
FINTECH AND FINANCIAL INCLUSION: A REVIEW OF THE EMPIRICAL LITERATURE

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INTRODUCTION

The financial technology industry, or “*fintech*,” has experienced rapid growth within recent years. Between 2015 and 2019, global fintech adoption among consumers rose from 16% to 64%.¹ Adoption of fintech services has continued to rise and further accelerated during the COVID-19 pandemic.²

An emerging field of research highlights the important role that fintech can play in promoting *financial inclusion*—the availability and equality of opportunities to access financial services. The 2017 Global Findex Database noted that 1.7 billion adults worldwide are unbanked, meaning they lack an account with a financial institution or mobile money provider; nearly all unbanked adults live in the developing world.³

Access to financial services is a key enabler for financial inclusion and, on a broader scale, reducing worldwide poverty. Financial accounts encourage personal savings and investment, provide insurance against risks

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1. SHARON CHENG & DOINA CHISELITA, ERNST & YOUNG LLP, GLOBAL FINTECH ADOPTION INDEX 2019 6 (2019), http://assets.ey.com/content/dam/ey-sites/ey-com/en_gl/topics/banking-and-capital-markets/ey-global-fintech-adoption-index.pdf [<http://perma.cc/BYD8-X6CX>].

2. Jonathan Fu & Mrinal Mishra, *Fintech in the Time of COVID-19: Technological Adoption During Crises*, J. FIN. INTERMEDIATION, Apr. 2022, at 1, 17.

3. ASLI DEMIRGÜÇ-KUNT, LEORA KLAPPER, DOROTHE SINGER, SANIYA ANSAR & JAKE HESS, WORLD BANK GRP., THE GLOBAL FINDEX DATABASE 2017: MEASURING FINANCIAL INCLUSION AND THE FINTECH REVOLUTION 4 (2018), <https://documents1.worldbank.org/curated/en/332881525873182837/pdf/126033-PUB-PUBLIC-pubdate-4-19-2018.pdf> [<https://perma.cc/3HFP-EV3Y>].

and shocks, and promote economic mobility.⁴ Thus, the importance of bringing financial services to the unbanked has captured the attention of many researchers.

Online platforms have an important role to play in financial inclusion. Numerous studies have demonstrated that fintech services, such as mobile money, digital payment solutions, and digital lending platforms, have the potential to enable account ownership among the unbanked.⁵ Further research has shown that countrywide fintech adoption can decrease income inequality by up to 23%.⁶ Overall, research points to the fact that fintech can have a positive impact on financial inclusion, yet the magnitude of its effects are dependent on relevant infrastructure and policies.⁷

Recently, governments and global organizations have begun to recognize the need for harnessing the power of fintech to promote financial inclusion. For example, the Group of Twenty (“G20”) High-Level Principles for Digital Financial Inclusion emphasize the importance of utilizing fintech to achieve financial inclusion and reduce global income inequality.⁸ Additionally, the United Nations (“U.N.”) 2030 Agenda for Sustainable Development calls for innovation and development of fintech to spur economic growth among emerging and developing countries.⁹

This research commentary surveys key research related to fintech and its implications for global financial inclusion. Specifically, it provides an overview of studies regarding digital lending, digital payment, and mobile money platforms and how these services can bridge the financial gap for traditionally unbanked and underserved communities. In terms of the legal role through public and private law, it also identifies common concerns and challenges associated with the adoption of fintech, as well as relevant policies to mitigate these concerns and foster financial inclusion.

4. See *id.* at 1–14.

5. See, e.g., CAMBRIDGE CTR. FOR ALT. FIN., WORLD BANK GRP. & WORLD ECON. F., THE GLOBAL COVID-19 FINTECH MARKET RAPID ASSESSMENT STUDY 8 (2020), https://www3.weforum.org/docs/WEF_The_Global_Covid19_FinTech_Market_Rapid_Assessment_Study_2020.pdf [<https://perma.cc/M8HN-GXFP>].

6. See Ayse Demir, Vanesa Pesqué-Cela, Yener Altunbas & Victor Murinde, *Fintech, Financial Inclusion, and Income Inequality: A Quantile Regression Approach*, 28 EUR. J. FIN. 86, 95 (2020).

7. See Purva Khera, Stephanie Ng, Sumiko Ogawa & Ratna Sahay, *Measuring Digital Financial Inclusion in Emerging Market and Developing Economies: A New Index* 16–17 (Int’l Monetary Fund, Working Paper No. 21/90, 2021).

8. GLOB. P’SHIP FOR FIN. INCLUSION (“GPFI”), G20 HIGH-LEVEL PRINCIPLES FOR DIGITAL FINANCIAL INCLUSION (2016), http://www.gpfi.org/sites/gpfi/files/documents/G20-HLP-Summary_0.pdf [<http://perma.cc/UY3D-HC28>].

9. U.N. Inter-Agency Task Force on Fin. for Dev., *United Nations Secretary General’s Roadmap for Financing the 2030 Agenda for Sustainable Development 2019–2021*, at 9 (2020), http://www.un.org/sustainabledevelopment/wp-content/uploads/2019/07/EXEC.SUM_SG-Roadmap-Financing-SDGs-July-2019.pdf [<http://perma.cc/GJ66-CCRF>].

I. DIGITAL CREDIT

A. HOW DOES FINTECH FILL THE CREDIT GAP?

1. Expanding Credit to Underserved Borrowers

Limited access to credit is one of the largest barriers to financial inclusion. Many studies have shown that digital lending platforms fill the credit gap by expanding credit services to traditionally underserved borrowers. Recent research compared account-level data between digital lending platform LendingClub and U.S. banks to examine whether fintech fills credit gaps in regions underserved by traditional banks. The results showed that LendingClub increased credit availability in areas that could benefit from additional credit supply, including both highly concentrated and underserved bank markets.¹⁰ Economists built upon this research by studying marketplace lending at the business and consumer levels across 109 countries from 2015 to 2017. They found that marketplace lending was more prevalent in lower-income economies and filled the credit gap when access to traditional banks and lenders decreased.¹¹

2. Providing Alternative Sources of Data

Fintech lending platforms often use alternative data sources to evaluate customer creditworthiness, as compared to traditional lenders that use standard measures such as credit score. Common sources of alternative data include utility bills, bank transactions, online footprints, and personal data such as occupation and education information. These alternative information sources can address information asymmetries and thus benefit borrowers who would typically be classified as subprime by traditional lenders.¹² Furthermore, the use of data and machine learning by fintech platforms can increase efficiency and thus decrease cost, as opposed to traditional lenders. Fintech lenders can process mortgage applications 20% faster than traditional lenders without compromising on default prediction accuracy.¹³

Numerous studies examine the accuracy of loan prediction by fintech

10. Julapa Jagtiani & Catharine Lemieux, *Do Fintech Lenders Penetrate Areas that Are Underserved by Traditional Banks?*, 100 J. ECONS. & BUS. 43, 53 (2018).

11. Majid Bazarbash & Kimberly Beaton, *Filling the Gap: Digital Credit and Financial Inclusion* 19–20 (Int'l Monetary Fund, Working Paper No. 20/150, 2020).

12. Julapa Jagtiani & Catharine Lemieux, *Fintech Lending: Financial Inclusion, Risk Pricing, and Alternative Information* 34–37 (Fed. Rsrv. Bank of Phila., Working Paper No. 17-17, 2017).

13. OECD, DIGITAL DISRUPTION IN BANKING AND ITS IMPACT ON COMPETITION 12 (2020) <http://www.oecd.org/competition/digital-disruption-in-banking-and-its-impact-on-competition-2020.pdf> [<http://perma.cc/DG5U-ZS47>].

lenders. Although the correlation between Fair, Isaac and Company (“FICO”) scores (used by traditional banks) and rating grades (used by fintech platform LendingClub) decreased from 80% in 2007 to 35% in 2015, rating grades continued to serve as an accurate predictor for loan default.¹⁴ This highlights how alternative data sources and machine learning used to assign rating grades within fintech platforms can serve as accurate predictors of loan delinquency, even for borrowers who lack traditional indicators of creditworthiness like credit scores. Further research demonstrated that applying big data methods to credit screeners significantly strengthened the lender’s accuracy of loan default prediction. Predicted default probabilities decreased most among small businesses and lower-tier cities that previously faced information disadvantages during risk assessment by traditional firms.¹⁵ Given that lower risk of default increases the likelihood of obtaining loans, their work suggests that the information advantage provided by fintech can play a key role in expanding credit access to underserved borrowers.

B. BIAS IN FINTECH LENDING

1. Evidence of Discriminatory Lending

In recent years, there has been increased debate as to whether discriminatory lending exists within fintech. While digital lending platforms have been shown to increase credit accessibility, there is a long history of discrimination in the lending industry. Fair-lending laws in many countries are designed to prohibit biased lending, yet there is still significant evidence that some lenders discriminate on the basis of characteristics such as gender and race.¹⁶

Researchers compared lending discrimination among fintech and traditional lenders. They merged data on government-sponsored enterprise (“GSE”) and Federal Housing Administration (“FHA”) loans with information on borrowers’ race and ethnicity. The results showed that fintech lenders charged Black and Latinx borrowers higher rates for FHA and GSE purchase loans, as well as GSE refinance loans, highlighting similar rate disparities for minority borrowers among traditional and fintech lenders.¹⁷ A similar study analyzed crowdfunding projects launched on the platform

14. Julapa Jagtiani & Catharine Lemieux, *The Roles of Alternative Data and Machine Learning in Fintech Lending: Evidence from The LendingClub Consumer Platform* 26 (Fed. Rsv. Bank of Phila., Working Paper No. 18-15, 2019).

15. Yiping Huang, Longmei Zhang, Zhenhua Li, Han Qiu, Tao Sun & Xue Wang, *Fintech Credit Risk Assessment for SMEs: Evidence from China* 33–35 (Int’l Monetary Fund, Working Paper No. 20/193, 2020).

16. See, e.g., Robert Bartlett, Adair Morse, Richard Stanton & Nancy Wallace, *Consumer-Lending Discrimination in the Fintech Era*, 143 J. FIN. ECON. 30, 55–56 (2022).

17. See *id.*

Kickstarter to test for bias against minority founders. The analysis proved that, compared to non-Black founders, Black founders raised on average 86.1% less for their projects, and prospective supporters held an unconscious bias against Black founders.¹⁸

Even when sensitive attributes like race and gender are not explicitly used as inputs for machine learning algorithms, they can be correlated with other input features which affect the prediction outcomes.¹⁹ Factors such as education level, gender, and income can influence perceptions of borrower trustworthiness and thus bias lending decisions. An analysis of 247,115 loans on Renrendai, one of the largest debt crowdfunding platforms in China, revealed that borrowers' regional social capital had a positive relationship with funding success and loan size.²⁰ The findings demonstrate how fintech lenders utilize alternative soft information and personal perceptions to inform their lending decisions and that these factors can be used to bias lending.

2. Debiasing with Artificial Intelligence

Improvements in machine learning that remove potential for biased decision-making hold promise in increasing credit opportunities for historically disadvantaged borrowers and contribute to financial inclusion. Evidence of lending discrimination has inspired researchers to examine ways in which machine learning algorithms can be designed to correct for bias. A recent study proposed a debiasing algorithm that makes input features independent of sensitive attributes and applied it to a previously biased machine learning algorithm for a peer-to-peer lending platform. The results showed that the differences in the probability of being funded between male and female, as well as non-Black and Black borrowers, were statistically insignificant, indicating the debiasing algorithm effectively removed previous biases.²¹

Likewise, fintech lending platforms may only be harmful to minority groups if the algorithm includes both a proxy for group membership and explicitly contains prejudice against the group. Research found that removing these proxies and developing debiasing algorithms can mitigate bias if it exists and ultimately benefit minority groups that are historically

18. Peter Younkin & Venkat Kuppaswamy, *The Colorblind Crowd? Founder Race and Performance in Crowdfunding*, 64 MGMT. SCI. 3269, 3273–74 (2018).

19. Runshan Fu, Yan Huang & Param Vir Singh, *Crowds, Lending, Machine, and Bias*, 32 INFO. SYS. RSCH. 72, 88–89 (2021).

20. Iftekhar Hasan, Qing He & Haitian Lu, *Social Capital, Trusting, and Trustworthiness: Evidence from Peer-to-Peer Lending*, 57 J. FIN. & QUANTITATIVE ANALYSIS 1409, 1449 (2022).

21. See Fu et al., *supra* note 19, at 72–74.

harmed by bias in traditional lending.²² A similar study revealed that by correcting for soft information bias and using hard information more effectively, machine learning algorithms can be fairer for disadvantaged borrowers than traditional lenders.²³

II. DIGITAL PAYMENTS

A large body of literature examines the ways in which digital payment services enable financial inclusion. Digital payment technologies support services such as salary disbursements, bill payments, peer-to-peer transfers, credit payments, and consumer-good payments. Quasi-experimental research on the impacts of global mobile money services has shown that digitizing payments has positive effects on the value chain and can benefit disadvantaged groups.²⁴

A. THE ROLE OF GOVERNMENTS IN DIGITIZING PAYMENTS

Several studies have examined the effects of digitization of government payments. Digital government payments have particularly large implications for overall fintech adoption, as a government shift toward digital finance could push private sectors to do the same. On a broader scale, transitioning to digital government-to-person (“G2P”) payments can have large effects on incorporating the unbanked into the financial system. Digital G2P payments may facilitate account ownership among 160 million currently unbanked adults who receive government payments exclusively in cash.²⁵

Digitizing G2P payments has been shown to benefit both governments and recipients by decreasing costs and increasing efficiency. For example, the Mexican government decreased its spending on G2P payments by 3.3% annually by shifting to digital payments.²⁶ Similarly, analysis of a social transfer program in Niger found mobile transfers decreased variable cost by 20%.²⁷ Digital payments also benefit recipients by decreasing travel time to collect payments, which translates to saved money in terms of travel

22. See Thomas Philippon, *On Fintech and Financial Inclusion* 17 (Nat'l Bureau of Econ. Rsch., Working Paper No. 26330, 2019).

23. See Prasanna Tantri, *Fintech for the Poor: Financial Intermediation Without Discrimination*, 25 REV. FIN. 561, 590 (2021).

24. Yan Dong, Moonwon Chung, Chen Zhou & Sriram Venkataraman, *Banking on Mobile Money: The Implications of Mobile Money Services on the Value Chain*, 21 MFG. & SERV. OPERATIONS MGMT. 290, 305–06 (2019).

25. Leora Klapper & Dorothe Singer, *The Opportunities and Challenges of Digitizing Government-to-Person Payments*, 32 WORLD BANK RSCH. OBSERVER 211, 217 (2017).

26. *Id.* at 213.

27. Jenny C. Aker, Rachid Boumnijel, Amanda McClland & Niall Tierney, *Payment Mechanisms and Antipoverty Programs: Evidence from a Mobile Money Cash Transfer Experiment in Niger*, 65 ECON. DEV. & CULTURAL CHANGE 1, 5 (2016).

expenses and lost wages. Researchers further examined these benefits by analyzing a government-sponsored debit-card program in Mexico. In 2009, the government issued debit cards to members of Prospera, a cash-transfer program for underserved populations. Analysis showed that prior to receiving the debit cards, 84% of recipients were forced to forgo important activities, such as work and childcare, to travel to the bank and access the transfer.²⁸ After receiving the debit cards, this number fell to 25%. This reduction in travel time and foregone activities led to an average increase of ninety-eight pesos in household net savings.²⁹

III. CASE STUDIES OF MOBILE MONEY

Many studies regarding digital payments are specifically focused on mobile money. Mobile money is defined as a service in which customers can store, send, and receive money via mobile phones.³⁰ Users cash in and cash out money from their accounts through a network of agents that serve as local ATMs.³¹ Given that nearly 80% of adults in developing countries own mobile phones, adoption levels of mobile-money services have been high and are continuing to rise.³² As of 2020, there were 1.21 billion registered mobile-money accounts globally.³³

A large portion of the case studies concerning mobile money adoption have been concentrated in Africa, which has historically faced high levels of financial exclusion due to insufficient banking services and lack of financial infrastructure. Mobile-money transactions in Africa account for nearly two-thirds of mobile-money transactions made worldwide.³⁴ Low-tech mobile money services, such as M-PESA, have achieved remarkable success, as they simply require users to have a basic phone with SMS text-messaging services as opposed to more advanced smartphones.³⁵ For example, 90% of Kenyan adults pay with M-PESA, and M-PESA transfers amount to nearly

28. See Pierre Bachas, Paul Gertler, Sean Higgins & Enrique Seira, *Digital Financial Services Go a Long Way: Transaction Costs and Financial Inclusion*, 108 AM. ECON. ASS'N PAPERS & PROC. 444, 444 (2018).

29. See *id.*

30. See SIMON K. ANDERSSON-MANJANG & NIKA NAGHAVI, GSMA, STATE OF THE INDUSTRY REPORT ON MOBILE MONEY 2021, at 78 (2021) http://www.gsma.com/mobilefordevelopment/wp-content/uploads/2021/03/GSMA_State-of-the-Industry-Report-on-Mobile-Money-2021_Full-report.pdf [<http://perma.cc/MK2Y-ZZ62>].

31. Nicholas Economides & Przemyslaw Jeziorski, *Mobile Money in Tanzania*, 36 MKTG. SCI. 815, 816 (2017).

32. See DEMIRGÜÇ-KUNT, KLAPPER, SINGER, ANSAR & HESS, *supra* note 3, at 86–87.

33. ANDERSSON-MANJANG & NAGHAVI, *supra* note 30, at 14.

34. See *id.*

35. David Yermack, *Fintech in Sub-Saharan Africa: What Has Worked Well, and What Hasn't* 18–19 (Nat'l Bureau of Econ. Rsch., Working Paper 25007, 2018).

half of Kenya's gross domestic product ("GDP").³⁶

A. SELF-TRANSPORTATION

Without mobile money or access to formal banking systems, unbanked individuals tend to rely on sending money via transportation services, friends and family, or physically carrying the cash to their recipient.³⁷ These informal transportation methods are not only inconvenient and inefficient, but also incur a high risk of theft. A recent study examined transaction data from Tigo, the second largest mobile network in Tanzania, to understand the role of self-transportation in mobile money. Self-transportation makes up 13% of mobile money transactions in Tanzania and serves as a secure method to carry money over short distances of up to ten kilometers; customers deposit money into their mobile money account with a local agent, travel a short distance, and then withdraw money at another location within the same day.³⁸ The authors argue that a high willingness to pay the withdrawal fee of 7.3% suggests that alternative methods of transporting physical cash are risky and further estimate that walking an extra kilometer while carrying cash increases the likelihood of being robbed by 124%.³⁹ These findings are consistent with the high street-crime rate in Tanzania cited by the U.N. Office on Drugs and Crime.⁴⁰ Overall, the study highlights how mobile money can mitigate the high crime risk associated with transporting money in developing economies.

B. INFORMATION NETWORKS AND REMITTANCES

Economists studied M-PESA usage in Sub-Saharan Africa, arguing that mobile money creates a sort of informal information insurance network that promotes more frequent remittances.⁴¹ Similar research on M-PESA usage in Kenya linked mobile-money with informal insurance-like transactions. Households using M-PESA in Kenya experienced more frequent transfers of greater value compared to households without access to an M-PESA account. In particular, M-PESA users were found to be over 34% more likely to send and receive remittances within personal networks as compared to non-users.⁴² Researchers built upon this work by studying the effect of

36. Tobias Adrian & Tommaso Mancini Griffoli, *The Rise of Digital Money*, 13 ANN. REV. FIN. ECON. 55, 66 (2021).

37. See Jenny Aker & Isaac Mbiti, *Mobile Phones and Economic Development in Africa*, J. ECON. PERSPS., Summer 2010, at 221.

38. Economides & Jeziorski, *supra* note 31, at 815.

39. *Id.*

40. See *id.* at 818.

41. Aker & Mbiti, *supra* note 37, at 222.

42. William Jack, Adam Ray & Tavneet Suri, *Transaction Networks: Evidence from Mobile*

mobile money on urban-to-rural remittances in Bangladesh. They experimentally introduced bKash, the largest mobile banking service in Bangladesh, to extremely impoverished rural households and their family members who had migrated to the city. Results revealed that after one year, urban-to-rural remittances increased by 26% among active mobile banking users.⁴³

C. ECONOMIC MOBILITY

Research has shown that the inconspicuous nature of mobile money, as compared to physical checks or currency, can be crucial to narrowing the gender gap among the unbanked.⁴⁴ The 2017 Global Findex Database estimates that women account for 56% of all unbanked adults, amounting to nearly 980 million unbanked women globally.⁴⁵ This gender gap tends to be even larger in developing economies where women are traditionally excluded from financial services and men control access to finances.⁴⁶ Digital payments offer a way for women to conceal payment information and make it more difficult for others to access their funds. Case studies indicate that mobile money enables women to increase personal savings without drawing attention from family and friends.⁴⁷ Similarly, research has suggested that the privacy provided by mobile money services such as M-PESA could empower traditionally oppressed women in the financial system.⁴⁸ Researchers built upon this theory by studying the long-term effects of M-PESA on the economic standing of Kenyans. Their data revealed that the spread of mobile money reduced extreme poverty among female-headed households by 22% and enabled 185,000 women to transition from farming into business or retail.⁴⁹ Empowering women in the financial system can generate benefits that extend beyond women themselves. Previous studies on intra-household decision-making suggest that when women have control of income, as opposed to men, they tend to focus more of the household spending on food, healthcare, and housing, leading to

Money in Kenya, 103 AMER. ECON. REV. (PAPERS & PROC.) 356, 357 (2013).

43. See Jean N. Lee, Jonathan Morduch, Saravana Ravindran, Abu Shonchoy & Hassan Zaman, *Poverty and Migration in the Digital Age: Experimental Evidence on Mobile Banking in Bangladesh*, 13 AM. ECON. J.: APPLIED ECON. 38, 67–69 (2021).

44. See Tavneet Suri & William Jack, *The Long-Run Poverty and Gender Impacts of Mobile Money*, 354 SCI. 1288, 1291 (2016) [hereinafter *Poverty and Gender Impacts*].

45. DEMIRGÜÇ-KUNT ET AL., *supra* note 3, at 36.

46. See Klapper & Singer, *supra* note 25, at 217–18.

47. See Aker & Mbiti, *supra* note 37, at 222.

48. See William Jack & Tavneet Suri, *Mobile Money: The Economics of M-Pesa* 11–12 (Nat'l Bureau of Econ. Rsch., Working Paper No. 16721, 2011) [hereinafter *Economics of M-Pesa*].

49. See *Poverty and Gender Impacts*, *supra* note 44, at 1292.

improvements in their children's welfare.⁵⁰

More generally, case studies have shown that mobile money adoption can enable financial mobility among users. M-PESA users reported higher annual expenditures and asset holdings as compared to non-users.⁵¹ Furthermore, researchers estimated that the spread of mobile money in Kenya successfully lifted 194,000 Kenyan households out of poverty.⁵² Similar effects of mobile money were observed in Bangladesh, where adoption of mobile money led to an increase in consumption and savings among active mobile money users, ultimately decreasing rural migrant poverty rates by 11%.⁵³

IV. FINTECH AND ECONOMIC SHOCKS

A. ADOPTION OF FINTECH

Many studies have analyzed the adoption and impact of fintech during economic shocks. Recent research examined whether epidemic exposure affects adoption of financial technology. The study matched worldwide epidemic data with Global Findex surveys of 250,000 individuals' financial behavior in 140 countries during 2011, 2014, and 2017. This was then merged with Gallup World Poll's data to obtain demographic information for these individuals. The results showed that epidemic exposure increased usage of online and mobile financial transactions by 10.6% while simultaneously reducing the likelihood of transacting at a physical bank branch.⁵⁴ This not only highlights the increase in fintech adoption during shocks, such as epidemics, but also the substitution effect of fintech for traditional in-person bank branches.

A similar study noted that the spread of coronavirus and government lockdowns during the pandemic led to an increase in downloads of finance-related mobile applications and a rise in the overall rate of fintech adoption globally. Using country-level download estimates for finance-categorized applications of seventy-one countries between January 1, 2019, and December 9, 2020, researchers estimated that the rate of daily downloads of finance-related mobile applications increased by up to 26% due to the spread of coronavirus.⁵⁵ In particular, emerging market and developing economies

50. See Klapper & Singer, *supra* note 25, at 217–18.

51. *Economics of M-Pesa*, *supra* note 48, at 15.

52. *Poverty and Gender Impacts*, *supra* note 44, at 1292.

53. See Lee et al., *supra* note 43, at 40.

54. See Orkun Saka, Barry Eichengreen & Cevat Giray Aksoy, *Epidemic Exposure, Fintech Adoption, and the Digital Divide 2–5* (Nat'l Bureau of Econ. Rsch., Working Paper No. 29006, 2021) (revised 2022).

55. Fu & Mishra, *supra* note 2, at 17.

(“EMDE”) countries experienced a 38.8% increase in adoption of lending apps, as compared to a 12.3% increase in advanced economy (“AE”) countries.⁵⁶

B. SPEED OF PAYMENTS

Economists studied the opportunities created by fintech during the COVID–19 pandemic, arguing that digital payments not only reduce the spread of the coronavirus through promoting social distancing but also are critical in responding to the economic shock.⁵⁷ During the pandemic, staffing shortages due to quarantine, illness, and other factors slowed processing time at banks. As digital payments do not require a financial intermediary, they allow payments, such as wages, taxes, government benefits, and peer-to-peer transfers, to flow seamlessly and instantaneously.

Speed of fintech payments is especially valuable in developing economies and informal sectors that often require a more urgent need of financial assistance during crises. One example of this can be seen from relief efforts after the 2010 Haiti earthquake, which had catastrophic effects on infrastructure and the economy. Analysis of non-governmental organization (“NGO”) programs following this disaster found that mobile money payments were both faster and significantly safer than traditional disaster relief payments in the form of physical cash or vouchers.⁵⁸ Digital payments are also beneficial for distributing payments for workers during crises. During the Ebola outbreak of 2014, the Liberian government made digital payments to thousands of health workers.⁵⁹ These payments were able to reach workers in remote and afflicted areas, providing efficient and instantaneous payments while avoiding human contact and spread of the deadly virus.

C. RISK-SHARING NETWORKS

Previous studies have also highlighted the role of mobile money in increasing the size and effectiveness of risk-sharing networks during times of financial crisis. Kenyan households with access to mobile money experienced more emergency-related transfers than those without access to

56. *Id.*

57. See ITAI AGUR, SOLEDAD MARTINEZ PERIA & CELINE ROCHON, INT’L MONETARY FUND, DIGITAL FINANCIAL SERVICES AND THE PANDEMIC: OPPORTUNITIES AND RISKS FOR EMERGING AND DEVELOPING ECONOMIES 9 (2020), <https://www.imf.org/-/media/Files/Publications/covid19-special-notes/en-special-series-on-covid-19-digital-financial-services-and-the-pandemic.ashx> [<https://perma.cc/Y6VU-9CFN>].

58. Klapper & Singer, *supra* note 25, at 214–15.

59. *See id.*

mobile money during crises.⁶⁰ Furthermore, the average M-PESA transaction traveled nearly 100 kilometers farther than non-user transactions. This increased mobility brought about by mobile money can be crucial in times of financial hardship. Researchers built upon this study when examining how the use of mobile money affected consumption when Kenyans faced income shocks. The analysis showed that upon experiencing a negative income shock, per capita consumption decreased by 7–10% for non-M-PESA users, while M-PESA users experienced no decrease in consumption.⁶¹ These effects can, at least partially, be attributed to improved risk sharing; during negative shocks, affected households reached deeper into their networks for financial assistance and remittances. As a result, M-PESA users were found to be 13% more likely to receive remittances when faced with a negative shock.⁶²

Risk-sharing was more recently examined in India. Using monthly data from India's largest mobile money platform, Paytm, economists studied whether the use of mobile money improved resilience to rainfall shocks in India. They found that a 10% increase in mobile money usage in regions hit by a rainfall shock led to a 3% reduction in the negative impact on economic activity proxied by nighttime lights.⁶³ Furthermore, the negative effect of shocks on per-capita consumption significantly decreased with Paytm adoption in remote areas, as digital payments and remittances allowed for individuals to transact even with limited access to physical bank branches.⁶⁴ These findings suggest that the risk-sharing effects of mobile money can mitigate the harmful impacts of large, unexpected events on economic activity.

V. EMPIRICAL STUDIES ON BLOCKCHAIN TECHNOLOGY

Given that blockchain is a relatively new technology, rigorous empirical research regarding its role in reducing financial exclusion is limited. That said, it is worth briefly noting a few case studies that demonstrate its potential to bring financial services to the unbanked and enable financial inclusion globally.

Blockchain technology acts as a digital ledger of transactions. The decentralized nature of blockchain is particularly appealing, as it can reduce

60. Jack et al., *supra* note 42.

61. See William Jack & Tavneet Suri, *Risk Sharing and Transaction Costs: Evidence from Kenya's Mobile Money Revolution*, 104 AM. ECON. REV. 183, 219–20 (2014) [hereinafter *Risk Sharing and Transaction Costs*].

62. *Id.* at 196.

63. Manasa Patnam & Weijia Yao, *The Real Effects of Mobile Money: Evidence from a Large-Scale Fintech Expansion* 30–31 (Int'l Monetary Fund, Working Paper No. 20/138, 2020).

64. See *id.*

costs and bring transparency to the financial system. Blockchain decreases costs by removing fees associated with third parties such as clearinghouses and banks.⁶⁵ Additionally, blockchain reduces currency fees associated with transferring money across borders, which could promote increased flow of remittances.⁶⁶ Blockchain-based contracts have also been shown to benefit micro, small, and medium enterprises (“MSMEs”) through process improvements, fraud reduction, and enhanced transparency.⁶⁷ Furthermore, blockchain facilitates MSME growth and access to credit by providing digital trails of transactions to financial institutions.⁶⁸

The increased trust and transparency brought about by smart contracts could provide even greater benefits in developing economies where official documentation is less common.⁶⁹ Currently, 2.4 billion people globally lack a digital identity, which hinders their access to financial services.⁷⁰ Blockchain technology can facilitate the account-opening process by creating digital identities for the unbanked. With access to an account, these individuals then have the tools they need to save for the future, invest into education and their businesses, prepare for financial shocks, and send remittances to family and friends, all of which are critical in spurring economic growth and promoting financial inclusion.

VI. FINTECH CHALLENGES IN PROMOTING INCLUSION

Rapid adoption of fintech can have disproportionate effects on groups. Young, higher-income, and full-time employed individuals are most likely to adopt fintech in response to epidemics.⁷¹ Research examining the risks of fintech expansion during the COVID–19 crisis demonstrated that rapid adoption of fintech may initially intensify income and gender inequality, as well as widen the rural-urban and young-old divide.⁷² This is particularly prevalent in the developing regions of South Asia and Sub-Saharan Africa, where women are 23% less likely than men to access mobile internet and rural populations are 40% less likely than urban populations to use mobile internet. Furthermore, rural regions tend to have fewer mobile money agents as compared to urban regions, highlighting how rural communities face

65. See Marco Lichtfocus, Vivek Yadav & Valentina Fratino, *Can Blockchain Accelerate Financial Inclusion Globally?*, *INSIDE MAG.*, at 68, 73 (2018).

66. See Inutu Lukonga, *Harnessing Digital Technologies to Promote SMEs in the MENAP Region* 20–21 (Int’l Monetary Fund, Working Paper No. 20/135, 2020).

67. *Smart Contract Technology and Financial Inclusion* 24 (World Bank Grp., Working Paper, FinTech Note No. 6, 2020) (modified 2021).

68. Lukonga, *supra* note 66, at 23.

69. *Smart Contract Technology and Financial Inclusion*, *supra* note 67, at 23.

70. Lichtfocus, Yadav & Fratino, *supra* note 65.

71. Saka et al., *supra* note 54, at 22–23.

72. See AGUR ET AL., *supra* note 57, at 7–8.

greater challenges with adopting mobile money due to limited agent infrastructure.⁷³

Quality and accessibility of adequate internet infrastructure is a key determinant of individuals' ability to adopt fintech.⁷⁴ Recent research examined financial inclusion gaps in Latin American countries, noting that access to internet and cellular networks is a key barrier to entry in the fintech sector and thus hinders financial inclusion in the region.⁷⁵ Similar studies have shown that fintech can only be successful with strong electrical power, telecommunication, and internet infrastructure, which has been built out more extensively in higher-income countries.⁷⁶ This indicates that those in regions with little to no internet infrastructure face significant disadvantages during periods of rapid global adoption of fintech.

Education level matters for financial inclusion as financially excluded adults generally have lower levels of education⁷⁷ and that lack of financial literacy inhibits fintech adoption and, consequently, financial inclusion.⁷⁸ For example, early M-PESA adopters were more likely to be literate than non-adopters.⁷⁹ Similar studies revealed mobile money adopters in rural Africa tend to be more educated than non-adopters.⁸⁰

Rapid scaling of digital payment services during crises also heightens risk of cyber attacks and fraud, especially in underdeveloped countries with weak regulations.⁸¹ Researchers noted a 15% increase in adoption of illegitimate lending apps during the COVID-19 pandemic.⁸² For the purposes of their study, illegitimate lending apps were defined as those containing falsified reviews and ratings, lacking legitimacy, or displaying predatory lending practices such as high rates and information scraping. The increased uptake in fraudulent lending apps was particularly prevalent in developing economies where borrowers in desperate situations were more willing to experiment with non-certified credit providers.

73. See Jenny Aker, Silvia Prima & Jamilah Welch, *Migration, Money Transfers, and Mobile Money: Evidence from Niger*, 110 AM. ECON. ASS'N PAPERS & PROC. 589, 590 (2020).

74. See Saka et al., *supra* note 54, at 22–23.

75. See Dmitry Gershenson, Luis Herrera, Frederick Lambert, Grey Ramos, Marina Rousset & Jose Torres, *Fintech and Financial Inclusion in Latin America and the Caribbean* 14 (Int'l Monetary Fund, Working Paper No. 21/221, 2021).

76. See Yermack, *supra* note 35.

77. See DEMIRGÜÇ-KUNT ET AL., *supra* note 3.

78. See Gershenson et al., *supra* note 75, at 10.

79. See *The Economics of M-Pesa*, *supra* note 48, at 17.

80. Catia Batista & Pedro C. Vicente, *Adopting Mobile Money: Evidence from an Experiment in Rural Africa*, 110 AM. ECON. ASS'N PAPERS & PROC. 594, 595 (2020).

81. See AGUR ET AL., *supra* note 57, at 9.

82. See Fu & Mishra, *supra* note 2, at 15.

VII. REGULATORY AND POLICY IMPLICATIONS

Rapid adoption of fintech and its use of personal, alternative data merits the need for strong regulatory frameworks, safeguards for data breaches, and consumer protection laws.⁸³ Fair lending laws within the United States such as the Equal Credit Opportunity Act (“ECOA”) and the Fair Housing Act (“FHA”) currently prohibit credit and housing discrimination. The existing anti-discrimination laws lack protection beyond the lending space, which creates opportunities for racial gaps in banking and other financial services.⁸⁴ There is a need for more “comprehensive regulatory framework” to not only protect consumers but also promote fairness and transparency within finance.⁸⁵ Without government regulation and consumer protection legislation, illegitimate fintech services could prey on vulnerable communities and threaten the overall legitimacy of fintech platforms in their efforts to foster financial inclusion. Therefore, researchers emphasize the urgency for collaboration between fintech companies, regulators, and operating systems to ensure legitimacy among publicly available fintech apps.⁸⁶ At the same time, however, it is critical that these regulations are carefully developed such that consumer privacy is protected without overly restricting the use of alternative data, as alternative data plays a crucial role in making finance more accessible to all.⁸⁷

To best support adoption of fintech and global financial inclusion, governments also need to make upfront investments in relevant infrastructure and education. This includes development of information and communication technologies (“ICT”), which are necessary for basic fintech services, such as mobile money, and have been shown to foster significant economic growth and financial inclusion in traditionally excluded regions such as Africa.⁸⁸ Additional government investment should be allocated toward financial literacy and training programs. Providing basic training and aiding with account setup for mobile banking increased the likelihood of mobile money adoption by 48%.⁸⁹ Given that many of the currently unbanked individuals who would most benefit from fintech services have low levels of education, basic training could reduce barriers to fintech adoption and bring financial services to the unbanked. Empirical research on

83. See Lukonga, *supra* note 66, at 39-43.

84. See Carol Evans & Karen Pence, *How Can Regulation Facilitate Financial Inclusion in Fintech?*, Summer 2021, at 5, 82-83.

85. *Id.*

86. See Fu & Mishra, *supra* note 2, at 17.

87. See Jagtiani & Lemieux, *supra* note 14, at 19.

88. Mihasonirina Andrianaivo & Kangni Kpodar, *ICT, Financial Inclusion, and Growth: Evidence from African Countries* 20–21 (Int’l Monetary Fund, Working Paper No. 11/73, 2011).

89. See Lee et al., *supra* note 43, at 51.

changes in regulation and legal regimes to foster online financial inclusion remain an understudied area.

CONCLUSION

Fintech has proven to enable financial inclusion on a global scale. This review highlighted case studies that demonstrate how digital lending, digital payment, and mobile money platforms can bring financial services to unbanked and underbanked communities. It further provided examples of how fintech can increase resilience in times of economic crises and shock, especially in underdeveloped regions. This review also acknowledged common challenges associated with the adoption of fintech, such as consumer data and privacy concerns, as well as infrastructure and education barriers. These challenges will ultimately influence the magnitude of impact that fintech can have on financial inclusion. Thus, it is important that corporations and governments work together to invest in relevant infrastructure and develop policies to foster the development of fintech to maximize its potential.