



# The impact of mobile money on monetary and financial stability in Sub-Saharan Africa



The GSMA represents the interests of mobile operators worldwide, uniting more than 750 operators with over 350 companies in the broader mobile ecosystem, including handset and device makers, software companies, equipment providers and internet companies, as well as organisations in adjacent industry sectors. The GSMA also produces the industry-leading MWC events held annually in Barcelona, Los Angeles and Shanghai, as well as the Mobile 360 Series of regional conferences.

For more information, please visit the GSMA corporate website at [www.gsma.com](http://www.gsma.com)

Follow the GSMA on Twitter: [@GSMA](https://twitter.com/GSMA)

## Mobile Money

The GSMA's Mobile Money programme works to accelerate the development of the mobile money ecosystem for the underserved.

For more information, please contact us:

Web: [www.gsma.com/mobilemoney](http://www.gsma.com/mobilemoney)

Twitter: [@gsmammu](https://twitter.com/gsmammu)

Email: [mobilemoney@gsma.com](mailto:mobilemoney@gsma.com)

**Published March 2019**

### Authors:

**Kennedy Kipkemboi,**

Mobile Money Regulatory Specialist, GSMA.

**Kalvin Bahia,**

Principal Economist, GSMA Intelligence.

### Acknowledgements:

The authors would like to acknowledge the significant contribution of Maria Sanchez and Pere Taberner from KSNET, who provided invaluable support on data gathering and analysis, as well as reviewing the relevant literature.

## GSMA™ Intelligence

GSMA Intelligence is the definitive source of global mobile operator data, analysis and forecasts, and publisher of authoritative industry reports and research.

Our data covers every operator group, network and MVNO in every country worldwide – from Afghanistan to Zimbabwe. It is the most accurate and complete set of industry metrics available, comprising tens of millions of individual data points, updated daily. GSMA Intelligence is relied on by leading operators, vendors, regulators, financial institutions and third-party industry players, to support strategic decision-making and long-term investment planning. The data is used as an industry reference point and is frequently cited by the media and by the industry itself.

Our team of analysts and experts produce regular thought-leading research reports across a range of industry topics.

[www.gsmaintelligence.com](http://www.gsmaintelligence.com)

[info@gsmaintelligence.com](mailto:info@gsmaintelligence.com)

THE MOBILE MONEY PROGRAMME IS SUPPORTED BY THE BILL & MELINDA GATES  
FOUNDATION, THE MASTERCARD FOUNDATION, AND OMIDYAR NETWORK

**BILL & MELINDA**  
GATES *foundation*



**ON**  
OMIDYAR NETWORK™

# Contents

|  |           |
|--|-----------|
| <b>Executive Summary</b>                 | <b>2</b>  |
| <b>1 Background</b>                      | <b>3</b>  |
| 1.1 Mobile money and monetary stability  | 3         |
| 1.2 Mobile money and financial stability | 5         |
| 1.3 The evidence gap                     | 6         |
| <b>2 Analytical approach</b>             | <b>7</b>  |
| <b>3 Monetary stability analysis</b>     | <b>11</b> |
| 3.1 Currency outside the banking sector  | 11        |
| 3.2 Money multiplier                     | 13        |
| 3.3 Velocity of money                    | 16        |
| 3.4 Inflation                            | 18        |
| 3.5 Summary                              | 19        |
| <b>4 Financial stability analysis</b>    | <b>20</b> |
| 4.1 Mobile money payments                | 21        |
| 4.2 Commercial banking sector growth     | 21        |
| 4.3 Return on equity for banks           | 24        |
| 4.4 Summary                              | 26        |
| <b>5 Conclusion</b>                      | <b>27</b> |
| <b>Appendix: Data sources</b>            | <b>28</b> |

# Executive Summary

An ever-increasing body of research and empirical evidence has demonstrated the positive impact of mobile money on individuals, households and businesses, especially in Sub-Saharan Africa, where there were almost 400 million registered accounts at the end of 2018.

Mobile money reduces transaction costs for users and helps households to better manage their cash flows; it allows firms to invest and build capital over time, fostering the creation and expansion of business; and it facilitates faster and more efficient government transfers. These benefits have enabled many mobile money users to realise significant quality of life improvements.

However, the impact of mobile money on macroeconomic and financial development is not as well understood, particularly in relation to monetary and financial stability, which form the two primary objectives of central banks. To address this evidence gap, this study assesses the impact of mobile money across several countries in Sub-Saharan Africa - something which, to our knowledge, no previous study has done.

In terms of monetary (or price) stability, we find that mobile money can enable more effective monetary policy by transferring currency and assets into the formal financial system and enhancing financial depth. In particular, mobile money is linked with a higher money multiplier, which means that a country's money supply is more responsive to changes in the monetary base, improving the effective implementation of monetary targeting.

We also find that concerns around mobile money increasing the velocity of money and therefore inflation are unfounded - in fact, there is more evidence to suggest that mobile money is linked to a decline in velocity, which is a sign of financial innovation. The direct impact of mobile money on inflation is unclear, although the lack of a correlation between the two is consistent with recent research that suggests mobile money has little to no impact on inflation.

With regard to financial stability, there is no evidence to suggest that mobile money poses a systemic risk to the financial system or other payment systems. Even in the most mature markets, mobile money accounts for a much smaller proportion of transaction values than transaction volumes, highlighting the 'high-volume, low-value' nature of the product.

Furthermore, we find that mobile money expansion is associated with growth in the traditional commercial banking sector, for example in the number and value of deposit accounts. This has positive implications for monetary policy: if consumers are saving and borrowing more within the financial system, then a greater share of economic activity falls under the influence of central bank interest rates. This means that changes in policy interest rates will have a bigger impact on consumption and investment, which in turn will make them more effective in maintaining stable prices.

Given the broad scope of countries covered in the study, these findings are highly relevant to central banks and policymakers because they can inform policy discussions both in countries where mobile money has not achieved scale and where it has. The study should also be useful to existing and new mobile money providers and the wider financial services industry by demonstrating that concerns around mobile money displacing other financial products and introducing risk in the payments system have not materialised in countries where mobile money adoption is widespread.

# 1 Background

Mobile money has helped reduce the financial exclusion gap in low- and middle-income countries, particularly in Sub-Saharan Africa, which had almost 400 million registered accounts at the end of 2018.<sup>1</sup> Within the region, more than one in ten adults are reliant solely on mobile money to access financial services.<sup>2</sup>

The positive impact of mobile money on individuals, households and businesses has been demonstrated by a burgeoning body of research and empirical evidence. Mobile money reduces transaction costs for users and helps households to manage their cash flows more effectively, enabling them to smooth consumption, manage risk and build working capital. It also allows firms to invest and build capital over time, fostering the creation and expansion of business, and facilitates faster and more efficient government transfers. These benefits allow many mobile money users to realise significant quality of life improvements.<sup>3</sup>

Mobile money has also supported other sectors such as education and utilities, for example by offering users a means of paying school fees<sup>4</sup> and enabling pay-as-you-go access to clean energy.<sup>5</sup>

However, the impact of mobile money on macroeconomic and financial development is not as well understood, particularly in relation to two important and inter-related areas: monetary (or price) stability and financial stability. These generally form the two primary objectives of central banks.

## 1.1 Mobile money and monetary stability

The potential inflationary effects of mobile money have generally been framed by the 'Quantity Theory of Money' (QTM). This is described by the relationship  $MV=PY$ , where M is the supply of money, V is the velocity of the circulation of money (the average number of transactions that a unit of money performs), P is the price level and Y is the volume of transactions in an economy.

An initial hypothesis was that mobile money could drive higher inflation if it makes it easier for consumers to spend money and increases the velocity of circulation.<sup>6</sup> However, this view has been contested on the basis that mobile money can also affect inflation by increasing saving, consumption, investment and

productivity. It has also been criticised by those who argue that the QTM is too simplistic and does not hold in practice.<sup>7</sup> Instead, there are several ways in which mobile money can potentially impact inflation, as outlined below.

### Mobile money's potential impact on inflation via increased investment and productivity

Mobile money can increase firms' ability to make productive investments,<sup>8</sup> which could enhance efficiency and therefore reduce prices. It can also transfer informal cash and/or non-financial assets into the banking system, enabling credit creation via

1 GSMA (2019). *State of the Industry Report on Mobile Money 2018*.

2 World Bank Group (2018). *The Global Findex Database 2017*.

3 A comprehensive discussion of the socio-economic impacts of mobile money, including a detailed review and critique of the relevant literature, can be found in Aron, J. (2017). 'Leapfrogging': A Survey of the Nature and Economic Implications of Mobile Money and Aron, J. (2018). *Mobile Money and the Economy: A Review of the Evidence*.

4 Frydrych, J., Scharwatt, C., Vonthron, N. (2015). *Paying school fees with mobile money in Côte d'Ivoire*. GSMA.

5 GSMA (2018). *Mobile for Development Utilities: Achieving SDGs 6 and 7: The promise and impact of mobile technology*.

6 Simpasa and Gurara (2012) *Inflation Dynamics in selected East African countries: Ethiopia, Kenya, Tanzania and Uganda*.

7 A more detailed discussion of mobile money and macro-financial outcomes can be found in the following: Mas and Klein (2012) *A note on macro-financial implications of mobile money schemes* and Aron (2017) 'Leapfrogging': A Survey of the Nature and Economic Implications of Mobile Money.

8 See for example, Islam, A., Muzi, S. and Meza, J.L. (2016). *Does Mobile Money Use Increase Firms' Investment: Evidence from Enterprise Surveys in Kenya, Uganda and Tanzania*.

the money multiplier.<sup>9</sup> This is because while almost all countries mandate the ring-fencing of mobile money funds in trust or escrow accounts,<sup>10</sup> these ‘pooled funds’ can be on-lent by the custodial banks in the same manner as normal deposits. Furthermore, mobile money can increase international remittance transfers, which brings in ‘new money’ to the banking system that was previously outside of the country.

Mobile money can also enable users to access credit and saving facilities, especially among unbanked populations. This can be driven by mobile money unlocking opportunities for users to improve credit scores and, in some countries, linking their mobile money accounts to formal bank accounts (for example M-Shwari in Kenya, MTN Qwikloan in Ghana and Tigo Nivushe in Tanzania).

This wider creation of credit can stimulate more productive investments in the economy, reducing prices and also increasing GDP growth and employment.<sup>11</sup> Furthermore, by reducing transaction costs and enabling digital payments and transfers, mobile money can facilitate increased trade and enhance economic efficiency and competition,<sup>12</sup> thereby further improving productivity and driving lower prices.

### Mobile money’s potential impact on inflation via saving and consumption

Inflation is also determined by the level of consumer demand in an economy. If mobile money increases saving by offering consumers a secure way to store money, as demonstrated by existing evidence,<sup>13</sup> this could reduce demand and therefore inflation. On the other hand, if mobile money increases consumption, which has also been documented in the literature,<sup>14</sup> then this could increase overall demand. Given that the two mechanisms work in opposite directions, the overall impact of mobile money on both aggregate saving and consumption, and therefore inflation, is an empirical question.

### Implications for monetary policy

Mobile money can also affect the efficacy of a central bank’s monetary policy, particularly in relation to the control of money supply and the setting of interest rates. Under QTM, it is assumed that velocity of circulation and volume transactions are constant in the short-term. Under a monetary targeting framework, central banks can then influence the money supply as an intermediate target to achieve price stability. This can be done via several methods, including:

- Increasing/decreasing the amount of currency in circulation (e.g. printing money or creating electronic money);
- Varying the liquidity available for commercial banks to meet their reserve requirements;
- Changing short-term interest rates; and
- Conducting open market operations (i.e. buying and selling government securities).

If mobile money increases the amount of cash and assets in the banking system, this would be associated with a larger money multiplier as there is more broad money relative to a given monetary base. This means that a smaller change in the money base, which the central bank can directly influence, will drive a higher impact on the money supply, therefore improving the effective implementation of monetary targeting.

Furthermore, if a greater proportion of a country’s money supply is in the banking system, and more households have access to formal financial markets, this will help to facilitate increased saving and borrowing. As a result, a greater share of economic activity will fall under the sway of central bank interest rates. This means that changes in policy interest rates will have a more direct effect on households’ intertemporal consumption and investment decisions and, therefore, price stability.<sup>15</sup>

---

9 The money multiplier refers to how an initial deposit can lead to a bigger increase in the total money supply, as banks hold a fraction of its deposits in reserve and lend out the remainder.

10 GSMA (2019). *The Mobile Money Regulatory Index*.

11 For a detailed discussion, see: Levine (2005). *Finance and Growth: Theory and Evidence*; Pasali (2013). *Where Is the Cheese? Synthesizing a Giant Literature on Causes and Consequences of Financial Sector Development*; Sahay et al (2015). *Financial Inclusion: Can it Meet Multiple Macroeconomic Goals?*

12 See for example, Sekabira and Qaim (2016). *Mobile Money, Agricultural Marketing, and Off-Farm Income in Uganda*.

13 See for example Ky, S., Rugemintwari, C. and Sauviat, A. (2018). *Does Mobile Money Affect Saving Behaviour? Evidence from a Developing Country*.

14 See for example Suri and Jack (2016) *The long-run poverty and gender impacts of mobile money*.

15 Mehrotra and Yetmen (2015). *Financial Inclusion – Issues for Central Banks*. The authors note that while financial inclusion increases the importance of interest rates in monetary transmission, policymakers need to pay attention to shifts in the velocity of money if they use monetary aggregates as intermediate targets. Mawejje and Lakuma (2017). *Macroeconomic Effects of Mobile Money in Uganda*. The authors suggest mobile money deposits in Uganda respond to changes in monetary policy instruments, thereby enhancing monetary policy transmission mechanisms.

## 1.2 Mobile money and financial stability

Another area garnering increasing attention is the impact of mobile money on financial stability. Concerns have been raised that the widespread adoption and use of telecom-led mobile money services have the potential to introduce systemic risks to payments systems if central bank oversight is less stringent than the supervision of banks and other financial service providers. However, while mobile money incurs the same solvency and liquidity risks as other forms of money, the vast majority of countries with live mobile money services require the safeguarding of 100 per cent of customer funds<sup>16</sup> meaning that sufficient funds are always available to serve withdrawals for all customers.<sup>17</sup> Furthermore, by definition, mobile money is a payments service and the actual deposits sit in trust or escrow accounts. This not only helps safeguard customer funds but it also ensures that, at any point in time, there is a digital equivalent of the cash that leaves the ecosystem. This provides a guarantee that financial shocks cannot be transmitted to other payment systems.

In some markets, there have also been concerns that mobile money could change the landscape for traditional banking, disadvantaging commercial banks. A particular issue arises if mobile money becomes a substitute for demand deposits in banks, which would constrain their lending capacity and deteriorate their liquidity position. If this drives a negative impact on the financial performance and health of commercial banks, this could have implications for broader financial

stability in a country. It would also reduce the role that commercial banks play in the financial system and therefore weaken the transmission of monetary policy.

On the other hand, if mobile money increases saving and enables more individuals to access formal financial services, as outlined in Section 1.1, then it would actually diversify and expand banks' depositor base.

In the middle of these two scenarios, where mobile money is either a substitute for or a complement to traditional banking and financial services, there is a third scenario where mobile money might have no discernible impact on commercial banking. Mobile money primarily remains a payments service and a way to store relatively low values of money electronically. Mobile money providers are not permitted to lend customer funds as they are not prudentially regulated, and therefore, they do not offer the same service as bank deposits or credit services. Indeed, a significant proportion of mobile money users would likely be underserved or excluded from traditional banking products.

At the other end of the spectrum, holders of mobile money accounts who are also banked may use mobile money to make digital payments conveniently, but will retain their primary savings in the commercial bank and continue to access credit services from traditional providers. This would mean that mobile money has little impact on the customer base of commercial banks.

<sup>16</sup> GSMA (2019). *The Mobile Money Regulatory Index*.

<sup>17</sup> There is still a risk that the custodial funds could be stolen, which requires appropriate conduct regulation. For further discussion on this issue as well as appropriate regulations where mobile money funds are not fully safeguarded, see Mas and Klein (2012). *A note on macro-financial implications of mobile money schemes*.

### 1.3 The evidence gap

The discussion above shows that the impacts of mobile money on monetary and financial stability and the implications for central bank policy instruments are theoretically ambiguous and need to be understood through empirical analysis. However, research in both areas is limited and the majority of studies thus far have focused on a single country (often Kenya or Uganda).

Of the few studies that exist, most have looked at the impact on inflation and have generally found that mobile money has either a moderate impact or no impact. For example, Aron et al (2015) found no evidence of a link between mobile money and inflation in Uganda<sup>18</sup> while Weil et al (2012) found that the monetary implications of mobile money in Kenya were likely to be minimal.<sup>19</sup> Adam and Walker (2016) found that mobile money should improve the macroeconomic stability of countries and is unlikely to undermine the conduct of monetary policy.<sup>20</sup>

The evidence assessing the impact of mobile money on financial stability and commercial banks is somewhat more mixed. An early study on Uganda found that mobile money was negatively correlated with banks' liquidity positions and therefore could have an impact on banks' ability to mobilise savings and deposits.<sup>21</sup> However, more recent studies have challenged this by showing that mobile money can be a positive driver of private sector credit and the payments ecosystem, and can increase the likelihood of users becoming banked.<sup>22</sup>

Other studies that have assessed the impact of mobile money and mobile financial services on individual or groups of commercial banks, mostly focusing on Kenya, have generally found that they have a positive impact or otherwise no impact on the financial performance of commercial banks.<sup>23</sup>



18 Aron, J., Muellbauer, J. and Sebudde, R. (2015). Inflation forecasting models for Uganda: is mobile money relevant?  
 19 Weil, D., Mbiti, I. and Mwega, F. (2012). The Implications of Innovations in the Financial Sector on the Conduct of Monetary Policy in East Africa.  
 20 Adam, C. and Walker, S. (2016). Mobile Money and Monetary Policy in East African Countries.  
 21 Kamukama and Tumwine (2012). Mobile Money Services: A Liquidity Threat to Uganda's Commercial Banks.  
 22 See: Bank of Ghana (2017). The Impact of Mobile Money on the Payment System in Ghana: An Econometric Analysis; Bank of Rwanda (2017). The Rwandan Banker, Issue No. 28 ISSN 2410-6844; Mbiti and Weil (2011). Mobile Banking: The Impact of M-PESA in Kenya; Nampewo et al (2016). Determinants of private sector credit in Uganda: the role of mobile money; Maweje and Lakuma (2017). Macroeconomic Effects of Mobile Money in Uganda.  
 23 See: Kinyanzui et al (2018). Effect of Mobile Credit on Operational Efficiency in Commercial Banks in Kenya and Munyokoi (2015). Effect of mobile banking on the financial performance of banking institutions in Kenya.

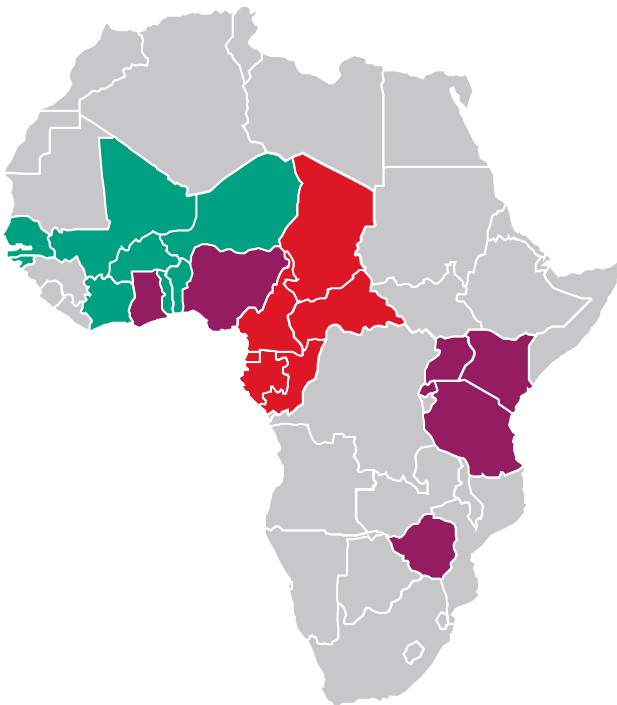


# 2 Analytical approach

In order to better understand the impact of mobile money on monetary and financial stability, this study gathered data on a range of indicators across 21 countries, which can be categorised into three groups.

Figure 1

## Country categorisations



### Group 1

Ghana, Kenya, Nigeria, Rwanda, Tanzania, Uganda and Zimbabwe

### Group 2

Benin, Burkina Faso, Cote d'Ivoire, Guinea-Bissau, Niger, Mali, Senegal and Togo

### Group 3

Cameroon, Central African Republic, Chad, Congo, Equatorial Guinea and Gabon

Source: GSMA

The second and third groups constitute distinct economic and monetary unions in West and Central Africa respectively, and so are considered separately, because their member states are subject to the same central bank oversight and mobile money regulatory framework. The first group includes countries outside of the two economic communities.

Within the first group, while Kenya (and to a lesser extent Uganda) has been the subject of several studies that assess the macroeconomic and financial implications of mobile money, the remaining countries have not generally been considered in the literature. Given the fast-changing nature of mobile money

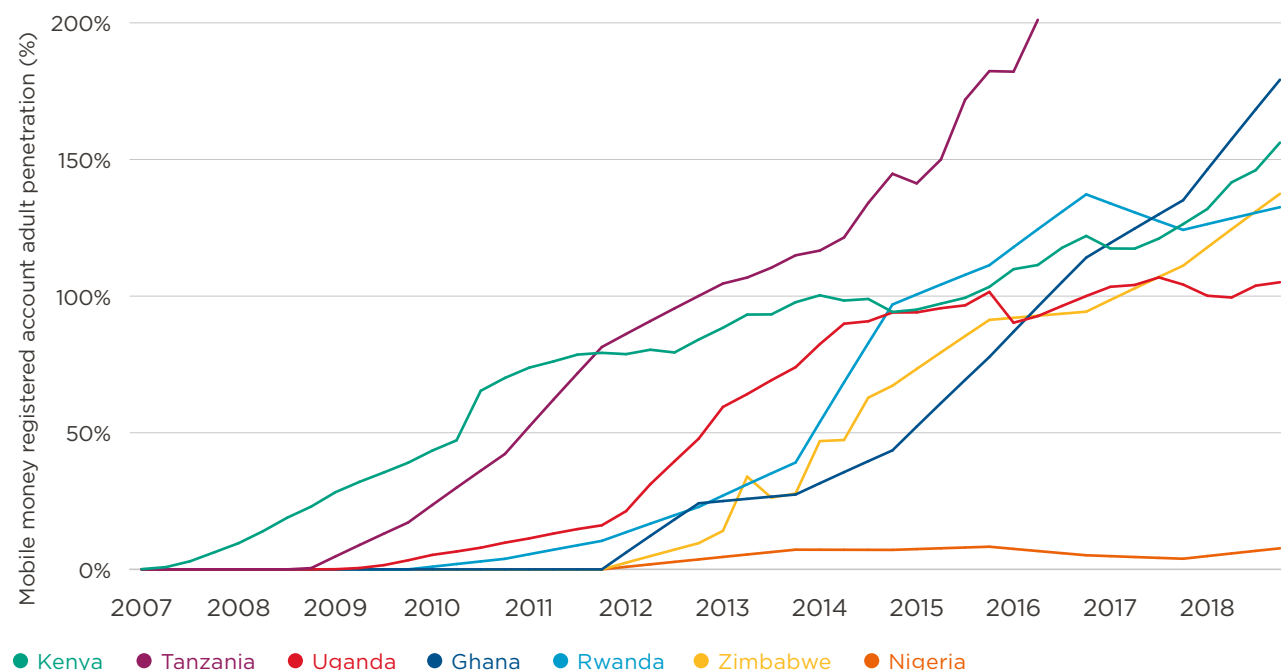
and financial innovation, it is important to update analysis of their impacts regularly, across a range of countries, because they are likely to evolve over time. For example, impacts may be different during the early stages of adoption relative to when a large proportion of the population is using mobile money or when transaction values exceed a certain threshold. Impacts may also differ depending on the economic and financial circumstances of the country in question.

Figure 2 presents trends in mobile money adoption across the first group of countries, based on the number of registered accounts as a proportion of the adult population.<sup>24</sup>

<sup>24</sup> As many individuals have multiple mobile money accounts, this does not represent the proportion of unique adults that have a mobile money account and so penetration can exceed 100 per cent.

Figure 2

### Mobile money adoption in Group 1 countries



Source: GSMA Intelligence analysis of data from central banks and the IMF. Note: Penetration is calculated by dividing the number of registered mobile money accounts by the adult population. Data was not available for Tanzania after June 2016.

The analysis shows that Kenya, Tanzania and Uganda<sup>25</sup> were the ‘first’ or early adopters of mobile money, with all three countries achieving at least 50 per cent penetration by the end of 2012. Ghana, Rwanda and Zimbabwe experienced mobile money expansion later but it scaled more quickly in these markets. For example, it took seven to eight years for mobile money to achieve 100 per cent penetration in Kenya and Uganda from when it was first launched, but in Ghana, Rwanda and Zimbabwe it took four to five years.

The other country in this group is Nigeria, where mobile money adoption has been much more limited. One reason for this is the country’s regulatory framework which, until October 2018, prohibited mobile network operators (MNOs) from providing mobile money services.<sup>26</sup> MNO-led models have been one of the primary drivers of successful mobile money markets.<sup>27</sup> This makes Nigeria a useful point of comparison for evaluating whether trends in monetary and financial outcomes evolved differently in a country where mobile money has not significantly scaled. This can provide indicative evidence on whether mobile money has a direct link with the outcome in question, although it is not conclusive since the analysis does not control for other factors that influence the outcome.

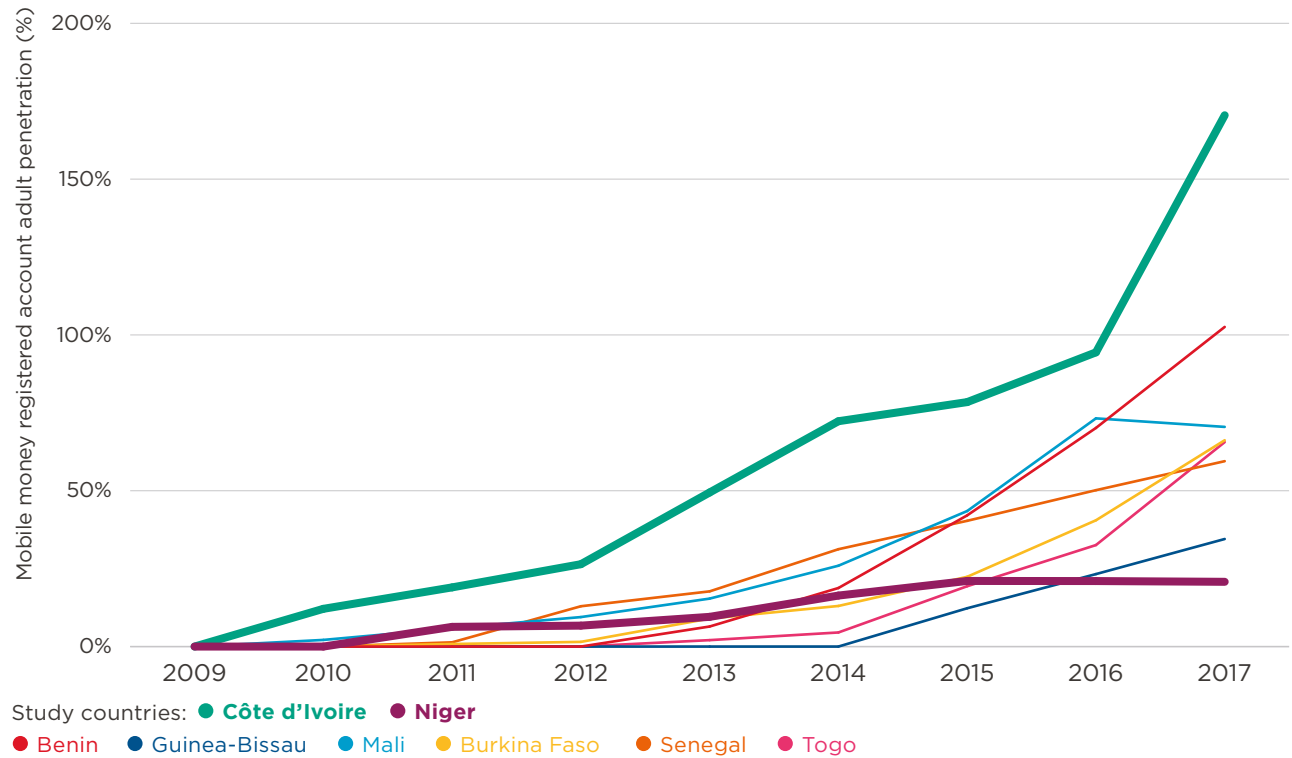
Where it was available, we also collected data on the eight countries in Group 2, which make up the West African Economic and Monetary Union (WAEMU/ UEMOA), and the six countries in Group 3, which make up the Economic and Monetary Community of Central Africa (CEMAC). Figures 3a and 3b present trends in mobile money adoption in these two regions. In both economic unions, mobile money providers effectively operate under the same regulatory framework and central bank oversight.<sup>28</sup> However, countries within the two unions have followed divergent paths in terms of mobile money adoption.

In WAEMU, for example, mobile money has progressed at a much faster rate in Cote d’Ivoire than in Niger. In CEMAC, Gabon has achieved the highest adoption rates, while the Central African Republic and Equatorial Guinea have seen very limited uptake. This therefore enables additional analysis of the potential impacts of mobile money by comparing markets in the same monetary union with different adoption rates. For this study, where possible, we compare Cote d’Ivoire with Niger, and Gabon with the Central African Republic. In most other markets, mobile money has begun to achieve some scale in recent years.

25 While Uganda appears to have lower levels of penetration than other countries in recent years, other data sources looking at active mobile money use show that it remains a market leader. For example, the 2017 World Bank Findex found that more than half of the adult population were active mobile money users, higher than all other countries apart from Kenya.  
 26 Central Bank of Nigeria, 2018. *Financial Inclusion Newsletter, 4th Quarter (December 2018), Volume 3, Issue 4.*  
 27 Naghavi, N. and Shullist, J. (2016). *Success factors for mobile money services: A quantitative assessment of success factors.* GSMA.  
 28 GSMA (2019). *GSMA Mobile Money Regulatory Index.* See: <http://www.gsma.com/regulatoryindex>.

Figure 3a

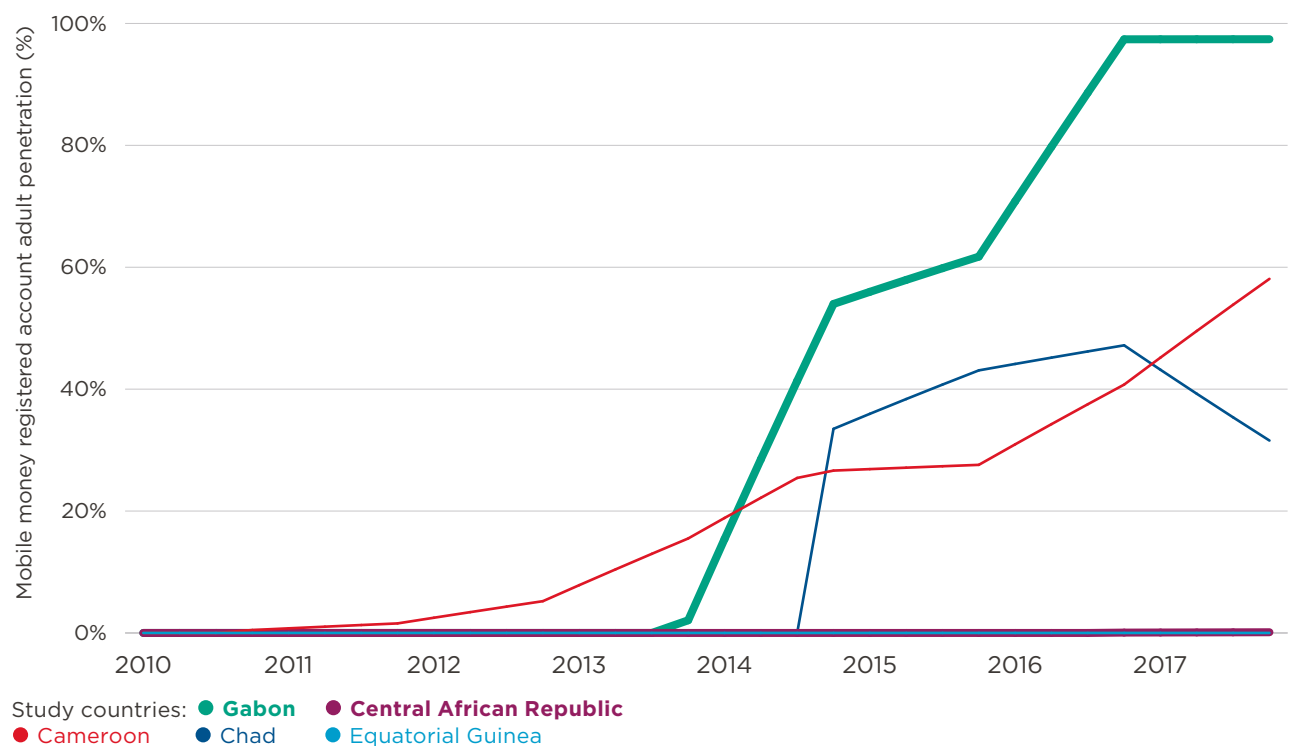
### Mobile money adoption in WAEMU



Source: GSMA Intelligence analysis of data from central banks and the IMF Note: Penetration is calculated by dividing the number of registered mobile money accounts by the adult population

Figure 3b

### Mobile money adoption in CEMAC



Source: GSMA Intelligence analysis of data from central banks and the IMF Note: Penetration is calculated by dividing the number of registered mobile money accounts by the adult population. Data on Congo was not consistent between different sources and so has not been presented.

In order to assess the impact of mobile money on monetary and financial stability, we sourced data on several indicators. For monetary stability, the key considerations set out in Section 1.1 were whether mobile money transferred informal cash and assets into the banking sector, the potential impacts on the money multiplier (and therefore the money supply) and velocity of money. We therefore assess trends in the following outcomes:

- **Ratio of currency outside the banking sector as a proportion of broad money (M2 or M3)<sup>29</sup>** – this measures the proportion of currency held outside the formal financial system relative to total money supply
- **Money multiplier** – the ratio of broad money to reserve money
- **Velocity of money** – calculated as the ratio of nominal GDP to broad money
- **Inflation** – the annual change in the Consumer Price Index (including all items)

For financial stability and the impact on the banking sector, we assess the following outcomes:

- **Proportion of electronic payments accounted for by mobile money transactions**
- **Penetration of commercial bank deposit accounts<sup>30</sup>**
- **Growth in commercial bank deposit values**
- **Return on equity<sup>31</sup> for commercial banks<sup>32</sup>**

For each of these outcome variables, we considered two pieces of analysis. The first looks at average annual growth in the outcome based on different thresholds of mobile money adoption, e.g. the average annual growth in the money multiplier when mobile

money adoption was 0%, 1–40%, 40–80% and greater than 80%. These thresholds represent three stages of market adoption, namely early, intermediate and mature.<sup>33</sup> This analysis allows us not only to assess the potential impact of mobile money, but also helps to determine whether any impacts vary depending on the stage of market development.

The second analysis looks at trends in the outcomes by comparing the ‘early adopter’ countries (Kenya, Tanzania and Uganda), the ‘later adopter’ countries (Ghana, Rwanda and Zimbabwe), and Nigeria where mobile money remains nascent. As discussed above, this allows us to assess whether trends in countries with high levels of mobile money adoption were significantly different to those observed in a country where mobile money has been more limited. If we observe a significant difference, then it is more likely that mobile money had an impact. Where there is available data, we also apply similar comparisons between Cote d’Ivoire and Niger in West Africa and Gabon and the Central African Republic (CAR) in Central Africa.

The main limitation of the trend analysis is that it does not fully isolate the impact of mobile money on the outcomes of interest – it only demonstrates whether there is a correlation or link. However, we believe there is value in such analysis given the current lack of evidence, especially outside Kenya. In particular, the trend analysis can start to inform policy discussions in countries where mobile money has not achieved scale, in order to highlight the potential impacts of mobile money on monetary and financial stability. Furthermore, we consider this to be the first phase of research and plan to build on this study with more sophisticated econometric analysis that can isolate the monetary and financial impact of mobile money.

29 The data gathered for this study includes four types of monetary aggregate commonly referred to as M0, M1, M2 and M3. While definitions vary across country, the following generally applies to the data we have gathered. M0 (or narrow money) refers to currency in circulation plus reserve deposits held at the Central Bank. M1 refers to M0 plus demand deposits. M2 refers to M1 plus time and saving deposits. M3 refers to M2 plus longer-term time deposits (e.g. foreign currency deposits) and less liquid assets. Some countries do not report M3 (for example Nigeria and in Central Africa) but their definitions of M2 are closely aligned with what other countries use for M3. In these cases, we used M2 as the definition of broad money.

30 We also gathered data on the number of loan accounts (and total loan values) but the analysis and findings are similar to those for deposits and so we only present the latter.

31 This is calculated by dividing net income by the value of capital. Data is sourced from the IMF and refers to all deposit-taking institutions in the country.

32 We also gathered data on return on assets – which is calculated by dividing net income by the value of total assets – but the analysis and findings are similar to those for return on equity and so we only present the latter.

33 We explored different percentage thresholds but the results did not significantly change.

# 3 Monetary stability analysis

In this section, we present the results of the analysis for each of the indicators set out in Section 2. Not all countries had comprehensive data on each indicator considered and so we present the analysis based on those countries with complete and available data.

## 3.1 Currency outside the banking sector

Figure 4a presents the average annual growth of the ratio between currency outside the banking sector (COB) and broad money. A negative growth rate means that the ratio of COB to broad money declined and therefore more money entered the banking system. The analysis shows that the growth of money in the banking sector accelerated after mobile money adoption in all four countries considered.

In Kenya and Uganda, the COB to broad money ratio declined more quickly following the uptake of mobile money, particularly during the early stages of adoption. For example, in Kenya the average annual decline in COB/broad money was 2% before mobile money took off, but during the period when mobile money penetration was between 0–40%, the average annual decline was 6%. When mobile money penetration was 40–80% and greater than 80%, the average annual decline was 3%.

In Ghana and Rwanda, the reductions were steeper during the later stages of adoption, which is explained to some extent by mobile money having scaled more quickly in these markets, meaning that impacts materialised at higher levels of penetration. All countries show a declining trend in the proportion of currency outside the banking sector as mobile money has scaled.

Figure 4b presents trends among the ‘early adopter’ countries and the ‘later adopter’ countries along with Nigeria. Nigeria shows that currency outside the banking sector also declined in a country with limited mobile money uptake, though the rate of decline was faster in the ‘early adopter’ countries before 2011 (during the earlier phase of mobile money adoption) and also faster in the ‘later adopter’ countries between 2011–2014. On the other hand, the COB to broad money ratio was already at a lower level in Nigeria compared to the other countries.

This analysis lends further support to a correlation between mobile money adoption and the transfer of informal cash to the formal banking sector, though it is not clear whether it had a direct and causal impact. Another potential explanatory factor in these trends is the continued expansion of the banking industry and, in some countries, the development of micro-finance institutions.<sup>34</sup>

Nevertheless, the fact that such trends are observed following the widespread adoption of mobile money is positive for central banks because it enhances the effectiveness of monetary policy tools if more money is held in the formal financial system.

34 The trends observed in the COB/M3 ratio are broadly similar to trends for COB/M0 so we have not published the latter.

Figure 4a

### Currency outside banking sector as a proportion of broad money

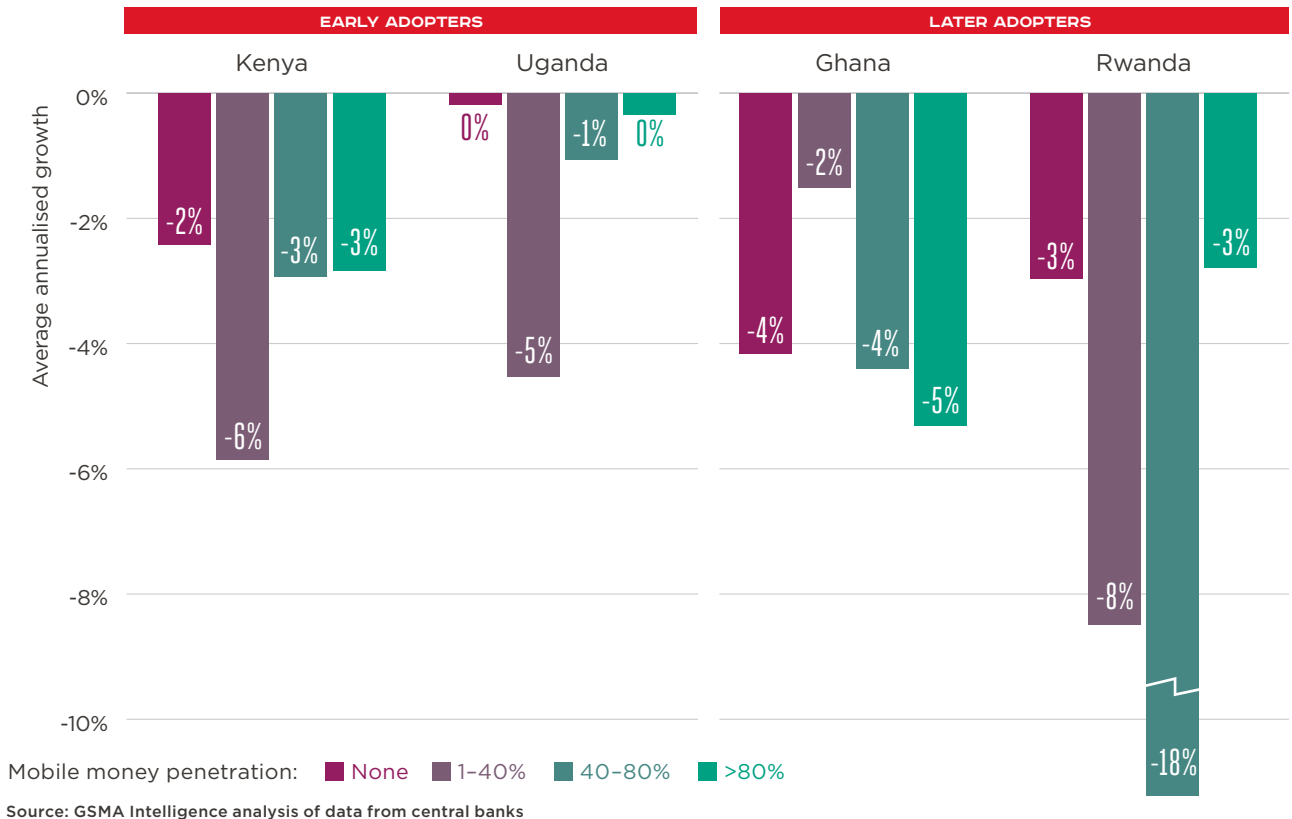
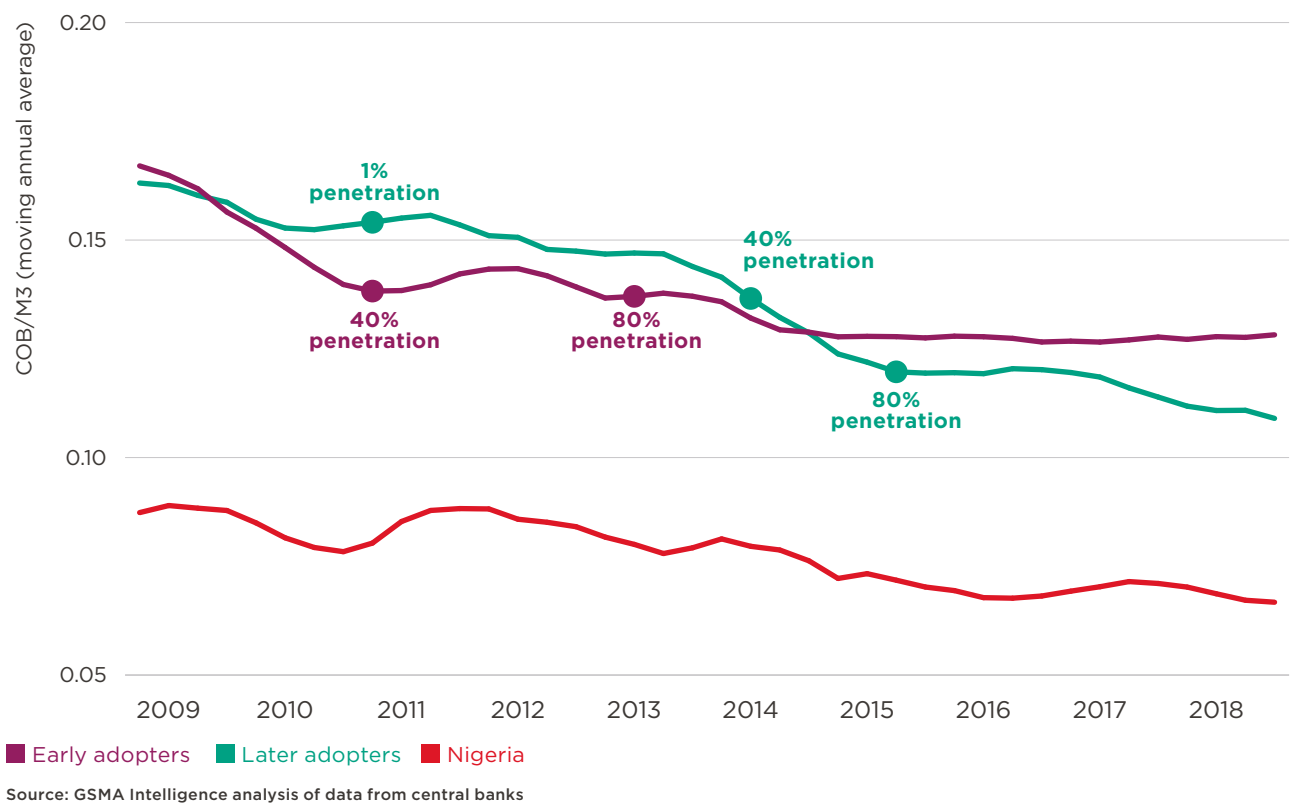


Figure 4b

### Currency outside banking sector - Trend analysis



## 3.2 Money multiplier

The link between mobile money and the money multiplier is likely to be driven by the substitution of currency in circulation by electronic money – as e-money is increasingly used, currency decreases as consumers have less need for cash, and deposits therefore increase.

Figure 5a presents average annual growth in the money multiplier, calculated as the ratio of broad money to reserve money. In most countries, mobile money adoption is associated with growth in the money multiplier, though the profile varies, for example in Tanzania and Ghana the positive link materialised after the early stages of mobile money adoption, when there was negative growth. Zimbabwe stands out as a notable exception where the multiplier decreased, but it is likely this was influenced by the country's decision to adopt the US dollar in 2009 as its main currency following the 2008-09 hyperinflation crisis. As the dollar became increasingly prevalent, additional reserves were added and the country's money multiplier dropped from around 14 in 2013 (compared to 3-4 in most other countries) to levels comparable with other countries in 2017. It is therefore unclear whether the adoption of mobile money has a strong link with the money multiplier in this instance.

Figure 5b presents a trend analysis (excluding Zimbabwe from the 'later adopters' for the reasons above) and shows that as mobile money scaled, the money multiplier generally increased in both the 'early' and 'later' adopter countries. This is in contrast to Nigeria, where the multiplier was more volatile and underwent several reductions. While it is difficult to draw strong conclusions given the significant difference in trends and money multiplier values in

Nigeria in 2008-2013, the period afterwards (when values were more comparable) shows that growth in the money multiplier was stronger and more stable in countries with widespread mobile money adoption.

Furthermore, Figure 5c demonstrates a clear divergent path in the evolution of the money multiplier between Cote d'Ivoire and Niger, with a positive trend in the former (as mobile money scaled) and a negative trend in the latter. Figure 5d also highlights the divergence between the two countries' currency ratios - defined by the currency in circulation as a proportion of total deposits - which closely tracks the opposite trends in the money multiplier in Figure 5c. This illustrates the relationship between higher mobile money adoption and lower demand for currency, which drives an expansion in bank deposits.

By contributing to an increased money multiplier, the volume of money created from the supply of a given monetary base is amplified and will therefore enhance the implementation of monetary policy because total money supply in an economy will be more responsive to a change in base money. However, it is also important that the money multiplier eventually stabilises because volatility introduces uncertainty in the transmission from base money to broad money, which makes it less effective for the purposes of achieving price stability. Figure 5a suggests there remains some growth in the money multiplier when mobile money is mature but that it is more limited than during the early and intermediate phases of adoption, particularly in Tanzania, Uganda, Ghana and Rwanda. Further analysis in the coming years will be useful to determine whether the money multiplier stabilises or if it significantly changes.

Figure 5a

### Money multiplier (broad money/reserve money)

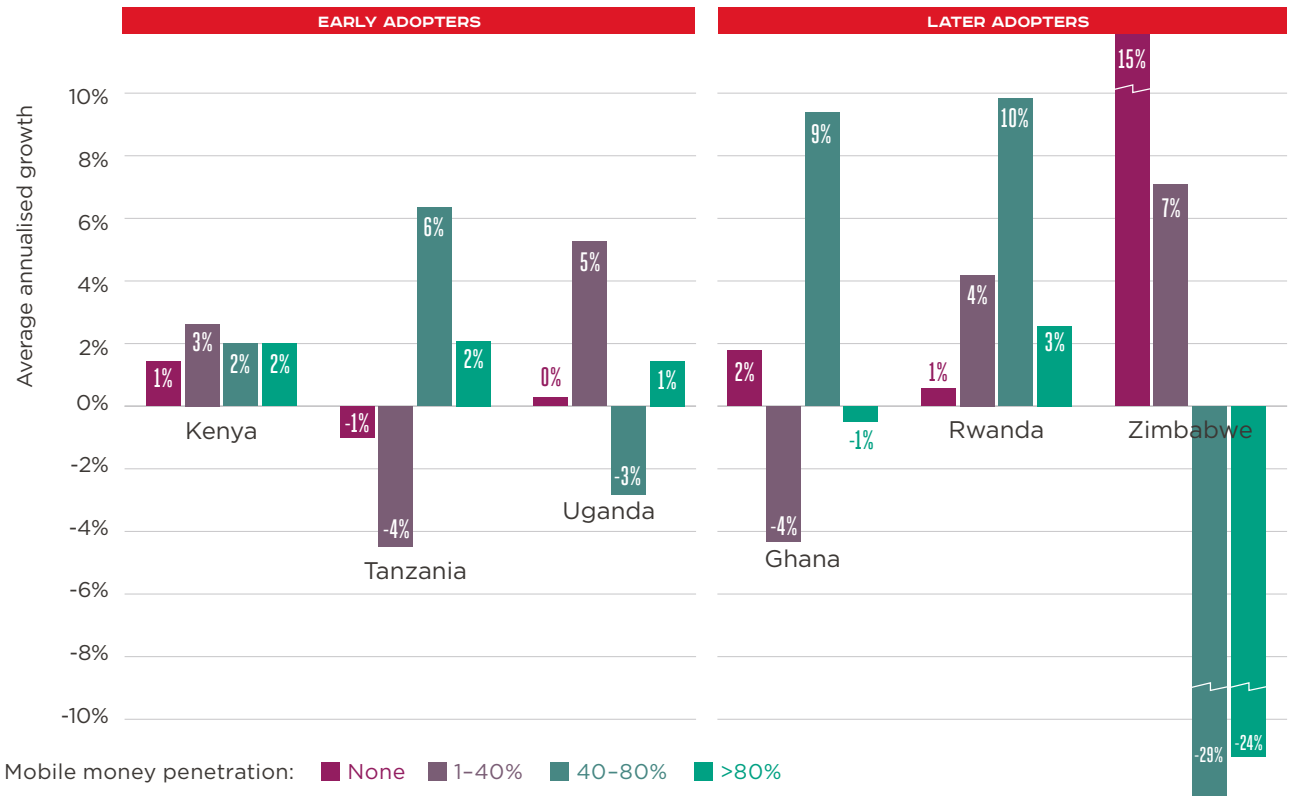


Figure 5b

### Money multiplier - Trend analysis

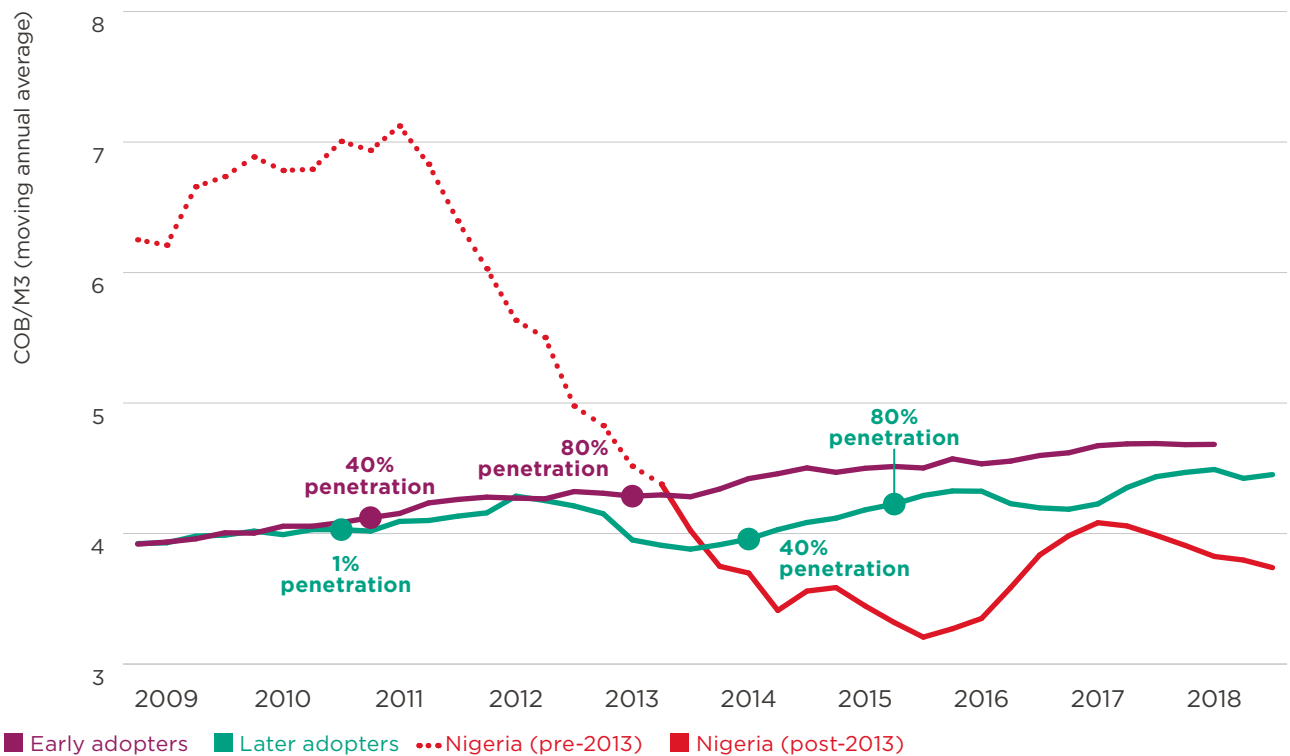
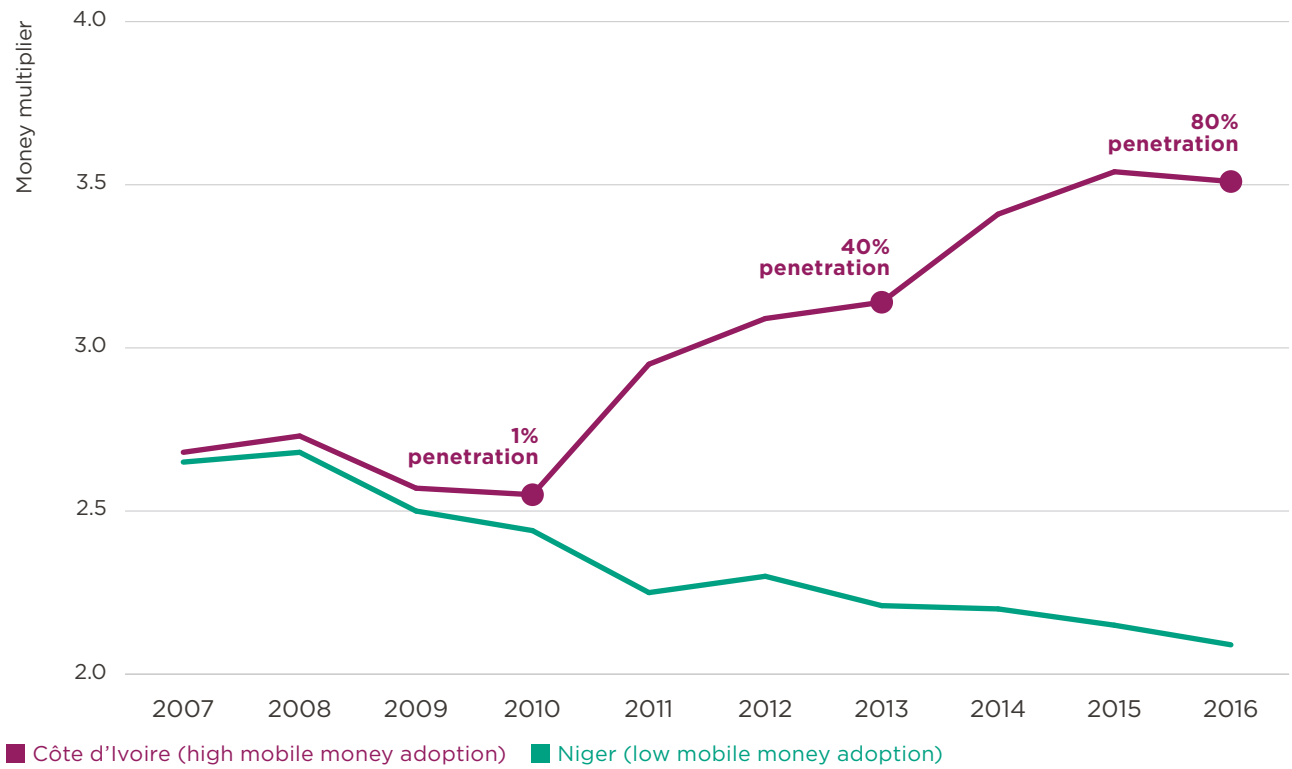




Figure 5c

### Money multiplier in Cote d'Ivoire and Niger



Source: GSMA Intelligence analysis of data from central banks

Figure 5d

### Currency ratio in Cote d'Ivoire and Niger



Source: GSMA Intelligence analysis of data from central banks Note: Currency ratio is calculated as currency in circulation divided by total deposits.

### 3.3 Velocity of money

As set out in Section 1.1, there have been some concerns that mobile money could drive higher inflation if it increases the velocity of circulation. Figure 6a presents the average annual growth rates in the velocity of money by country. It shows that in the early and intermediate stages of mobile money expansion, there was generally a reduction in velocity of money (Uganda being the exception). In three markets (Kenya, Tanzania and Ghana), it increased when mobile money became mature though the magnitude in growth was more limited compared to previous changes (e.g. in Ghana, the average annual increase in velocity was 1% after mobile money adoption reached 80%, compared to an average annual reduction of 7% when mobile money adoption was between 40–80%).

Figure 6b shows a declining trend in the velocity of money as mobile money expands in the ‘later-adopter’ group of countries, before stabilising towards the end of the period. In the ‘early adopter’ group, there was a decline during the initial adoption phase, followed by a relatively stable cycle. By contrast, there was no comparable reduction in the velocity of money over the period of analysis in Nigeria – in fact, the overall trend was upwards.

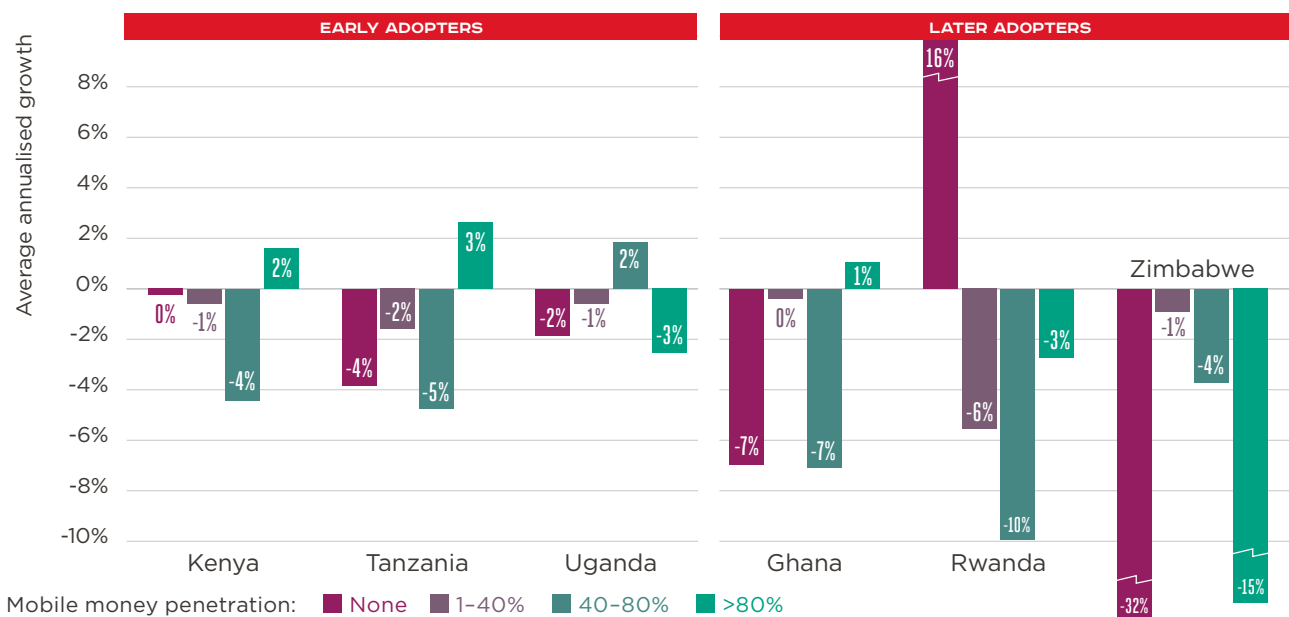
A declining trend is also observed in Gabon in Figure 6c, until the end of the period when it starts to increase, though more data would be required to see if this increase is sustained or if it follows a more stable path, as in some of the countries in Figure 6a. In the case of Figure 6c, however, the declining trend in velocity is also observed in the Central African Republic, which has achieved limited mobile money adoption.

The three pieces of analysis therefore point either towards a link between mobile money expansion and a decline in the velocity of money, or otherwise no relationship between the two. This means that concerns around mobile money driving an increase in the velocity of money did not ultimately materialise in the countries considered in this study.<sup>35</sup>

Furthermore, under the QTM it is necessary for the velocity of money to be stable if a monetary targeting policy is to be effective, otherwise changes in monetary aggregates may not produce the desired changes in overall price levels. Therefore, if velocity becomes stable as the mobile money market matures, which appears to have occurred in most countries with widespread adoption,<sup>36</sup> then this should enable more effective monetary policy.<sup>37</sup>

Figure 6a

#### Velocity of money (nominal GDP/broad money)



Source: GSMA Intelligence analysis of data from central banks and IMF

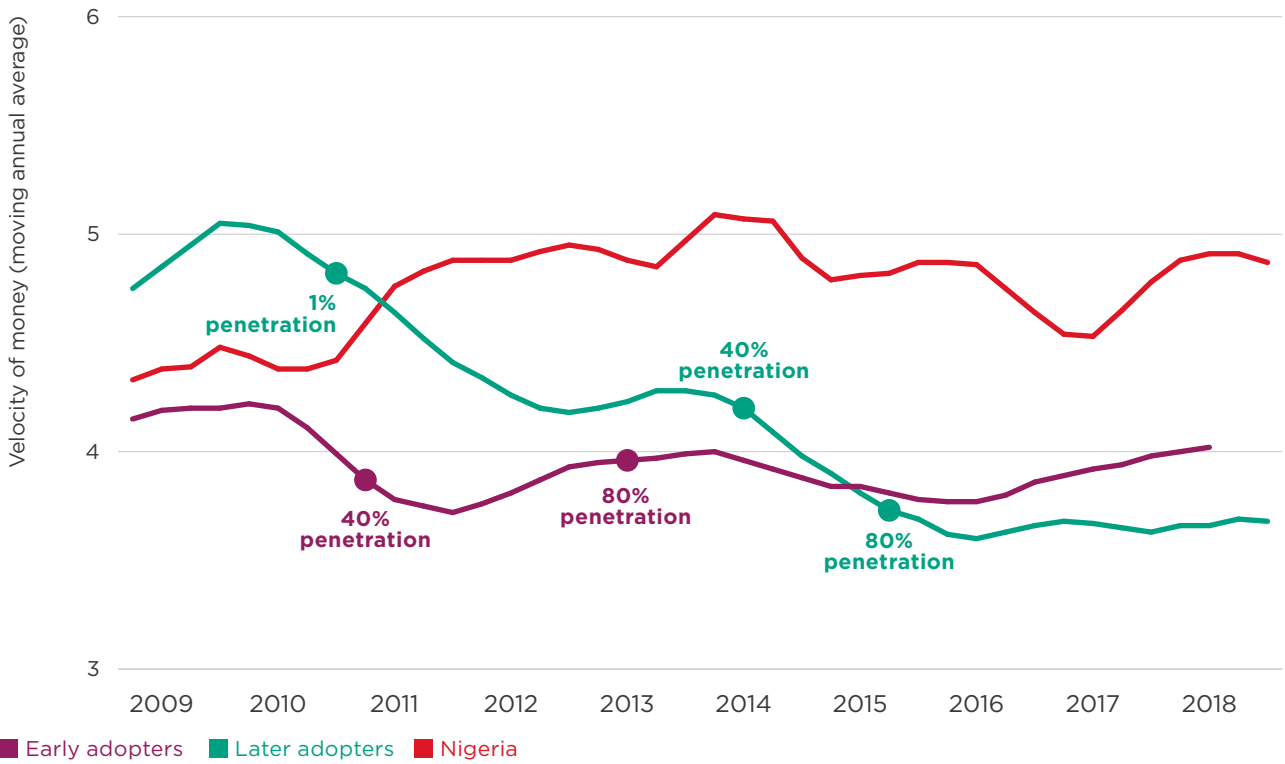
35 Previous studies in Kenya also found this. See Weil, D., Mbiti, I. and Mwega, F. (2012). *The Implications of Innovations in the Financial Sector on the Conduct of Monetary Policy in East Africa*. The authors found that M-Pesa velocity is no higher than the velocity of cash or other monetary components.

36 Zimbabwe is a notable exception.

37 It is worth noting that regular changes in the velocity of money and money multiplier have led to some central banks targeting measures other than monetary aggregates. For example, the Central Bank of Kenya has adopted Net Domestic Assets and Net International Reserves as operational targets.

Figure 6b

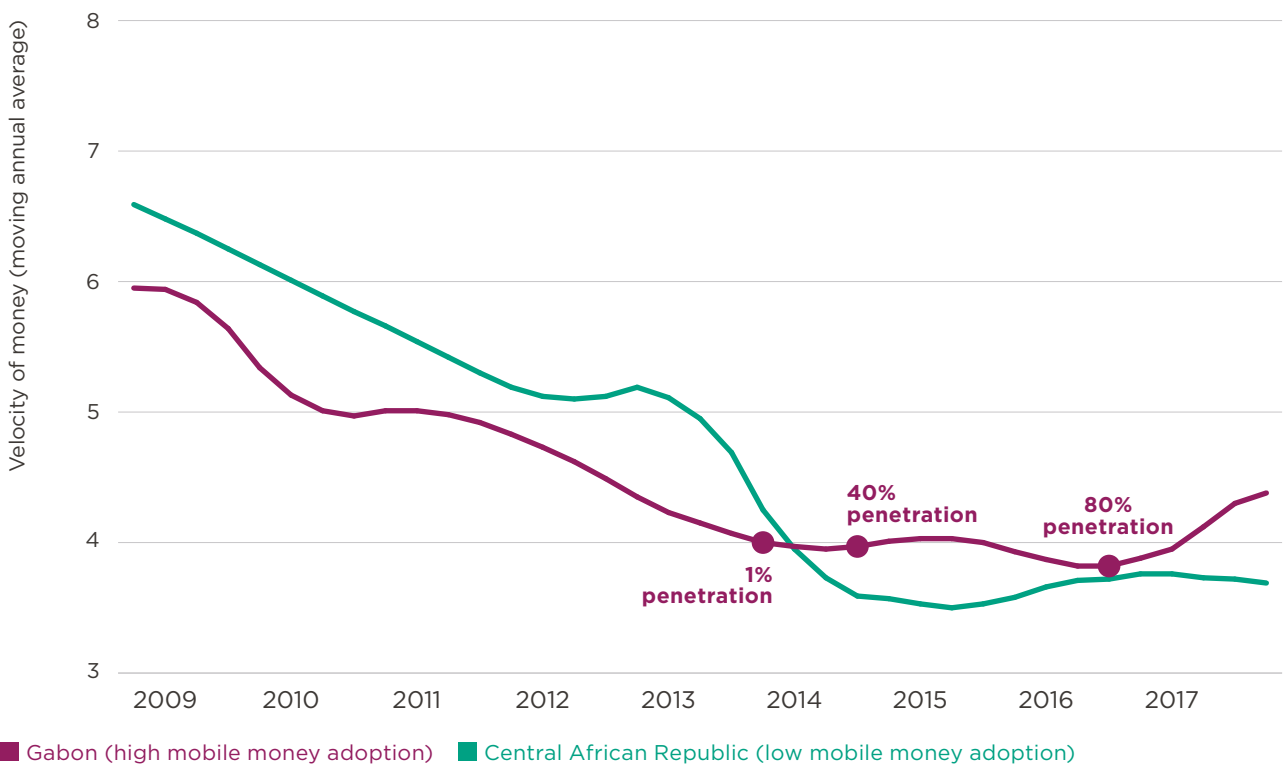
### Velocity of money - Trend analysis



Source: GSMA Intelligence analysis of data from central banks and IMF

Figure 6c

### Velocity of money in Gabon and Central African Republic



Source: GSMA Intelligence analysis of data from central banks and IMF

### 3.4 Inflation

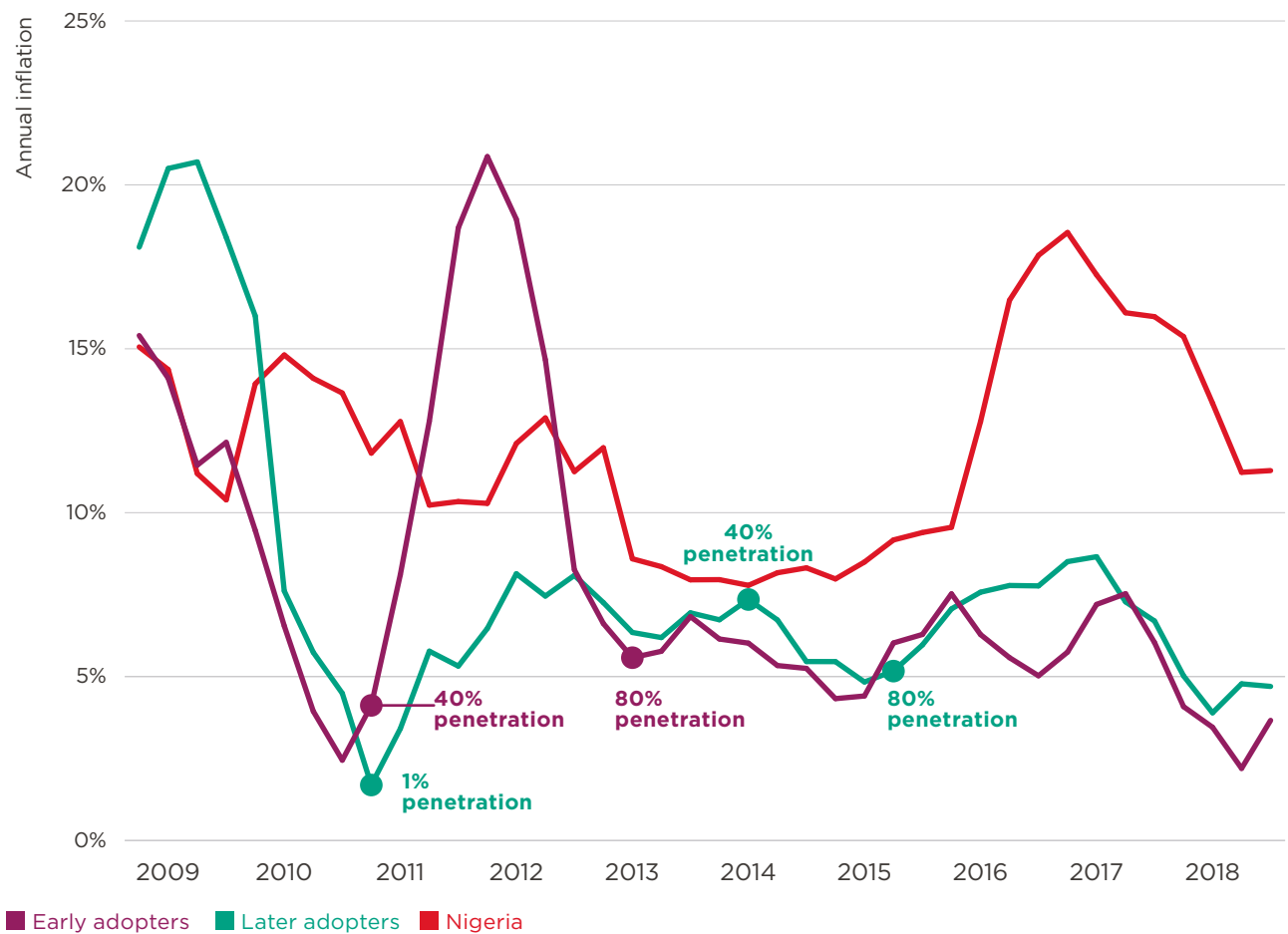
As discussed in Section 1.1, the impact of mobile money on inflation is unclear due to the ambiguous effects on consumption and saving as well as the impact on investment, productivity, competition and the policy response of central banks. Figure 7a shows that there is no clear relationship between inflation and mobile money adoption. In all markets, including Nigeria, inflation has been cyclical. A similar finding is

observed in Cote d'Ivoire and Niger in Figure 7b.

The lack of any clear correlation is consistent with recent research that suggests mobile money has little to no impact on inflation. However, more sophisticated econometric analysis will be required to make a definitive conclusion because it is necessary to control for other relevant factors that drive inflation.<sup>38</sup>

Figure 7a

#### Annual inflation



Source: GSMA Intelligence analysis of data from central banks

38 See for example Aron, J., Muellbauer, J. and Sebudde, R. (2015) Inflation forecasting models for Uganda: is mobile money relevant?

Figure 7b

### Annual inflation in Cote d'Ivoire and Niger



Source: GSMA Intelligence analysis of data from central banks

## 3.5 Summary

The analysis presented in this chapter has important implications. First, the evidence shows that as mobile money scales, there is a decline in the proportion of currency outside the banking sector and an increase in the proportion of money held in the formal banking system. Second, while further analysis is required to confirm a causal relationship, there appears to be a direct link between mobile money adoption and a larger money multiplier, which is partly driven by the reduction in amount of currency relative to overall deposits. This means that money supply is more responsive to changes in the monetary base, improving the effective implementation of monetary targeting. Lastly, concerns that mobile money might increase the velocity of money – and therefore inflation – have not materialised in countries that have achieved widespread mobile money adoption.

Notwithstanding these findings, there is a broader question around the validity of the QTM and whether velocity of money and transactions in an economy can be assumed as stable and unaffected by the money supply. Many economists have also criticised the QTM

at a more fundamental level by arguing that the entire framework ignores important demand- and supply-side factors.<sup>39</sup> This is one of the reasons why some countries in Sub-Saharan Africa have moved towards an inflation-targeting framework, which considers many factors in the conduct of monetary policy and does not give primary focus to the overall money supply (though it still remains an important consideration).<sup>40</sup>

One of the key policy levers in such a framework is (short-term) interest rates. Given the extent of the informal economy in many Sub-Saharan Africa countries,<sup>41</sup> the impact of a central bank’s monetary policy is determined by the amount of economic activity that is influenced by interest rates, which depends on the degree to which individuals use the formal financial system. The analysis in this chapter has shown that mobile money is linked to a greater proportion of currency being held in the financial system. If it is also linked with more individuals using formal financial products (e.g. deposits and loans), then the effectiveness of interest rate policy will be further enhanced. We consider this in the next section.

39 See Aron, J. (2017). ‘Leapfrogging’: A Survey of the Nature and Economic Implications of Mobile Money.

40 Bank of Rwanda (2017). *The Rwandan Banker*, Issue No. 28 ISSN 2410-6844.

41 Meinda, L., Jonelis, A. and Cangul, M. (2017). *The Informal Economy in Sub-Saharan Africa: Size and Determinants*.

# 4 Financial stability analysis

In this section, we present the results of analysis for each of the financial stability indicators set out in Section 2. As in Section 3, not all countries had comprehensive data and so each analysis considers countries with available data.

## 4.1 Mobile money payments

As discussed in Section 1, there have been concerns that the widespread use of mobile money could introduce systemic risk in the payments system. However, in practice the nature of mobile money means that it is very unlikely to pose such a risk, partly because almost all countries require 100 per cent of customer funds to be safeguarded,<sup>42</sup> and also because mobile money is a ‘high-volume, low-value’ payment mechanism.

Figure 8 shows how mobile money payments have evolved in four countries since 2011 relative to other forms of electronic payment (including real-time gross settlements, payment cards, cheques etc).<sup>43</sup> In all four countries considered, mobile money now accounts for a very high proportion of transaction volumes (80–90% in Kenya and Zimbabwe and more than 90% in Ghana and Rwanda), but the proportion of transaction values is significantly less. In Kenya, the most mature mobile money market in the world, it accounts for

less than 10 per cent of total electronic transaction values (if cash transactions were also considered, the proportion would be less). In some countries – notably Zimbabwe – it can be higher, though again this is partly due to the unique circumstances in the country such as cash shortages in recent years. In this case, the expansion of mobile money is likely to have played an important role in facilitating payments and alleviating certain economic and social pressures by allowing individuals to use electronic money instead of cash.

Therefore, the fact that aggregate mobile money payments remain a relatively small proportion of total throughput value suggests that it is very unlikely to trigger disruptions or shocks to a country’s financial system or to other payment systems. Furthermore, central banks can (and do) effectively mitigate any risks by imposing limits on the value and frequency of transactions, along with other limits on account functionality.<sup>44</sup>

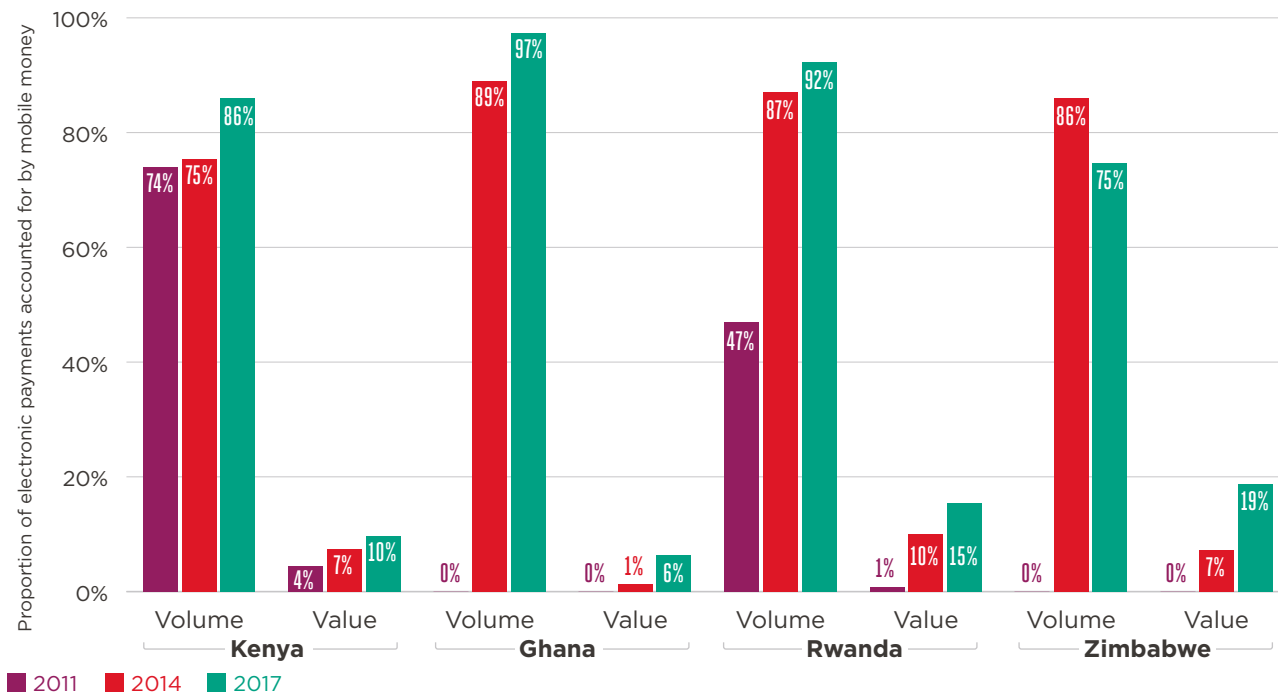
<sup>42</sup> GSMA (2019). GSMA Mobile Money Regulatory Index. See: <http://www.gsma.com/regulatoryindex>.

<sup>43</sup> Data on other countries are not presented because it was unclear whether data on all forms of electronic payment were accounted for.

<sup>44</sup> GSMA (2019). GSMA Mobile Money Regulatory Index. See: <http://www.gsma.com/regulatoryindex>.

Figure 8

### Role of mobile money in electronic payments



Source: GSMA Intelligence analysis of data from central banks

## 4.2 Commercial banking sector growth

Figure 9 presents the average penetration of commercial bank deposit accounts by mobile money market maturity. With the exception of Zimbabwe (which again is likely to be an outlier given the macroeconomic and financial conditions during the past decade), the number of deposit accounts was higher than when mobile money was not in place.<sup>45</sup> For example, in Ghana, the ratio of deposit accounts to adult population was 29% in the period before mobile money was available. When mobile money penetration was below 40% the average ratio increased to 48%, and after mobile money penetration exceeded 80% the average ratio was 69%.

Furthermore, in Kenya, Tanzania, Uganda and Ghana the penetration rate continued to increase as mobile money scaled, which indicates that commercial bank services were not displaced by mobile money services. On the other hand, Rwanda has seen its penetration of deposit accounts slightly decline after a large increase during

the early phase of mobile money adoption. Further analysis would be required to investigate whether this was driven by mobile money or other factors (for example, increasing use of micro-finance products).

The analysis in Figure 10a also shows that outstanding deposit values continued to grow in markets where mobile money scaled. While the growth rate has declined, it has generally been higher than the trend observed in Nigeria, where mobile money adoption has been limited.<sup>46</sup> This provides further evidence that commercial banking was not negatively impacted by mobile money. The analysis is also consistent with Figure 10b, which shows that annual growth in outstanding loans grew more quickly in Cote d'Ivoire (high mobile money adoption) than in Niger (low mobile money adoption), although further data is required to determine whether these trends remain sustained and more analysis is needed to control for other relevant factors, given the volatility observed.

<sup>45</sup> A similar finding is observed for penetration of commercial bank loan accounts.  
<sup>46</sup> A similar finding is observed for outstanding loans.

It does not therefore appear that commercial bank products have been replaced by mobile money. Instead, one of two scenarios is likely to apply:

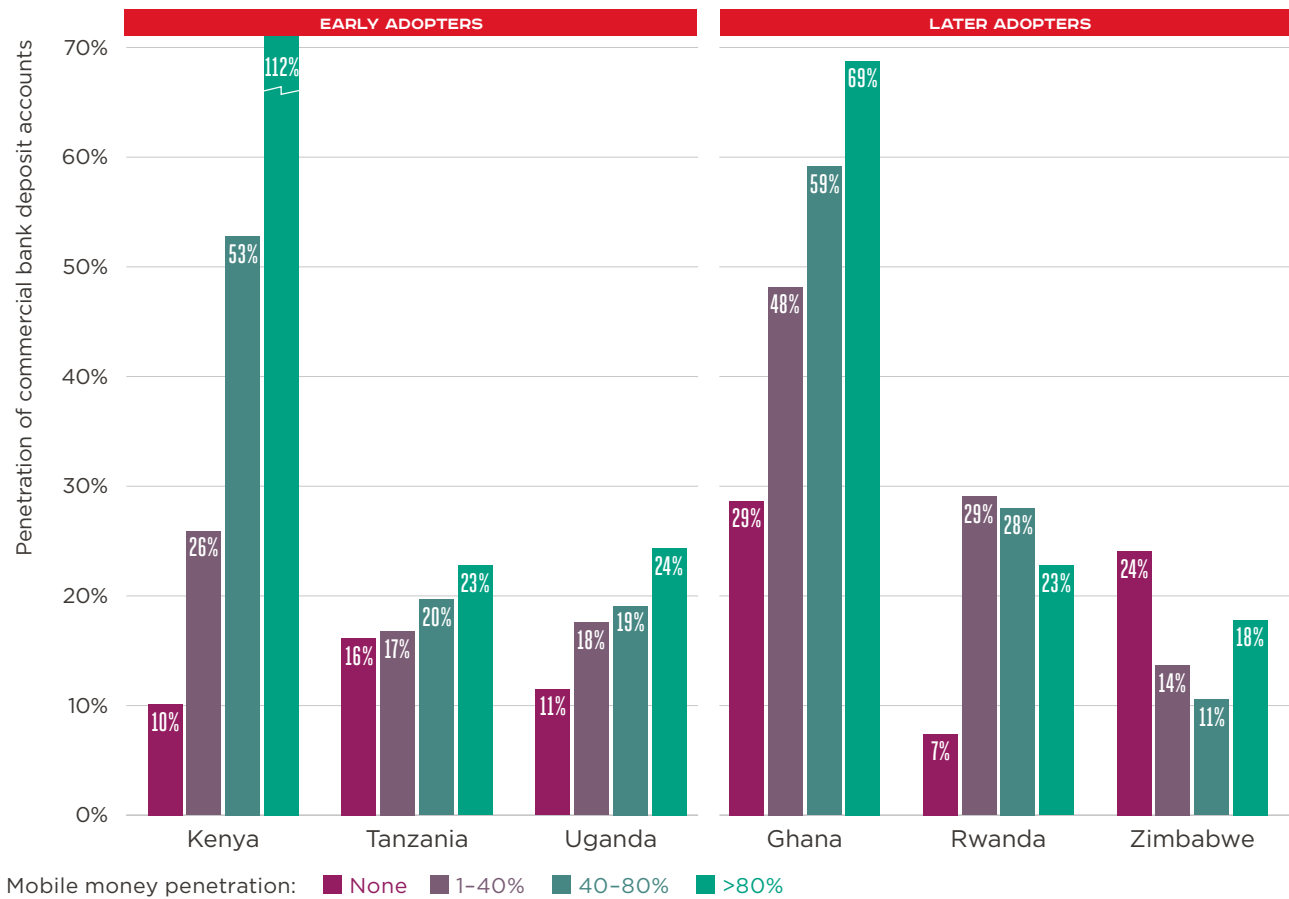
- 1 Mobile money and commercial banks serve different purposes and are not substitutes, which means that commercial banks can continue to expand as mobile money scales, or;
- 2 Mobile money and commercial banking are complementary, with mobile money helping to mobilise deposits and enabling customers to

eventually use more commercial bank services. In countries where mobile money products are linked to formal bank accounts, it may also reduce the unit cost of financial services, allowing banks to expand their customer base and product offering.

Given that Figures 10a and 10b show that commercial banks have expanded more rapidly in markets with higher levels of mobile money adoption, current evidence suggests that the second scenario may better explain the observed trends. However, further analysis is required to conclude on this issue.

Figure 9

### Commercial bank deposit account penetration

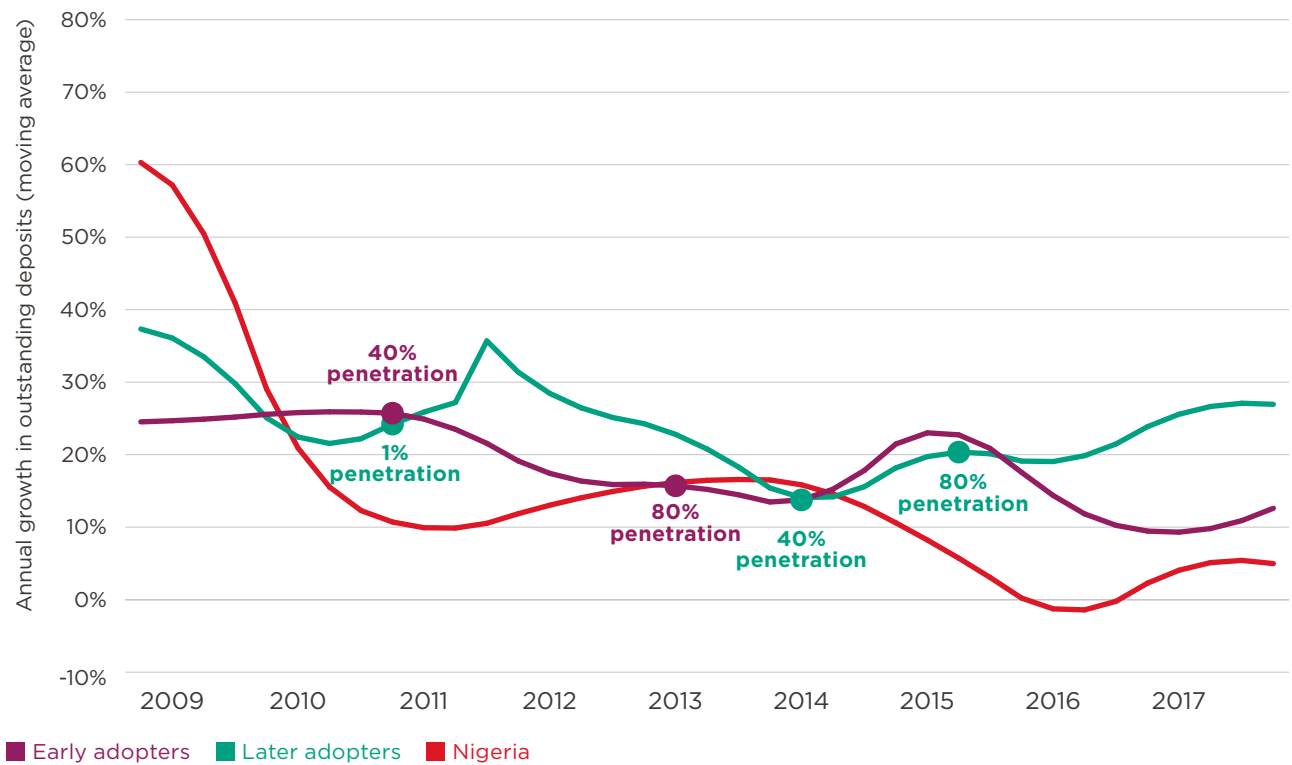


Source: GSMA Intelligence analysis of data from central banks and IMF. Commercial bank deposit account penetration is calculated by dividing the total number of commercial bank deposits accounts by adult population.



Figure 10a

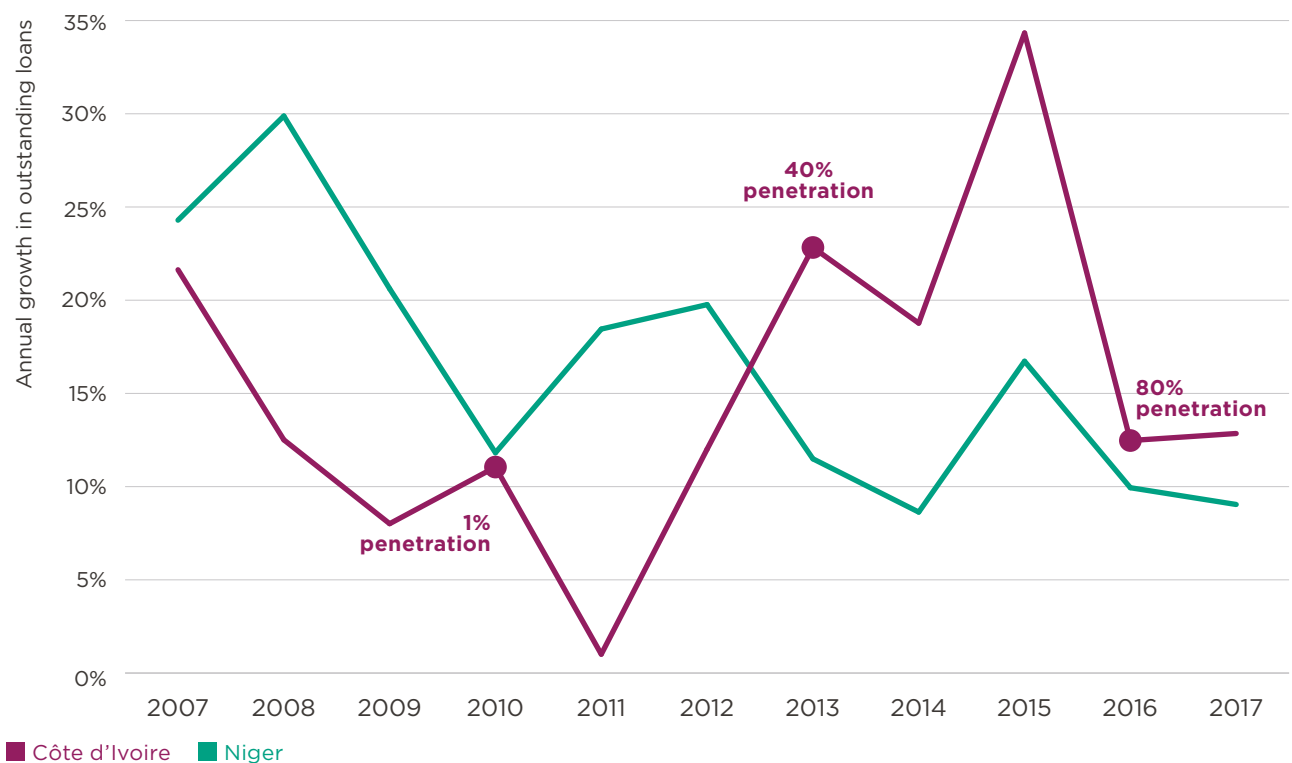
### Growth in commercial bank deposit values - Trend Analysis



Source: GSMA Intelligence analysis of data from central banks and IMF

Figure 10b

### Growth in Commercial Bank Loan Values in Cote d'Ivoire and Niger



Source: GSMA Intelligence analysis of data from central banks and IMF

### 4.3 Return on equity for banks

Figure 11 presents trends in the returns on equity (RoE) for deposit-taking institutions. It shows a declining trend for countries with growing mobile money penetration, though we also observe a decline in Nigeria (after a volatile period before 2013).<sup>47</sup>

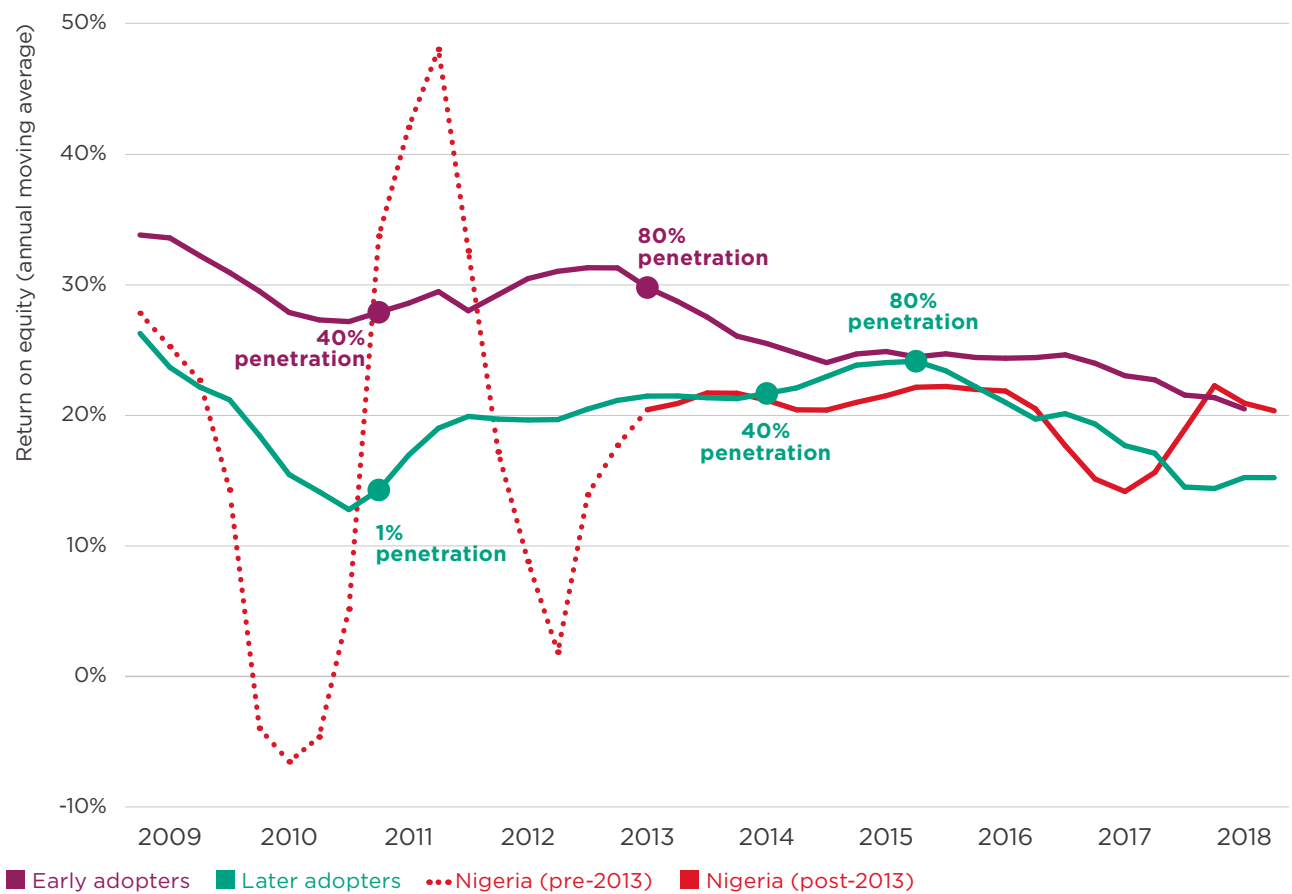
Figure 12 shows that during the period of analysis, average returns earned by banks in other Sub-Saharan African countries also declined. It also shows that returns were consistently and significantly higher than those observed in other regions. The decline has therefore brought average RoE to a level closer to (but still higher than) countries outside Sub-Saharan Africa. This suggests that the observed decline in returns on equity in countries with high levels of mobile money adoption was not driven by mobile money. Instead, there are likely to have been other contributing factors such as central bank policies and financial regulation, for example the tightening of loan provisioning and

legislative interest rate caps (e.g. in Kenya)<sup>48</sup>. Other factors could be increased competition between banks and falling profitability as commercial banks expanded their portfolio to less profitable products or customers.

While the trend is negative across all countries in Sub-Saharan Africa, it is worth noting from Figure 12 that returns on equity for commercial banks have generally been at a higher level than those in countries with lower adoption levels. This is also consistent with analysis presented in Figure 13, which shows that the return on equity in Gabon has been consistently higher as mobile money has expanded, than in the Central African Republic. This could be driven by the potential link outlined in Section 4.2 between mobile money development and more diverse and profitable banking products (and customers) as well as a reduction in operational costs. However, further analysis is required to draw firm conclusions on this.

Figure 11

#### Return on equity - Trend analysis

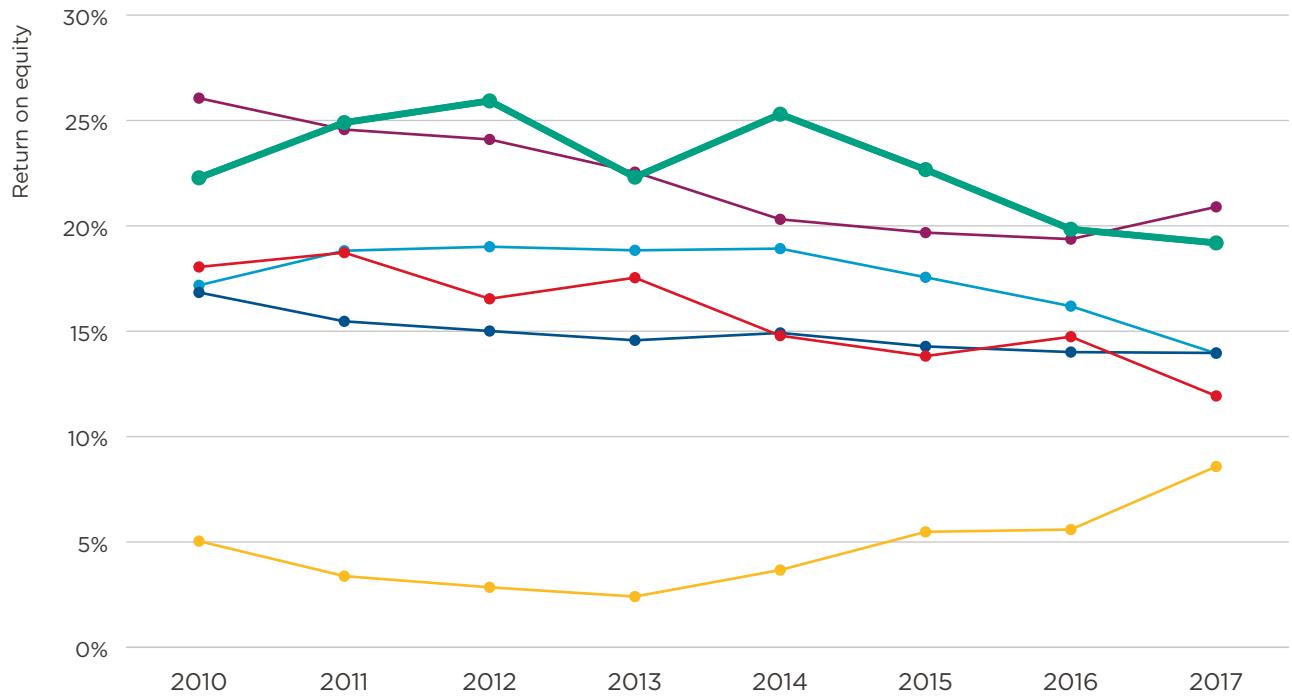


Source: GSMA Intelligence analysis of data from IMF

47 The trends and findings presented on returns on equity are very similar to those based on returns on assets and so we only present the former in the report.  
 48 Central Bank of Kenya (2018). *The Impact of Interest Rate Capping on the Kenyan Economy: Highlights*.

Figure 12

### Return on equity by region



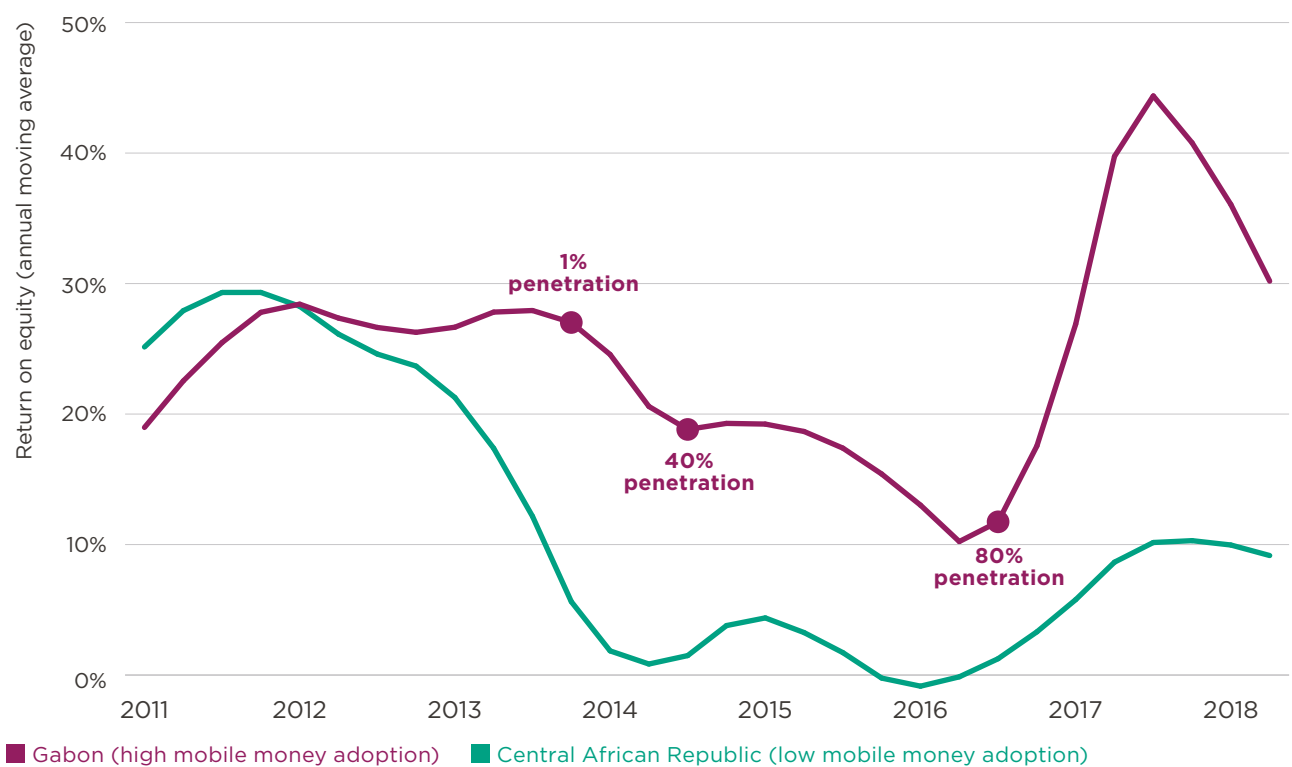
Study countries: ● Sub-Saharan Africa

● Sub-Saharan Africa (other) ● Asia-Pacific (Developing) ● MENA ● Latin America ● Europe

Source: GSMA Intelligence analysis of data from IMF

Figure 13

### Return on equity in Gabon and Central African Republic



■ Gabon (high mobile money adoption) ■ Central African Republic (low mobile money adoption)

Source: GSMA Intelligence analysis of data from IMF

## 4.4 Summary

The analysis in this chapter shows that in countries with high levels of mobile money adoption, commercial banks have continued to expand, suggesting that concerns around mobile money causing financial instability and displacing traditional banks are unfounded. Instead, the analysis indicates that mobile money is complementary to commercial banking services and can enable its diversification and expansion – or at the very least, it has no discernible significant impact.

There is also no evidence to suggest that mobile money has had a negative impact on the financial performance and health of the commercial banking sector. While most countries have seen a declining trend in returns on equity and assets, this is observed in countries with both high and low levels of mobile money uptake. Instead, we observe a more general reduction in returns that are now closer to (though still higher than) those seen in other regions.



# 5 Conclusion

This is the first study, to our knowledge, that has assessed the impact of mobile money on monetary and financial stability across several countries, particularly outside East Africa. This fills an important evidence gap given the fast-evolving nature of mobile money and financial innovation.

In terms of monetary stability, the analysis shows that mobile money can enable more effective monetary policy by transferring currency and assets into the financial system and enhancing financial depth. In particular, mobile money is linked with an increase in the money multiplier, which means that the volume of money created from a given monetary base is amplified, enhancing the monetary targeting instrument. The growth in the multiplier also appears to level off or at least slow down once mobile money is mature, meaning that it returns to a degree of stability, which is a key requirement for effective monetary targeting.

Concerns that mobile money would increase the velocity of money (and therefore inflation) are also unfounded. In fact, there is more evidence to suggest that it is linked with a decline in velocity - a sign of financial innovation and less cash being exchanged. That said, further analysis in the future will be useful to determine whether recent trends showing a levelling off or, in some cases, an increase in velocity are sustained in mature mobile money markets. This is important because, similar to the money multiplier, stability in the velocity of money is a pre-requisite for central banks that use monetary targeting as a policy instrument.

The direct impact of mobile money on inflation is unclear, though the lack of any clear correlation is consistent with recent research that suggests mobile money has little to no impact on inflation.

With regard to financial stability, there is currently no evidence to suggest that mobile money poses a systemic risk to the financial system or other payment systems. Even in the most mature markets, mobile money accounts for a much smaller proportion of transaction values relative to its volumes, highlighting the 'high-volume, low-value' nature of the product.

Furthermore, there is no evidence to suggest that mobile money has significantly displaced commercial bank products or has had a negative impact on the financial health of banks. If anything, the higher growth in bank deposits and loans in countries with high mobile money penetration relative to those countries with limited adoption suggests that mobile money may have enabled growth in the banking sector, for example by enabling users to access more sophisticated financial products. This also has positive implications for monetary policy: if more consumers are saving and borrowing within the financial system, then a greater share of economic activity falls under the influence of central bank interest rates. This means that changes in policy interest rates will have a bigger impact on consumption and investment, which will in turn make them more effective in maintaining stable prices.

Given the broad scope of countries covered in the study, these findings are highly relevant to central banks and the financial industry as they can inform policy discussions both in countries where mobile money has not achieved scale (in order to highlight the potential impacts of mobile money on monetary and financial stability) and where it has.

Going forward, however, it will be important to build on this research by utilising the data in more sophisticated analysis, in order to isolate and better quantify the direct impact of mobile money. It will also be important to refresh such analysis on a regular basis, to ensure that central banks, policy-makers and financial service providers have up-to-date evidence and are able to assess whether the impacts of mobile money change over time.

# Appendix

## Data sources

| Indicator  | Source   | Notes   |
|--|--|---|
| Registered mobile money accounts                 | Central bank data<br>IMF Financial Access Survey | Where data was unavailable from central banks, IMF data was used.<br><br>The number of registered accounts can exceed a country's adult population because individuals can have multiple accounts.  |
| Adult population                                 | World Bank                                       | Used to calculate mobile money penetration  |
| Currency outside the banking sector              | Central bank data                                |   |
| Reserve money and monetary base                  | Central bank data                                |   |
| Broad money                                      | Central bank data                                | M3 was used as the measure of broad money where available. Some countries do not report M3 (for example Nigeria) but their definitions of M2 are closely aligned with what other countries use for M3. In these cases, we used M2 to measure broad money. |
| Nominal GDP                                      | IMF World Economic Outlook                       |   |
| Inflation  | Central bank data                                |   |
| Mobile money payment volumes and values          | Central bank data                                |   |
| Commercial bank deposit accounts                 | IMF Financial Access Survey                      |   |
| Commercial bank deposit values                   | IMF Financial Access Survey                      |   |
| Return on equity for deposit-taking institutions | IMF Financial Soundness Indicators               |   |

[gsma.com/mobilemoney](http://gsma.com/mobilemoney)



### **GSMA Head Office**

Floor 2

The Walbrook Building

25 Walbrook

London EC4N 8AF

United Kingdom

Tel: +44 (0)20 7356 0600

Fax: +44 (0)20 7356 0601