.	0.34	0.003**
	(-1.51E+6)	(2.67E-3)	(-1.44E+5)
FINTECH:COVID-19	0.01*	0.07.	1-52E-3**
	(-4.82E+6)	(0.01)	(-3.79E+5)
Last Year's ROE	0.013*		
	(0.16)		
Last Year's NIM		0.28	
		(0.06)	
Last Year's Stock Retum			0.015*
			(-1.51E-1)
Size	0.24	1.44E-4***	0.90
	(-1.92E+6)	(-2.69E-3)	(2.50E+1)
Capital Ratio	0.03*	0.004**	0.98
	(8.59E+6)	(-3.99E-3)	(6.02E+2)
Cost-Income Ratio	0.05	9.26E-8***	0.54
	(-6.49E+6)	(6.68E-4)	(1.27E+4)
Observations	249	249	249
Year dummies Firm effe	Included Individual	Included Individual	Included Individual
R-Squared	0.15	0.32	0.15
Adj. R-Squared	0.07	0.25	0.06
F-statistic	5.88	15.52	5.13
Note:		* p <0	). 1 **p<0.01,***p<0.001

Table 8: HP2b Robustness analysis

Regarding hypothesis 2b (table 7), the regression models employed to assess the late impact of FinTech development on various banking performance metrics reveal nuanced outcomes. While FinTech consistently shows a significant positive effect on Return on Equity (ROE) and Annual Stock Returns, its influence on Return on Assets (ROA) and Net Interest Margin (NIM) is not significant. This suggests that while FinTech investments can boost equity valuations, their effect on operational efficiency or interest income is limited. Furthermore, the interaction terms with the COVID-19 pandemic highlight that external economic shocks can mitigate the positive impacts of FinTech, particularly during periods of crisis, as evidenced by the significant negative coefficients for ROE and stock returns during the pandemic. This differential impact underscores the importance of

contextual factors, indicating that the benefits of FinTech investments are contingent on stable economic conditions and may be disrupted during global crises.

In conclusion, while the immediate effects of FinTech on some of the considered financial metrics may not always be significant, the long-term benefits, especially on Return on Equity (ROE), advocate for a strategic, long-term relationship between FinTech development and banks' profitability.

6.4.2 Robustness Analysis with ROA

To further strengthen the analysis and validate the main findings, an additional robustness test was conducted using a panel regression model where Return on Assets (ROA) was employed as the dependent variable. This approach seeks to provide deeper insights into the interplay between FinTech development and the performance of traditional banks. ROA is a crucial metric in assessing the profitability of the banking sector, as it reflects the efficiency with which a bank utilizes its assets to generate profit (Rizal and Rofiqo, 2020). Calculated by dividing net profit by total assets, ROA offers a clear perspective on a company's ability to convert its invested capital into earnings (Palepu et al., 2007; Haddad & Hornuf, 2021; Bezwada, 2020). Given that ROA serves as an alternative indicator of profitability, this analysis is expected to confirm and reinforce the primary conclusions derived from the investigation of the study.

Robustness analysis - ROA HF1 -		
	Dependent variables	
	ROA	
FINTECH	0.44	
	(0.12)	
Last Year's ROE		
Last Year's ROA	1.31E-06 ***	
	(0.30)	
Last Year's NIM		
Last Year's Stock Retum		
Sizo	0.69	
Size	(-0.11)	
Capital Ratio	(-0.11) 8 54F-06 ***	
	(-3,99F+5)	
Cost-Income Ratio	8.58E-4***	
	(-2.20)	
Observations	249	
Year dummies Firm effects	Included Individual	
R-Squared	0.35	
Adj. R-Squared	0.29	
F-statistic	249.012	
Note:	* p <0. 1 **p<0.01,***p<0.001	

Table 9: Robustness analysis - ROA HP1 -

Robustness analysis - ROA HP1 -

The results in Table 10 from this additional robustness check indicate that FinTech development does not show a statistically significant direct impact on ROA, with a positive but non-significant coefficient of 0.12. However, the control variables—such as the previous period's ROA, the capital ratio, and the cost-income ratio—demonstrate significant effects, underscoring their critical roles in determining asset profitability. Specifically, the persistence of profitability in the banking sector is confirmed by the positive and highly significant coefficient of the previous period's ROA (0.30). This strong persistence suggests that banks that perform well in one period tend to maintain their performance in subsequent periods, likely due to stable business models and effective management practices. Moreover, the capital ratio continues to play a crucial role, with a significant positive coefficient of 3.9, reinforcing the importance of maintaining adequate capital buffers for enhancing profitability. This result aligns with the notion that well-capitalized banks are better positioned to generate higher returns on assets, highlighting the importance of financial stability and prudent risk management. The cost-income ratio, with a significant negative coefficient of -2.20, further suggests

that banks with higher operational efficiency tend to perform better in terms of asset returns. This finding emphasizes the critical role of managing costs relative to income to maximize ROA. Lower cost-income ratios, indicative of greater efficiency, contribute positively to a bank's overall profitability.

These findings are consistent with the results of Hypothesis 1 and highlight the nuanced impact of FinTech development on different profitability measures within the banking sector.

Robustness analysis - ROA HP2B -		
	Dependent variables	
	ROA	
FINTECH	0.1	
	(8.16E+6)	
COVID-19	0.13	
	(-2.53E+6)	
FINTECH:COVID-19	0.10	
	(-8.7E+6)	
Last Year's ROE		
Last Year's ROA	8.28F-06 ***	
	(0.30)	
Last Year's NIM	(0.00)	
Last Year's Stock Retum		
Size	0.53	
	(-0.19)	
Capital Ratio	0.011***	
	(-3.99E+5)	
Cost-Income Ratio	4.60E-4***	
	(2.E+6)	
Observations	249	
Year dummies Firm effects	Included Individual	
R-Squared	0.36	
Adj. R-Squared	0.29	
F-statistic	18.231	
Note:	* p <0. 1 **p<0.01,***p<0.001	

Table 10: Robustness analysis - ROA H2B -

Regarding Hypothesis 2B, the robustness analysis presented in Table 11 reveals that FinTech might not dramatically alter asset profitability in the banking sector. This is further substantiated by the interaction term of FinTech with COVID-19, also presenting a non-significant positive coefficient, indicating that the pandemic did not notably modify the influence of FinTech advancements on ROA during the study period.

However, several control variables demonstrate significant impacts. The capital ratio shows a positive and statistically significant effect, with a coefficient of 0.011, indicating that banks with higher capital adequacy are better positioned to achieve favorable ROA. This finding underscores the critical role of robust capital buffers in enhancing bank profitability, aligning with financial stability principles. Moreover, the cost-income ratio, with a coefficient of 4.60E-4, reflects significant implications for asset returns, suggesting that operational efficiency is crucial for improving profitability. This indicates that lower operational costs relative to income are beneficial for banks, aligning with the need for effective management practices to optimize financial performance. In contrast, the size of the bank and other variables like last year's ROA and last year's stock return do not exhibit significant effects, indicating that past financial performance and scale are not determinants of current profitability in the context of this analysis.

Overall, also these findings are in line with the results of Hypothesis 2B providing valuable insights into the interplay between technological innovation and financial fundamentals in the banking industry.

## 7. DISCUSSION

The literature has extensively investigated the drivers of the performance of financial institutions and the possible endogenous and exogenous factors that may influence and impair it (Aebi et al., 2012). Therefore, given the significant hype around the growth of the FinTech sector in the past decade, it seems appropriate to investigate whether the formation of this new market segment within the banking industry has an impact on traditional financial institutions' performance.

The significant transformation in banking lies in how primary functions are performed and how products are offered to customers. Contrary to traditional banking models that rely on brick-andmortar branches, FinTech startups implement a low-cost structure, offering feature-rich and customized products and services that are easily accessible from any location at any time (Finnovate, 2018). This shift emphasizes the centrality of customer needs. FinTech companies address a broader range of customer problems by offering services tailored to individual needs at low and direct costs, avoiding the formalities typical of the banking sector. This results in high community engagement with the product. By leveraging cutting-edge technologies and the development of big data, FinTech companies offer unique, niche, and personalized services compared to traditional banks (Lee & Shin, 2019). Furthermore, IT-enabled innovations provide opportunities to create entirely new products and services (Puschmann, 2017; 2021). However, this disruptive wave of change, coupled with the distinct technological superiority of these innovative startups, has been recognized by many financial institutions. To protect their market position, they have begun to adopt new ways of communicating with and serving customers. Consequently, these institutions have gradually embarked on a digital transformation of their products, resulting in the introduction of a digital banking business model. The digital banking model involves modifying internal processes and optimizing the products offered through the application of innovative financial technologies (Dapp, 2015; European Banking Authority, 2018). This can manifest as the simple transfer of previously offered banking products to digital platforms, such as mobile applications, or through the creation of partnerships with innovative financial startups by incorporating their solutions (Hornuf et al., 2020; PwC, 2016). This model serves as a convergence point between the traditional banking and FinTech business models. Therefore, it is evident that the impact of FinTech is not significant due to the proactive behavior of traditional banks in embracing technological innovation. By transitioning to digital platforms, banks can significantly reduce the operational costs associated with maintaining physical branches and performing manual processes. This shift to digital infrastructure enhances cost efficiency, enabling banks to offer financial products at more competitive prices (McKinsey & Company, 2020). As a result, traditional banks can maintain solid profitability despite the presence of FinTech startups.

Moreover, it is crucial to consider external shocks to have a comprehensive understanding of the evolutionary wave promoted by FinTech. The COVID-19 pandemic serves as a recent example of an external shock that significantly influenced the FinTech sector. This disruption provided an environment where FinTech companies could demonstrate their resilience and adaptability, filling gaps left by traditional financial institutions. The widespread diffusion is also explained by the Technology Acceptance Model, which highlights the increased perceived usefulness and ease of use of FinTech applications during the pandemic. With lockdowns and social distancing measures, consumers and businesses sought digital alternatives for financial transactions, thereby enhancing the perceived benefits of FinTech solutions (Davis, 1989).

In addition, this success has also had a significant impact on investor behavior. The successful adoption and performance of FinTech solutions during the pandemic served as a positive signal to investors. The demonstrated reliability and scalability of FinTech platforms during a global crisis enhanced investor confidence, leading to increased funding rounds (Spence, 1973). FinTech firms capitalized on their technological capabilities and agility to rapidly meet the evolving demands of consumers and businesses during the pandemic. This strategic advantage made them attractive targets for investors seeking resilient and innovative companies amidst economic uncertainty (Barney, 1991). Moreover, the Behavioral Finance theory suggests that during periods of heightened uncertainty, investors tend to gravitate towards sectors demonstrating clear growth potential and stability. The pandemic underscored the critical role of digital financial services, driving a reallocation of capital towards FinTech firms as investors sought to mitigate risks associated with traditional financial institutions (Shefrin, 2002).

Therefore, although the COVID-19 pandemic has been identified as a driver for the growth and evolution of the FinTech sector, its impact on bank performance is not always fully significant when investigated. While such catalyzing shock can boost FinTech growth and stimulate investor interest, can also strain the resources and capabilities of FinTech companies. Rapid growth can bring operational challenges, such as the need to quickly deploy new technology infrastructure and manage exponential increases in demand (Haddad & Honuf, 2021). Furthermore, economic instability and financial market fluctuations during times of crisis can make raising capital difficult, despite investor interest (Le, 2021). Therefore, while external shocks can accelerate the growth and adoption of

FinTech products, their impact on performance can be partially mitigated by the challenges they bring.

Additionally, this negligible effect on bank performance may be attributed to the fact that the FinTech wave has successfully attracted customers who were previously underserved by traditional banking giants (Jagtiani & Lemieux, 2018). For instance, a high-risk start-up may face financial constraints due to its limited credit history. In such a scenario, when traditional banks deny credit, the start-up finds a viable solution in the financial tools offered by FinTech companies (Boustani, 2020). However, as supported by the results of the second hypothesis, in a stressed economy, such as during the COVID-19 pandemic, the imposed restrictions accelerated the growth of the FinTech market segment by indirectly promoting the adoption of their products. In this scenario, not only did new clients adopt FinTech solutions, but traditional bank clients were also attracted to these services. As a result, the impact on certain performance indicators shifted from being negligible to statistically significant and negative. This suggests that while the consolidation of the FinTech segment under normal conditions does not appear disruptive to bank profitability due to its focus on different client segments, in stressed conditions, such as those analyzed in the study, the expectation concerning its impact can be different, translating into a more pronounced and negative effect on bank performance indicators.

## **8 LIMITATIONS**

The present thesis investigated the impact of the development of the FinTech market on the performance of traditional financial institutions, with a particular focus on the role of external factors such as COVID-19 in this interaction. However, despite the various implications that have emerged, it is important to be aware of the limitations when analyzing the results.

Despite the growing interest in the literature regarding the effects of the revolutionary wave of FinTech on the national and international financial landscape, several limitations were encountered during the study. As stated above, the FinTech market in Italy is relatively new, although the last decade has been significant in terms of development. This led to difficulties in data collection. The data regarding FinTech players is restricted due to the absence of disclosure obligations for these newly formed small entities. From the perspective of the main independent variable, other data could be chosen and used to proxy the growth in the market, such as transaction data, referring to the transactions conducted through FinTech channels over the years. However, the limited available FinTech data did not allow for alternative approximations beyond those made in this study. In many cases, the data were either aggregated for groups of years or found in databases with numerous missing values. Consequently, the limited area of interest, Italy, may restrict the generalizability of the results. The findings are based on a specific sample of banks, which may not be representative of all financial institutions globally. Different regions and types of banks may experience varying impacts from FinTech development and economic shocks.

Overall, while this study provides valuable insights into the interaction between FinTech development and traditional financial institutions' performance within a unique context like Italy, where the banking industry is dominated by a few giants, it is crucial to consider the limitations (Comana, 2020). The limited data availability and the specific market context prevented a deeper analysis. It is important to highlight that while FinTech shows a potential positive impact on ROE, this impact is not consistent across all performance metrics. Each metric reveals different aspects of bank performance, suggesting that the influence of FinTech varies. Further research is needed to fully understand how FinTech integration affects different areas of financial performance, particularly given the complex interplay between traditional banking factors and new technological advancements. Moreover, the moderate quality of the model fit may be due to the restricted sample used, but the Italian banking sector seems to function as an oligopoly dominated by a few solid banks (Comana, 2020). Future studies could delve deeper into how the peculiarities of the Italian banking sector interact with these changes. This would provide a more comprehensive understanding of the broader implications of FinTech growth on the financial industry, particularly in markets with similar characteristics.

In conclusion, while this study sheds light on the interaction between FinTech development and traditional financial institutions' performance, it underscores the need for more comprehensive research to fully capture the multifaceted impacts of FinTech growth, particularly in markets with unique characteristics like Italy.

## **9 IMPLICATIONS AND FUTURE RESEARCH**

The global diffusion of new financial technologies has varied by region, with countries like Italy experiencing a slower expansion. Consequently, research in this area remains poorly consolidated. This study offers crucial insights into the peculiarity of new financial players, FinTech startups, and their interplay within the evolving financial landscape. Referencing Dorfleitner et al. (2017), it is noted that the FinTech sector does not pose a systematic risk to the German economy or the stability of its financial sector. The empirical analysis presented similarly confirms that the emergence of this new market segment in Italy has not significantly impacted the performance of large banking institutions. However, changes are visible in the financial services market. Contrary to Elliott et al. (2016), who predicted drastic impacts from disruptive technologies, the changes in Italy have been less radical but still evident. Indeed, the presence of new financial service providers has introduced competition, prompting traditional banks to innovate and thereby defend their profitability. This indicates robust growth prospects for FinTech and suggests a gradual transformation from a traditional bank-centric system to a more diversified financial ecosystem with significant implications for the future.

### 9.1 Managerial Implication

From the analysis conducted in this study, the primary evident implication due to the technological evolution is the enhancement of global financial inclusiveness. The emerging FinTech start-ups target market segments traditionally overlooked by traditional banking systems due to perceived insufficient creditworthiness (Jagtiani & Lemieux, 2018). By focusing on these unserved clients, FinTech start-ups create a niche in the broader banking sector. Traditionally, certain demographics, such as those in rural or low-income areas, have faced barriers in accessing mainstream financial services due to factors like physical distance from bank branches, lack of documentation, or high transaction costs. However, the rise of FinTech innovations is progressively dismantling these barriers. Notably, the expansion of FinTech extends beyond mere business implications, affecting profoundly the societal fabric. Individuals gain significantly from these developments, empowered by the simplified, cost-effective access to financial resources that FinTech companies provide. These start-ups enable individuals to manage their finances more efficiently, save for future needs, and access credit when necessary. Moreover, the accessibility provided by FinTech extends also beyond geographical constraints, including groups traditionally limited by financial literacy. Through user-friendly

interfaces, mobile applications, and simplified processes, FinTech companies democratize financial services, making them more inclusive and accessible to a broader spectrum of society. Consequently, future research should delve deeper into the socio-economic impacts of FinTech diffusion, exploring its role in reducing inequalities, promoting economic empowerment, and fostering financial resilience among vulnerable populations. In essence, as part of the literature suggests there is a correlation between finance and economic growth, positing that FinTech, by enhancing financial inclusion, likely contributes positively to economic growth and development (Frost, 2020). Indeed, cross-country evidence supports this, showing that most indicators of financial inclusion are associated with higher economic growth (Frost, 2020).

Secondly, the study confirms the evolving landscape of the current banking environment and the change in client needs and expectations, being essential for transitional banks to understand how to remain aligned with these changes. A key attribute of FinTech is its innovative business model, suggesting that the adoption of cutting-edge technologies is essential for traditional banks to maintain competitiveness amid the rise of fintech startups. By integrating innovative solutions like artificial intelligence, blockchain, and data analytics into their operations, banks can streamline processes, enhance efficiency, and improve customer experiences. However, this alone may not be sufficient. To date, it appears that traditional banks' profitability has not been compromised, as they have managed to stay competitive by digitizing traditional products that meet the daily demands of most customers. Yet, these institutions should prioritize customer-centric innovations. Understanding and addressing the shifting needs and preferences of customers are crucial for retaining loyalty and attracting new consumers. This may involve developing user-friendly digital platforms and broadening their range of products to include more accessible, personalized, and rapidly accessible options. Furthermore, traditional banks must foster agility and adaptability within their organizational cultures. The ability to respond swiftly to market changes and customer demands is vital for staying ahead in the industry. However, one significant obstacle for the banking sector is stringent regulation. A potential solution could be collaboration with FinTech startups, which could prove mutually beneficial. Partnering with innovative FinTech companies allows banks to leverage specialized expertise and technologies while providing startups with access to a broader customer base and regulatory support. Through strategic partnerships and alliances, traditional banks can enhance their capabilities and drive innovation more effectively (Preziuso et al., 2023).

Finally, the analysis of the post-COVID-19 impact on the FinTech sector presents a further area for future research, offering valuable insights into how the pandemic has shaped and continues to

influence this rapidly evolving industry. The study has shown how the pandemic acted as a powerful catalyst, accelerating digitalization and the adoption of FinTech solutions in a context marked by uncertainty and social distancing. This phenomenon has opened a unique window to explore how these transformations are influencing consumer behavior, the operational efficiency of financial institutions, and the economic resilience of communities. However, current research tends to focus on the initial impacts of the pandemic, leaving room for further exploration of the long-term effects of this wave of innovation. Has COVID-19, with its global spread of FinTech solutions, truly led to lasting improvements in financial inclusion, financial stability, and economic development, as suggested by Sahay et al. (2020)? Additionally, it is crucial to investigate whether the pandemic has significantly altered the competitive dynamics between FinTech startups and traditional financial institutions in the long term. Therefore, the post-pandemic period offers fertile ground for academic research that could make significant contributions to the existing literature, helping to better understand the evolution of the FinTech sector and its impact on society and the global economy.

## 9.2 Policy Implication

The research findings provide crucial information to policymakers regarding the influence of the FinTech wave. This data underscores the need for policymakers to comprehend and adapt to the rapid advancements and diversification in the banking sector. As these innovations continue to reshape the financial landscape—offering cost reductions, reducing transactional frictions, improving efficiency and competition, decreasing information asymmetry, and broadening access to financial services— they also introduce new risks to the financial system and its consumers (FSB 2017). This dual nature presents a critical trade-off for national authorities: fostering the benefits of digital transformation while mitigating associated risks to maintain the financial system's stability and integrity (World Bank/IMF 2018).

Given these dynamics, it is essential for regulatory bodies to evolve, adapting their frameworks and supervisory practices. According to the World Bank and IMF (2018), adapting these practices involves expanding the regulatory perimeter to ensure that all entities operate under a level playing field with clear, consistent licensing requirements (Feyen, 2021). Such measures would prevent any undue advantage that might arise from less stringent oversight of new entrants compared to established financial institutions. Furthermore, the integration of regulatory (regtech) and supervisory (suptech) technology solutions should be considered a significant component of the policy response to these FinTech developments (Feyen, 2021). Regtech tools can improve the efficiency and

effectiveness of regulatory processes by using advanced technologies to monitor compliance and manage risks dynamically Broeders and Prenio 2018). Suptech solutions, on the other hand, could equip supervisory bodies with better tools for supervision, thus ensuring that the increased diversity of financial services does not compromise the overall safety and soundness of the system (Broeders and Prenio 2018).

In essence, the integration of FinTech innovations requires a balanced approach that promotes their growth and maintains the resilience of the system, fostering the development of a more inclusive and robust financial ecosystem.

# **10 CONCLUSION**

The thesis provides a comprehensive examination of the impact of FinTech startups on traditional financial institutions, with a particular focus on the Italian banking context. In addition, it explores how technological advancements and external shocks, particularly the COVID-19 pandemic, have contributed to the accelerated adoption and growth of FinTech solutions, thereby reshaping the financial landscape.

FinTech start-ups are proving essential in the transformation of the traditional banking sector, offering innovative, customer-centric services that are more accessible and affordable than those offered by traditional banks (Le, 2021). The pandemic has acted as a catalyst, driving the adoption of FinTech solutions as consumers and businesses have sought digital alternatives for financial transactions, thus stimulating the growth of the sector and the interest of investors. Despite the exponential growth of FinTech, the impact on traditional banks' performance metrics shows variable results. The adoption of digital banking, which has enabled traditional banks to reduce costs and maintain competitiveness, affects various performance metrics differently, being significant in some specific cases, such as ROE.

Overall, the analysis highlights the need for traditional banks to adapt, integrating advanced technologies and practical innovations to remain competitive. It also highlights the urgent need for regulatory adjustments to accompany the evolution of the financial ecosystem, while ensuring stability and inclusiveness.

In conclusion, the interaction between the FinTech and traditional banking sectors signals a dynamic evolution of the financial industry, driven by technological innovation and external factors such as the COVID-19 pandemic. While FinTech has introduced new competitive pressures, it has also provided opportunities for traditional banks to innovate and adapt. Future research is crucial to explore the long-term implications and ensure that the benefits of FinTech growth are extended across the financial landscape.

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# APPENDIX

#### FinTech-to-GDP ratio (% transaction volume on GDP) 7,10% 8,00% 300,00 6,00% 200,00 3% 3% 3% 2,10% 4,00% 1,40% 100,00 2,00% 216,10 131,10 91,70 29,00 38,30 0,00 0,00% UK Germany France Italy Spain Netherlands =GDP FinTech transaction volume -

Figure 6: FinTech-to-GDP ratio (% transaction volume on GDP). EY Report (2020); Statista (2018)



Top five sectors in Italy by VC funding (€m)

Figure 7: Top five sectors in Italy by Venture Capital Funding. EY Report (2023).



Figure 8: Distribution of FinTech start-ups in Italy. PwC (2023).



Italian FinTech funding by year, 2016-2022 (€m, including all types of equity funding)

Figure 9:Italian FinTech funding by year, 2016-2022. EY Report (2020)



Figure 10: FinTech startups in Italy in 2008-2023.

Table 11: Descriptive Statistics

Variable	Description	Mean	SD	Min	Max
ROE	Return on Equity	9,96	17,42	-90,61	77,44
ROA	Return on Asset	1,51	4,72	-6,5	41,4
NIM	Net Interest Margin	0,01	0,01	0	0,06
ANNUAL STOCK RETURN	Annual Stock Return	1,03E+04	8,57E+04	-8,96E+04	1,15E+06
FINTECH	Total additional funding raised by FinTech	1,19E+12	3,59E+12	0	1,5E+13
SIZE	Bank size	10,06	2,43	2,03	13,88
CAP	Capital Ratio	0,22	0,55	0	4,85
CTI	Cost Income Ratio	0,44	0,33	-0,08	2,95
INF	Inflation Rate	1,95	2,21	-0,14	8,2
INR	Real interest Rate	2,54	1,38	-0,69	4,33
GDP	Gross domestic product	0,05	3,68	-8,97	8,31

#### Table 12: Pearson Correlation Matrix

	ROE	ROA	NIM		ANNUAL STO(FINTECH	(	COVID_19	SIZE	CA	P CTI	IN	F D	NR (	GDP
ROE	1	,00												
ROA	Q	,61	1,00											
NIM	-0	,07	0,00	1,00										
ANNUAL STOCK RETURN	Q	,26	0,09	-0,05	1,00									
FINTECH	0	,11	0,00	-0,01	0,05	1,00								
COVID_19	C	,18	-0,01	-0,22	0,05	0,49	1,0	)						
SIZE	-0	,33	-0,57	-0,37	-0,10	0,04	0,0	)	1,00					
CAP	0	,42	0,85	0,08	0,11	-0,04	-0,0	5	-0,64	1,00				
CTI	-0	,22	-0,07	0,42	-0,01	-0,06	-0,0	7	-0,14	0,03	1,00			
INF	0	,03	-0,05	-0,02	-0,07	0,36	0,40	)	0,06	-0,07	-0,07	1,00		
INR	-0	,15	-0,01	0,29	0,03	0,12	-0,6	5	-0,07	0,03	0,00	-0,23	1,00	
GDP	0	,06	-0,03	-0,12	0,03	-0,15	0,1	5	0,04	-0,02	-0,02	0,32	-0,23	1,00

### Table 13: Variance Inflation Factor (VIF)

	MODEL ROE	MODEL NIM	MODEL ANNUAL STOCK RETURN
Variable	VIF	VIF	VIF
FINTECH	1.01	1.02	1.00
ROE LAST	1.39		
NIM LAST		1.18	
ANN_RETURN LAST			1.01
SIZE	1.77	1.94	1.75
CAP	1.96	1.75	1.72
СТІ	1.08	1.04	1.03

Table 14: HP1"The growth of FinTech has no significant impact on the performance of traditional financial institutions".

	Pan	el Data Fixed Effect Re	gression - HP1
		Dependent variat	bles
	ROE	NIM	Annual Stock Return
FINTECH	0.06 .	0.13	0.44
	(-1.55E+6)	(4.65E-4)	(-4.18E+6)
Last Year's ROE	0.02*		
	(0.15)		
Last Year's ROA			
Last Year's NIM		0.07.	
		(0.10)	
Last Year's Stock Retum		· · /	0.03*
			(-0.13)
Size	0.02 *	5.83E-5***	0.30
	(-3.55E+6)	(-3.26E-3)	(-1.01E+7)
Capital Ratio	0.02*	2.99E-3 * *	0.07.
	(-9.25E+6)	(1.39E-3)	(-4.55E+7)
Cost-Income Ratio	0.13	3.96E-4***	0.67
	(-5.08)	(6.52E-3)	(-9.2E+6)
Observations	249	249	249
Year dummies Firm effects	Included Individual	Included Individual	Included Individual
R-Squared	0.11	0.29	0.03
Adj. R-Squared	0.03	0.23	0.050
F-statistic	588.536	195.378	160.997
Note:			* p <0. 1 **p<0.01,***p<0.001

	COVID-19 Impact on Fintech			
	Depender	nt variable:		
	Fin	tech		
	(1)	(2)		
COVID_19	3.35e-16***	< 2e-16***		
	(3,94E+15)	(6,98E+15)		
GDP		1.38e-05***		
		(-1,96E+14)		
INF		1.39e-06***		
		(-1,96E+14)		
INR		< 2e-16***		
		(1,87E+15)		
Constant	0.853	< 2e-16***		
	(4,74E+13)	(-6,38E+15)		
Observations	249	249		
R2	0.2367	0.6074		
Adjusted R2	0.2336	0.601		
Residual Std. Err	3.32E+12(df = 247)	2.395E+12(df = 244)		
F Statistic	$76.6^{***} (df = 1; 247)$	$94.39^{***}$ (df = 4; 244)		
Note:	*p<0.1;**p<0.01,***p<	<0.001		

 Table 5: HP 2A: "The COVID-19 pandemic has led to an increase in funds raised by FinTech start-ups."

	Panel Data Fixe	ed Effect Regression - H	P2B
		Dependent varia	ables
	ROE	NIM	Annual Stock Return
FINTECH	0,00827**	0.117	3.21E-3**
	(6.86E+7)	(-0.014)	(5.32E+8)
COVID-19	0.039*	0.355	2.99E-3**
	(-1.82E+7)	(2.39E-3)	(-1.67E+8)
FINTECH:COVID-19	8.92E-3**	0.097.	1.45E-3**
	(-6.8E+7)	(0.015)	(-5.28E+8)
Last Year's ROE	0.013*		
	(0.165)		
Last Year's NIM		0.259	
		(-0.069)	
Last Year's Stock Retum			0.015*
			(-0.15)
Size	0.24	0.013***	0.98
	(1.92E+6)	(-2.6E-3)	(0.89)
Capital Ratio	0.03*	4.22E-3**	0.97
	(8.6E+5)	(-1.39E-3)	(0.82)
Cost-Income Ratio	0.05.	7.49E-4***	0.53
	(-6.46E+1)	(6.86E-3)	(1.33E+4)
Observations	249	249	249
Year dummies Firm effects	Included Individual	Included Individual	Included Individual
R-Squared	0.15	0.32	0.15
Adj. R-Squared	0.07	0.26	0.06
F-statistic	59085	59155	58951
Note:			* p <0. 1 **p<0.01,***p<0.001

 Table 15:HP 2b
 "The accelerated adoption of FinTech services has not significantly impacted the bank's performance."

### Table 16: HP1 Robustness Analysis

	KODU	Stiless Analysis - Late L	
		Dependent variables	
	ROE	NIM	Annual Stock Return
FINTECH	0.04*	0.30	0.46
	(3.12E+6)	(5.95E-4)	(7.56E+3)
Last Year's ROE	0.02*		
	(0.15)		
Last Year's NIM		0.08	
		(0.10)	
Last Year's Stock Retum			0.03*
			(-1.39E+1)
Size	0.025*	7.4E+8***	0.30
	(3.5E+6)	(-3.25E-3)	(1.08E+4)
Capital Ratio	0.21*	0.002**	0.07.
	(9.29E+6)	(-0.004)	(4.55E+4)
Cost-Income Ratio	0.129	4.95E+7***	0.68
	(-5.15E+6)	(6.47E-3)	(8.99E+3)
Observations	249	249	249
Year dummies Firm effe	Included Individual	Included Individual	Included Individual
R-Squared	0.11	0.29	0.033
Adj. R-Squared	0.038	0.23	-0,05
F-statistic	59.921	19.193	1.601
Note:		* p <0	). 1 **p<0.01,***p<0.001

Robustness Analysis - Late Effect HP1

Table 17: HP2b Robustness analysis

	Robus	tness Analysis - Late El	fect HP2B
		Dependent variables	
	ROE	NIM	Annual Stock Return
FINTECH	8.39E-2**	0.11	0.001**
	(4.92E+6)	(-0.01)	(3.82E+5)
COVID-19	0.05.	0.34	0.003**
	(-1.51E+6)	(2.67E-3)	(-1.44E+5)
FINTECH:COVID-19	0.01*	0.07.	1-52E-3**
	(-4.82E+6)	(0.01)	(-3.79E+5)
Last Year's ROE	0.013*		
	(0.16)		
Last Year's NIM		0.28	
		(0.06)	
Last Year's Stock Return	ı		0.015*
			(-1.51E-1)
Size	0.24	1.44E-4***	0.90
	(-1.92E+6)	(-2.69E-3)	(2.50E+1)
Capital Ratio	0.03*	0.004**	0.98
	(8.59E+6)	(-3.99E-3)	(6.02E+2)
Cost-Income Ratio	0.05	9.26E-8***	0.54
	(-6.49E+6)	(6.68E-4)	(1.27E+4)
Observations	249	249	249
Year dummies Firm effe	Included Individual	Included Individual	Included Individual
R-Squared	0.15	0.32	0.15
Adj. R-Squared	0.07	0.25	0.06
F-statistic	5.88	15.52	5.13
Note:		* p <0	0.1**p<0.01,***p<0.001

Table 18: Robustness analysis - ROA HP1 -

Robustness a	Robustness analysis - ROA HP1 -		
	Dependent variables		
	ROA		
FINTECH	0.44		
	(0.12)		
Last Year's ROE			
Last Year's ROA	1.31E-06 ***		
	(0.30)		
Last Year's NIM			
Last Year's Stock Retum			
Size	0.69		
	(-0.11)		
Capital Ratio	8.54E-06 ***		
	(-3.99E+5)		
Cost-Income Ratio	8.58E-4***		
	(-2.20)		
Observations	249		
Year dummies Firm effects	Included Individual		
R-Squared	0.35		
Adj. R-Squared	0.29		
F-statistic	249.012		
Note:	* p <0. 1 **p<0.01,***p<0.001		

## Table 11: Robustness analysis - ROA H2B -

Robustness analy	Robustness analysis - ROA HP2B -			
	Dependent variables			
_	ROA			
FINTECH	0.1			
	(8.16E+6)			
COVID-19	0.13			
	(-2.53E+6)			
FINTECH:COVID-19	0.10			
	(-8.7E+6)			
Last Year's ROE				
Last Year's ROA	8.28E-06 ***			
	(0.30)			
Last Year's NIM				
Last Year's Stock Retum				
Size	0.53			
	(-0.19)			
Capital Ratio	0.011***			
	(-3.99E+5)			
Cost-Income Ratio	4.60E-4***			
	(2.E+6)			
Observations	249			
Year dummies Firm effects	Included Individual			
R-Squared	0.36			
Adj. R-Squared	0.29			
F-statistic	18.231			
Note:	* p <0. 1 **p<0.01,***p<0.001			