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Fintech in sub-Saharan Africa

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Abstract: This paper traces the development of fintech in sub-Saharan Africa, its evolution over time, and the unfolding benefits attained at each stage of its adoption and market evolution. From the onset, fintechs have revolutionized retail electronic payment systems—a revolution that has evolved into a technological platform to manage micro-savers’ accounts, virtual savings and credit systems, public financial management, and cross-border remittances, and has led to the adoption of new monetary policy frameworks. The uptake of fintech products has led to increased financial inclusion for underserved and unserved populations, improvement of welfare, and the efficient and cost-effective provision of services across all sectors of the economy. The paper also outlines the challenges that persist and need to be addressed to allow the rapid uptake of fintech products and solutions in sub-Saharan Africa. The paper concludes that the fourth Industrial Revolution, driven by fintech, has the potential to propel the continent to higher levels of savings, investments, employment, and inclusive growth, provided an appropriate legal and regulatory framework is put in place and resources are channelled for sufficient infrastructural development.

Key words: fintech, financial inclusion, micro-savers, technology, sub-Saharan Africa

JEL classification: G21, G23, O14, O55

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1 Introduction

Technology and innovation are revolutionizing the financial sector around the world and moving to other sectors of the economy. They have changed several sectors of the economy in terms of how they operate and their resource management. The world has witnessed diverse developments of instruments and processes, such as mobile phones, artificial intelligence (AI)/machine learning (ML) and big data analytics, blockchain/distributed ledger technology (DLT), and cloud computing, which have stimulated the development of fintech (financial technology)—technology-enabled solutions that are disrupting traditional financial services and challenging incumbent service providers (Disrupt Africa 2021).

These developments seem to stem from the roll-out of physical infrastructure that has allowed the development of and investment in the core infrastructure—a combination of innovative products and processes. For example, fibre optic cables have enabled the growth of internet and mobile phone services, which have in turn enabled developments in communications, but above all have enabled fintechs¹ to innovate and roll out products that are considered disruptive but have shaped the way financial services are offered and created electronic payment platforms that are effective, efficient, and real-time.

The first fintech disruption was witnessed with the development of mobile phone-based retail electronic payments that were effective, efficient, transparent, and safe. This all-inclusive, real-time retail electronic payments platform was an easy entry point for financial services navigating across all market segments, including informal markets. It was operated by commercial banks, which were thus able to increase their level of retail activity. In the process, this made banking services accessible and important to African economies. Once an effective electronic payments platform is operational, it becomes transformative. Fintechs can roll out new products across all sectors of the economy.

In the last 20 years, fintechs have changed the way banking services are provided; the way banks work; how capital is raised; and how payments, including retail payments, are conducted. They have also redefined knowledge of money and its form through the rise of mobile money, with consequences on the design of monetary policy frameworks. The increased use of fintech has been viewed as a catalyst to innovation, promoting savings and investment, driving economic activity in diverse sectors, and above all increasing access to financial services at different levels. Increased access to financial services is likely to lead to economic vibrancy and a drive to inclusive growth for SSA.

In the next decade, it is expected that fintech development will be driven by AI, DLT, cloud computing, the internet of things, ‘open source software, serverless architecture and software as a service’, ‘no code and low code development’, and process automation (Fong et al. 2021). These developments will lead to massive investment by firms in technology to facilitate innovations and remain competitive in the market.

This paper traces the development of fintech in sub-Saharan Africa (SSA) and the role it is expected to play in future. The paper outlines the benefits of fintech in its initial penetration through retail

¹ Fintechs are firms that combine innovative business models and technology to enable, enhance, and disrupt financial services. Fintechs can be classified into two categories: those that provide financial services (core fintechs) and those that enable such services (enabling fintechs) (Ernst & Young 2019).

electronic payment platforms that also promoted financial inclusion by increasing access to financial services, especially among underserved and unserved populations. Other major benefits of the adoption of fintech include digitization of government processes such as tax collection, revenue administration, social transfers, and public financial management, leading to savings of cost and time for both citizens and government. One of its recent successes is the targeted social protection programme that operated during the lockdowns occasioned by the COVID-19 pandemic. This was made easy by the presence of a retail electronic payments ecosystem via mobile phone. The paper also examines the issues around fintech regulation and provides policy suggestions for SSA countries seeking to balance potential fintech benefits and risks.

The rest of the paper is organized as follows. Section 2 outlines the evolution of fintech and financial inclusion in SSA. Section 3 discusses how fintechs are providing solutions to the binding constraints on financial services. Section 4 examines the adoption and development of fintech in SSA. Section 5 explores fintech regulatory challenges, while Section 6 discusses the possibilities of fintech propelling the fourth Industrial Revolution. Section 7 concludes.

2 Fintech evolution, savings, and financial inclusion in SSA

The evolution of digital financial services (DFS) in Africa provided a means of managing bank accounts at minimal cost, thus enabling commercial banks to reach more customers and grow deposits. Recall the years when banks used to set minimum balances for deposit and savings accounts, which meant that those with a low or irregular flow of income remained unbanked. In addition, a trip to the bank was an expensive exercise, especially in Africa. The digital banking platform solved these financial service access constraints. Consequently, commercial banks have used digital platforms to increase their base of micro-accounts, deposit taking, and credit extension to populations that were previously unbanked, thus increasing efficiency in intermediation (Misati et al. 2022).

The financial system in Africa was initially designed to cater mainly for deposits and transactions by corporates and well-off individuals. It was supported by a network of outlet channels that were physical (bricks-and-mortar branches). This meant that customers had to physically visit a branch to deposit or transact, which—along with minimum balance requirements and other factors—excluded many people on the basis of physical distance, low income level, and irregular flow of income. The regulatory environment also restricted innovation. All this changed with the fintech evolution, which has seen the emergence of technology that drives banking and payment services remotely. Real-time retail electronic payment platforms and lending activities outside traditional banking structures, led by mobile network operators (MNOs), are now becoming the norm.

In the case of Kenya, Gubbins and Totolo (2018) showed that it took several days for customers to access credit facilities within traditional banking. The 2016 Kenya Integrated Household Budget Survey found that on average, across all loan types, borrowers needed 11 days to secure a short-term loan. If it was a long-term loan that required formal security, other than the employer's details, it could take months for the collateral to be registered, credit committees to meet, and lawyers to perfect the collateral charge.² In addition to high interest rates and collateral requirements, application for a bank loan involved out-of-pocket costs such as physical travel to the point of service, valuing the collateral, legal fees to perfect the collateral applications, and, once the loan was disbursed, a component of insurance. Some consumers, especially small businesses, could not

² i.e. register and effect the charge on a security (e.g. title deed) used to secure a loan.

meet the collateral requirements to access bank loans. This led to a significant use of informal sources of funding such as moneylenders (“shylocks”), credit terms from suppliers, *chamas*,³ friends, and family. These informal financial outlets for entrepreneurs were costly, risky, and not conducive to business development, but above all they robbed the formal banking system of a huge potential proportion of customers. The fintech evolution appears to be solving this problem as the digital platform of virtual banking services is developing independently of physical bank branches.

In SSA, low saving and investment rates are observed in comparison with the world average. The nominal national gross saving rate as a percentage of GDP has remained an average of 20.1 per cent in the period 2004–21 compared with 41 per cent for Emerging Markets Developing Economies (EMDEs) and the world average of 26 per cent. Similarly, the national investment rate as a percentage of GDP has stagnated at around 20 per cent, compared with the world average of 25 per cent. Savings and investments largely drive financial sector development, but investments in general also drive economic growth in economies. The key question is: who should finance the much-needed investments in SSA countries—should the focus be on enhancing domestic savings (to encourage investment by citizens) or on attracting FDIs? Further, how can domestic savings be enabled and increased to cope with the demand for investment to drive economic vibrancy and growth? The upscaling of fintech offers SSA an opportunity to leap ahead in the promotion of economic growth and development (IMF 2019). With a population of over 1 billion, half of whom are projected to be below 25 years old by 2050, the SSA region offers huge potential for innovation aimed at driving inclusive growth (World Bank 2021).

Africa has been ranked among the lowest regions in terms of access to financial services. For example, only 23 per cent of adults in Africa have an account with a formal financial institution compared with 89 per cent in high-income regions and 55 per cent in East Asia & Pacific (IMF 2019). Lack of access to accounts with a formal financial institution excludes whole populations from the security and reliability provided by these institutions. This low financial inclusion profile can also be related to low savings in the region. A savings culture emerges with secure saving products and available avenues for secure investment (and, in turn, returns on investments).

Evidence is emerging that the success of financial inclusion in African economies, especially among women and low-income earners, is being driven by the fintech evolution in the financial sector, which has helped overcome most of the binding constraints on financial services. Among the constraints that sustained financial exclusion in Africa were low levels of income, irregular flows of income, physical distance from a bank branch or financial service point, and the collateral requirements to access credit (Ndung’u and Oguso 2021b). At a stroke, the fintech evolution seems to have removed these constraints and turned financial exclusion into financial inclusion. As noted by Ndung’u and Oguso (2021b), financial inclusion implies that individuals and businesses have access to useful and affordable financial products and services—transactions, payments, savings, credit, and insurance—that meet their needs and are delivered in a responsible and sustainable way. Ndung’u (2018) affirmed that financial transactions using a digital platform or electronic banking services are the first step to greater financial inclusion and a pathway to a broader range of financial services provided by stronger and more diverse financial institutions.

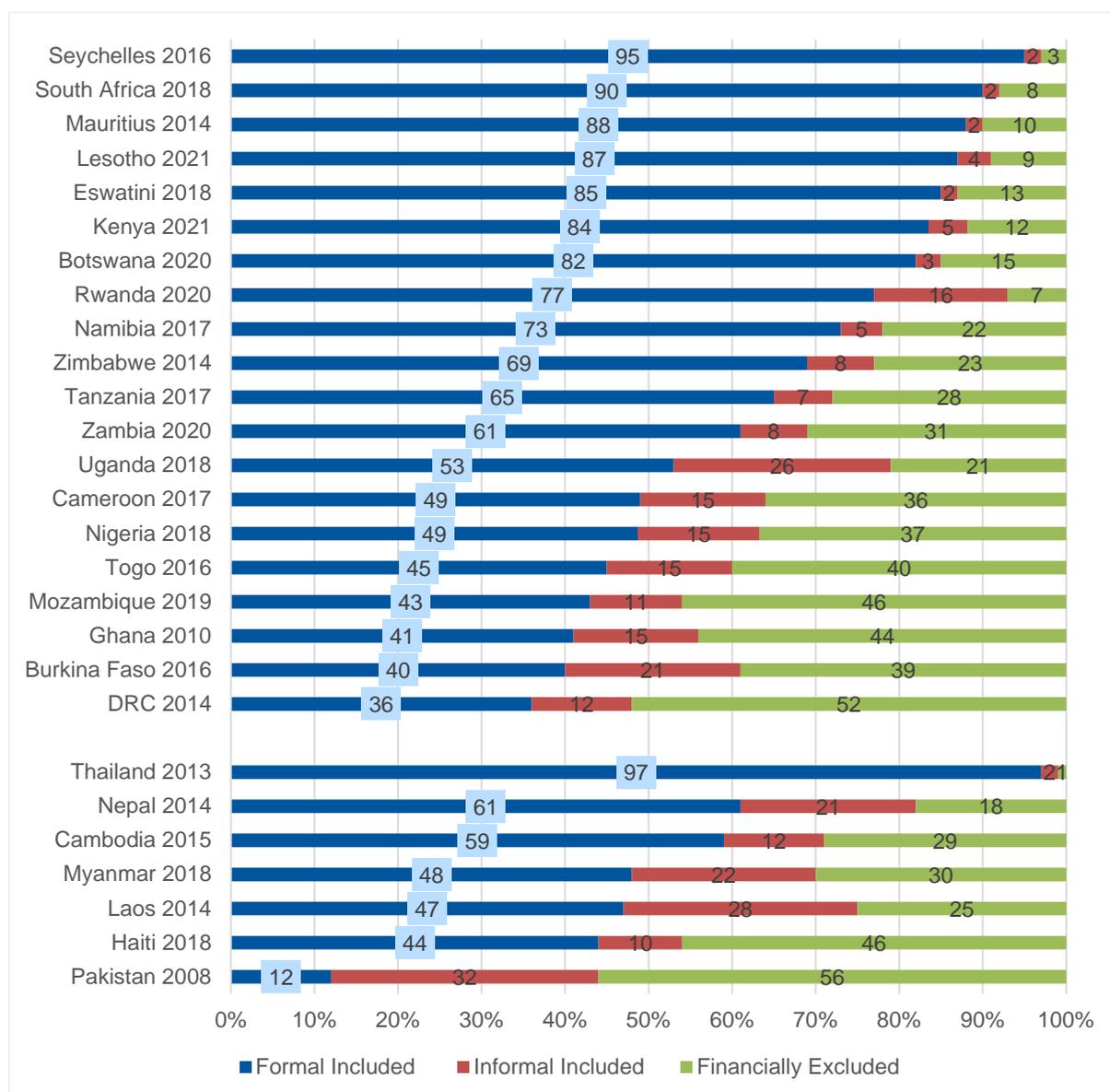
In the case of Kenya, the fintech journey—and the consequent transformation of the financial ecosystem—began with the development of the M-Pesa technological platform in March 2007. M-Pesa was developed as a bank product in partnership with a telecommunications company. Over the years, the uptake of M-Pesa has seen market, product, and fintech development in six

³ This refers to a group or an informal cooperative society through which members pool savings and borrow money for their personal use, as well as for individual or group investments.

major stages, as outlined by Ndung'u (2018) (see Appendix A), and has created opportunities for raising the level of savings in SSA.

Following the uptake of fintech in the last two decades, financial inclusion in SSA has grown significantly, bringing the unbanked and the poor from informality to access and use of formal financial services. Figure 1 shows the financial inclusion trends in selected SSA countries and other comparator countries that have conducted demand-side financial inclusion surveys in the last two decades.

Figure 1: Financial inclusion—regional comparison



Source: author's construction based on financial inclusion survey reports.

Figure 1 shows that in South Africa, financial inclusion increased from 62 per cent in 2004 to 90 per cent in 2018. In Kenya, the 2021 FinAccess Household Survey showed that financial inclusion had increased from 26.7 per cent in 2006 to 83.7 per cent in 2021. However, in Nigeria, despite the uptake of fintechs, financial inclusion remained below 50 per cent in 2018, on account of limited banking sector partnerships with telcos, reflected also in low mobile money accounts and digital payments of 6 per cent and 30 per cent, respectively (Financial Technology Partners 2019).

Seychelles, a small island country with a small population, had almost 100 per cent financial inclusion by 2021, while countries that had lagged behind in adopting fintechs, such as DRC, Burkina Faso, and Ghana, had low financial inclusion.

3 How fintechs are providing solutions to constraints on financial services

There is emerging evidence that fintechs have solved the inefficiency problems associated with traditional financial services, starting with retail payments. In Africa, there seems to be an increase in market information flow, which has come with other benefits such as formalized capital investment, increased productivity, and more efficient financial services and e-government services. These results have been driven by the evolution of a retail electronic payments system that is effective, efficient, transparent, and safe, but above all real-time. This has been a game changer in providing easier entry into the financial services sector and a platform for the development of new products across all sectors of the economy.

Taking Kenya as an example, Suri and Jack (2016) pointed out that when M-Pesa was launched, the average distance to the nearest bank was 9.2 kilometres; eight years later (in 2015), the average distance to the nearest M-Pesa agent was a mere 1.4 kilometres. An earlier study by Suri and Jack (2014) showed that the safety and certainty of using mobile phone-based (M-Pesa) money transfers substantially reduced the risks and costs of sending and receiving money as well as of making payments.

The commercial banks have adopted this technological platform to manage micro-accounts and reach customers cost-effectively. Additionally, women, who are considered efficient savers, are now able to save in instruments that are safe, confidential, and tailored to their needs, thus lowering the gender financial inclusion gap. In addition, fintechs have rolled out sustainable business models mostly for underserved and unserved populations. The new business models have been adopted across various sectors of the economy (Ndung'u 2021). Examples are: M-Kopa in the solar energy sector⁴; the One Acre Fund, which has focused on smallholder farmers, thus increasing their productivity, crop insurance, and activity in the agriculture sector⁵; M-Tiba virtual health insurance products; water vending machines for poor urban households; and Kenya's M-Akiba, a retail infrastructure bond issued by the government to encourage investment in government securities using mobile phones, among other products (see Appendix B). The fintech evolution has also allowed monitoring of financial transactions, improved the AML/CFT regime, and enabled central banks to design forward-looking monetary policy.

Governments have also developed e-government services, tax policy designs, tax payment platforms, and revenue administration systems that minimize leakages, enhancing domestic resource mobilization and increasing the tax base. Digital platforms have revolutionized the way payments to and from the government are made. Digital payments have reduced paperwork and ensured direct payments of money from accounts at the consolidated fund to the intended recipients (Ndung'u 2019). Governments have also been able to design and develop targeted social protection programmes, especially during the COVID-19 pandemic and lockdowns.

⁴ <http://solar.m-kopa.com/about/our-impact/>

⁵ <https://www.oneacrefund.org/library>

4 The fintech landscape in SSA

The uptake of fintechs in SSA has been propelled by increased usage of mobile phones, which has spurred innovation around mobile money. The mobile internet penetration rate in SSA was 46 per cent in 2020 and is projected to grow to 50 per cent by 2025, compared with the global average penetration rate of 51 per cent in 2020, which is expected to grow to 60 per cent by 2025 (GSMA 2021a).

The mobile phone has been used to solve communication as well as information flow/search problems but, more importantly, has become a useful technological tool in the development discourse. The mobile telephony industry's contribution to SSA's GDP was estimated at 8 per cent (US\$130 billion of economic value added) in 2020 compared with 5.7 per cent in MENA and 5.1 per cent of global GDP (GSMA 2021a). This shows the huge potential for this sector to contribute to economic vibrancy and development.

Continued growth in the mobile telephony industry has also created growth in employment opportunities (directly and indirectly), thereby generating significant global economic value added. This has led to significant growth in public funding, with more than US\$410 billion raised through taxes on the mobile phone industry. SSA stands to gain massively from improvements in productivity and efficiency resulting from the continued increase in the adoption of mobile phones, diverse use/applications, and other technological developments.

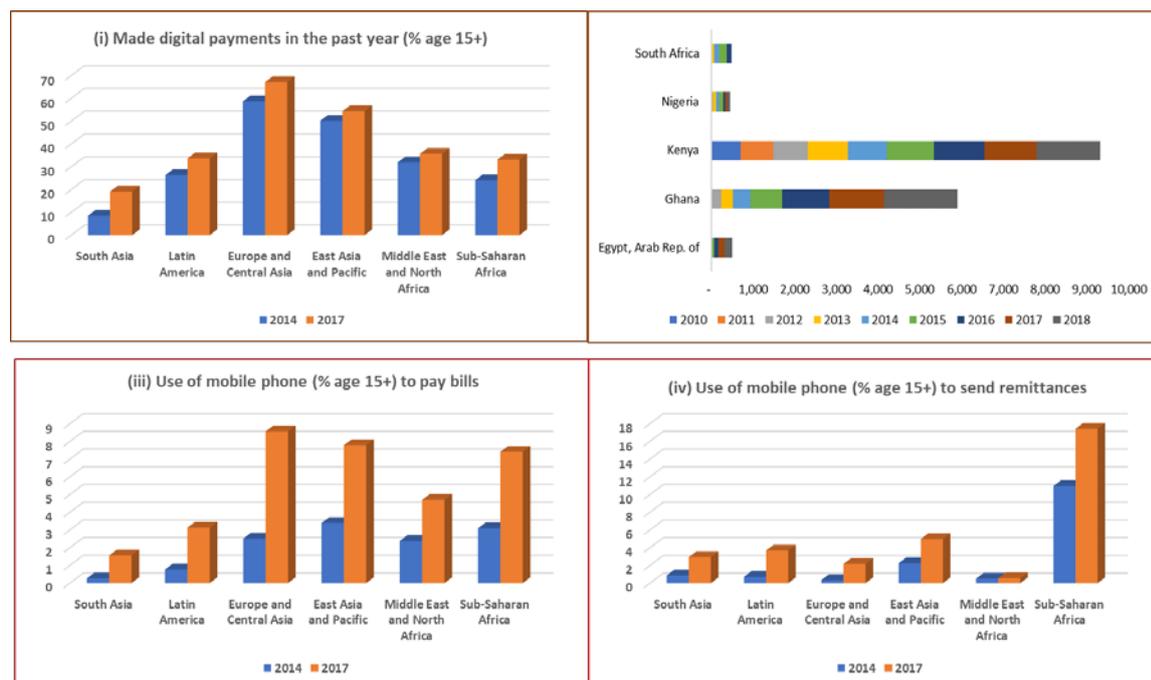
Table 1 and Figure 2 show that the number of people without access to mobile internet services is higher in SSA, at 24 per cent, than in MENA or globally, at 9 per cent and 8 per cent, respectively. However, World Bank data show that the use of mobile phones to make payments and send remittances has particularly gained importance in SSA compared with other world regions. Remittances sent via mobile phone increased by 6.5 percentage points, from 10.9 per cent in 2014 to 17.4 per cent in 2017, in SSA, while remittance flows through the same channel in the other five regions remained low, growing by an average 1.9 percentage points from 2014 to 2017 (Figure 2, panel iv). The use of mobile phones also increased in SSA from 3.1 per cent in 2014 to 7.4 per cent in 2017, an increase of 4.3 percentage points. A similar change was experienced in the Europe and Central Asia region, where usage grew from 2.5 per cent to 8.6 per cent in a similar period (Figure 2, panel iii).

Table 1: Fintech and Financial Development Indicators

Indicator	Sub-Saharan Africa	Low- & middle-income countries	High-income countries
Mobile cellular subscription (per 100 people) (2017)	73	96	126
ATMs (per 100,000 adults) (2017)	6	27	68
Fixed broadband subscriptions (per 100 people) (2017)	1	9	31
Bank or mobile money account (% of pop. aged 15+) (2017)	43	63	94
GDP per capita, PPP (current international \$) (2017)	3,730	10,345	45,789
	SSA	MENA	Global
Mobile industry contribution to GDP (%) (2020)	8.0	5.7	5.1
Mobile internet penetration rate (%) (2020)	46	65	51
People without access to mobile internet services (% of total pop.) (2020)	24	9	8
Mobile internet subscribers (% of total pop.) (2020)	48	46	41

Source: author's construction based on World Bank & IMF data; GSMA (2021a).

Figure 2: Uptake of use of mobile phone and mobile money accounts



Source: author's construction based on IMF data, FinAccess Surveys, and the World Bank Global Financial Development database.

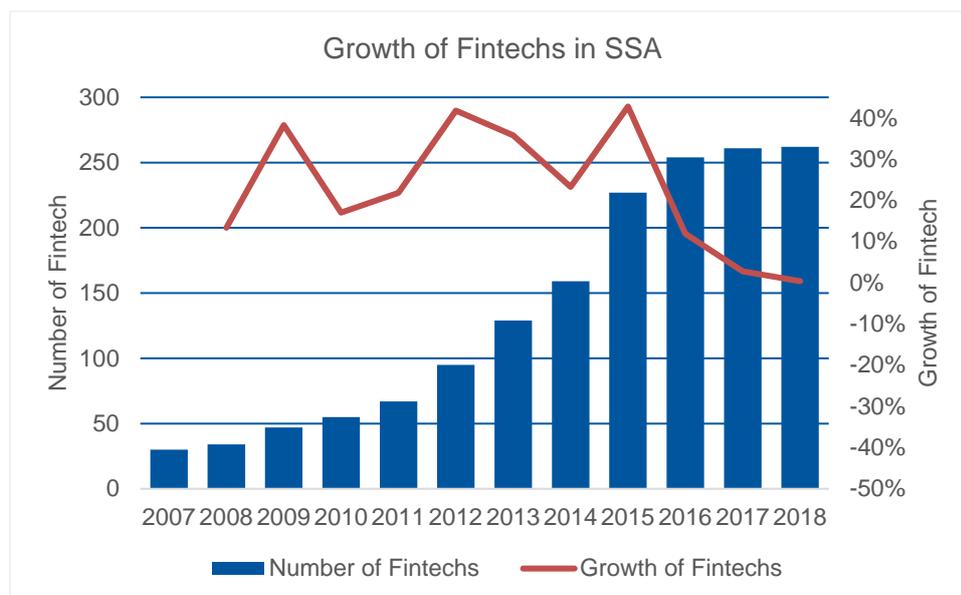
The use of digital payments is also rising as rapidly in SSA as in advanced economies. In Europe and Central Asia mobile digital payments increased from 58.7 per cent in 2014 to 67.1 per cent (8.4 percentage points) in 2017 compared with a growth of 24.1–33.1 per cent (9 percentage points) in a similar period for SSA (Figure 2, panel i). In the selected African countries,⁶ the number of registered mobile money accounts per 1,000 adults has continuously increased over the years, with Kenya leading, followed by Ghana and South Africa (Figure 2, panel ii)—a clear indication of the great strides being achieved in Kenya as well as in other countries in SSA.

During the COVID-19 pandemic, mobile technologies offered vital lifeline services to the vulnerable, especially during the lockdowns. This was supported by a shift to online platforms to access services enhancing health, schooling, shopping, and social interaction. The SSA region recorded the highest data traffic on average in the 12 months to September 2020. This contributed to a reduction in the mobile connectivity inclusion gap as approximately 225 million previously unconnected people were brought online for the first time. This increased the total number of connected people to over 51 per cent of the global population (GSMA 2021b).

The fintech evolution has been successful in developing core infrastructure with immediate application and uptake and seems to ride on the available physical infrastructure. In the case of communications, the spread of fibre optic networks has allowed fintechs to flourish. The fintech revolution in Africa is primarily driven by the three main hubs of South Africa, Kenya, and Nigeria. These areas have more advanced fintech ecosystems than the rest of Africa. Ernst & Young (2019) showed that in 2018, the fintech sector in SSA comprised over 260 active companies, with both local (80 per cent) and international (20 per cent) players. Figure 3 shows the number and growth of fintechs in the SSA region from 2007 to 2018.

⁶ The selected countries are leaders in mobile money in SSA, ranked in that order, based on IMF and WB financial access data.

Figure 3: Growth of fintechs in SSA

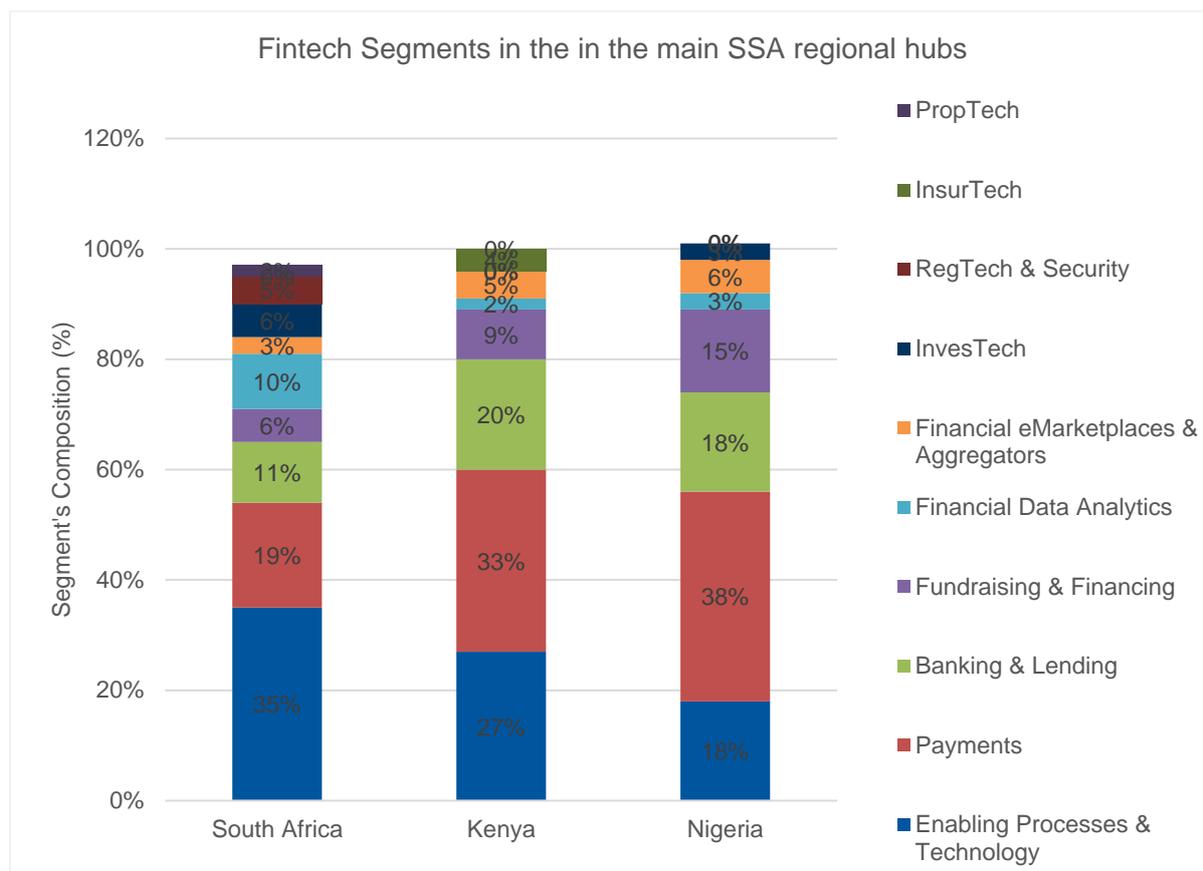


Source: author's construction based on Ernst & Young (2019).

Despite the COVID-19 pandemic, Disrupt Africa (2021) showed that fintech start-ups in Africa grew by 17.3 per cent from the 491 reported in 2019 to 576 in 2021. However, this was a slower growth than the 63.1 per cent recorded between 2017 and 2019. This implies an average annual growth of 20.1 per cent for fintech start-ups in Africa in the period 2017–21. According to Ernst & Young (2019), the number of fintechs had grown at a compound annual growth Rate (CAGR) of 24 per cent over the 10-year period to 2018, as shown in Figure 3. Disrupt Africa (2021) reported that the top six countries—South Africa, Nigeria, Kenya, Egypt, Ghana, and Uganda—performed particularly well, contributing 85.4 per cent of start-ups (492 companies) in 2021. This was up from 81.7 per cent in 2019 after a peak of 88.4 per cent in 2017.

The three main fintech hubs in SSA have formed in the economic centres of South, East, and West Africa: South Africa, Kenya, and Nigeria, respectively—though, in addition to these three main hubs, there are encouraging signs of fintech growth in Ghana, Uganda, Cameroon, and Rwanda. South Africa, arguably the epicentre of SSA fintechs, harbours about a third of the firms, and Ernst & Young (2019) have noted that the South African fintechs are predominantly located in Cape Town and Johannesburg. As the most diversified hub, South Africa exhibits great similarities to more developed markets. Its focus is strategically placed on the enabling fintech segment, making the country one of the main contributors to the growth of fintechs across the continent (Ernst & Young 2019). Kenya, the second largest fintech hub, hosting around 20 per cent of the entire SSA fintech landscape, has a stronger focus on the payments segment (Ernst & Young 2019). Nigeria's fintech sector is the third-largest hub, with most of its fintechs based in Lagos. Like Kenya, the Nigerian fintech sector is dominated by the payments segment. Figure 4 shows the fintech segments in the three major hubs in SSA.

Figure 4: fintech segments in the main SSA regional hubs



Source: author's construction based on Ernst & Young (2019).

As in the fintech sectors in more developed markets, the payments segment is dominant in SSA, mainly due to the large unbanked population and corresponding high demand for financial inclusion and the changing pattern of the payments infrastructure. The high concentration of mobile phones in SSA has also aided the segment's expansion. Furthermore, the majority of enabling fintechs are closely tied to the demand for payments: they establish the payments infrastructure in the region, and thus further amplify the segment's leading position (Ernst & Young 2019). These segment compositions show that the focus of fintechs in SSA is on the demands of the retail sector.

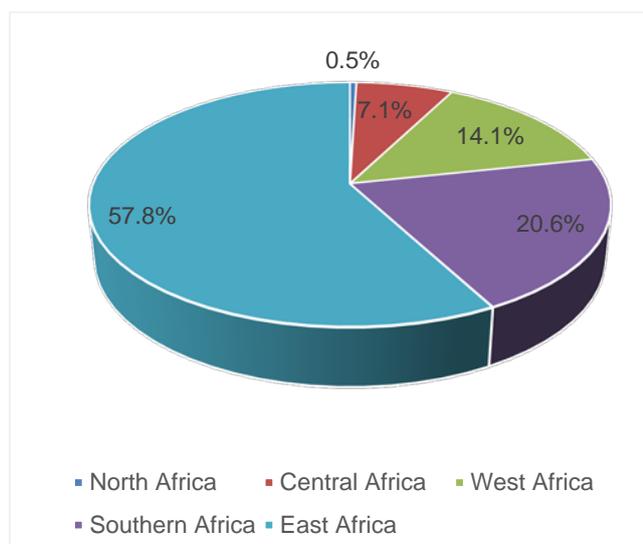
The increasing demand for investments in Africa has provided a ground for the development of segments of fintechs like investment technologies (Investtech), which, like the insurance segment (Insurtech), is revolutionizing the assets management subsector by helping to raise expected risk-adjusted net returns for investors. Investtech enhances the capabilities of investment firms to increase the speed of acquiring and executing transactions, as well as inferential depth (profoundness and durable accuracy of investment insights). Disrupt Africa (2021) shows that Investtech start-ups in Africa grew by 18.5 per cent from 2019 to 2021, when there were 77 start-ups, accounting for 13.4 per cent of fintech companies in Africa. This, however, was a much slower growth rate than the 242 per cent increase recorded between 2017 and 2019.

The Cambridge Centre for Alternative Finance (CCAF) (2020) showed that online alternative finance models are developing in Africa. The models include: donation-based⁷ crowd funding; crowd-led⁸ microfinance; revenue-share; real estate⁹ crowd funding; P2P business lending¹⁰; reward-based¹¹ crowd funding; equity-based¹² crowd funding; and balance sheet¹³ business lending. CCAF (2020) showed that in 2018, P2P consumer lending was the dominant model across the African continent, with a 53 per cent market share, followed by balance sheet business lending at 22 per cent. Figure 5a shows the trend in total alternative finance market volume in the African regions from 2016 to 2018, while Figure 5b shows the region's market share in 2018.

Figure 5a: Total online alternative finance market volume by region in Africa, 2016–18 (US\$ million)



Figure 5b: Market share, 2018



Source: author's construction based on CCAF (2020).

As shown in Figure 5a, CCAF (2020) reported that the alternative finance market across Africa raised US\$209.1 million in 2018, which represented a substantial increase of 102 per cent from the 2017 volume of US\$103.8 million. There had been sporadic improvement from US\$44.4 million in 2013 to US\$181.6 million in 2016 before the drop reported in 2017 (CCAF 2020). This growth is partially due to the continued growth of African platforms, which CCAF (2020) attributes to an improved regulatory environment for domestic fintech ecosystems as new firms were established

⁷ In donation-based crowd funding, donors provide funding to individuals, projects, or companies on the basis of philanthropic or civic motivations with no expectation of monetary or material return.

⁸ In crowd-led microfinance, crowd-lenders provide micro-loans to unbanked/low-income borrowers via an online microfinance platform, for zero or low-interest returns.

⁹ In real estate crowd funding, individuals or institutional funders provide equity or subordinated-debt financing for real estate purchases.

¹⁰ In P2P business lending, individuals or institutional funders provide a loan to a business borrower. In P2P consumer lending, individuals or institutional funders provide a loan to a consumer borrower.

¹¹ In reward-based crowd funding, backers provide finance to individuals, projects, or companies in exchange for non-monetary rewards or products.

¹² In equity-based crowd funding, individuals or institutional funders purchase equity issued by a company.

¹³ In balance sheet business lending, the platform entity provides a loan directly to a business borrower.

and, more crucially, existing firms grew and expanded. Figure 5b shows that the overall regional leader in the total online alternative finance market in 2018 was East Africa, with a 57.8 per cent market share—an 18 percentage point increase from its 40 per cent market share in 2017 (with Kenya as the primary engine for the region’s growth). Southern Africa (led by South Africa) had the second largest market share, at 20.6 per cent, followed by West Africa (led by Nigeria) at 14.1 per cent. In contrast, Central Africa had a market share of just 7.1 per cent, while North Africa reported a negligible share of only 0.5 per cent.

4.1 Fintech and savings uptake

Fintech has enabled the financial sector to catalyse savings into more usable forms. Commercial banks have broadened their deposit base through mobile banking and agency banking, tapping into low-income households and collecting even low-value deposits. These developments encourage micro-savers to increase their deposits/savings in commercial banks, and the variety of mobile financial products and services has expanded considerably (IMF 2016). Subsequently, growth in deposits has provided banks with the capacity to intermediate and grow, leading to the emergence of strong banks leveraging the digital platform to manage micro-accounts, build deposits that provide them with intermediation capacity, and extend financial services to previously unbanked and underserved populations (CCAF 2020).

Since 2012, when M-Shwari (a virtual savings product linked directly to an M-Pesa mobile phone account) demonstrated the viability of moving from a transactions platform to a virtual savings and credit supply platform, partnerships between MNOs and banks have multiplied (Ndung’u and Oguso 2021a).¹⁴ The development of similar digital financial products has taken place across Africa. These include: M-Co-op cash by the Co-operative Bank of Kenya; KCB M-Pesa by the Kenya Commercial Bank; Timiza by Barclays Bank (now ABSA Bank) and Eazzy loans by the Equity Bank in Kenya; M-Pawa in Tanzania; Mokash in Uganda and Rwanda; and MoMoKash in Côte d’Ivoire.

Ndung’u and Oguso (2021a) pointed out that other unregulated application-based fintech products also emerged in response to the increasing demand for short-term micro credit provided on the digital lending platform. Application-based (app-based) fintech lenders in Kenya include Tala, Branch, Saida, Haraka, Okash, Pesa Pata, Pesa na Pesa, Zidisha, and Kiva. Tala was the first instant mobile loans app launched in Kenya, as Mkopo Rahisi (Easy Loan), in 2014. These app-based virtual credit supply platforms were not previously regulated and did not report to the credit reference bureaus like the telco-facilitated bank virtual savings and credit products. However, the Amendment of Central Bank of Kenya Act in 2021 brought app-based virtual credit providers under Central Bank of Kenya regulation. Table 2 highlights some of the key characteristics of fintech virtual savings and short-term credit products across Africa.

¹⁴ One of the innovative resource management styles adopted by small business people is pushing back to a virtual savings account from a transactions account and transferring from the virtual savings account to the transactions account when payments are required. This can happen several times in a single business day. It is costless to push back and to withdraw. In this way, the businesses keep less funds in the transactions account. They also tend to open several virtual savings accounts.

Table 2: Characteristics of fintech savings and credit products in Africa

	M-Shwari (Kenya)	M-Pawa (Tanzania)	MoKash (Uganda)	MoKash (Rwanda)	MoMoKash (Ivory Coast)
Launched	November 2012	May 2014	August 2016	February 2017	January 2018
Number of customers (June 2019)	28.8 million	8.6 million	5.5 million	1.3 million	2.1 million
Interest on savings (per annum)	6.65%	5%	5%	5%	7%
Loan qualification	Have had an active M-Pesa account for at least six months	Have had an active M-Pesa account for at least 6 months, save on M-Pawa, and actively use M- Pawa services	Have been an MTN mobile money subscriber for at least 6 months, save on MoKash, and actively use other MTN services	Have been an MTN mobile money subscriber for at least 6 months, save on MoKash, and actively use other MTN services	Have an MTN MoMo account, be well identified, and be an active MoMoKash user
Loan limit	Based on the M- Pesa transactions history, savings and past loan repayments	-	UGX 1,000,000	Rwf 300,000	100,000 CFA francs
Repayment duration	30 days	30 days	30 days	30 days	30 days
Facilitation fee	7.5%	9%	9%	9%	-
Total deposits at June 2018 (US\$m)	140.20	8.04	1.48	0.51	-
Total deposits at June 2019 (US\$m)	166.60	7.79	1.98	1.06	7.84
Average savings at June 2018 (\$)	5.97	1.09	-	0.65	-
Average savings at June 2019 (\$)	5.82	0.91	0.36	0.81	2.51
Total loan amount disbursed at June 2018 (US\$m)	2,771.63	56.43	19.81	4.11	-
Total loan amount disbursed at June 2019 (US\$m)	3,749.71	69.52	50.27	13.46	6.87
Average usage per day in June 2019 (no. of customers)	16,333	2,953	6,189	1,399	9,037

Source: author's own data.

Table 2 shows that there are similarities among the various savings products in the five SSA countries under study, with interest on savings ranging from 5 per cent to 7 per cent per annum. Less than seven years after their launch (as of June 2019), these products were already serving over 28.8 million customers in Kenya, 8.6 million in Tanzania, 5.5 million in Uganda, 1.3 million in Rwanda, and 2.1 million in Côte d'Ivoire. There has been a general increase in digital savings and deposits in most of the countries, which reflects the important role that virtual credit supply products are playing as alternative sources of finance in Africa. The average utilization of the virtual savings and credit platforms in the five countries shows that these are actively used by customers (Ndung'u and Oguso 2021a). For example, as of June 2019 in Kenya, approximately 16,333 loans were approved per day, with an average loan of US\$35 repayable within 27 days. The picture is similar across the five countries; small amounts and a short turnaround time are characteristic of digital lending.

Moreover, fintech such as M-Akiba, a micro-investment in government securities using mobile phone accounts, has presented a unique opportunity for Kenyans to save and invest in the short run with a risk-free government paper (*akiba* is Kiswahili for 'saving') (Ndung'u 2018). Through the programme, the government of Kenya sought to borrow KSh5 billion (approximately US\$50 million) to fund government infrastructure projects in the financial year 2017/18. The M-Akiba

bond was also aimed at enhancing savings and encouraging an investment culture among Kenyans. The initial minimum investment amount per account was set at KSh3,000 (approximately US\$30), with consecutive trades in multiples of KSh500 (approximately US\$5). The proceeds of the M-Akiba bond are tax-free and earn interest at 10 per cent per annum, payable semi-annually. The M-Akiba opened up a savings and investment opportunity for individual small investors in the country, who previously constituted less than 2 per cent of government bond uptake. The idea that small savers can lend their savings to the government and so earn good returns using mobile phones marks the success of digitization across market segments in Kenya.

The development of digital financial services products has especially benefited the young population, which is technologically savvy, and the unbanked (mostly women). Women are particularly benefited because they tend to be efficient savers and invest in instruments that are safe and tailored to their needs. Ndung'u and Oguso (2021a) have shown that both urban and rural dwellers, retailers and artisans (who earn low daily incomes and seek a safe and profitable way to save and borrow money in order to expand their businesses), and poor households (who must deal with urgent family situations and attempt to smooth consumption) have benefited from digital financial products and platforms. Poor households can now enlarge their asset base through savings and investments to escape cycles of poverty. We thus see that micro-savers and micro-borrowers can benefit from fintech-driven financial services and increase financial inclusion, thereby fighting poverty sustainably.

The most important benefit of the financial inclusion–digitization dimension is that once digitization has taken root in the economy, it allows sustainable business models to be developed to support a particular market segment or productive activity, with positive results across all other sectors of the economy. Several examples from Kenya and the East African region that demonstrate this emerging trend are given by Ndung'u (2018, 2019) (see Appendix B), and fintechs are working continuously to roll out new products on the digital platform.

5 Regulation of fintech

5.1 Fintech and the regulatory space

It is evident that fintechs have transformed the provision of financial services in the last two decades. Fintechs have emerged not only as major competitors but also enablers in the provision of financial services. They have in some places collaborated with existing providers to scale up financial services, while in some cases fintechs have launched financial services products in direct competition with traditional providers. Their disruptive effect is also evident in recent changes to the way in which services are provided by banks and by insurance, pension, and payments providers (Ndung'u 2019).

The uptake of fintechs has led to benefits in SSA that include: increased financial inclusion of the previously financially excluded and unbanked populations; vibrancy in the financial sector; increased remittance inflows; increased uptake in savings and digital-based credit; and improved utilization of facilities in other sectors such as agriculture, health, education, energy, water, and e-government and e-commerce services.

Fintechs also seem to be at an advantage over bricks-and-mortar banks in the following respects:

- They provide solutions along the banking value chain that have greater appeal to customers and are more easily accessible.
- Their services involve lower search and verification costs and carry less of a regulatory burden.
- Their income is mainly from fees from atomistic transactions rather than interest.
- They make use of big data and machine learning to match borrowers and lenders using algorithms.
- The ease of regulatory surveillance improves the CFT/AML regime for the country. (OECD 2021)

Overall, in comparison with traditional banks, fintechs have been able to offer customers the precise financial product they need, at the right price, within the shortest possible time. However, all these characteristics, albeit positive, pose challenges relating to data privacy, consumer protection, and price discrimination practices that need to be addressed and regulated. But in pushing the frontiers of financial services fintechs have moved to sectors in which no specific regulations have been developed, which has raised concerns, especially with regard to cybersecurity. Moreover, ease of access, particularly to credit apps, has in some cases led to over-indebtedness and welfare losses among poor, vulnerable, and financially illiterate populations (MicroSave Consulting 2019). Among the activities considered especially risky are digital lending and digital betting. Yet the regulators of betting and gambling in Kenya, for example, do not seem concerned about these developments and have been under political pressure not to impose regulations.

Thus, maximizing the benefits of fintech while minimizing the risks for the financial system is the major challenge that financial regulators must deal with. The introduction of more and stricter regulations to minimize likely risks and vulnerabilities resulting from the adoption of fintech may stifle further financial innovation. The ideal approach for policy-makers would therefore be to adopt regulation that continuously identifies emerging risks and vulnerabilities while at the same time strengthening the incentives for prudent behaviour among the fintech players in a particular market segment. Such regulation requires a financial system that is stable, efficient, and innovative (Erik et al. 2021). However, policy-makers in SSA continue to face difficulty in striking the right balance between adopting regulations that support growth-enhancing fintech innovations and implementing effective risk-based regulations across different sectors.

The regulation of fintech is in its infancy in SSA and several challenges persist. The first is that mobile payments still require the use of an electronic signature or PIN to authorize transactions. The legality of electronic signatures, however, still relies on old national laws and regulations that typically verify individuals on the basis of an official identity document and their physical address.¹⁵ Additionally, international AML/CFT regulations requiring customer due diligence to identify suspicious transactions also rely largely on old national laws. Given that only 22 per cent of African households have postal addresses and a large number of the adult population lack official identification documents (African Development Bank 2013), this limits the reach of technology-based solutions. These challenges necessitate amendments to legal clauses that inhibit the

¹⁵ One of the legal amendments in Kenya in 2006 that supported the roll-out of M-Pesa was the recognition of an electronic signature and of electronic units of money. That in a sense legitimized the retail electronic payments platform.

development of fintech and also calls for a clear regulatory framework for fintech and other technology-based solutions, especially with regard to electronic identification and legality issues.

A second challenge is the limited interoperability of technology-based platforms and products in SSA countries. As these products were developed separately, the first-mover advantage is prevalent. But optimizing fintech requires interoperability of different platforms at various levels so that, for example, customers can access a single point of sale to perform various transactions across different platforms. The World Bank 2010 Global Payment Systems Survey (World Bank 2011) shows that less than 20 per cent of technology-based products are fully or partially interoperable, which limits the attractiveness and usage of fintech solutions. Limited interoperability has largely been driven by the lack of a clear regulatory framework covering, for example, termination costs for mobile money, pricing, and fair competition among the players. Interoperable platforms would increase innovation in the market, enlarge the market, and lower unit costs.

Third, there are challenges on market conduct issues. The low levels of financial literacy and income in SSA limit the ability of a large population to optimally use and understand fintech-based solutions. This has raised market conduct issues with regard to consumer protection against exploitation, high indebtedness, and other undesirable behaviours. The problem calls for a clear market conduct regulatory framework that guides and governs the provision and operation of technology-based financial services. Additionally, there is need for a clear regulatory framework aimed at promoting financial literacy.

Fourth, challenges exist on market development issues such as supportive infrastructure, including internet connectivity, fair competition practices, safety, and security. This has led to calls for an adequate regulatory framework to eliminate entry and exit barriers for fintech solutions development with the aim of promoting general market development. Such a regulatory framework should also seek to address security and safety issues in relation to the use of technology-based solutions.

The fifth challenge to regulation is policy trade-offs. The upsurge of digital innovations largely fuelled by fintech's diverse development and coverage has led to complex policy trade-offs in four broad areas:

1. **Balancing 'traditional' financial stability and competition:** SSA's central banks' traditional role has been to promote financial system stability through appropriate regulation and financial institution supervision. The call for central banks to take a leading role in promoting the adoption of fintech in order to expand financial inclusion may lead to conflict with their traditional objective of promoting financial stability. Proponents of increased competition argue that greater market entry in the financial sector is desirable and that increased competition may lead to diversified products and increased efficiency—hence better outcomes for customers. On other hand, fintech entry may lead to diversified products or innovations dominating a certain market segment, such as retail payments, thereby entrenching market power and leading to conflicts of interest between fintech and telecom/bank competitors. The proliferation of new products will not necessarily lead to increased competition. The global 2007–09 financial crisis remains a reminder of the systemic risks emanating from increasing access to financial regulation policies and practices (Erik et al. 2021). To address the traditional financial stability vs. market integrity regulation trade-off, the authorities (including central banks) should adopt a risk-proportionality objective. This implies that the adoption of technology-based financial solutions should be based on the benefits and associated risks. Therefore, traditional

financial stability and market integrity become complementary regulatory and policy objectives.

2. **Balancing efficiency and risks:** It is evident that fintech and other technology-based solutions have led to reduced costs and friction, increased efficiency, narrowed information asymmetry, and availability of higher computing power. However, there are also potential risks to both customers and the financial system. For example, fintech brings new risks such as lack of infrastructure interconnectedness while at the same time continuing to be vulnerable to risks common in the financial system in terms of liquidity, credit, market access, and operations. Fintech-led innovations have supported digital finance to reach a level where market failure potentially raises systemic risks in some countries. For example, P2P lending by fintechs reached significant levels in China, necessitating a regulatory crackdown in 2017 (Erik et al. 2021). This means that authorities should develop a regulatory environment that balances efficiency and risks in fintech adoption.
3. **Balancing fintech adoption and control of new risks to data privacy and consumer protection:** The proliferation of fintech services increases the risks of compromising data privacy, exploitative costs, abusive practices, fraud, and errors that customers may not be aware of. This raises the question of how policy-makers can adopt policies promoting the adoption of fintech solutions without compromising consumer protection (Erik et al. 2021). Policy-makers are aware that data-sharing restrictions may lead to market failure and further market segmentation. Free and wide data sharing is paramount in supporting fintech innovation. For example, the sharing of customers' financial transaction data (banking, payments, social media activities) allows fintechs to construct a complex credit scoring mechanism and hence offer tailor-made credit services to unbanked and underserved populations. However, policy concerns remain on data privacy due to issues such as identity theft, reputational damage, and consumer manipulation. Bearing in mind that the majority of consumer protection regulatory policies in SSA focus on the traditional provision of financial services, any shortcoming emanating from fintech customers' interactions may lead to undetected consumer protection risks. This calls for delicate policy balancing to ensure data privacy and consumer protection while spurring fintech adoption.
4. **Shifting from quantity- to price-based monetary policy:** Fintech innovations have led to a decline in cash held outside the banking system, increasing inside money and changing cash handling behaviour by households. The velocity of money is no longer constant and the relationship between base and broad money is not predictable. These factors have led to a shift from a quantity- to a price-based monetary policy framework. Thus, new and efficient indicators of monetary policy and monetary policy instruments will need to be developed to create an efficient signalling environment.

5.2 Emerging issues in regulation

Technology is ever-changing, developing, and dynamic, constantly raising new issues and challenges, such as that posed by recent advances in DLT. Whereas emerging technologies are still facing significant challenges, such as scalability, security, and high energy consumption, the utilization of DLT offers potential solutions, including enhanced transparency, security, and efficiency for SSA payment platforms, hence lowering trading costs and increasing interoperability across platforms, countries/jurisdictions, and time (IMF 2019). Ultimately, regional payments will facilitate intra-Africa trade.

An emerging practice in fintech regulation is the adoption of regulatory sandboxes to facilitate entry into markets, as already practised in Kenya, South Africa, and the UK. Regulatory sandboxes allow regulators to support product development by fintechs by providing a secure testing

environment for innovative products, ultimately catalysing disruptive innovations. The ‘test and learn’ environment created by Kenya’s first regulatory sandbox for M-Pesa development allowed innovation and rolling-out of financial products under a special regulatory environment. In the UK, firms under the regulatory sandbox were found to attract greater funding due to lower regulatory costs and information asymmetries (Cornelli et al. 2020). The original idea of a regulatory sandbox made M-Pesa the most successful fintech product in Kenya, revolutionizing digital financial services.

It is evident that the mobile technology drive has great potential for leapfrogging financial developments and enhancing economic vibrancy in SSA. High-powered networks such as 5G, which continues to make progress globally, offer significant opportunities for increasing efficiency and speed, but SSA is lagging behind in the adoption of 5G technologies, which is projected to be 3 per cent in 2025 for the SSA region compared with 7 per cent in MENA, 21 per cent globally, and 53 per cent in East Asia and the Pacific (GSMA 2021a). While Kenya, Togo, Seychelles, Madagascar, and South Africa have begun deploying 5G networks for commercialization, Mali, Uganda, Zambia, Nigeria, and Ethiopia are still in the early stages of 5G network deployment (GSMA 2021a). SSA governments should ensure the adoption and availability of this high-powered spectrum to realize high-performance networks and services and should support their digital connectivity goal by having effective spectrum pricing models to ensure affordable high-quality mobile technology services.

Mobile technology players also have a significant role in ensuring the effective adoption of 5G technologies, which have the potential to fast-track digitalization in SSA countries—e.g. through the adoption of electronic and biometric identification cards (e-ID), application programming interfaces (APIs), and cloud computing—thereby enhancing the automation of government and business services. Additionally, these technologies can be utilized to address market challenges by providing more reliable and faster connectivity, enhancing regulatory capacity for state actors, and increasing transparency and interoperability. For example, mobile phone-based transaction products in Kenya are facilitating tax payments and government revenue administration. Such a transformation would raise the ability of SSA countries to create innovative solutions, hence increasing their competitiveness across market segments, and encourage the formalization of informal markets and transactions.

For the effective adoption of 5G technologies, SSA governments and other players should first ensure that users have access to affordable and quality networks. This involves providing high-quality and affordable handsets, tariffs, data, and services. Second, they must seek to improve users’ digital skills and knowledge. Increased digital literacy enhances awareness of mobile technology benefits. Third, they must ensure the safety and security of users’ data and devices. This can be achieved through addressing data privacy, theft, harassment, and fraud, with the aim of building users’ trust. Fourth, they must see to it that users are constantly provided with relevant and appropriate services, content, and product to meet customers’ ever-changing tastes and preferences.

Finally, effective regulation of fintech will create a platform for regulator collaboration. The success of M-Pesa in Kenya was attributed to the regulatory coordination between the central bank and the Communication Authority. Other collaborations might be between: industry-specific regulators such as those in insurance and pensions sectors, and service providers; different government sectors (Agriculture, Energy, Health, Communication, and Technology); competition and telco regulators.

5.3 Suggested solutions to fintech development challenges

To enhance fintech development and financial inclusion in Africa, several policy and institutional reforms are required. First, Africa needs to create a competitive ecosystem and infrastructure that facilitate entry. Second, robust consumer protection regulations are needed to create an enabling and innovative environment. Third, state capacity will need to be enabled to develop institutions that will protect the market and foster innovation. Fourth, since most African countries lack a comprehensive legal framework for addressing cybercrime, there is need to build capacity to monitor and prevent cybercrime, especially in terms of office-level surveillance.

Low internet access, connectivity, and service quality is another challenge. Despite improvements in the ICT infrastructure across the continent, there are still several technological bottlenecks that are restricting the spread of digital infrastructure. Mahnkopf (2019) points to limited fibre-optic networks; lack of a standardized application programming interface or common data language; poor integration of largely autonomous systems; and exposure to the danger of cyber-attacks. Successful fintech applications must operate on a reliable electrical grid that permits large numbers of participants to connect via mobile phones or the internet, and the products must be designed with simplicity and low cost in mind (Yermack 2018). There is a need to address the key enablers of mobile and internet connectivity (that is, infrastructure, affordability, consumer readiness, and content), particularly around network quality, affordability for low-income users, digital skills, and the creation of content in more local languages (Ndung'u 2018). If these issues are not adequately addressed, the exclusion resulting from connectivity challenges is likely to further widen the digital divide in Africa. Connectivity issues slow financial services as well as communication. Upscaling the digitization process is also important for sustainability (Ndung'u and Oguso 2021a).

Deficiencies in the interoperability of MNOs and transparency in the pricing of services are still concerns for telecommunication regulators and financial institutions (Ndung'u 2019). The market dominance of certain telecommunication companies in Africa creates a fundamental conflict of interest, since all financial institutions remain customers of, and potentially competitors to, one dominant MNO, and fails to take into account first-mover advantage, whereby the initial investors create extensive physical infrastructure that is costly for followers to replicate. However, a system of leasing can be devised to enhance interoperability. The lack of interoperability between retail electronic payment platforms is a particular challenge that requires feasible and practical solutions (Ndung'u and Oguso 2021a). The retail electronic payments platforms were developed individually but should now move towards an interoperable platform that would facilitate leasing agreements to enlarge the market, lower unit costs, and provide room for more innovative solutions and scalability, while at the same time allowing seamless and transformative regulatory technology to emerge. There is a need to enhance MNOs' and MVNOs' interoperability, agent network interoperability, and regional payments interoperability across Africa.

Another requirement is improvement in the personal identity system (e-ID system) to cope with market innovations and secure the market. One of the major impediments to credit and other types of borrowing in Africa is the lack of collateral—not because of insufficient assets but rather due to inefficient registration systems (Dahou et al. 2009). There is a need for Africa to leverage digital technology to generate comprehensive databases of all citizens (where they are, what they do, their physical addresses) and the services they use or require. A move towards a robust, inclusive, and privacy-supporting e-ID system able to provide identification services for an increasingly digitized society is required (Ndung'u 2019). A new e-ID system including a machine-readable card with a microchip that contains comprehensive details of the holder will make it easier to transmit transaction and other data in real time and minimize risks (Ndung'u and Oguso 2021a).

Deficits in education and vocational training also represent a great obstacle for developing countries, including those in SSA, especially regarding the key technology of artificial intelligence (AI), which is based on four components: algorithms or computer programs, computing power, huge amounts of data, and people to develop programs and applications (Mahnkopf 2019). There is a need to enhance research and capacity in these areas across SSA in order to increase the uptake of fintech products and to encourage innovation.

Finally, in conjunction with the banking sector, capital markets are a central component of efficient financial markets and resource mobilization. However, they remain largely underdeveloped in Africa and therefore further discourage investors (Dahou et al. 2009). Thus, there is a need for African governments to support the development of capital markets to enhance resource mobilization, intra-Africa trade, and opportunities for both domestic and foreign investors (Dahou et al. 2009). Pooling resources and investors at the regional level will also help to build economies of scale in terms of financial infrastructure and regulatory capacity while providing both domestic and foreign investors with a diversified set of opportunities (Dahou et al. 2009; Ndung'u and Oguso 2021b).

6 Fintech and the fourth Industrial Revolution

Fintech innovations have heralded a fourth Industrial Revolution (4IR) across the world, where automation and the internet of things (IoT) now apply to almost all aspects of life. The digital revolution being experienced across Africa could allow countries to create their own unique development path that will skip certain historical development stages by taking the lead in innovation and technologies of the 4IR such as drones, robotics, AI, and renewable energies. The historical narrative of developing 'smokestack industries' has traditionally been regarded as the key driver of structural transformation in Africa. However, there has been an emergence of 'industries without smokestacks' such as services, agro-processing, and horticulture, which have benefited from technological change to achieve productivity growth.

Small-scale manufacturing in Africa may also become more competitive and efficient thanks to emerging technologies (Naudé 2017). Prisecaru (2016) notes that innovative producers have rapid access to digital platforms for R&D, marketing, and distribution and so can quickly improve the quality, price, and availability of their products/services. On the other hand, consumers are increasingly involved in production and distribution chains and can easily connect to suppliers by means of digital technological platforms. Naudé (2017) argues that additive manufacturing (3D-printing) has the potential to open opportunities for entrepreneurs to enter manufacturing and has promising implications for agricultural industrialization in Africa. A recent project that piloted additive manufacturing is the 3D4AgDev project, funded by the Bill and Melinda Gates Foundation and GIZ and supported by the University of Galloway. This project provides women smallholder farmers with 3D-printing technology to design labour-saving agricultural tools, producing plastic prototypes for local tool manufacturers (artisans, blacksmiths) to copy or modify.

The 4IR in Africa will increase its participation in global value chains, a significant driver of labour productivity, mainly in the agro-industrial and horticultural, tourism, business, and trade services sectors (Newfarmer et al. 2018). This will allow countries to industrialize at a much earlier stage of development, as lead firms choose to offshore fragments of the production value chain to countries where labour is cheaper or where locational criteria confer a competitive cost advantage (Newfarmer et al. 2018). The 4IR may also allow suppliers in developing countries to meet standards and regulations that allow access to rich country markets; it may permit imports under privileged tariff treatment for intra-firm trade; or it may facilitate the use of network technology

that would not otherwise be available (Newfarmer et al. 2018). This vibrancy will allow fintechs to roll out new products to cover the space and increase efficiency.

The service industry is becoming increasingly important in African economies. Much of manufacturing is undergoing a process of servicification, while services sector firms have become larger, providing a range of specialized services such as engineering design, legal advice, and accounting (Newfarmer et al. 2018). Evidently, services in African markets are fast becoming the primary source of within-sector productivity growth, already accounting for more than 50 per cent of labour productivity growth in several African countries.

The uptake of fintech in SSA is pegged on overcoming the challenges outlined above and implementing regulatory frameworks that will facilitate market development. Physical infrastructure is also key to this growth, accompanied by human capital development to raise technical skills. Governments in Africa should continue to develop capacity to support these developments. The current digital evolution has networked citizens, government services, and businesses and can therefore serve to coordinate policies efficiently and ultimately drive the fourth Industrial Revolution.

7 Conclusions

It is evident that fintechs are defining the growth and development path of the financial sector in Africa. They have supported the evolution of national retail electronic payments, the entry point to financial services; positioned banks as a platform to manage micro-accounts through virtual savings products; and enabled the evolution of virtual credit, micro-insurance, and investments in government securities (Ndung'u 2019). The lessons from the East African region seem to show that once fintechs had revolutionized the retail electronic payments platform, the effects were felt across all other sectors of the economy.

In summary, the fintech evolution in SSA has provided several benefits:

1. Fintech has revolutionized the retail payments ecosystem, and this revolution has spilled over to other sectors of the SSA economies and navigated across different market segments. The retail electronic payments system operated by commercial banks that has emerged is effective, efficient, transparent, and safe. Retail electronic payments are easier entry points for financial services, which have the capacity to formalize informal market transactions thanks to their ability to navigate between formal and informal markets.
2. Fintechs have rolled out new products across all sectors of the economy—especially the financial sector, which has benefited from a wide range of innovations, but also the agriculture, manufacturing, health, energy, and education sectors.
3. Fintech has enhanced both financial inclusion and financial sector development across SSA. Commercial banks and microfinance institutions now have a technological platform for managing micro-accounts and reaching out to customers cost-effectively. With the creation of retail electronic payment systems, banks have been able to upgrade their banking infrastructure so that virtual savings and credit supply platforms have emerged, along with increased investment in government instruments. Strong banks with intermediation capacity have also emerged in Africa.
4. Fintech has enabled the formulation of effective price-based monetary policy, supportive of market development and innovation. In addition, digital financial services have allowed an efficient surveillance system to be developed and thus have enabled improvements in the AML/CFT regime.

5. Low-income earners have been enabled to save in instruments that are safe and secure. Women, in particular, who tend to be efficient savers, have been enabled to escape from cycles of poverty.
6. Fintech is supporting e-government services platforms. Perhaps the most significant driver of future economic management is the development of tax payment platforms and revenue administration. This increases efficiency, resolves governance issues, supports the mobilization of domestic resources, and minimizes revenue leakages. Fintechs are designing platforms for e-government services that are effective and easy to access, as well as targeted government social protection programmes that were effective during the COVID-19 pandemic.
7. The fintech revolution is pushing African economies towards the 4IR, propelling the continent forward in savings, investment, and growth.

Innovation and regulation must work hand in hand to ensure a safe environment for innovation and inclusive growth. It is evident that fintech has the potential to transform business models and livelihoods, as well as the way in which services and payments are made in SSA. Africa is characterized by market segmentation, but fintech products are navigating across market segments, both formal and informal, thus solving information asymmetry problems. The fintechs will thus propel the 4IR in the continent, provided that they are embraced wholeheartedly, that appropriate infrastructure is provided, and that suitable legal and regulatory frameworks are put in place. The expected impact of fintech remains huge, with likely positive multiplier effects across other sectors of the economy and across the continent.

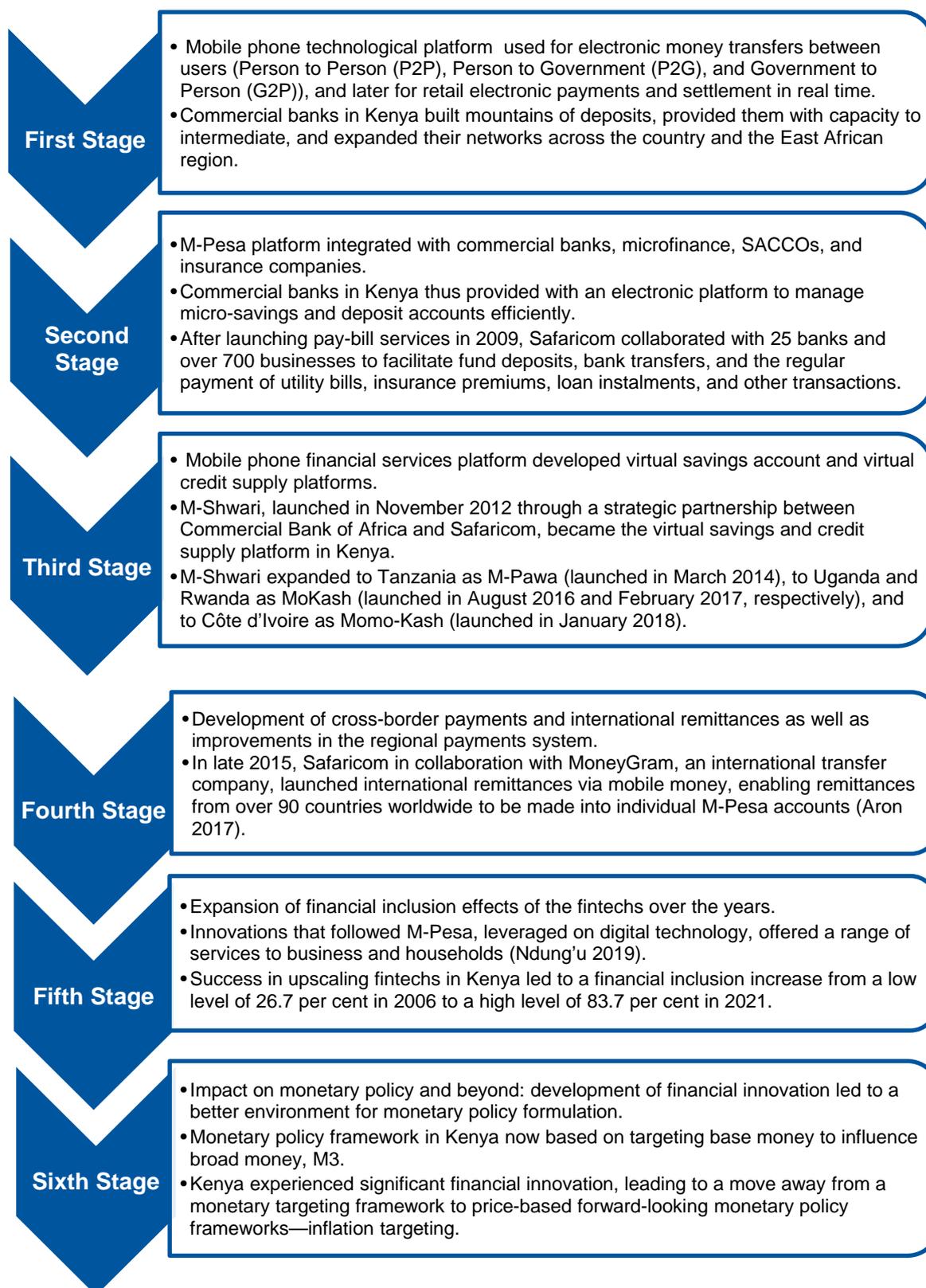
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Appendix A: Fintech evolution – an example of Kenya’s M-Pesa case



Source: author's elaboration based on Ndung'u (2018, 2019).

Appendix B: Other fintech products in SSA

Agriculture	Access to utilities	Energy
<ul style="list-style-type: none"> • Rapid diffusion of fintech to support the supply of inputs and prompt payment of outputs. • One Acre Fund (OAF) launched in Kenya in 2006 targeting smallholder farmers, currently serving farmers also in Rwanda, Burundi, Tanzania, Uganda, and Malawi. • OAF interventions reduce constraints that smallholder farmers in the East African region face in terms of inputs, managerial skills, market access, and effective real-time payments. • Other ventures and digital solutions in SSA focused on agriculture developed with the aim of increasing the inclusion of youth and women in agricultural activities, productivity, market access, and finance, reducing post-harvest handling, and enhancing supply chain management. 	<ul style="list-style-type: none"> • In Nairobi's Mathare slums, a public-private partnership between Nairobi Water, Safaricom (a telco), and Grundfos (a Danish water engineering firm) installed water vending machines. • Through M-Pesa, payment is collected from customers more efficiently, while a cloud-based system receives and publishes all transactional and operational data from each water dispenser, ensuring accountability and reducing service costs. • Grundfos's report on the programme shows that the vendors operating in the slum charge KShs50 (US\$0.50) for a 20-litre container of water (an average family would require five containers a week). • Introduction of water vending machines saw weekly expenditure on water in the slum reduced by 90% from KShs250 (US\$2.5) to KShs2.50 (2.5 cents). 	<ul style="list-style-type: none"> • M-Kopa, a connected asset financing platform, launched in 2010, offers millions of underbanked customers access to life-enhancing products and services. • The M-Kopa solar programme helps low-income consumers acquire and own high-quality, affordable energy solutions. • The programme has to date connected over 500,000 households to affordable solar power. • After completing payments, customers own the product outright. • Programme reports show that households that have benefited are expected to make savings of US\$375 million over four years and enjoy kerosene-free lighting, thus improving their welfare. • In the last decade, the M-Kopa asset financing platform has provided nearly US\$400 million in financing that has enabled 1 million customers to access solar lighting, energy-efficient televisions and fridges, smartphones, cash loans, and more.
Financing health services	E-government and e-service delivery	E-commerce
<ul style="list-style-type: none"> • The M-Tiba savings product is a mobile phone-based health wallet that enables users to save money for themselves and others to use at accredited health service providers. • M-Tiba, initially developed by CarePay International in Netherlands in 2017, is now available in Nigeria, Kenya, and Rwanda as M-Tiba. • Users are encouraged to save as much as possible so that they can pay for healthcare services in full. • Meessen (2018) shows that as early as June 2017 M-Tiba was reported to have registered nearly 900,000 users, providing them access to 450 health facilities, and that the system had processed payments totalling US\$1.4 million over 100,000 visits. • This partnership has led to quicker delivery of life-saving medical products in rural areas, expanding healthcare inclusion in Rwanda and Kenya (IMF 2019). 	<ul style="list-style-type: none"> • E-government platforms such as Kenya's eCitizen digital platform have reduced bureaucracy and improved access to government services. • Through the platforms, citizens apply for G2C services and pay via mobile money, debit cards, and eCitizen agents. • In Kenya, the platform provides portals that enable individuals to access government services such as business licences, permits, and registrations; obtain driving licences; process police clearance certificates; search for official land titles for Nairobi blocks; and apply for passports. • Targeted social protection programmes have also taken advantage of the digital revolution to enhance efficiency on payments to and from the government. 	<ul style="list-style-type: none"> • The fintech evolution has enabled the establishment of various online shopping platforms in Africa. • Traders using the e-commerce platforms do not have to establish physical shops all over the country, since customers can log on to their websites, view their products, purchase, and have the products delivered at their convenience. • For example, in Kenya, there are a number of online shopping platforms, such as Jumia Kenya, PigiaMe, Nuria, OLX, and Kilimall. • There are other opportunities on the digital platform, ranging from Uber taxi services to YouTube and Amazon self-published books, as well as application stores.

Source: author's elaboration based on Ndung'u (2018, 2019).